W912DQ-09-D-4004-0024

COMMISSARY
FORT LEE, VIRGINIA

09 MAY 2012

SPECIFICATIONS
100% FINAL DESIGN SUBMITTAL

ARCHITECTURAL AND REFRIGERATION UPGRADE AT THE COMMISSARY

PROJECT NUMBER: EA11M104
A/E PROJECT NUMBER: 2011-052

CROMWELL

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DeCA Guide Specifications

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SECTION 01 11 00

SUMMARY OF WORK

(Edited from DeCA June 2011 Design Criteria)

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Project information.
2. Work covered by Contract Documents.
3. Miscellaneous provisions.

B. Related Requirements:

1. Division 01 Section Work Restrictions for temporary use of premises.
2. Division 01 Section Mechanical, Refrigeration, Food Service Equipment, and Electrical Coordination.
3. Division 01 Section Construction Progress Documentation.
4. Division 01 Section Temporary Facilities and Controls for temporary utilities, support facilities, security, and protection.
5. Division 01 Section Government Furnished Products.

1.2 PROJECT

A. The Work performed under this Contract consists of providing all plant, labor, appliances, equipment, materials, permits, bonds, insurance, and performing all operations necessary and incidental to the work, in accordance with the Contract Drawings and Specifications to complete the following project:

1. Project Name: Architectural, Refrigeration, HVAC, and Uniform Décor Upgrade.
2. Project Location: Fort Lee, Virginia.
3. Project Number: EA11M104.
4. Project Type: Add/Alter.
5. Design Loads: As indicated on drawings.

a. Floor Live Load: Slab on Grade 100 psf.
b. Roof Live Load: 20 psf.
c. Roof Snow Load: 20 psf.
d. WIND: (REFERENCE: ASCE 7-05)
BASIC WIND SPEED 90 MPH
EXPOSURE C
WIND IMPORTANCE FACTOR Iw = 1.00
INTERNAL PRESSURE COEFFICIENTS +/- 0.18
WIND LOAD ON WALL COMPONENTS & CLADDING FIELD: 22 PSF
WITHIN 10' OF CORNER 27 PSF

e. SEISMIC: (REFERENCE: ASCE 7-05)
SEISMIC IMPORTANCE FACTOR Ie = 1.00

SPECTRAL RESPONSE COEFFICIENTS
Ss = 0.187
S1 = 0.058
SITE CLASS D
ADJUSTED MCE SPECTRAL RESPONSE
Sms = 0.299
Sm1 = 0.139
DESIGN SPECTRAL RESPONSE ACCELERATION
SDS = 0.199
SD1 = 0.093
SEISMIC DESIGN CATEGORY B.

f. Other Loads: N/A
g. Unless otherwise indicated calculate design loads according to building code.
h. Provide construction, including anchorage, capable of resisting the effects of applicable design loads.
i. Determine loads using the appropriate exposure coefficient for the construction configuration indicated.

6. Design and Construction Criteria:

a. Department of Defense (DoD) Unified Facilities Criteria (UFC).

1) Design: General Building Requirements, UFC 1-200-01, 27 16 August 2010.
2) Building Code: 2009 International Building Code as supplemented and amended by UFC 1-200-01.

b. Unless otherwise indicated in the Contract Documents, provide materials, systems and equipment designed in accordance with design criteria specified herein.
c. Where performance criteria differ from each other within the Contract Documents, the more stringent performance criteria shall govern in accordance with the Contracting Officer's interpretation.

1.3 GENERAL DESCRIPTION OF PROJECT

A. Alterations to Existing Store:

1. Interior alterations include: Floor finishes of vinyl composition tile, ceramic tile, and resinous flooring; wall finishes of paint, ceramic tile, and fiberglass reinforced panels; and ceiling finishes of suspended acoustical panels and gypsum wallboard.
2. Partial replacement of display cases throughout Sales Area and update decor in the Sales and Checkout Area. New decors includes wall, floor, and ceiling finishes, lighting systems, department signage, accent graphics, aisle directory signs, and slot boards.
3. Rework Checkout Area: Provide new customer service kiosk and registers and adjust layout.
4. Remove existing bank and provide mass display area.
5. Remove existing and provide new patron toilets in new location. Make new mass display area.
6. Additional work includes repair/replacement of existing deficiencies throughout the Commissary Facility.
7. Remove existing roof system and replace with new E.P.D.M. single-ply membrane roof system.
8. Architectural and refrigeration upgrade including electrical upgrades and modifications, mechanical and plumbing improvements and modifications.

B. Site Work:

1. Provide new canopy and sidewalk area for cart storage and provide new benches.

1.4 OVERHEAD MOUNTED ARCHITECTURAL FEATURES

A. Mount overhead mounted architectural features weighing 31 lbs or more (excluding distributed systems such as suspended ceilings that collectively exceed that weight) in accordance with the following to minimize the likelihood they will fall and injure building occupants:

1. Mount such systems so they resist forces of 0.5 times the component weight in any horizontal direction and 1.5 times the component weight in the downward direction.
2. This requirement does not preclude the need to design architectural feature mountings for forces required by other criteria such as seismic requirements.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

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SECTION 01 13 00

NOTICE TO PROCEED

(Edited from DeCA June 2011 Design Criteria)

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Notice to Proceed.

B. Related Sections:

1. Division 01 Section Contract Modification Procedures.
2. Division 01 Section Administrative Requirements.
3. Division 01 Section Construction Progress Documentation.
4. Division 01 Section Project Web Site.
5. Division 01 Section Quality Control.
6. Division 01 Section Temporary Facilities and Controls.
7. Division 01 Section Environmental Management.
8. Division 01 Section Government Safety Requirements.

1.2 SUBMITTALS

A. Submittal List:

Div	Section Title	Reference	Submittal Item	Quantity	Action
00	Solicitation	See Section	General Liability and other items required in this Section	X	I
00	Solicitation	See Section	SF1413	X	R
01	Notice to Proceed	1.3C.2.b.	Roster of Personnel, Suppliers and Subcontractors	X	R
01	Quality Control	See Section	Quality Control Plan	X	R
01	Construction Progress Documentation	See Section	CPM schedule and Sub-schedules	X	R
01	Government Safety Requirements	See Section	Security Plan	X	R
01	Government Safety Requirements	See Section	Fire Prevention Plan	X	R
01	Government Safety Requirements	See Section	Safety Plan	X	R
01	Temporary Facilities and Controls	See Section	Temporary Utilities Plan	X	R

Div	Section Title	Reference	Submittal Item	Quantity	Action
01	Temporary Facilities and Controls	See Section	Temporary Support Facilities Plan	X	R
01	Administrative Requirements	See Section	Record Photographs	X	R
01	Environmental Management	See Section	Spill Prevention and Response Procedure (SPRP) Plan	X	R
01	Environmental Management	See Section	Hazardous Material List	X	R
01	Environmental Management	See Section	Storm Water Pollution Prevention Plan (SWPPP)	X	R
01	Environmental Management	See Section	Notice of Intent (NOI)	X	R
01	Environmental Management	See Section	Solid Waste, Construction, and Demolition Debris Waste Management Plan	X	R

X Submit quantity specified in Division 01 Section Administrative Requirements.
R Review each submittal, mark to indicate action taken, and return.
I Submittal is for information or record purposes only. No action will be taken.

1.3 NOTICE TO PROCEED

A. The Contracting Officer will issue the Notice to Proceed only after Government receipt of Performance and Payment Bonds.

B. Contract Completion:

1. The Notice to Proceed sets the Contractor's Contract start and completion date.

C. Mobilization and Submittal Processing:

1. The activities listed are all included in the time period set forth to complete the Project.
2. Within ten (10) calendar days after receipt of Notice to Proceed, generate and submit all items listed for Government review and/or approval. Government acknowledgement of their approval of these items is a condition-precedent to the Contractor’s commencement of <u>any</u> building construction or demolition activity. Allow for Government review time of 21 calendar days for the first submission and an additional 14 calendar days for any re-submittals, if required.

   a. SF 1413 for all trades.
   b. A Project roster of Contractor’s personnel, subcontractors, and suppliers that includes the name of the firm, names, titles, mailing addresses, email addresses, business phones, and emergency phone numbers.
   c. Quality Control Plan - Reference Division 01 Section Quality Control.
   d. Security Plan - Reference Division 01 Section Government Safety Requirements.
   e. Safety Plan - Reference Division 01 Section Government Safety Requirements.
   f. Fire Prevention Plan - Reference Division 01 Section Government Safety Requirements.

g. Site Usage Plan and submittals related to Government's Designated Inspector's office, Contractor's temporary facilities, fencing, and staging area.

1) Applicable submittal requirements for temporary facilities. See performance and submittal requirements in Division 01 Section Temporary Facilities and Controls.

h. The Government's Designated Inspector's and Contractor's temporary offices, utilities, other facilities, fencing, and staging are installed according to the approved submittals and operational.
i. All of the Contractor's contractually required field staff is on site.
j. Record photographs.
k. Storm Water Pollution Prevention Plan and Notice of Intent.
l. Hazardous Material List and Waste Management Plan.

D. Construction/Demolition:

1. Notify the Contracting Officer upon 100 percent completion of the items listed under Mobilization and Submittal Processing and then commence construction/demolition activities.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

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STATEMENT AND ACKNOWLEDGMENT

OMB No.: **9000-0014**
Expires: 5/31/2011

Public reporting burden for this collection of information is estimated to average 30 minutes per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to the FAR Secretariat, (VIR), Regulatory and Federal Assistance Division, GSA, Washington, DC 20405; and to the Office of Management and Budget, Paperwork Reduction Project (9000-0014), Washington, DC 20503.

PART I - STATEMENT OF PRIME CONTRACTOR

1. PRIME CONTRACT NO.	2. DATE SUBCONTRACT AWARDED	3. SUBCONTRACT NUMBER

4. PRIME CONTRACTOR			5. SUBCONTRACTOR		
a. NAME			a. NAME		
b. STREET ADDRESS			b. STREET ADDRESS		
c. CITY	d. STATE	e. ZIP CODE	c. CITY	d. STATE	e. ZIP CODE

6. The prime contract ☐ does, ☐ does not contain the clause entitled "Contract Work Hours and Safety Standards Act -- Overtime Compensation."

7. The prime contractor states that under the contract shown in Item 1, a subcontract was awarded on the date shown in Item 2 to the subcontractor identified in item 5 by the following firm:

a. NAME OF AWARDING FIRM

b. DESCRIPTION OF WORK BY SUBCONTRACTOR

8. PROJECT	9. LOCATION

10a. NAME OF PERSON SIGNING	11. BY *(Signature)*	12. DATE SIGNED
10b. TITLE OF PERSON SIGNING		

PART II - ACKNOWLEDGMENT OF SUBCONTRACTOR

13. The subcontractor acknowledges that the following clauses of the contract shown in Item 1 are included in this subcontract:

- Contract Work Hours and Safety Standards Act - Overtime Compensation - (If included in prime contract see Block 6)
- Payrolls and Basic Records
- Withholding of Funds
- Disputes Concerning Labor Standards
- Compliance with Davis-Bacon and Related Act Regulations
- Davis-Bacon Act
- Apprentices and Trainees
- Compliance with Copeland Act Requirements
- Subcontracts (Labor Standards)
- Contract Termination - Debarment
- Certification of Eligibility

14. NAME(S) OF ANY INTERMEDIATE SUBCONTRACTORS, IF ANY

A		C	
B		D	

15a. NAME OF PERSON SIGNING	16. BY *(Signature)*	17. DATE SIGNED
15b. TITLE OF PERSON SIGNING		

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SECTION 01 14 00

WORK RESTRICTIONS

(Edited from DeCA June 2011 Design Criteria)

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Contractor use of premises.
2. Occupancy requirements.

B. Related Sections:

1. Division 01 Section Administrative Requirements.
2. Division 01 Section Mechanical, Refrigeration, Food Service Equipment, and Electrical Coordination.
3. Division 01 Section Construction Progress Documentation.
4. Division 01 Section Quality Control.
5. Division 01 Section Temporary Facilities and Controls.
6. Division 01 Section Environmental Management.
7. Division 01 Section Closeout Procedures.

1.2 CONTRACTOR USE OF PREMISES - ADD/ALTER PROJECTS

A. Use of the Site: Limit use of the premises to work in areas indicated in the contract documents. Confine operations to areas within contract limits indicated. Do not disturb portions of the site beyond the indicated work areas. Utilize the lay down area identified in the Contract Drawings for all materials and supplies.

B. Government Occupancy: Allow for government occupancy. Do not disrupt operations of the existing facility. Coordinate use of premises under direction of the Contracting Officer. Provide and maintain signage and barriers to prevent patrons and DeCA store employees' access into construction areas.

C. Do not load structure with weight that will endanger structure.

D. Relocate stored construction materials or equipment that interferes with commissary operations.

E. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site. Do not unreasonably encumber site with materials or equipment.

F. Assume full responsibility for protection and safekeeping of material, equipment, and products stored on premises.

G. Keep temporary office yard and material storage (staging) areas arranged in orderly manner, clean and mowed. Repair areas damaged during construction operations.

H. Use of Existing Building: Maintain existing building in a weather tight condition throughout construction period. Repair damage caused by construction operations. Secure and protect building and its occupants during construction period.

I. Provide temporary chain link fence enclosure (gated and locked) around material storage area as indicated and as specified in Division 01 Section Temporary Facilities and Controls. The temporary construction fence remains in place until final acceptance of the Project. Provide temporary barriers around site work areas to keep pedestrians out of the construction areas.

J. Obtain and pay for use of additional storage or work areas as needed for Contractor operations.

K. Provide signage and physical barriers to control, direct, and maintain vehicular and pedestrian traffic during the construction process.

L. Do not impact/disturb surfaces that are known to contain hazardous materials until properly trained workers and systems are established to prevent release, transport, and disposal. If unknown/suspect hazardous materials are scheduled to be disturbed, Contractor to cease work, notify Contracting Officer, and allow confirmation by CIH prior to proceeding.

1.3 OCCUPANCY REQUIREMENTS - ADD/ALTER PROJECTS

A. Full Government Occupancy: The government will occupy the site and existing facility during the entire construction period. Cooperate with the government during construction operations to minimize conflicts, store disruptions, and facilitate government usage. Perform the work so as not to interfere with the government's operation.

B. Contractor Occupancy: Seven calendar days prior to Contractor occupancy of any phase or subphase of construction, submit a written request to the Contracting Officer for approval to move and work in the area. Approval of said request will depend on Contractor's satisfactorily completing other contract requirements, such as but not limited to, returning other phases to the Commissary in a condition ready for occupancy.

C. Partial Government Occupancy: The government reserves the right to occupy and to place and install equipment in areas of the facility under construction prior to construction completion, provided such occupancy does not interfere with completion of the work.

1. The Government’s Designated Inspector will record a Beneficial Occupancy Date as established by the Contracting Officer for each specific portion of the work prior to government occupancy.
2. Prior to government occupancy of a phase, within the phase, make equipment and systems fully operational, complete construction and finishes, and verify there are no limits to the intended use of the area and systems in that phase or previously accepted phases. Successfully complete required inspections and tests.
3. Upon occupancy, the government will assume responsibility for loss or damage to work resulting from the government’s use and possession. The government will assume responsibility for maintenance (Exception: HVAC and refrigeration) and custodial service for occupied portions of the facility.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

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SECTION 01 26 00

CONTRACT MODIFICATION PROCEDURES

(Edited from DeCA June 2011 Design Criteria)

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Funding.
2. Construction versus equipment elements.
3. Modification procedures.

B. Related Sections:
1. Division 01 Section Notice to Proceed.
2. Division 01 Section Administrative Requirements.
3. Division 01 Section Construction Progress Documentation.
4. Division 01 Section Project Web Site.
5. Division 01 Section Quality Control.
6. Division 01 Section Temporary Facilities and Controls.
7. Division 01 Section Closeout Procedures.

1.2 SUBMITTALS

A. Refer to Division 01 Section Administrative Requirements for procedures.

B. Submittal List:

Reference	Submittal Item	Quantity	Action
1.5	Contract Modification Procedures	X	R

X Submit quantity specified in Division 01 Section Administrative Requirements.
R Review each submittal, mark to indicate action taken, and return.
I Submittal is for information or record purposes only. No action will be taken.

1.3 FUNDING

A. Elements of Work: The Government may fund different elements of the Work from different funding sources. Identify and segregate costs of the different elements of the Work when preparing the Critical Path Method (CPM) Construction Schedule and Contract modification proposals.

1.4 CONSTRUCTION VERSUS EQUIPMENT ELEMENTS

A. Refer to the attachment at the end of this Section for identification of building components and process equipment.

B. Use this attachment and the other specifically identified funded work requirements as it relates to CLIN allocation and as an aid in developing the schedule of values, the Contractor's Critical Path Method Construction Schedule, applications for payment, and Contract modification proposals.

1.5 MODIFICATION PROCEDURES

A. Supplemental Instructions:
1. From time to time during progress of the Work the Contracting Officer may issue supplemental instructions which interpret the Contract Documents or order minor changes in the Work without change in Contract Sum or Contract Time.
2. Should the Contractor consider that these instructions or minor changes require a change in the Contract Sum or Contract Time, he shall comply with F.A.R. notice requirements, and then submit an itemized proposal to the Contracting Officer prior to proceeding with the Work. If the government agrees to entitlement and the proposal is satisfactory and in proper order, a Contract Modification for that event will supersede the supplemental instructions.

B. Proposal Requests:
1. From time to time during progress of the Work, the Contracting Officer may issue a proposal request for an itemized quotation for a potential change in the work that affects the Contract Sum or Contract Time.
2. This is not a direction to proceed with the changes described therein.

C. Government's Right to Change:
1. Without invalidating the Contract and without notice to any surety, the Contracting Officer may, at any time or from time to time, order additions, deletions, or revisions in the work, within the general scope of the Contract.

D. Modification Requests:
1. Government-initiated Proposal Requests: The Contracting Officer will issue a detailed description of proposed changes in the work that will require adjustment to the Contract sum or Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications. Proposal requests issued by the Contracting Officer are for information only. Do not consider them an instruction either to accelerate or stop work in progress or to execute the proposed change.
2. Contractor-initiated Proposals: When differing or unforeseen conditions require modifications to the Contract, the Contractor may propose changes by submitting a request for change to the Contracting Officer. Comply with F.A.R. notice requirements. Include a statement outlining the reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract sum or schedule by including a detailed cost proposal and the CPM Construction Schedule depicting affected critical path changes.

E. Allowances:
1. Allowance Adjustment: For unit cost allowance adjustment, base each modification proposal on the difference between the actual unit purchase amount and the unit allowance, multiplied by the final measurement of work-in-place. Where applicable, include reasonable allowances for cutting losses, tolerances, mixing wastes, normal product imperfections, and similar margins.
2. Unless specifically directed otherwise, include furnishing and installing the allowance item, inclusive of any testing or start-up requirements, in the allowance cost.
3. Notify the Contracting Officer or Government's Designated Inspector at least 24 hours in advance of installing allowance based items. Coordinate with the Government's

Designated Inspector who must be present for witness and certification of the quantity installed.

4. Submit proposals for increased costs because of a change in scope or nature of the allowance described in the Contract Documents, whether for the purchase order unit amount or the contractor's handling, labor, installation, overhead, and profit.
5. Submit proposals within 10 days of receipt of the modification or directive authorizing work to proceed. The Contracting Officer will reject claims submitted later than 10 days after the event giving rise to the claim.
6. There is no change to the Contractor's indirect expense for selection of higher or lower-priced materials or systems of the same scope and nature as originally indicated.

F. Differing Site Conditions: Refer to F.A.R 52.236-2.
1. Promptly, and before disturbing such conditions (except in an emergency), notify the Contracting Officer.
2. Comply with written F.A.R. notice requirements. The Contracting Officer will not allow any claim for additional compensation by the Contractor under this clause unless the Contractor first gives notice required by this Contract.
   a. Promptly is defined as "without delay."
3. In the event the Contracting Officer and the Contractor are unable to reach an agreement concerning an alleged differing site condition, keep an accurate and detailed record which will indicate the actual cost of the work done under the alleged differing site condition. Failure to keep such record precludes the Contractor’s recovery of alleged differing site conditions. Contractor must give the Contracting Officer the opportunity to supervise and check the keeping of such record.

G. Errors or Omissions:
1. Promptly, and substantially before work scheduled on such conditions (except in an emergency), notify the Contracting Officer in writing of:
   a. The discovery of an error, omission, or some other conflict with the Contract Documents that materially affect the intended use of the facility.
2. The Government’s Designated Inspector will promptly investigate the conditions and will notify the Contracting Officer who will provide the Contractor with instruction.

H. Proposal Preparation:
1. Include a detailed list of quantities of required products, labor, hours, rates, and unit costs, with the total amount of purchases.
   a. State proposed change in the Contract Sum, if any.
   b. State proposed change in the Contract Time of completion supported by a fragnet.
   c. Clearly describe other changes in the Work, if any, required by the proposed change.
   d. Include full backup data such as subcontractors’ letter of proposal or similar information.
2. List and include applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
3. Comply with paragraphs of this Contract that address substitution.
4. Within 10 days of receipt of a proposal request, on AF 3052, submit the proposal of cost necessary to execute the change, including time impact related costs, to the Government’s Designated Inspector for review.
5. Refer to Division 01 Section Construction Progress Documentation for required schedule related attachments to the proposal.
6. The Contracting Officer will negotiate maximum mark-ups allowed in proposal cost estimates.
7. Use the modification numbering sequence established by the Contracting Officer to identify the various proposed modifications and approved modifications.

8. Instruct any subcontractor to comply with above requirements when the cost proposal includes a quotation from a subcontractor. Review subcontractors' cost and time proposals for legitimacy and reasonableness. Do not forward any illegitimate or unreasonable proposals to the Contracting Officer.
9. Upon the Contracting Officer's approval of a modification proposal, the Contracting Officer will issue a modification for the Contractor's signature. The Contract Modification will become effective upon execution by the Contracting Officer and Contractor.

I. Processing Proposal Requests:
1. Make written reply to the Contracting Officer in response to each proposal request.
   a. Submit response in single copy and simultaneously e-mail the Contracting Officer and Government's Designated Inspector a duplicate PDF version.
2. When the Contracting Officer and the Contractor have agreed upon a change, or when the Contracting Officer directs that cost or credit be determined in accordance with the provisions of the Contract, the Contracting Officer will issue a Contract Modification to the Contractor.

J. Processing Contract Modifications:
1. The Contract Modification will describe the change or changes, will refer to the proposal requests or supplemental instruction involved, and contain the Contracting Officer's signature.
2. The Contracting Officer will issue the Contract Modification to the Contractor.
   a. Promptly sign and return to the Contracting Officer and electronically transmit a duplicate scanned copy bearing both signatures to the Contracting Officer.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

CONSTRUCTION VERSUS EQUIPMENT ELEMENTS

Refer to Schedule "B" attachment to Standard Form 1442, "Solicitation, Offer, and Award," for CLINs applicable to this project.

CONSTRUCTION

BUILDING

§ normal building construction, including foundations, slab and structural elements, roofing, walls and partitions.

§ normal architectural finishes, both interior and exterior.

§ plumbing, including sinks, toilets, and other fixtures

§ utility meters.

§ fire protection and alarm systems.

§ electrical power & lighting to the building and equipment, including power to all equipment such as balers, material handling equipment, charger units, processing equipment, etc. (but NOT to refrigerated equipment).

§ fire extinguisher cabinets

§ toilet partitions

§ toilet and bath accessories

§ building demolition (including foundation, and all building systems to 5' line

§ utilities 5' or less from building lines

- entry/exit automatic doors and associated appurtenances to include electrical connections
- overhead warehouse/receiving/shipping doors and door operating systems
- HVAC systems and associated appurtenances, including associated platforms and electrical connections, except systems serving the commissary sales area
- loading dock levelers and dock accessories including electrical connections
- trash chutes and conveyors, including associated doors and connections for compactors and storage containers.

SITE WORK

§ site clearing.

§ grading and drainage improvements.

§ Improvements for parking, circulation, walks, and receiving areas, including lighting more than 5' outside building lines.

§ Traffic safety devices, controls and other improvements.

§ landscaping.

§ retention ponds, environmental mitigation.

§ site demolition.

§ utilities more than 5' outside building lines and associated costs of extending utilities to the site.

- berms and force protection barriers
- exterior protective bollards and guard rails fencing and other screening

EQUIPMENT

GENERAL SALES AREA

§ all refrigerated and non-refrigerated display cases and shelving.

§ island merchandisers.

§ aisle markers and decor

§ carts (carryout, grocery, stocking, etc.).

§ cash registers and associated equipment.

§ scanning equipment.

§ scales.

§ checkout stands and lane number lights.

§ queuing directors.

§ pizza carts and tables.

§ plant and floral display units.

§ mass merchandising pedestals.

§ merchandise demonstration tables.

- equipment and wall protective bollards and rails
- sales area HVAC systems and appurtenances

BAKERY/DELI

§ reach-in freezers and coolers.

§ shelving.

§ ovens.

§ oven/proofer.

§ retarders.

§ glazing and icing centers.

§ mixers.

FURNITURE AND FIXTURES

§ systems furniture.

§ modular seating units.

§ desks.

§ file cabinets.

§ refrigerators.

§ microwave ovens.

MEAT DEPARTMENT

§ tables, freestanding.

§ conveyors.

§ slicers.

§ saws.

§ grinders.

§ scales

§ labelers.

§ wrappers.

§ fat testers.

§ platters and trays.

§ tenderizers.

§ molders.

§ carts

§ mixers.

§ patty machines.

STAGING AND RECEIVING

§ bumper guards.

§ dock seals.

§ storage racks.

§ materials handling equipment.

§ chargers.

§ forklifts.

§ pallet jacks.

§ order selectors.

§ balers.

§ compactors.

§ sweepers and scrubbers.

EQUIPMENT, continue

DAIRY DEPARTMENT

§ roll-in dairy milk bossy carts

§ Insulated curtains

- Glass door merchandisers and accessories

PRODUCT REFRIGERATION SYSTEMS

§ walk-in coolers and freezer enclosures.

§ refrigerated unit doors, seals, strips, and heater elements.

§ electrical power tie-in to all refrigerated systems.

§ plumbing tie-ins to all refrigerated equipment.

§ condenser units.

§ compressor units.

§ blowers and exhaust systems.

§ refrigeration system controls and monitoring devices.

§ refrigeration lines

§ Electrical Service from panel to compressor system

PROCESSING AREAS

§ ice machines.

§ wire rack shelving for refrigerated walk-in units.

§ garbage disposal units.

§ work tables

§ scales.

OTHER

§ telephone, intercom, public address and other in-store communications systems.

§ background music systems.

§ emergency generators and transfer switches

§ safe.

§ sales area marketing décor, including all departmental and store signage

§ lockers

§ protective bollards and rails in product storage and transfer areas

§ security systems (duress and intrusion)

- all prewiring and connection junctions for IT systems.

§ closed circuit television (CCTV) systems.

- Key cabinets and cipher locking systems

FACILITY MAINTENANCE AND REPAIRS ASSOCIATED WITH BUILDING RENOVATION AND REMODELING, INCLUDING REPAIRS BY REPLACEMENT:

§ architectural building finishes for repair of walls, ceilings, and flooring (exterior and interior)

§ roofing.

§ repainting.

§ patching, reconstruction, or overlay of deteriorated pavements.

§ repair by replacement of utility systems inside and outside the building.

§ domestic hot water systems.

§ structural systems, including upgrades for code compliance.

§ site systems, including drainage, landscaping, paving and striping.

§ communications systems, internal and external.

§ closed circuit television (CCTV) systems.

§ public address (PA) systems.

THIS FUNDING CATEGORY INCLUDES ADDITIONAL ITEMS THAT ARE CLASSIFIED AS EQUIPMENT WHEN PART OF AN ALTERATION, RENOVATION, REMODELING AND/OR REFRIGERATION UPGRADE PROJECT.

§ loading dock levelers and dock accessories, including electrical connections.

§ HVAC systems and appurtenances, including special platforms and electrical connections

§ specialty lighting systems for product merchandising.

§ entry/exit automatic doors and associated appurtenances, including electrical connections.

§ overhead warehouse/receiving/shipping doors and door operating systems.

§ trash chutes and conveyors, including associated connections for compactors and storage containers.

END OF SECTION

CONSTRUCTION COST ESTIMATE BREAKDOWN CONTINUATION SHEET

OMB No. 0704-0193

Expires 31 October 1989

CONTRACTOR	ADDRESS

CONTRACT FOR (Work to be preformed)	PROPOSED TOTAL CONTRACT PRICE

PURCHASE REQUEST NUMBER	PROJECT NUMBER	WORK LOCATION

LINE NO.	ITEM (1)	UNIT OF MEASURE (2)	QUANTITY (3)	MATERIAL COST UNIT (4)	MATERIAL COST TOTAL (5)	LABOR COSTS MANHOUR MANDAYS (6)	LABOR COSTS AVERAGE RATE (7)	LABOR COSTS TOTAL (8)	OTHER DIRECT COSTS (9)	LINE TOTAL (10)

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SECTION 01 30 00

ADMINISTRATIVE REQUIREMENTS

(Edited from DeCA June 2011 Design Criteria)

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Project coordination.
2. Submittal procedures.
3. Shop Drawings.
4. Product data.
5. Quality Assurance submittals.
6. Samples.
7. Substitutions.
8. Requests for information procedures.
9. Project Register.
10. Contractor Production Report.
11. Record photographs.

B. Related Sections:

1. Division 01 Section Notice to Proceed.
2. Division 01 Section Contract Modification Procedures.
3. Division 01 Section Mechanical, Refrigeration, Food Service Equipment, and Electrical Coordination.
4. Division 01 Section Sustainable Design Reporting.
5. Division 01 Section Construction Progress Documentation.
6. Division 01 Section Project Web Site.
7. Division 01 Section Quality Control.
8. Division 01 Section Temporary Facilities and Controls.
9. Division 01 Section Environmental Management.
10. Division 01 Section Closeout Procedures.

1.2 SUBMITTALS

A. Submittal Schedule:

1. Provide the indicated quantity. Note that the Government will retain three copies and the pdf file.

B. Submittal List:

Reference	Submittal Item	Quantity	Action
1.9	Substitutions	X	R
1.10	Requests for Information	X	I
1.11	Project Meeting Minutes	X	R
1.12	Project Register	X	R

1.13	Contractor Production Reports	X	R
1.13.D	Record Photographs	X	R

X Submit quantity specified in Division 01 Section Administrative Requirements.
R Review each submittal, mark to indicate action taken, and return.
I Submittal is for information or record purposes only. No action will be taken.

1.3 PROJECT COORDINATION

A. Comply with the Government's procedures for intra-project communications; submittals, report and records, schedules, coordination drawings, and recommendations; and resolution of ambiguities and conflicts.

B. Coordinate construction operations of work described in these Contract Documents to ensure orderly installation of each part of the Work. Coordinate construction operations that depend on each other for proper installation, connection, and operation.

1. Sequence construction operations where installation of one part of the work depends on installation of other components, before or after its own installation.
2. Sequence construction operations to ensure that completed or work in progress is not subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.
3. Coordinate installation of different components to ensure maximum accessibility for required maintenance, service, and repair.
4. Make provisions to accommodate items scheduled for later installation.
5. Keep store fully operational during normal store hours.
6. Coordinate all work with the store director, and provide advance notice of planned power outages.

C. Where necessary, prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and attendance at meetings.

1. Prepare similar memoranda for the government and outside contractors where required for coordination of work.

D. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities to avoid conflicts and ensure orderly progress of the work. Such administrative activities include, but are not limited to, the following:

1. Review of the Contract Documents well in advance of the Work.
2. Preparation, production, and maintenance of Project CPM Construction Schedule and Phasing Plan (if Add/Alter project).
3. Installation and removal of temporary facilities.
4. Delivery and processing of submittals.
5. Weekly progress meetings, toolbox meetings, and meetings with other parties and entities as required to facilitate the construction effort.
6. Contractor Quality Control meetings, testing, etc., preparation/submittal of the Contractor's Daily Inspection Log, and coordination of testing and inspections with the Government's Designated Inspector.
7. Production of Short Interval Schedules.
8. Project close-out activities.

E. Conservation: Coordinate construction operations to ensure that operations give consideration to conservation of energy, water, and materials.

F. General Coordination Provisions:

1. Inspection of Conditions: Require the installer of each major component to inspect the substrate and conditions for compatibility with manufacturer's installation requirements. Do not proceed until the remedy of the unsatisfactory conditions.
2. Coordinate required inspections and tests to minimize the necessity of uncovering completed construction.

G. Cleaning and Protection:

1. Clean and protect construction in progress and adjoining materials in place, during handling and installation. Apply protective covering where required to ensure protection from damage or deterioration at substantial completion.

H. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.

1.4 SUBMITTAL PROCEDURES

A. Definitions:

1. Field samples are full size physical examples erected on site to illustrate finishes, coatings, or finish materials. Field samples will establish the standard by which the Contracting Officer will judge the work.
2. Delegated-Design:

a. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.

1) If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Contracting Officer.

b. Delegated-Design Submittal: In addition to Shop Drawings, Product Data, and other required submittals, submit copies of a statement, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.

1) Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.

B. Send all material submittals for review to the Contracting Officer or Government’s Designated Inspector.

C. Coordination: Coordinate preparation and processing of submittals with performance of construction activities. Transmit each submittal sufficiently in advance of performance of related construction activities to avoid delay.

1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
2. Coordinate transmittal of different types of submittals for related elements of work so processing does not delay by the need to review submittals concurrently for coordination.

    a. The reviewer reserves the right to withhold action on a submittal requiring coordination with other submittals until receipt of all related submittals.
    b. Review of separate items does not constitute review of an assembly in which items function.

3. Processing: To avoid the need to delay installation as a result of the time required to process submittals:

    a. Allow 21 calendar days for initial review. Allow additional time if the reviewer must delay processing to permit coordination with subsequent submittals.
    b. If an intermediate submittal is necessary, process the same as the initial submittal.
    c. Allow 14 calendar days for reprocessing each submittal.
    d. Contracting Officer will not extend contract time because of failure to transmit submittals to the reviewer sufficiently in advance of the work to permit processing.

D. Provide the following types of submittals to the Government's Designated Inspector:

1. Requests for interpretation.
2. Requests for substitution.
3. Shop Drawings, product data, and samples.
4. Test and inspection reports.
5. Design data.
6. Manufacturer's instructions and field reports.
7. Applications for payment and change order requests.
8. Progress schedules (Print and electronic).
9. Coordination drawings.
10. Closeout submittals.
11. Operations and Maintenance Manuals.
12. Submittal Schedules.
13. Submittal Registers.
14. Record Photographs.
15. Submittals for Authorities in Jurisdiction.
16. SOVs.
17. AF3052 (Modifications).
18. Sustainable Design submittals.

E. Quantity of Submittals: Unless otherwise noted, provide four originals and 1 PDF version. The Government will retain three copies and the pdf. To obtain additional reviewed sets, submit additional sets over these requirements. The pdf file is not required for physical samples.

F. Submittal Preparation: Place a permanent label or title block on each submittal for identification. Indicate the name of the entity that prepared each submittal on the label or title block.

1. Provide a space approximately 4 by 5 inches on the label or beside the title block on shop drawings to record the contractor's review and approval markings and the action taken.

    a. Include the following information on the label for processing and recording action taken.

b. Project name.
c. Date.
d. Name and address of the reviewer.
e. Name and address of the Contractor.
f. Name and address of the subcontractor.
g. Name and address of the supplier.
h. Name of the manufacturer.
i. Number and title of appropriate Specification Section.
j. Drawing number and detail references, as appropriate.

G. Submittal Transmittal: Package each submittal appropriately for transmittal and handling. Transmit each submittal from the contractor to the reviewer using the Government transmittal form. The reviewer will not accept submittals received from sources other than the Contractor.

1. On the transmittal, record relevant information and requests for data. Comply with paragraphs entitled "Substitutions," for deviations from contract document requirements, including variations and limitations. Include Contractor's certification that information complies with contract documents requirements.
2. Transmittal Form: Use Government Form Number AF 3000, "Material Approval Submittal."

H. Submittal Information. Include the following information on submittals, as applicable:

1. Room names and numbers in which Contractor will install equipment.
2. Identification of product or material:

a. Use identifying symbols indicated on Contract Documents.
b. Indicate salient features and other information necessary for complete equipment identification.
c. Clearly identify model submitted where catalog cuts show more than one model of a product.
d. Submit capacity and performance data in same form, units, and completeness given in Contract Documents.

3. Relation to adjacent structure or material and clearances required.
4. Field dimensions, clearly identified.
5. Applicable standards, such as ASTM, ANSI, Federal Specifications.

I. Submittal Register and Schedule:

1. Develop two documents; a submittal schedule and a submittal register.
2. Coordinate submittals progress schedule with the Schedule required in Division 01 Section Construction Progress Documentation.
3. Prepare the schedule in chronological order and the register in specification order. On each, provide the following information for each required submittal.

a. Scheduled date for the first submittal.
b. Specification Section number.
c. Related Section numbers.
d. Submittal category (shop drawings, product data, samples, certificates, or other).
e. Description of the part of the work covered.
f. Scheduled date for submission or resubmission.
g. Scheduled date for the reviewer's final release or approval.

4. Distribution: Following response to the initial submittal, print and distribute copies to the reviewer, subcontractors, and other parties required to comply with submittal dates indicated. Post copies in the project meeting room and field office.

    a. When Contractor makes revisions, distribute to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the work.

J. Submittal Action by Reviewer:

1. Action Submittals: Written and graphic information and physical samples that require Contracting Officer's responsive action. Action submittals are those submittals indicated in individual Specification Sections as follows:

    a. R: Review each submittal, mark to indicate action taken, and return.

2. Informational Submittals: Written and graphic information and physical samples that do not require Contracting Officer's responsive action. Submittals may be rejected for not complying with requirements. Informational submittals are those submittals indicated in individual Specification Sections as follows:

    a. I: Submittal is for information or record purposes only. No action will occur.

1.5 SHOP DRAWINGS

A. Submit newly prepared information drawn accurately to scale. Highlight, encircle, or otherwise indicate deviations from the Contract Documents. Do not reproduce contract documents or copy standard information as the basis of Shop Drawings. Standard information prepared without specific references to the Project is not a Shop Drawing.

B. Shop Drawings include fabrication and installation drawings, setting diagrams, schedules, patterns, templates, and similar drawings. Include the following information:

1. Dimensions.
2. Identification of products and materials included by sheet and detail number.
3. Compliance with specific standards.
4. Notation of coordination requirements.
5. Notation of dimensions established by field measurements.
6. Sheet size: Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches but no larger than 30 by 42 inches.
7. Submittal: Submit blue or black line prints for review.
8. Do not use Shop Drawings without an appropriate final stamp indicating action taken.
9. Do not submit Shop Drawings until Contractor confirms compliance with requirements of the contract documents.
10. Distribution: Furnish copies of final submittal to installer, subcontractors, suppliers, manufacturer, fabricators, and others required for performance of construction activities. Show distribution on transmittal form.

    a. Do not proceed with installation until a copy of the approved or approved as noted Shop Drawing is in the installer's possession.
    b. Do not permit use of unmarked copies of Shop Drawings for construction.

1.6 PRODUCT DATA

A. Collect product data into a single submittal for each element of construction or system. Product data includes printed information, such as manufacturer's installation instructions, catalog cuts, standard color charts, rough-in diagrams, templates, standard wiring diagrams, and performance curves.

1. Mark each copy to show applicable choices and options. Where printed product data includes information on several products that are not required, mark copies to indicate the applicable information. Include the following information:

a. Manufacturer's printed recommendations.
b. Compliance with trade association standards.
c. Compliance with recognized testing agency standards.
d. Application of testing agency labels and seals
e. Notation of dimensions verified by field measurements.
f. Notation of coordination requirements.

2. Do not submit product data until Contractor confirms compliance with requirements of the Contract Documents.
3. Distribution: Furnish copies of final submittal to installer, subcontractors, suppliers, manufacturer, fabricators, and others required for performance of construction activities. Show distribution on transmittal form.

a. Do not proceed with installation until a copy of the approved product data is in the Installer's possession.
b. Do not permit use of unmarked copies of product data for construction.

B. Bind each group of manufacturer's data and catalog cuts in a heavy paper binder such as "Duo-tang" binder or an "Accopress" press board binder.

1.7 SAMPLES

A. Submit full-size fully fabricated samples cured and finished as specified and physically identified with the material or product proposed. Samples include partial sections of manufactured or fabricated components, cuts or containers of materials, color range sets, and swatches showing color, texture, and pattern.

1. Mount or display samples in the manner to facilitate review of qualities indicated. Prepare samples to match the reviewer's sample, if any. Include the following:

a. Specification Section number and reference.
b. Generic description of the sample.
c. Sample source.
d. Product name or name of the manufacturer.
e. Compliance with recognized standards.
f. Availability and delivery time.

2. Submit samples for review of size, kind, color, pattern, and texture. Submit samples for a final check of these characteristics with other elements and a comparison of these characteristics between the final submittal and the actual component as delivered and installed.

a. Where variation in color, pattern, texture, or other characteristic is inherent in the material or product represented, submit at least 3 multiple units that show approximate limits of the variation.
b. Refer to other Specification Sections for requirements for samples that illustrate workmanship, fabrication techniques, details of assembly, connections, operations, and similar construction characteristics.
c. Refer to other Section for samples returned to the Contractor for incorporation in the work. Such samples must be undamaged at the time of use. On the transmittal, indicate special requests regarding disposition of sample submittals.

1) Samples not incorporated into the work, or otherwise designated as the Government's property, are the property of the Contractor and Contractor must remove from the site prior to project's final acceptance.

3. Preliminary Submittals: Submit a full set of choices where Contractor submits samples for selection of color, pattern, texture, or similar characteristics from a range of standard choices.

a. The reviewer will review and return preliminary submittals with the reviewer's notations, indicating selection and other action. Do not proceed with installation until a copy of the approved sample is in the Installer's possession.

4. Maintain sets of samples, as returned, at the project site, for quality comparisons throughout construction.

a. Unless Contracting Officer observes noncompliance with Contract Documents provisions, the submittal may serve as the final submittal.
b. Contractor may use sample sets to obtain final acceptance of the construction associated with each set.

5. Distribution of Samples: Prepare and distribute additional sets to subcontractors, manufacturers, fabricators, suppliers, installers, and others as required for performance of the work. Show distribution on transmittal forms.

a. Field samples are full size examples erected on site to illustrate finishes, coatings, or finish materials, and to establish the project standard.

1) Process transmittal forms to provide a record of activity.

1.8 SUBMITTAL REVIEW

A. Government Reviewer's Action:

1. Review of submittal is to determine approval for general conformance with the design concept and Contract Documents. Reviewer's approval is not an approval of any deviation from the requirements of the Contract Documents. If the reviewer takes no exceptions or comments or marks on or attaches to the submittal, it does not relieve the Contractor from compliance with the Contract Documents. It does not construe authorization of departures or a change. Only when the parties to the original Contract agreement sign a written Contract modification are changes in the Contract Documents made effective. If there is conflict between the Contract Documents and submittals, the Contract Documents govern. Contractor remains responsible for details and accuracy, for confirming and correlating quantities and dimensions, for selecting fabrication

processes, for techniques of assembly, for coordination of work between trades, and for performing work safely.

2. Where reviewer requests submittals for information or record only, the reviewer will receive and file such submittals for its use. The reviewer will not necessarily take any action on such submittals unless in its judgment action is required. Reviewer not taking action does not imply in any way its approval of any submittal.
3. Except for submittals for the record or information, where Contract Documents require action and return, the reviewer will review each submittal, mark to indicate action taken, and return promptly.

    a. Compliance with specified characteristics is the Contractor's responsibility.

4. Action Stamp: The reviewer will stamp each submittal with a uniform action stamp. The reviewer will mark the stamp appropriately to indicate the action taken as follows:

    a. Final Unrestricted Release: When the reviewer marks a submittal "Approved" the work covered by the submittal may proceed provided it complies with requirements of the Contract Documents.
    b. Final-but-Restricted Release: When the reviewer marks a submittal "Approved as Noted," the work covered by the submittal may proceed provided it complies with notations or corrections on the submittal and requirements of the Contract Documents.
    c. Returned for Re-submittal: When the reviewer marks a submittal "Not approved, Revise and Resubmit," do not proceed with work covered by the submittal, including purchasing, fabrication, delivery, or other activity. Revise or prepare a new submittal according to the notations; resubmit without delay. Repeat if necessary to obtain a different action mark.

        1) Do not use, or allow others to use, submittals marked "Not Approved, Revise and Resubmit" at the project site or elsewhere where work is in progress.

5. Unsolicited Submittals: The reviewer will return unsolicited submittals to the sender without action.

1.9 SUBSTITUTIONS

A. General:

1. Definition: Substitutions - Changes in Contract-required products, materials, equipment, and methods of construction. Contracting Officer will consider substitutions proposed by the Contractor after award of the Contract. The Government does not consider the following requests for substitutions:

    a. Revisions to the Contract Documents requested by the Contracting Officer.
    b. Specified options of products and construction methods included in the Contract Documents.
    c. The Contractor's determination of and compliance with governing regulations and orders issued by governing authorities.

B. Conditions:

1. The Contracting Officer will receive and consider the Contractor's request for substitution when Contractor satisfies a, b, and c of the following conditions and one or more of the

items in d through k of the following conditions, as determined by the Contracting Officer. If the Contractor does not satisfy these conditions, the Contracting Officer will return the request without action except to record noncompliance with these requirements.

a. The Contract Documents do not require extensive revisions.
b. Proposed changes are in keeping with the general intent of the Contract Documents.
c. The request is timely, fully documented, and properly submitted.
d. The Contractor cannot provide the specified product or method of construction within the Contract Time. The Contracting Officer will not consider the request if the contractor cannot provide the product or method as a result of failure to pursue the Work promptly or coordinate activities properly.
e. The request directly relates to an "or-equal" clause or similar language in the Contract Documents.
f. The requested directly relates to a "product design standard" clause in the Contract Documents.
g. The requested substitution offers the Government's a substantial advantage in cost, time, energy conservation, or other considerations, after deducting additional responsibilities the Government must assume. The Government's additional responsibilities may include compensation to the Architect-Engineer for redesign and evaluation services, increased cost of other construction by the Government, and similar considerations.
h. The specified product or method of construction cannot receive necessary approval by a governing authority, and the Contracting Officer can approve the requested substitution.
i. The Contractor cannot provide the specified product or method of construction in a manner that is compatible with other materials and where the Contractor certifies that the substitution will overcome the incompatibility.
j. The Contractor cannot coordinate the specified product or method of construction with other materials and where the Contractor certifies they can coordinate the proposed substitution.
k. The specified product or method of construction cannot provide a warranty required by the Contract Documents and where the Contractor certifies that the proposed substitution provides the required warranty.

2. The contractor's submittal and the Contracting Officer's acceptance of Shop Drawings. Shop drawings, product data or samples for construction activities not complying with the Contract Documents do not constitute an acceptable or valid request for substitutions, nor do they constitute approval.

C. Submittals:

1. Substitution Request Submittal: The Contracting Officer will consider requests for substitution if received within 60 days after commencement of the Work. Contracting Officer will reject requests received more than 60 days after commencement of the Work at his discretion.

a. Submit requests in submittal format and according to procedures required for contract modification proposals. Display in bold and in a conspicuous area the words "REQUEST FOR SUBSTITUTION."
b. Identify the replacement for the product or the fabrication or installation method in each request. Include related Specification Section and Drawing numbers.
c. Provide complete documentation showing compliance with the requirements for substitutions, and the following information, as appropriate.

1) Coordination information, including a list of changes or modifications needed to other parts of the Work and to construction performed by the Government and separate contractors, which will be necessary to accommodate the proposed substitution.
2) A detailed comparison of significant qualities of the proposed substitution with those of the size, durability, and visual effect.
3) Product data, including Drawings and descriptions of products and fabrication and installation procedures.
4) Samples, where applicable or requested.
5) A statement indicating the substitution's effect on the Contractor's Construction Progress Management Schedule compared to the schedule without approval of the substitution. Indicate the effect of the proposed substitution on overall Contract Time.
6) Cost information, including a proposal of the net change, if any in the Contract Sum.
7) The Contractor's certification that the proposed substitution conforms to requirements in the Contract Documents in every respect and is appropriate for the applications indicated.

2. Contracting Officer's Action: If necessary, the Contracting Officer will request additional information or documentation for evaluation for a request for substitution. The Contracting Officer will notify of acceptance or rejection of the substitution within 20 calendar days after receipt, or 7 calendar days after receipt of additional information or documentation. Acceptance will be in the form of a change to the Contract.
3. Use the product specified if the Contracting Officer cannot make a decision on the use of a proposed substitute within the time allocated.

1.10 REQUESTS FOR INFORMATION

A. General:

1. Submit a Request for Information (RFI) when questions arise concerning interpretation, conflicts, omissions, errors, or regulatory violations within the Contract Documents.

B. Review:

1. Review all RFIs prior to submission to the Contracting Officer or Government's Designated Inspector. The General Contractor is responsible to have a thorough and working knowledge of the entire Contract Documents and to review subcontractor's and in-house RFIs for legitimacy and reasonableness. Do not forward questions to the Contracting Officer or Government's Designated Inspector that are easily answerable from a cursory review of the Contract Documents.
2. Form a review committee composed of the General Contractor's superintendent, quality control manager, and project manager.

a. When source of RFI is from the contractor's staff:

1) Assign independent members (not the originator of the RFI) of the contractor's management team to review the question and Contract Documents for potential answers available within the documents.

b. When source of RFI is from subcontractor's or suppliers:

1) Assign management members of the contractor's staff to review information requester's question and the entire contract documents for potential answers available within the documents.

3. For RFIs determined as reasonable and a change to the contract price or time is not involved, submit to the government using the transmittal processes described hereafter.

C. Transmittal:

1. On the project website enter the following information:

a. Include brief synopsis.
b. State a precise question.
c. List the Specification Section.
d. List the Drawing page number.
e. Suggest a recommendation(s) to solve the issue. Include:

1) The specific line item(s) impact to the schedule.
2) The impact to the Contract (if any).
3) A technical solution recommendation.

D. Response:

1. Response Time:

a. Allow 14 calendar days for government review of the RFI. The Government will respond to all RFI's on the Project website only. The Contractor will be able to print out a hardcopy of the response from the website for its files.

2. If the response to the RFI does not involve a change to the contract, after receipt of the government response, proceed as if the answer to the RFI existed within the Contract Documents.

E. Changes to Contract:

1. For RFIs where the government determines a change to the Contract price or time is appropriate, officially close the RFI and refer thereafter as a pending modification. Comply with the modification requirements of Division 01 Section Contract Modification Procedures.

F. Refer to Division 01 Section Project Web Site for project website related requirements.

1.11 PROJECT MEETINGS

A. Pre-Performance Conference:

1. The Government will schedule a Pre-performance conference before construction begins, at a time convenient to the Government and the Contractor. The conference will be at or near the project site. The meeting will include the review of responsibilities and personnel assignments.

a. Attendees: Contracting Officer, Government's Designated Inspector, other authorized representatives of the Government, and their consultants; the

Contractor (project manager, CQC, and his superintendent); major subcontractors; manufacturers; suppliers; and other concerned parties.

b. Agenda: Discuss items of significance that could affect progress, including the following:

1) Preliminary construction schedule.
2) Critical work sequencing/phasing.
3) Designation of responsible personnel.
4) Procedures for processing field decisions and changes to the Contract.
5) Procedures for processing applications for payments.
6) Distribution of Contract Documents.
7) Submittal of Shop Drawings, product data, and samples.
8) Preparation of record documents.
9) Use of the premises.
10) Availability of parking.
11) Office, work, and storage areas.
12) Equipment deliveries and priorities.
13) Security.
14) Housekeeping.
15) Working hours.
16) Request for Information (RFI) process.
17) Significant contractual terms and conditions.
18) Adequacy of Temporary Storage of Government Furnished Equipment.
19) Other relevant matters.

B. Progress Meetings:

1. Attendees: Provide representative(s) of entities concerned with the current progress, or involved in planning, coordination, or performance of future activities of the Work. In addition to the Government's Designated Inspector, mandatory attendees include the Contractor's staff **Superintendent, CQC, and on site Project Manager (if so staffed)**, every major subcontractor (as determined by the Government's Designated Inspector), and other Government representatives as deemed necessary by the Government (for example: Commissary Store Director, Base Civil Engineering Representative). Have all participants at these conferences familiar with the project and authorized to conclude matters relating to the Work.
2. Agenda: Review and correct or approve minutes of previous progress meetings. Review other items of significance that could affect progress. Include topics for discussion as appropriate to the status of the Project.

a. Review the present and future needs of each entity present, including the following:

1) Interface requirements.
2) Time.
3) Sequences.
4) Status of submittals.
5) Deliveries.
6) Off-site fabrication problems.
7) Access.
8) Site utilization.
9) Temporary facilities and services.
10) Hours of work.
11) Hazards and risks.
12) Housekeeping.
13) Quality and work standards.

14) Changes to the contract.
15) Documentation of information for payment requests.
16) Short Interval Schedule (SIS).
17) Status of RFI's.
18) Safety.
19) Other topics as required.

3. Reporting: Provide minutes for the prior week's progress meeting prior to each new weekly meeting. No later than 3 days after each meeting, distribute minutes of the meeting to each party present and to parties who should have been present. Include a brief summary, in narrative form, of progress since the previous meeting and report.

C. Red Zone Meeting:

1. An initial Red Zone meeting will be held to build a schedule of events necessary to achieve project and fiscal completion within 120 days of the Project Beneficial Occupancy Date (BOD). The initial meeting identifies key project milestones, responsibilities, and target task completion dates. Particular attention must be given to the BOD and Grand Opening (or Re-Opening) dates. The initial Red Zone meeting is held approximately 60 days prior to BOD.

a. There are three objectives to the initial meeting:

1) Representatives responsible for specific remaining tasks must be identified and be in attendance at the meeting.
2) Representatives in attendance must be able to fully identify remaining work necessary to complete their portion of the scope.
3) Representatives must commit to finishing the task they are responsible for by the agreed date.

2. The objective of each follow on weekly meeting is to discuss and record actual progress of each task. If a specific task appears to be slipping or occurs earlier than the completion date; means methods and resources will be discussed, identified, and committed to maintain the Red Zone Schedule. The impact to related activities is determined and discussed. The entire team is notified of the potential impact to the remaining work.
3. Attendees: At a minimum, the following attendees shall participate in the initial Red Zone Meeting.

a. DeCA Project Manager: Chair of the Red Zone Meeting, Responsible for Design and Construction of the Project.
b. DeCA Operations Monitor: Responsible for the operations activities related to the Project.
c. DeCA Store Director: Responsible for Operational aspects of the Project.
d. DeCA Zone Manager.
e. DeCA Region Engineer.
f. DeCA Communications.
g. CARTS-DeCA POSM Personnel.
h. DeCA Equipment Personnel.
i. DeCA Contacting Branch/AMDF Contracting Officer: Authority for Construction Contract.
j. Construction Contractor:

1) Superintendent.
2) Quality Control Manager.
3) Major Sub-Contractor Representatives.
4) Installation Personnel:

a) Fire Department Representative.
b) Civil Engineer or Public Work Representative.
c) Environmental Representative.
d) Safety Representative.
e) Security Representative.
f) Communications Representative.

5) Program Management Assistance Contractor (PMAC):

a) PMAC Program Manager.
b) PMAC Technical Inspector.
c) Specialty Inspectors (As required per specific project requirements).

6) Commissioning Agent.
7) Architect of Record (As required per specific project requirements).

4. At a minimum, the following attendees shall participate in the follow on weekly Red Zone Meetings. All other attendees from the initial meeting that are not listed below will attend as required and shall receive copies of all weekly red zone meeting discussions.

a. DeCA Store Director.
b. Construction Contractor.

1) Superintendent.
2) Quality Control Manager.
3) Major Sub-Contractor Representatives.

c. Program Management Assistance Contractor (PMAC).

1) PMAC Technical Inspector.

5. Initial Red Zone Meeting Process:

a. Initial Red Zone Meeting Date: The PMAC technical inspector will notify the DeCA Project Manager of an estimated initial Red Zone Meeting date. This date will be based on the construction Contractor's CPM schedule and shall be estimated as approximately 60 days prior to the construction Contractor's scheduled BOD date. The DeCA Project Manager will coordinate with the DeCA Operations Monitor and a final date will be determined.
b. The DeCA PM; in conjunction with the PMAC TI will invite attendees related to the construction portion of the Project to the meeting and the DeCA Operations Monitor will invite the required attendees related to the operational activities of the Project. Invitations to the meeting shall be distributed no later than 30 days prior to the established initial Red Zone meeting date.
c. The DeCA PM chairs the initial Red Zone Meeting. The meeting discussions will focus on the following three major areas:

1) Construction Activities and Milestones.
2) Operation Activities and Milestones (incorporate the P-Plan into the Red Zone schedule).
3) Fiscal Activities and Milestones.

6. Initial Red Zone Meeting Discussions: The group discusses remaining construction activities and reaches a consensus on percent complete and remaining durations required for each to include the agreed completion date. Operational activities are

identified and estimated durations and responsibilities are assigned to include the agreed completion date. Participants build a schedule for completing each task in a logical sequence, and assign responsibility for actions to reach financial completion. The technical inspector records key project milestones, responsibilities and dates and provides distribution to all team members prior to the close of the meeting. The TI shall prepare minutes of the meeting to include all agreed dates, milestones, durations and represented attendees. The team shall:

a. Plan to finish on schedule.
b. Identify and emphasize the importance of the key milestones, especially Grand Opening.
c. Identify outstanding modifications and obstacles to closure.
d. Identify outstanding activities, whose responsible and scheduled completion.
e. Review Contract and contingency balance for all operational and construction requirements remaining.
f. Discuss Warranty plan implementation.
g. Commitment to finish the DD Form 1354.
h. Discuss transfer from Construction Contractor maintenance to DeCA Maintenance Contractor.

7. Follow on Weekly Red Zone Meeting Process: The PMAC technical inspector holds a weekly construction meeting. Following the initial red zone meeting, the inspector will add the red zone update to the weekly meeting agenda. Each member identified as a mandatory attendee will provide input as to the status of each Red Zone activity/milestone. The technical inspector will update the red zone schedule template during the meeting. If any activity/milestone duration is different than originally planned, the TI will identify the impact to remaining activities through the schedule software tool. The TI will discuss with the Construction Contractor available options to maintain the original agreed upon schedule. Emphasis shall be placed on maintaining the original schedule. The TI shall review each impact and record the new status in the minutes. The minutes shall be distributed to all responsible parties with specific attention brought to any critical changes to the agreed upon schedule. If required, the DeCA PM will establish a special meeting to help mitigate any problem that has the potential to extend the Project end date and determine measures required to recover any lost time and bring the activities back on schedule.
8. Suggested Activities/Milestones Listed by Responsibility:

CONSTRUCTION ACTIVITIES/MILESTONES

General Contractor

Communication System PA/Sound Installation
Lock and Key Plan
Landscaping Complete
Test and Balance Systems
Commissioning
GC Punchlist Complete
Final Cleaning
Pre-Final Inspection
Beneficial Occupancy Date (BOD)
As-Built Delivery
Warranty Documents
Government Punchlist Complete
User Training
O & M Manual Submittal
DD 1354
Construction Contract Complete
Release of Claims

Commissioning Agent

Commissioning

Installation

Fire System Inspection
Safety Inspection
Installation Fire Department
Installation Safety Department

Security Inspection	Installation Security Department
PMAC	
Run Weekly Meetings with Red Zone Discussion	PMAC TI
Update Red Zone Schedule	PMAC TI
Photographer	PMAC and/or Government
PMAC TI leaves site	
DeCA Project Manager	
Chair Red Zone Meeting	DD 2626 Contractor Evaluation
Red Zone Process	DD 2631 AE Performance Evaluation
Final Inspection	DeCA Site Visit
Operations Monitor	
Order GFGI	
Order Vendor Contracts	
Store Director	
Furniture Installation/GFGI Installation	
Store Set	
Final Cleaning for Opening	
User Move-in	
Grand Opening	
Government Contractor	
Communication Phone System Installation	
POS Installation	
DeCA Contacting Branch/AMDF	
Final Payment	DeCA Contacting Branch/AMDF Contracting Officer
Return of Un-obligated Funds	DeCA Contacting Branch/AMDF Contracting Officer
Refrigeration/HVAC Maintenance Meeting	DeCA Contacting Branch/AMDF Contracting Officer
Refrigeration/HVAC Maintenance Transfer	DeCA Contacting Branch/AMDF Contracting Officer

1.12 PROJECT REGISTER

A. Register:

1. Maintain Registers of proposal requests, supplemental instructions, RFIs, submittals, and Contract modifications in electronic version at the jobsite that accurately reflects current status of all pertinent data.
2. Make register available to the Contracting Officer for review when requested.
3. Develop and provide a project roster to the Government's Designated Inspector within 30 days of mobilization. Include contractor's staff, subcontractors, and suppliers. Include names, titles, addresses, phone numbers, email addresses of management personnel and emergency contacts associated to the project for each firm involved.

1.13 CONTRACTOR PRODUCTION REPORT

A. Submit reports for each day that Contractor performs work to the Government's Designated Inspector by 10 AM (local) the following workday. Account for each calendar day throughout the life of the Contract. Use the same terminology used in the construction schedule. The project superintendent must prepare, sign, and date the Contractor Production Reports and include the following information:

1. Date of report, report number, name of Contractor, Contract number, title and location of contract and superintendent present.
2. Weather in the morning and in the afternoon including maximum and minimum temperatures.
3. The site conditions and its suitability for performing work.
4. A list of Contractor and subcontractor personnel on the work site, their trades, work classification (e.g., journeyman, labor, etc.), employer, work location, number of employees, description of work performed, hours worked, and etc.
5. Did Contractor release hazardous material/waste into the environment? (If YES, attach a description of meetings held and actions taken.)
6. Safety events or inspections.
7. A list of equipment/material received each day.
8. A list of construction and plant equipment on the work site including the number of hours used, idle and down for repair.
9. Include a "remarks" section in this report to document pertinent information including directions received, problems encountered during construction, work progress and delays, conflicts or errors in the Drawings or Specifications, field changes, safety incidents, instructions given and corrective actions taken, delays encountered, and a record of visitors to the work site.
10. Refer to the example at the end of this Section for other information required.

B. Include a Government's Designated Inspector "comments" section with signature block.

C. Provide electronically via the project website. Refer to Division 01 Section Project Web Site, for other requirements.

D. Record Photographs:

1. Prior to starting construction, coordinate with and accompany the Government's Designated Inspector to the project site and take photographs depicting existing site conditions as the Government's Designated Inspector may direct.
2. Take a minimum of **100** digital color photographs.
3. Deliver **two** 5-inch by 7-inch prints each of the photographs and .jpg data (maximum quality) copies on CD-ROM media to the Government's Designated Inspector within 15 days of the shoot. Identify the filenames on the back of each print.
4. Photographic work shall be of a quality that illustrates conditions clearly. Take the photographs from various positions at the camera's highest quality jpg setting and at a resolution no less than five megapixels in size.
5. Identify each photograph to show the date made, contract title and number, and include a brief description of what each photograph depicts.
6. Insert each photograph in its own individual "see-through" plastic pouch (don't arrange prints back-to-back) and enclose the two sets in two separate vinyl covered "D-ring" binders for submission.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

EXAMPLE PRODUCTION REPORT:

CONTRACTOR PRODUCTION REPORT (ATTACH ADDITIONAL SHEETS IF NECESSARY)			DATE
CONTRACT NO.	TITLE AND LOCATION		REPORT NO.
CONTRACTOR		SUPERINTENDENT	
AM WEATHER	PM WEATHER	MAX TEMP: ° F	MIN TEMP: ° F

WORK PERFORMED TODAY

WORK LOCATION AND DESCRIPTION	EMPLOYER	NO.	TRADE	HOURS

PART 1 - JOB

WAS A JOB SAFETY MEETING HELD THIS DATE? o YES o NO
(If YES attach a copy of the meeting minutes)
WERE THERE ANY LOST TIME ACCIDENTS THIS DATE? o YES o NO
(If YES attach copy of completed OSHA report)
WAS TRENCHING/SCAFFOLD/HV ELECTRICAL/HIGH WORK DONE? o YES o NO
(If YES attach statement or checklist showing inspection performed)
WAS HAZARDOUS MATERIALS/WASTE RELEASED INTO THE ENVIRONMENT
(If YES attach description of incident and proposed action) o YES o NO

TOTAL WORK HOURS ON JOB SITE THIS DATE	
CUMULATIVE TOTAL OF WORK HOURS FROM PREVIOUS REPORT	
TOTAL WORK HOURS FROM START OF CONSTRUCTION	

LIST SAFETY ACTIONS TAKEN TODAY/SAFETY INSPECTIONS CONDUCTED		SAFETY REQUIREMENTS HAVE BEEN MET

EQUIPMENT/MATERIAL RECEIVED TODAY TO BE INCORPORATED IN JOB

CONSTRUCTION AND PLANT EQUIPMENT ON JOB SITE TODAY. INCLUDE NUMBER OF HOURS USED TODAY

REMARKS

CONTRACTOR/SUPERINTENDENT DATE

FORM 01400-1 6/91

SHEET OF

TRANSMITTAL OF SHOP DRAWINGS, EQUIPMENT DATA, MATERIAL SAMPLES, OR MANUFACTURER'S CERTIFICATES OF COMPLIANCE *(Read instructions on the reverse side prior to initiating this form)*	DATE	TRANSMITTAL NO.

SECTION I - REQUEST FOR APPROVAL OF THE FOLLOWING ITEMS *(This section will be initiated by the contractor)*

TO:	FROM:	CONTRACT NO.	CHECK ONE: ☐ THIS IS A NEW TRANSMITTAL ☐ THIS IS A RESUBMITTAL OF TRANSMITTAL _____
SPECIFICATION SEC. NO. *(Cover only one section with each transmittal)*	PROJECT TITLE AND LOCATION		CHECK ONE: THIS TRANSMITTAL IS FOR ☐ FIO ☐ GOV'T. APPROVAL

ITEM NO. *a.*	DESCRIPTION OF ITEM SUBMITTED *(Type size, model number/etc.)* (With Country of Origin) *b.*	MFG OR CONTR. CAT., CURVE DRAWING OR BROCHURE NO. *(See instruction no. 8)* *c.*	NO. OF COPIES *d.*	CONTRACT REFERENCE DOCUMENT: SPEC. PARA. NO. *e.*	CONTRACT REFERENCE DOCUMENT: DRAWING SHEET NO. *f.*	FOR CONTRACTOR USE CODE *g.*	VARIATION *(See instruction No. 6)* *h.*	FOR CE USE CODE *i.*
							☐	
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							☐	
							☐	

REMARKS

I certify that the above submitted items have been reviewed in detail and are correct and in strict conformance with the contract drawings and specifications except as other wise stated.

_____
NAME AND SIGNATURE OF CONTRACTOR

SECTION II - APPROVAL ACTION

ENCLOSURES RETURNED *(List by Item No.)*	NAME, TITLE AND SIGNATURE OF APPROVING AUTHORITY	DATE

INSTRUCTIONS

1. Section I will be initiated by the Contractor in the required number of copies.

2. Each transmittal shall be numbered consecutively in the space provided for "Transmittal No.". This number, in addition to the contract number, will form a serial number for identifying each submittal. For new submittals or resubmittals mark the appropriate box; on resubmittals, insert transmittal number of last submission as well as the new submittal number.

3. The "Item No." will be the same "Item No." as indicated on ENG FORM 4288-R for each entry on this form.

4. Submittals requiring expeditious handling will be submitted on a separate form.

5. Separate transmittal form will be used for submittals under separate sections of the specifications.

6. A check shall be placed in the "Variation" column when a submittal is not in accordance with the plans and specifications--also, a written statement to that effect shall be included in the space provided for "Remarks".

7. Form is self-transmittal, letter of transmittal is not required.

8. When a sample of material or Manufacturer's Certificate of Compliance is transmitted, indicate "Sample" or "Certificate" in column c, Section I.

9. U.S. Army Corps of Engineers approving authority will assign action codes as indicated below in space provided in Section I, column i to each item submitted. In addition they will ensure enclosures are indicated and attached to the form prior to return to the contractor. The Contractor will assign action codes as indicated below in Section I, column g, to each item submitted.

THE FOLLOWING ACTION CODES ARE GIVEN TO ITEMS SUBMITTED

A -- Approved as submitted.

B -- Approved, except as noted on drawings.

C -- Approved, except as noted on drawings. Refer to attached sheet resubmission required.

D -- Will be returned by separate correspondence.

E -- Disapproved (See attached).

F -- Receipt acknowledged.

FX -- Receipt acknowledged, does not comply as noted with contract requirements.

G -- Other *(Specify)*

10. Approval of items does not relieve the contractor from complying with all the requirements of the contract plans and specifications.

SUBMITTAL REGISTER					TITLE AND LOCATION: Commissary for FORT LEE, VIRGINIA																							MAY 2012
																							DeCA Project: WP09MI03 A/E Project:2011-052					
Activity No.	Transmittal No.	Section Number	Paragraph Number	Description of Submittal	01-PRECON SUBMITTALS	02-SHOP DRAWINGS	03-PRODUCT DATA	04-WARRANTIES	05-SAMPLES	06-DESIGN DATA	07-TEST REPORTS	08-CERTIFICATES	09-MFRS INSTRUCTIONS	10-MFRS FIELD REPORT	11 -PROJECT RECORD DOCUME	12-O&M DATA	13-LEED REQUIREMENTS	14-CLOSEOUT SUBMITTALS	Information Only	A/E Approval G, AE	Government Approved G, AO	Submit	Approval Needed By	Material Needed By	Action Code	Date of Action	Action Code	Date of Action	
		03 30 00	1.4 A	For each type of admixtures, vapor retarders, and floor slab treatments			X													X									
		03 30 00	1.4 B	Design mixtures for each concrete mix						X	X									X									
		03 30 00	1.4 C	Statement of material content and proportions								X								X									
		03 30 00	1.4 D	Detail fabrication, bending, and placement of steel reinforcement.		X														X									
		03 30 00	1.4 E	Vapor retarder					X											X									
		03 30 00	1.4 F	Field Quality Control Tests and Inspection Reports							X									X									
		03 30 00	1.4 G	ACI 301 Sections 1 through 5				X												X									
		03 30 00	1.4 H	Special Inspection Reports							X									X									
		03 30 00	1.4 I	Saw cutting system			X													X									
		04 20 00	1.5 A	Reinforcing Steel		X														X									
		04 20 00	1.5 B	Masonry Units and Face Brick, cementitious materials, reinforcing bard, joint reinforcement, misc anchors, ties, and metal accessories								X								X									
		04 20 00	1.5 C	For each type and color masonry and brick and precast items					X											X									
		04 20 00	1.5 D	Statement of Compressive Strength of Masonry								X								X									
		04 20 00	1.5 E	Field Quality control tests and inspection							X									X									
		04 20 00	1.5 F	Special Inspection Reports							X									X									
		05 12 00	1.3 A	For each type of cold-formed metal framing product and accessory indicated			X													X									
		05 12 00	1.3 B	detail fabrication of structural steel		X														X									
		05 12 00	1.3 C	Welding certificates								X								X									
		05 12 00	1.3 D	Mill test reports							X									X									
		05 12 00	1.3 E	Special inspection reports							X									X									
		05 30 00	1.2A	For each type of deck, accessory, and product indicated			X													X									
		05 30 00	1.2B	Show layout and types of deck panels, anchorage details and accessories		X														X									
		05 30 00	1.2C	Field quality-control test and inspection reports							X									X									
		05 30 00	1.2D	Welding certificates								X								X									
		05 50 13	1.3A	Fabrication and installation details. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items.		X														X									
		05 50 13	1.3B	Stainless steel quilted wall panel 24 by 24 inches					X											X									
		05 50 13	1.3C	Welding certificates								X								X									
		05 50 13	1.3D	Special Inspection Reports							X									X									
		05 50 13	1.3E	Bumper Post Sleeves			X														X								

SUBMITTAL REGISTER					TITLE AND LOCATION: Commissary for FORT LEE, VIRGINIA																							MAY 2012
																							DeCA Project: WP09MI03 A/E Project:2011-052					
Activity No.	Transmittal No.	Section Number	Paragraph Number	Description of Submittal	01-PRECON SUBMITTALS	02-SHOP DRAWINGS	03-PRODUCT DATA	04-WARRANTIES	05-SAMPLES	06-DESIGN DATA	07-TEST REPORTS	08-CERTIFICATES	09-MFRS INSTRUCTIONS	10-MFRS FIELD REPORT	11 -PROJECT RECORD DOCUME	12-O&M DATA	13-LEED REQUIREMENTS	14-CLOSEOUT SUBMITTALS	Information Only	A/E Approval G, AE	Government Approved G, AO	Submit	Approval Needed By	Material Needed By	Action Code	Date of Action	Action Code	Date of Action	
		05 50 13	1.3F	Delegated Design Criteria: For installed products indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.						X											X								
		05 50 13	1.3G	G. Qualification Data								X							X										
		06 10 00	1.3A	For each type of process and product			X													X									
		06 40 23	1.3A	All products			X													X									
		06 40 23	1.3B	Show location of each cabinet, dimensioned plans and elevations, large-scale details, attachment devices, and other components.		X														X									
		06 40 23	1.3C	All products and finishes					X											X									
		07 41 13	1.5B	Manufacturer's data sheets on each product			X													X									
		07 41 13	1.5C	Include layouts of roof panels, details of edge and peentration conditions, cpacing and type of connections, flashings, and special conditions.		X														X									
		07 41 13	1.5D	For each roofing system submit color chips representing manufacturer's range					X											X									
		07 41 13	1.5E	Include typical panel joint in sample and fastening detail. Minimum sample 12 inches square representing actual roofing metal, thickness, profile, color and texture.					X											X									
		07 41 13	1.5F	Indicate compliance of preformed metal roofing system to specified requirements.							X								X									
		07 41 13	1.5G	Submit manufacturer's warranty				X											X									
		07 53 23	1.4A	All products			X													X									
		07 53 23	1.4B	Include plans, elevations, sections, details, and attachments, flashings, insulation		X														X									
		07 53 23	1.4C	Installer certificate								X							X									
		07 53 23	1.4D	Manufacturer Certificate								X							X									
		07 53 23	1.4E	Product Test Report							X								X									
		07 53 23	1.4F	Maintenance manuals												X			X									
		07 53 23	1.4G	Special warranties				X											X									
		07 53 23	1.4H	Inspection reports										X					X									
		07 60 00	1.3A	Layout, joining, profiles, and anchorages, plans and elevations of all fabricated work		X														X									
		07 60 00	1.3B	For each type of exposed finish required					X											X									
		07 71 00	1.3A	For each type of product			X													X									
		07 71 00	1.3B	Include plans, elevations, expansion-joint locations, keyed details, and attachments to		X														X									

SUBMITTAL REGISTER					TITLE AND LOCATION: Commissary for FORT LEE, VIRGINIA																							MAY 2012
																							DeCA Project: WP09MI03		A/E Project:2011-052			
Activity No.	Transmittal No.	Section Number	Paragraph Number	Description of Submittal	01-PRECON SUBMITTALS	02-SHOP DRAWINGS	03-PRODUCT DATA	04-WARRANTIES	05-SAMPLES	06-DESIGN DATA	07-TEST REPORTS	08-CERTIFICATES	09-MFRS INSTRUCTIONS	10-MFRS FIELD REPORT	11 -PROJECT RECORD DOCUME	12-O&M DATA	13-LEED REQUIREMENTS	14-CLOSEOUT SUBMITTALS	Information Only	A/E Approval G, AE	Government Approved G, AO	Submit	Approval Needed By	Material Needed By	Action Code	Date of Action	Action Code	Date of Action	
		07 71 00	1.3C	For copings, roof-edge flashings, fasteners, cover joints, accessories, and attachments					X											X									
		07 71 00	1.3D	For copings, roof-edge flashings indicating performance							X								X										
		07 71 00	1.3E	Sample of special warranty				X											X										
		07 72 33	1.2	For each type of roof accessory. Include construction details, material descriptions, dimensions of components, profiles, and finishes.			X													X									
		07 92 00	1.3A	For each joint-sealant product indicated.			X													X									
		07 92 00	1.3B	For each kind and color of joint sealant required					X											X									
		07 92 00	1.3C	Preconstruction Compatibility and Adhesion Test Reports	X						X	X							X										
		07 92 00	1.3D	Product test reports							X								X										
		07 92 00	1.3E	Preconstruction Field-Adhesion Test Reports	X							X							X										
		07 92 00	1.3F	Sealant, Waterproofing, and Restoration Institute (SWRI) Validation Certificate								X							X										
		08 08 00		Commissioning submittals																X									
		08 11 13	1.3A	Manufacturer's product description, installation and maintenance instructions for each type and size of traffic door			X									X					X								
		08 11 13	1.3B	Schedules, details, elevations of doors and frames		X														X									
		08 11 13	1.3C	Drawings of each opening, including door and frame, drawn to scale and coordinating door hardware		X														X									
		08 31 13	1.2A	For each type of access door assembly specified, including details of construction relative to materials, individual components, profiles, and finishes.			X													X									
		08 33 13	1.4A	For each type product			X													X									
		08 33 13	1.4B	Comply with performance requirements						X									X										
		08 38 00	1.2A	For each type product			X													X									
		08 71 00	1.2A	For each type of product			X						X			X					X								
		08 71 00	1.2B	Certify that locksets approved for use complies with “Buy American Act".								X							X										
		08 71 00	1.2C	Hardware Sets		X															X								
		08 71 00	1.2D	Keying Schedule									X								X								
		08 71 00	1.2E	AHC Report							X	X							X										
		08 71 00	1.2F	Product test report							X								X										
		09 29 00	1.2A	For each type product			X													X									

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		09 30 00	1.3A	For each type product			X													X									
		09 30 00	1.3B	Assembled samples with grouted joints for each type tile and each color and finish					X											X									
		09 51 00	1.3A	Each type of acoustical ceiling unit and suspension system			X													X									
		09 51 00	1.3B	Delegated design submittal						X									X										
		09 51 00	1.3C	Field quality reports										X					X										
		09 51 00	1.3D	qualification for testing agency								X							X										
		09 51 00	1.3E	For each acoustical panel ceiling							X								X										
		09 51 00	1.3F	For each acoustical panel ceiling							X								X										
		09 51 00	1.3G	For finishes to include in maintenance manuals												X			X										
		09 65 19	1.2A	Each type of product			X													X									
		09 65 19	1.2B	Full-size units of each color and pattern of resilient floor tile					X											X									
		09 65 19	1.2C	Each type of product												X			X										
		09 65 19	1.2D	Moisture/Bond Tests							X								X										
		09 67 23	1.3A	Each type of product			X													X									
		09 67 23	1.3B	Of each resinous flooring system		X														X									
		09 72 00	1.2A	Each type of product			X													X									
		09 72 00	1.2B	Show location and extent of each wall-covering type		X														X									
		09 72 00	1.2C	For each type of wall covering and for each color, texture, and pattern required					X											X									
		09 90 00	1.2A	Each type of product			X													X									
		09 90 00	1.2B	Each color, texture, and pattern required					X											X									
		09 90 00	1.2C	MPI Approved Products List							X								X										
		10 08 00		Commissioning submittals																X									
		1010 00	1.2A	For each type product			X													X									
		1010 00	1.2B	For each type of visual display surface					X											X									
		10 14 00	1.3A	For each type product			X													X									
		10 14 00	1.3B	Showing fabrication and erection of signs		X														X									
		10 14 00	1.3C	Sign message verification		X														X									
		10 15 00	1.3A	For each type of interior décor			X													X									
		10 15 00	1.3B	Show fabrication and erection of interior décor specialties. Include plans, elevations, and large-scale sections		X														X									
		10 15 00	1.3C	For each type of interior décor					X											X									
		10 21 13	1.2A	For each type product			X													X									

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		10 21 13	1.2B	Include plans, elevations, sections, details, and attachments to other work		X														X									
		10 26 00	1.2A	Include construction details, material descriptions, impact strength, dimensions of individual components and profiles, and finishes for each type of product indicated			X													X									
		10 28 13	1.2A	For each type product			X													X									
		10 28 13	1.2B	Indicating types, quantities, sizes, and installation locations by room of each accessory required						X										X									
		10 44 00	1.2A	For fire extinguishers and cabinets			X													X									
		10 56 23	1.3A	For each item of equipment required			X													X									
		11 08 00		Commissioning submittals																X									
		11 13 00	1.3C	Show fabrication and installation details		X														X									
		11 13 00	1.3D	Maintenance manuals for loading dock equipment												X			X										
		11 13 00	1.3E	Special warranties				X											X										
		11 13 00	1.3F	Special guarantees				X											X										
		11 14 00	1.2A	For each item of queuing systems			X													X									
		11 14 00	1.2B	Operating and maintenance data												X				X									
		11 40 00.13	1.2	For each item of equipment			X													X									
		11 40 00.16	1.2	For each item of equipment			X													X									
		11 40 00.26	1.2A	For each item of equipment			X													X									
		12 48 13.13	1.2A	Include construction details, material descriptions, dimensions of individual components and profiles, perimeter floor moldings, and finishes			X													X									
		12 48 13.13	1.2B	Samples for verification					X											X									
		12 93 00	1.2A	For each type product indicated			X													X									
		13 21 26	1.3A	Submit complete catalog data. Submit catalog cuts of each type of unit, as well as cuts of hardware and accessories proposed for use			X													X									
		13 21 26	1.3B	Show fabrication and installation details, plans, elevations, sections, details and attachments.		X														X									

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		13 21 26	1.3C	Complete drawings showing details of anchorage and connection, location and method of attachment of installed equipment											X				X										
		13 21 26	1.3D	Provide complete written installation instructions for cold storage rooms									X						X										
		13 21 26	1.3E	Ceiling suspension structural calculations						X									X										
		13 21 26	1.3F	Cold storage rooms operating and performance tests							X									X									
		13 21 26	1.3G	Provide written sample warranties for review				X				X							X										
		21 08 00		Commissioning submittals																X									
		21 13 00	1.4A.4	two hydrant flow test							X									X									
		21 13 00	1.4A.5	Working plans and hydraulic calculations sealed with PE stamp		X														X									
		21 13 00	1.4A.6	Operation and maintenance data												X			X										
		21 13 00	1.4B	Project Record Docs; Manufacturer's certificate; operation and maintenance data; warranty; NFPA 25; certification and testing data														X			X								
		22 05 19	1.3A	For all products			X									X				X									
		22 05 19	1.3A	Indicate dimensions, weights, and placements of openings		X														X									
		22 05 19	1.3B	Certify that grease interceptors meet or exceed specified requirements.								X								X									
		22 05 19	1.3B	Installation instructions, including assembly and support requirements									X						X										
		22 05 19	1.3C	Record actual locations of equipment, cleanouts, backflow preventers, water hammer arrestors, insrumentation											X			X			X								
		22 05 19	1.3C	Indicate frequency of treatment required												X		X			X								
		22 05 19	1.3C	Include instructions for calibrating instruments												X		X			X								
		22 05 19	1.3C	Certification data that supplements previously submitted O & M Manuals												X		X			X								
		22 07 19	1.4A	Provide product data for each type of mechanical insulation identifying k-value, thickness, jackets (factory and field applied) and accessories. Include maintenance data.			X									X				X									
		22 08 00		Commissioning submittals																X									
		22 10 00	1.4A	Provide data on pipe materials, pipe fittings, valves and accessories.			X													X									
		22 10 00	1.4A	Provide manufacturers catalog; indicate valve data and ratings.												X				X									
		22 10 00	1.4B	Record actual locations of valves											X			X		X									
		22 10 00	1.4B	Certifications and testing supplemental to previously submitted O & M manuals.							X	X						X		X									

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		22 30 00	1.3A	For all products; including dimension drawings of water heaters, pump type, capacity and power requirements; performance characteristics; connection requirements			X													X									
		22 30 00	1.3A	Maintenance data												X				X									
		22 30 00	1.3B	Manufacturer's instructions									X						X										
		22 30 00	1.3C	Record actual locations of components											X			X			X								
		22 30 00	1.3C	Include operation, maintenance, and inspection data, replacement part numbers and availability, and service depot location and telephone number.												X		X			X								
		22 30 00	1.3C	Water heater warranty				X										X			X								
		22 30 00	1.3C	Certifications and testing data as a supplement to previously submitted O & M							X	X						X			X								
		22 40 00	1.3A	Provide catalog illustrations of fixtures, electric/electronic controls for lavatories and flush valves, sizes, rough-in dimensions, utility sizes, trim, and finishes.			X									X					X								
		22 40 00	1.3B	Indicate installation methods and procedures.									X						X										
		22 40 00	1.3C	Maintenance Data: Include fixture trim exploded view and replacement parts lists.												X		X			X								
		22 40 00	1.3C	Warranties				X										X			X								
		22 40 00	1.3C	Submit all certifications and testing data as a supplement to previously submitted O & M manuals at contract closeout.							X	X						X			X								
		23 05 00	1.6B	Prior to approval of the material to be used, the manufacturer shall furnish written certification that the material contains no asbestos.								X									X								
		23 05 13	1.3A	For each type and size of motor, provide nameplate data and ratings; shipping, installed, and operating weights; mounting arrangements; size, type, and location of winding terminations; conduit entry and ground lug locations; and information on coatings or finishes			X													X									
		23 05 13	1.3B	Dimensioned Plans, Elevations, Sections, and Details, including required clearances and service space around equipment		X														X									
		23 05 13	1.3C	Field Quality test reports							X									X									
		23 05 13	1.3D	For field-installed motors to be included in operation and maintenance manuals												X			X										
		23 05 93	1.4B	Submit name of adjusting and balancing agency for approval within 30 days after award of Contract.	X																X								

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		23 05 93	1.4C	Field Reports: Indicate deficiencies in systems that would prevent proper testing, adjusting, and balancing of systems and equipment to achieve specified performance.	x																x								
		23 05 93	1.4D	Prior to commencing work, submit report forms or outlines indicating adjusting, balancing, and equipment data required.	x																x								
		23 05 93	1.4E	Submit draft copies of report for review prior to final acceptance of Project. Provide final copies for Architect/Engineer and for inclusion in operating and maintenance manuals.							x										x								
		23 05 93	1.4F	For all products and systems.												x					x								
		23 07 13	1.3A	Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.			x									x					x								
		23 07 19	1.4	For all products; identifying k-value, thickness, jackets, and accessories			x									x					x								
		23 08 00		Commissioning submittals																x									
		23 09 13	1.3A	Provide description and engineering data for each control system component, and software module.			x													x									
		23 09 13	1.3B	Include inspection period, cleaning methods, recommended cleaning materials, and calibration tolerances												x		x			x								
		23 09 13	1.3B	Certifications and testing supplement to previously submitted O & M manuals							x	x						x			x								
		23 09 16	1.3	Equipment cut sheets for all products, systems, components indicated and installation and user manuals.			x						x			x					x								
		23 09 16	1.3	Provide drawings showing; components locations in commissary and required wiring between components.		x										x					x								
		23 09 16	1.3	RMCS Manufacturer's resume								x									x								
		23 09 16	1.3	Startup technician's resume								x									x								
		23 09 16	1.3	RMCS Manufacturer's approval of startup technician.								x									x								
		23 09 16	1.3	Display case/Compressor Manufacturer coordination.										x	x						x								
		23 09 16	1.3	RMCS Installer qualifications								x									x								
		23 09 16	1.3	RMCS Manufacturer's approval of startup technician.								x									x								
		23 23 00	1.3B	Indicate schematic layout of system, including equipment, critical dimensions, and sizes developed by the Condensing Unit Manufacturer.		x															x								
		23 23 00	1.3B	Record actual locations of components.											x			x			x								

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		23 23 00	1.3B	Include operation, maintenance, and inspection data, replacement part numbers and availability, and service depot location and telephone number.												X		X			X								
		23 23 00	1.3B	Submit compressor manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.				X										X			X								
		23 23 00	1.3B	Submit all certifications and testing data as a supplement to previously submitted O & M manuals at contract closeout.							X	X						X			X								
		23 31 13	1.4A	Indicate pressure tests performed. Include date; section tested, test pressure, and leakage rate, following SMACNA HVAC Air Duct Leakage Test Manual.							X					X					X								
		23 31 13	1.4B	Record actual locations of ducts and duct fittings. Record changes in fitting location and type. Show additional fittings used.											X			X			X								
		23 31 13	1.4B	Submit all certifications and testing data as a supplement to previously submitted O & M manuals at contract closeout.							X	X				X		X			X								
		23 34 23	1.3A	Include rated capacities, furnished specialties, and accessories for each type of product indicated			X													X								
		23 34 23	1.3A	For each type product									X							X								
		23 34 23	1.3B	Include manufacturers' descriptive literature, instructions for lubrication, motor and drive replacement, spare parts list, and wiring diagrams.												X		X			X								
		23 34 23	1.3B	Submit all certifications and testing data as a supplement to previously submitted O & M manuals at contract closeout.							X	X						X			X								
		23 37 13	1.3A	Provide data for equipment required for this project. Include outlets, inlets, size, finish, type of mounting, schedule of outlets.			X									X				X								
		23 54 16	1.3A	Provide manufacturer's literature and data indicating rated capacities, weights, accessories, electrical nameplate data, and wiring diagrams			X													X								
		23 54 16	1.3A	Indicate assembly, required clearances, and locations and sizes of field connections		X														X								
		23 54 16	1.3A	For all products												X				X								
		23 54 16	1.3B	Indicate rigging, assembly, and installation instructions									X						X									
		23 54 16	1.3C	Include manufacturer's descriptive literature, operating instructions, maintenance and repair data, and parts listing												X		X			X								
		23 54 16	1.3C	Submit warranty, fill out in government's name and register with manufacturer				X										X			X								

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		23 54 16	1.3C	Manufacturer's qualifications								X						X			X								
		23 54 16	1.3C	Submit all certifications and testing data as a supplement to previously submitted O & M manuals at contract closeout.							X	X						X			X								
		23 62 13	1.3A	Indicate components, assembly, dimensions, weights and loadings, required clearances, and location and size of field connections. Include schematic layouts showing condensing units, cooling coils, refrigerant piping, and accessories required for complete system.		X															X								
		23 62 13	1.3A	Provide rated capacities, weights specialties and accessories, electrical nameplate data, and wiring diagrams. Make submission with fan-coil units, refer to Section 15835 to ensure capacities are complementary.			X									X					X								
		23 62 13	1.3B	Provide a piping schematic. Indicate pipe and equipment sizing.						X									X										
		23 62 13	1.3B	Manufacturer's installation instructions									X						X										
		23 74 13	1.3A	Indicate capacity and dimensions of manufactured products and assemblies required for this project. Indicate electrical service with electrical characteristics and connection requirements, and duct connections.		X															X								
		23 74 13	1.3A	Provide capacity and dimensions of manufactured products and assemblies required for this project. Indicate electrical service with electrical characteristics and connection requirements, and duct connections.			X			X	X		X			X					X								
		23 74 13	1.3B	Include manufacturer's descriptive literature, operating instructions, installation instructions, maintenance and repair instructions, including lubrication instructions, desiccant filter replacement, motor and drive replacement, and spare parts lists.												X		X			X								
		23 74 13	1.3B	Recommended Spare Parts List with long and short term requirements														X			X								
		23 74 13	1.3B	Submit all certifications and testing data as a supplement to previously submitted O & M manuals at contract closeout.							X	X						X			X								
		23 81 26	1.3A	Indicate components, assembly, dimensions, weights and loadings, required clearances, and location and size of field connections. Include schematic layouts showing condensing units, cooling coils, refrigerant		X														X								
		23 81 26	1.3A	Provide rated capacities, weights, data and wiring diagrams.			X													X								

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		23 82 16	1.3	Provide coil and frame configurations, dimensions, materials, rows, connections, and rough-in dimensions.			X														X								
		23 82 16	1.3	Indicate coil and frame configurations, dimensions, capacities, materials, rows, connections, and rough-in dimensions.		X															X								
		23 82 16	1.3	Operation and maintenance data												X					X								
		23 84 16	1.3	Indicate capacity and dimensions of manufactured products and assemblies required for this project. Indicate electrical service with electrical characteristics and connection requirements, and duct connections.		X															X								
		23 90 00	1.3	Contract variances										X							X								
		23 90 00	1.3	Refrigeration Capacity Calculations: For each refrigeration system, and for refrigeration piping pressure drops.			X			X											X								
		23 90 00	1.3	Provide completed refrigeration schedules in same format as on contract drawings.		X															X								
		23 90 00	1.3	Installation drawings including proposed piping, wiring, and equipment; interconnecting piping and wiring between evaporators, unit coolers, heat recovery coils, and refrigerated display cases. Include details for attachment, anchoring, and hanging to structural framing of the building; vibration isolation units; and foundation and supports.		X															X								
		23 90 00	1.3	Letter Acknowledging Submitted Design for Electrical								X									X								
		23 90 00	1.3	Electrical - Provide power layout drawings showing electrical runs with wire sizes, conduit sizes, and connection points. Wiring diagrams shall identify each component, and one diagram shall show interconnected or interlocked components.		X															X								
		23 90 00	1.3	Electrical - Breaker Cut Sheets			X														X								
		23 90 00	1.3	Electrical - Transformer Cut Sheets			X														X								
		23 90 00	1.3	Subcontract plan			X														X								
		23 90 00	1.3	Manufacturer data sheets for each product indicated			X						X			X					X								
		23 90 00	1.3	Manufacturer approval of Installer								X									X								
		23 90 00	1.3	Installer qualifications								X									X								
		26 05 00	1.2A	For electricity-metering equipment			X														X								
		26 05 00	1.2B	Dimensioned plans and sections or elevation layouts of electricity-metering equipment.		X															X								
		26 05 00	1.2C	Indicate and interpret test results for compliance with performance requirements.							X										X								

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		26 05 19	1.2A	For each type of product indicated			X														X								
		26 05 19	1.2B	Field quality test reports							X										X								
		26 05 26	1.2	For each type of product indicated			X														X								
		26 05 26	1.3	For firms and persons listed in "Quality Assurance" paragraph								X									X								
		26 05 26	1.4	Test reports							X										X								
		26 05 33	1.3A	For raceways, wireways and fittings, outlet boxes, floor boxes, hinged-cover enclosures, and cabinets.			X													X									
		26 05 33	1.3B	Show fabrication and installation details of components for custom raceways, fittings, boxes, enclosures, and cabinets not completely described by published Product Data.			X					X								X									
		26 05 33	1.3C	Signed and sealed by a qualified professional engineer. Include design calculations, detail assemblies, dimensions, weights, loads, required clearances, method of field assembly, components and location and size of each field connection.		X														X									
		26 05 33	1.3D	Manufacturer Seismic Qualification Certification								X								X									
		26 05 36	1.2A	Include data indicating dimensions and finishes for each type of cable tray indicated.			X													X									
		26 05 36	1.2B	For each type of cable tray. Show fabrication and installation details and seismic restraint details		X														X									
		26 05 36	1.2C	Coordination drawings		X														X									
		26 05 36	1.2D	For each type of cable tray, signed by product manufacturer.								X								X									
		26 05 36	1.2E	Manufacturer Seismic Qualification Certification								X								X									
		26 05 36	1.2F	Field Test Reports							X									X									
		26 05 36	1.2G	For cable trays including emergency, operation, and maintenance manuals												X				X									
		26 05 48	1.3A	Illustrate and indicate types, styles, materials, strength, fastening provisions, and finish for each type and size of seismic restraint component used.			X													X									
		26 05 48	1.3B	For anchorage and bracing not defined by details and charts on Drawings. Indicate materials, and show designs and calculations signed and sealed by a professional engineer.		X														X									
		26 05 48	1.3C	Coordination Drawings		X														X									

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		26 05 48	1.3D	Signed by manufacturers of seismic restraints certifying that products furnished comply with requirements.								X																
		26 05 48	1.3E	For firms and persons listed in "Quality Assurance" paragraph								X								X								
		26 05 48	1.3F	From a qualified testing agency indicating and interpreting test results of seismic control devices for compliance with requirements indicated.							X									X								
		26 05 53	1.2A	For each electrical identification product			X													X								
		26 08 00		Commissioning submittals																X								
		26 09 23	1.2A	For each type of product indicated.			X													X								
		26 09 23	1.2B	Show installation details for occupancy and light-level sensors.		X														X								
		26 09 23	1.2C	Field quality-control test reports.										X						X								
		26 09 23	1.2D	For each type of product to include in emergency, operation, and maintenance manuals.												X				X								
		26 22 00	1.2	Include rated nameplate data, capacities, weights, dimensions, minimum clearances, installed devices and features, and performance for each type and size of transformer indicated.			X													X								
		26 22 00	1.2	Wiring and connection diagrams		X														X								
		26 22 00	1.2	Manufacturer Seismic Qualification								X								X								
		26 22 00	1.2	Source quality-control test reports							X									X								
		26 22 00	1.2	Output Settings Reports							X									X								
		26 24 16	1.3A	For each type of panelboard, overcurrent protective device, transient voltage suppression device, accessory, and component indicated. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.		X														X								
		26 24 16	1.3B	For each panelboard and related equipment.		X														X								
		26 24 16	1.3C	Manufacturer Seismic Qualification Certification								X								X								
		26 24 16	1.3D	Qualification Data: For testing agency.								X								X								
		26 24 16	1.3E	Field quality-control test reports							X									X								
		26 24 16	1.3F	Panelboard Schedules: For installation in panelboards. Submit final versions after load balancing.		X							X		X					X								
		26 24 16	1.3G	For panelboards and components to include in emergency, operation, and maintenance manuals.												X				X								
		26 27 26	1.3	For each type product indicated		X	X													X								

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		26 28 13	1.2	For each type fuse indicated			X													X									
		26 28 13	1.2	Ambient temperature adjustment information			X			X			X							X									
		26 28 13	1.2	For fuses to include in emergency, operation and maintenance manuals												X				X									
		26 28 16	1.3	For each type of enclosed switch, circuit breaker, accessory, and component indicated. Include dimensioned elevations, sections, weights, and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.			X													X									
		26 28 16	1.3	Diagram power, signal, and control wiring		X														X									
		26 28 16	1.3	Submit certification that enclosed switches and circuit breakers, accessories, and components will withstand seismic forces defined in Division 26 Section Vibration and Seismic Controls for Electrical Systems								X								X									
		26 28 16	1.3	Qualificaton data								X																	
		26 28 16	1.3	Field quality test reports							X									X									
		26 28 16	1.3	For enclosed switches and circuit breakers to include in emergency, operation, and maintenance manuals												X				X									
		26 32 14	1.3	Data on features, components, accessories ratings, and performance; Thermal damage curve for generator; Time-current characteristic curves for generator protective device			X													X									
		26 32 14	1.3	Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.		X														X									
		26 32 14	1.3	Welding certificates								X								X									
		26 32 14	1.3	Manufacturer seismic qualification certification								X								X									
		26 32 14	1.3	Qualification data for installer and testing agency								X								X									
		26 32 14	1.3	Certified summary of prototype-unit test report.								X								X									
		26 32 14	1.3	Certified Test Reports: For components and accessories that are equivalent, but not identical, to those tested on prototype unit								X								X									
		26 32 14	1.3	Certified Summary of Performance Tests: Demonstrate compliance with specified requirement to meet performance criteria for								X								X									
		26 32 14	1.3	Factory tests on units showing evidence of compliance. Report of sound generation. Field quality control tests.							X									X									

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		26 32 14	1.3	Certification of Torsional Vibration Compatibility								X								X									
		26 32 14	1.3	For packaged engine generators to include in emergency, operation, and maintenance manuals												X				X									
		26 32 14	1.3	Warranty				X												X									
		26 36 00	1.2	Include rated capacities, operating characteristics, furnished specialties, and accessories.			X													X									
		26 36 00	1.2	Dimensioned plans, sections, and elevations showing minimum clearances, conductor entry provisions, gutter space, installed features and devices, and material lists for each switch specified		X														X									
		26 36 00	1.2	Manufacturer Seismic Qualification Certification								X								X									
		26 36 00	1.2	Qualification data for manufacturer								X								X									
		26 36 00	1.2	Field quality test reports																X									
		26 36 00	1.2	For each type product												X				X									
		26 43 00	1.2	For each type product			X													X									
		26 43 00	1.2	Signed by manufacturers of transient voltage suppression devices, certifying that products furnished comply with specified testing and labeling requirements								X								X									
		26 43 00	1.2	Field test reports							X								X										
		26 43 00	1.2	Maintenance data for transient voltage suppression devices												X				X									
		26 43 00	1.2	Warranties				X											X										
		26 51 00	1.3	For each type of lighting fixture scheduled, arranged in order of fixture designation. Include data on features, accessories, finishes, photometric performance data			X													X									
		26 51 00	1.3	Wiring Diagrams: Power, signal, and control wiring.		X									X					X									
		26 51 00	1.3	For each type of ballast for dimmer-controlled fixtures, signed by product manufacturer.								X								X									
		26 51 00	1.3	Field quality-control test reports.							X									X									
		26 51 00	1.3	For lighting equipment and fixtures to include in emergency, operation, and maintenance manuals.												X				X									
		26 51 00	1.3	Special warranties				X												X									
		27 08 00		Commissioning submittals																X									
		27 15 00	1.5	For each type product			X													X									
		27 15 00	1.5	System labeling schedules; cabling administration drawings; wiring diagrams; cross-connects and patch panels; cable tray layouts		X														X									

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		27 15 00	1.5	For workstation outlets, jacks, jack assemblies, in specified finish, one for each size and outlet configuration and faceplates for color selection and evaluation of technical					X											X								
		27 15 00	1.5	For Installer, qualified layout technician, installation supervisor, and field inspector.								X								X								
		27 15 00	1.5	Source quality reports							X									X								
		27 15 00	1.5	Field quality reports							X									X								
		27 15 00	1.5	For splices and connectors												X				X								
		27 15 00	1.5	Software and firmware operational documentation												X				X								
		28 31 00	1.6	For each type product			X													X								
		28 31 00	1.6	System operation description; device address list; control input output matrix; system riser diagram; wiring diagrams; batteries; duct smoke detectors; elevation details; device mounting details; floor plans		X														X								
		28 31 00	1.6	Cut sheets, calculations and other design documents listed		X														X								
		28 31 00	1.6	Copies of certificates for installers and documenting approved manufacture representation shall be provided								X								X								
		28 31 00	1.6	Field quality-control test reports							X								X									
		28 31 00	1.6	Operation and Maintenance data												X			X									
		28 31 00	1.6	Submittals to Authorities Having Jurisdiction								X							X									
		28 31 00	1.6	"Record of Completion" form and "permanent records documents"														X			X							
		33 08 00		Commissioning submittals																X								

SECTION 01 31 13.13

MECHANICAL, REFRIGERATION, FOOD SERVICE EQUIPMENT, AND ELECTRICAL COORDINATION

(Edited from DeCA June 2011 Design Criteria)

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. General reference.
2. Related requirements.
3. Space reference.
4. Standards, laws, ordinances.
5. Operation and maintenance of equipment.
6. Wiring.
7. Grounding.
8. Access panels.
9. Operation and Maintenance Manuals.
10. Excavation and backfill.
11. Painting.
12. Vandal proofing.
13. Protective covering.
14. Interruption of service.
15. Demolition and remodeling.
16. Disposition of salvaged equipment and material.
17. Cleaning.

B. Related Sections:

1. Division 08 Section Access Doors and Frames.
2. Division 09 Section Painting and Coating.
3. Division 11 Equipment.
4. Division 13 Special Construction.
5. Division 23 Heating, Ventilating, and Air Conditioning.
6. Division 26 Electrical.

1.2 SUBMITTALS

A. Refer to Division 01 Section Administrative Requirements for procedures.

B. Submittal Schedule:

1. Provide the indicated quantity. Unless otherwise stated, Provide four originals and 1 PDF version. The Government will retain three copies and the pdf file.
2. Submittal action by reviewer: Review each submittal, mark to indicate action taken, and return.

C. Each Section of the Specifications may contain submittal requirements. Review all Sections of the Specifications and provide all required submittals. Submittal requirements for this Section are as follows:

1. Coordination Drawings.
2. Access panels.

1.3 GENERAL

A. Coordinate with other trades regarding the location and size of pipes, equipment, fixtures, conduit, ducts, openings, switches, outlets, etc., so that there may be no interference between the installation or the progress of the work of any Contractor or subcontractor on the Project.

B. The Mechanical and Electrical Drawings are diagrammatic. Follow as closely as actual construction of the building and the work of other trades will permit. Where the Contractor provided Shop Drawings approved by the Contracting Officer; follow the Shop Drawings. Formally advise the Contracting Officer's Representative of any required changes from the approved Shop Drawings, and record variances in Record Drawings.

C. The Contracting Officer’s Representative may change the location of any equipment 5-feet and any piping, ductwork, conduit, etc., up to 10-feet in any direction without incurring extra charge from the Contractor, provided such changes occur before installation.

D. Unless specified otherwise, furnish and install each item of equipment or material complete with all necessary fittings, supports, trim, piping (supply, discharge, and drain), valves, switches, relays, disconnects, cable, cords, conduit, overcurrent and overload protection, interfaces or contacts, insulation, connection to power supply or source pipe, etc., as required for a complete and operating installation in accordance with applicable codes and regulations.

E. Install all equipment and material according to the manufacturer's written instruction unless otherwise specified.

1.4 COORDINATION DRAWINGS AND SPACE PREFERENCE

A. Review the Architectural, Civil, Structural, Demolition, and any special Drawings to ensure the inclusion of mechanical, electrical, and plumbing included in those drawings but omitted in the Mechanical, Electrical, and Plumbing Drawings. Distribute such information to the appropriate subcontractor(s) for inclusion in the Work.

B. Carefully verify and coordinate the location and level of all pipes, ducts, etc. Run preliminary levels and coordinate with all other contractors to avoid conflicts in other locations.

C. Plumbing lines below plumbing fixtures and electrical conduits above or below electric switchgear and panels have precedence over ductwork or heating mains. Do not install piping or ductwork directly over, under or within code required frontal clearances of the electrical equipment.

D. In spaces with high concentrations of inter-related equipment, piping, conduit, and ductwork (spaces like Mechanical Rooms), provide coordination drawings clearly depicting the layout (both plan and elevation, or perspective). Clearly define in advance of construction the relationship of all piping, conduit, ductwork, and equipment. Demonstrate clearance space sufficient to service the equipment.

1.5 STANDARDS, LAWS, AND ORDINANCES

A. Where laws require, obtain written approval of systems (such as fire alarm, sprinklers) from proper authorities before ordering equipment.

B. Supplementing the requirements of the General Conditions for compliance with laws and ordinances, meet or exceed the requirements of the following:

Building	ABA, International Building Code in conjunction with the UFC 1-200-01
Plumbing	National Standard Plumbing Code (NAPHCC)
Electrical equipment and wiring	NFPA 70 (National Electrical Code) in conjunction with the ICC EC - 06 ADA
HVAC	NFPA 90A in conjunction with the UFC 3-410-01FA
Boilers, water heaters, pressure vessels	ASME Boiler Code, Section VIII, Division 1 and 2 with Addenda; AGA
Sprinkler systems	NFPA 13, NFPA 24 in conjunction with the UFC 3-600-01

1.6 OPERATION AND MAINTENANCE OF EQUIPMENT

A. Be responsible for the operation, maintenance, and safety of all equipment furnished, make all necessary repairs, and do all necessary maintenance required to maintain the equipment in first class condition until acceptance by the government.

B. Unless otherwise stated in this or other Specifications, where other contractors operate such equipment, the other Contractor is solely responsible for the operation and safety of such equipment.

C. Maintenance work includes, but is not limited to:

1. Lubrication.
2. Adjustments.
3. Filter replacements.
4. Chemical treatment.

1.7 WIRING OF MECHANICAL EQUIPMENT AND MOTORS

A. Furnish and install all conduit, wiring, disconnects, starters, thermal overload heaters, holding coils, remote push buttons stations, "hand-off-auto," multi-speed switches, and pilot lights for all electrically operated mechanical equipment, including the final connections for ready operation, as specified and shown on the Drawings.

B. Where motor starters come as an integral part of the equipment, comply with the Contract Documents including, but not limited to, overload protection on all phases. Install "hand-auto-off" switches on all heating, ventilating, air conditioning and temperature control starters.

C. Where starters or control panels come as an integral part of the respective equipment such as boilers, packaged air conditioning units, sump pumps, etc., furnish and install all wiring and make final connections to the line side of the starter or disconnect device and all wiring beyond this point.

D. Furnish and install all required control and interlock wiring for all automatic control devices, alarms, accessories, etc. Install on the holding coils of the starters or in the grounded load side of TT switches unless otherwise specifically shown on the Electrical Drawings or specified elsewhere.

E. Perform all electrical work in accordance with the Contract Documents. Install control wiring at 120 volt or less. Install all control wiring in conduit.

F. Consult with the electrical subcontractors before ordering or installing equipment. Coordinate the motor type, voltage, and sizes with starter type, voltage and sizes, holding coil voltage, thermal overload capacities, interlocks, etc. Each trade is equally responsible to ensure that the equipment installed is of proper size and type.

G. Electrical subcontractor(s) shall consult with all other contractors furnishing motors that require starters by the electrical subcontractor(s) to verify the exact type of starter required (e.g., part winding, across the line, two speed, etc.) for each motor before ordering starters.

H. After the electrical subcontractor(s) completes the wiring, have each Contractor inspect the wiring before operating their respective motors. The Contractor who furnished the motor is completely responsible for the motor's protection during the warranty period, including initial startup of each motor, unless specifically shown otherwise in the Contract Documents.

I. Furnish motor protection devices on all 3 phase motors 5 HP and larger.

1.8 GROUNDING

1. Ground all electrically powered equipment per electrical specifications and NFPA 70. See specifically Sections 250-1, 42, 43, 44, 50, 70, and 90.
2. Non-electrical powered roof-mounted equipment such as roof hoods, chimneys, vents, etc.: Ground as required by NFPA 70.

1.9 ACCESS PANELS

A. Where control valves, shut-off valves, drip traps, air vents, heating coils, pull boxes, or other mechanical or electrical equipment are above inaccessible furred ceilings or back of masonry or furred walls, provide access panels. The Drawings indicate the location of many, but not necessarily all locations requiring access panels.

B. Size access panels of sufficient size for adequate servicing, adjustment, removal, and replacement of concealed equipment through the opening provided. Size panels as shown on the Drawings. Size panels not dimensioned a minimum of 16 inches by 24 inches in walls and 24 inches by 24 inches in ceilings.

C. Submit Shop Drawings for approval before ordering panels. Furnish appropriated labeled doors where fire rating is required.

D. Division 08 Section Access Doors and Frames (if applicable) specify panels.

1. Install Panels:

	Bilco	Milcor	Karp
Drywall	B	DW	214P
Masonry	C	M	214M

Acoustical tile	D	AT	210
Plaster	A	K	214P

1.10 OPERATION AND MAINTENANCE MANUALS

A. Submit all Mechanical, Electrical, and Plumbing operation and maintenance (O&M) manuals with the initial submittals. Prior to completion of the Contract, provide inserts for the O&M manuals containing testing documentation related to the performance testing for each piece of equipment tested.

1.11 EXCAVATION AND BACKFILL

A. Each Contractor performs all excavation, sheathing, bracing, and backfill required for the installation of his respective work.

1. See: Division 31 Section Earthwork (if applicable).

B. Bed piping, conduit, etc., firmly and continuously on undisturbed earth (or sand or pea gravel where specified or required). Where piping has bells, excavate deeper at same.

C. Where the excavation is in rock, ashes, cinders, refuse or other unsuitable materials, make the trench 6 inches deeper and 12 inches wider than required for the piping and backfill with sand or pea gravel 6 inches deep. In these areas, provide 6 inches of sand or pea gravel backfill around the entire perimeter of pipe, conduit, etc. The intent is to have a minimum of 6 inches of the appropriate fill below, on both sides, and atop the pipe, conduit, etc.

D. Maintain trenches and excavations free of standing water. Do not backfill trench until pressure tests are complete, joints and pipe are watertight and the installation inspected. Backfill trenches in 6-inch layers. Compact by tamping and puddling. Do not install frozen backfill material.

E. Place backfill for the first 12 inches over piping, etc., by hand and carefully tamp.

F. Use sand or pea gravel fill for trench backfill under floors, parking areas, streets, walks, drives, etc. Backfill over excavation with sand or pea gravel in 8-inch layers, dampen (do not soak) and mechanically tamp to 95 percent minimum of maximum density per ASTM D 1557-78. Where backfill of other construction surrounds pipe, remove same to undisturbed earth and backfill with sand or pea gravel.

G. Surplus earth is acceptable for backfill in yards and seeded areas of the Project only upon approval. The backfill cannot contain cinders, ashes, wood, large rocks, concrete, or debris. Promptly remove (from the site) surplus excavation material not needed for backfill or elsewhere on the site.

H. Provide adequate barricades, construction signs, torches, red lanterns, guards, etc., as required during the progress of the excavation, installation, and backfill work. Observe all applicable regulations respecting safety provisions, sheathing, and barricades.

I. For excavations made through streets, lawns, sidewalks, curbs, parking areas or other finished surfaces, replace surfaces with material to match existing surfaces as approved by proper authorities, including reinforced steel, where required. Neatly perform all cuts with saws, etc.

J. Protect utilities, trees, shrubbery, fences, poles, sidewalks, curbs and all other property and surface structures from damage. Restore all disturbed by construction.

K. Before beginning excavation work, contact utility companies or, if applicable, responsible host installation shops and request they locate and stake buried piping, wiring, etc. Expose such piping, wiring, etc., by hand excavation prior to the use of power equipment.

L. The minimum cover over buried water pipe is frost depth plus 12 inches.

1.12 PAINTING

A. Clean, prepare, and paint the following with rust inhibitor followed by enamel paint at the time of fabrication to stop rusting, whether exposed or concealed, insulated or un-insulated:

1. Welds to building structural members.
2. Welds on pipes without insulation.
3. Supplementary steel supports (see Division 21 Section Fire-Suppression Sprinkler Systems, Divisions 22 Section Hangers and Supports for Plumbing Piping and Equipment, Division 23 Section Hangers and Supports for HVAC Piping and Equipment, and Division 26 Section Common Work Results for Electrical).

B. Paint all surfaces visible through grilles of fin tube radiation, cabinet unit heaters, etc., with flat black paint.

C. Touch up all damaged or chipped paint on all materials furnished.

D. Perform all other painting and all finish painting (if any) of mechanical and electrical equipment, materials, etc. See Division 09, Finishes. Leave all materials and equipment clean and dust free and ready for paint. Do not paint over manufacturers' name plates. Do not paint sprinkler heads.

1.13 VANDAL PROOFING

A. Reduce the number of exposed screws, bolts, etc., used in the occupied areas of the building to a minimum.

B. Where screws, bolts, etc. is unavoidable, provide a flat-span vandal proof type or Allen wrench type.

1.14 PROTECTIVE COVERING

A. Furnish and install suitable covering and protection for all equipment, devices, and materials, etc., stored or set-in-place on the Project.

B. Prevent damage from mortar, plaster, paint, or other construction procedures or debris to coverings.

C. A 6 mil polyethylene covering securely attached is acceptable in most cases. In cases where daily temperature fluctuations will cause condensation inside the wrappings, provide a lamp or other heat source to prevent formation of corrosion on controls, contacts, etc.

D. Protect all equipment nameplates from damage or defacement.

1.15 INTERRUPTION OF SERVICE

A. Arrange work to minimize the period of interruption or outages in the various services.

B. For ADD/ALTER PROJECTS

1. No extra payment is due if it is necessary to do this work after normal business hours on premium time to minimize inconvenience to the occupants.
2. No less than 21 days before interruption of any service, notify the Contracting Office of such necessity, including the extent of the work required during the outage, the probable length of time required for that phase of the work, and the desired time at which the outage will begin.
3. The Contracting Officer dictates the beginning time and other regulations governing each particular outage to minimize inconveniences to the occupants.

1.16 DEMOLITION AND REMODELING

A. Remove existing equipment and materials pertaining to this Contract as specified and as required to prepare for the new work of all contracts.

B. Where necessary, reroute piping, conduits, wiring, etc., from within walls, floors, ceilings, etc. scheduled for removal.

C. Report to the Contracting Officer's Representative; any existing receptacles, light fixtures, switches, panels, mechanical, plumbing, etc., rendered inoperable in areas outside the construction zone and caused by work under this Contract.

D. Cap all abandoned or terminated piping, conduit, etc., below floor, behind wall surfaces, above ceiling, etc., as required to completely conceal before new work is complete. Properly caulk, seal, and provide an appropriate and appropriately sized pre-manufactured cap, escutcheon, or faceplate to penetrations through walls, ceilings, and floors.

E. Most mechanical and electrical remodeling work is shown on the Mechanical and Electrical Drawings. Carefully study all Drawings (all contracts) for "demolition" and "remodeling" work in the existing building and field check to verify locations where such is underway to determine the exact extent of work required.

F. The electrical subcontractor(s) shall test all new and existing electrical panels for new work and verify their adequacy before and after connecting new loads. Report any inadequacies immediately.

G. See Division 21 Section Fire-Suppression Sprinkler Systems, Division 22 Section Hangers and Supports for Plumbing Piping and Equipment, Division 23 Section Hangers and Supports for HVAC Piping and Equipment, and Division 26 Section Common Work Results for Electrical for additional requirements.

H. NOTE! IMPORTANT! Do not remove existing equipment, systems, or etc. scheduled for replacement by new equipment, systems, etc. from service until the installation and make ready of the new equipment, materials, systems, etc. is complete. Provide temporary feeds to the

existing devices so they remain in service while GC is performing new work. Deviation from this requirement requires specific written approval.

1.17 DISPOSITION OF SALVAGED EQUIPMENT AND MATERIAL

A. Where the Contract Documents specify removal of existing materials or equipment from service, unless otherwise noted as items to be retained by the government, take possession and remove them from the Project site promptly, except as specified below or unless otherwise noted in the Contract Documents.

B. Prior to disposal of commissary operational equipment, fill out the appropriate form, provided by the commissary store director (CSD), including, but not limited to a list of the itemized equipment with name, model #, part number, and value. Return the completed form to the Contracting Officer Representative with a copy to the CSD.

C. Coordinate removal of old salvageable equipment with the CSD prior to removal. Failure to do so might result in GC compensating the government for lost sales due to premature equipment removal.

1.18 CLEANING

A. Keep the premises free from accumulations of waste materials or rubbish caused by contractor operations. At completion of each days work, remove rubbish from the construction area. At the completion of the Project, remove all rubbish, tools, scaffolding, surplus materials, etc.

B. At completion, clean all surfaces of all paint, plaster, mortar, stains, paper labels, stickers, dust, grime, etc. Do not mar or damage surfaces while cleaning.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 01 31 23

PROJECT WEB SITE

(Edited from DeCA June 2011 Design Criteria)

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative provisions for coordinating and reporting construction operations on Project Web Site.

B. Related Sections:

1. Division 01 Section Contract Modification Procedures.
2. Division 01 Section Mechanical, Refrigeration, Food Service Equipment and Electrical Coordination.
3. Division 01 Section Administration Requirements.
4. Division 01 Section Construction Progress Documentation.
5. Division 01 Section Quality Control.
6. Division 01 Section Temporary Facilities and Controls.
7. Division 01 Section Environment Management.
8. Division 01 Section Closeout Procedures.
9. Division 01 Section Government Safety Requirements.

1.2 PROJECT WEB SITE - FACTSdocs

A. General: The Government will provide the Contractor access to a web based application "FACTSdocs," which will be utilized in submitting, transmitting, reporting, and uploading project documents and data as indicated in the Contract Documents. The project management software will be accessible to the project team members designated by the Contractor and the Government. The Government will provide training in the use of this project management software to the designated project team.

B. Manage forms, submissions, and correspondence as set forth below to assist the Government in its monitoring and administration of this Contract. Use this system to record, maintain, and submit information throughout the contract period. This joint Government-Contractor use will facilitate electronic exchange of information and overall management of the Contract. This approach provides the means for the Contractor to input, track, and electronically submit and or share information with the Government in the following areas:

1. Administration.
2. Finances.
3. Requests for information (Project Website).
4. Price proposals and background data.
5. Quality control.
6. Submittal monitoring (Project Website).
7. Transmittals (Project Website).
8. Scheduling.
9. Import/export of data.
10. Deficiency tracking.

11. Accident/safety tracking.
12. Daily activity / production reporting.

C. The primary function of the project management software is to ensure timely processing and approval of all documentation in coordination with the project schedule. The Contractor shall use the "FACTSdocs" software to complete, submit, update and upload the following data. Request for Information (RFIs), Daily Construction Quality Control and Contractor Production Reports Submittals, Transmittals, Weekly, Schedules to include Preliminary, Baseline, Progress, Weekly Short Interval, Phasing Plans, Submittal Register, Project Register, Test Reports, QCM Meeting Minutes, Safety Meeting Minutes and all other documentation and correspondence specified in the Contract Documents and as deemed necessary by the Government.

D. The Government will require the following naming convention format be used for all files uploaded: Project Name-YY-MO-DD-File Name and/or description. Example: Keesler 08-06-16 Submittal 001 Quality Control Plan.

E. Project RFIs: The Contractor shall enter and transmit all Requests for Information (RFIs) through the Project Management software. The Government will then answer the RFIs through the Project Management software only. The project team will be able to print record copies of the RFIs from the Project Management software.

F. Project Submittals: The Contractor shall enter submittals into the FACTSdocs software. Copies of the product data and Shop Drawings shall be hand delivered to the Technical Inspector as required and entered and/or uploaded into the project management software as a PDF file and/or native format as required and/or indicated in this document.

G. Daily Quality Control Reports and Daily Contractor Production Reports: The Contractor shall submit these reports daily into the Project Management software and sign them electronically The Technical Inspector will then add any comments and sign electronically. The daily reports may be printed as separate files or in "Log Format" as a report for use by the "Project Team."

H. Application for Payment: In addition to submittal requirements and in accordance with the Contract Documents, the Contractor shall enter and/or upload all documents as listed in Division 01 Section Contract Modification Procedures for progress payment, and final payment and as deemed necessary by the Government in PDF format into the Project Management software.

I. Transmittals: The Contractor shall log the transmittal of all documentation and correspondence to the Government using the Project Management software. Likewise, the Government will log the transmittal of all correspondence and documentation to the Contractor into the Project Management software.

J. Weekly Progress Meeting Minutes: The Technical Inspector will chair the Weekly Progress Meeting and will upload the meeting minutes in the Project Management Software where they can be viewed / printed by the project team.

K. Quality Control and Safety Meeting Minutes: In accordance with the Contract Documents, the Contractor shall enter and/or unload Quality Control and Safety Meeting Minutes into the Project Management software.

L. Preparatory Phase Meeting Minutes: In accordance with the Contract Documents, the Contractor shall enter and/or upload Preparatory Phase Meeting Minutes into the Project Management software.

M. Preliminary, Baseline, Progress, Fragnet and Weekly Short Interval Schedules: In addition to submittal requirements, the Contractor shall upload Preliminary, Baseline, Progress, Fragnet Schedules and the Weekly Short Interval schedules in accordance to time periods as listed in the Contract Documents into the Project Management software in both PDF and their native formats.

N. Phasing Plans and Phasing Schedules: In addition to submittal requirements and in accordance with the Contract Documents, the Contractor shall upload Phasing Plans, Schedules, and Coordination Drawings into the Project Management software in both PDF and their native formats.

O. Submittal Register and Project Register: In addition to submittal requirements and in accordance with the Contract Documents, the Contractor shall upload their submittal register and project register/schedules into the Project Management software.

P. Test Reports, Rework Logs and Punchlists: In addition to submittal requirements and in accordance with the Contract Documents, the Contractor shall enter and/or upload all required test reports, outstanding rework items, and Punchlists into the Project Management software.

Q. Pre-Performance Inspections, Photos, Inspections, and Reports: In accordance with the Contract Documents, the Contractor shall enter and/or upload Pre-Performance Inspections and Photos, on-going inspections and reports into the Project Management software.

R. Training: The Government shall provide training on use of the Project Management software to the entire project team as soon as practical and or the construction trailers are in place and a broadband internet connection is established. The FACTSdocs Administrator offers training via web and teleconference formats for the convenience of the project team members. Scheduling of these sessions should occur at the pre-performance conference. Initial training sessions may be performed onsite by a competent person. The FACTSdocs Administrator will provide additional sessions and/or follow-up training and/or training for any team member unable to attend the onsite session via teleconference, webex, and or webinar style meeting. The Contractor must provide the following information to the Government for each person requesting access to the FACTSdocs software. Employee Name, Company they Represent, Contact Phone Number, and Company Email Address.

S. Printing: All components-RFI's, submittals, daily quality control reports, transmittals, weekly meeting minutes, modification information, project logs etc., shall be available in print through the FACTSdocs software.

T. There is no separate payment or line item for establishing and maintaining these requirements. Include all associated costs within the Contract pricing for the Work.

1.3 CORRESPONDENCE AND ELECTRONIC COMMUNICATIONS

A. For ease and speed of communications, both the Government and Contractor shall exchange correspondence and other documents in electronic format. As required by the Contracting Officer, the Contractor shall provide correspondence, pay requests, requests for information, and other documents comprising the official contract record in paper format, with original signatures and dates. Paper documents shall govern, in the event of discrepancy with the electronic version. The Technical Inspector shall store all paper documents after submittal and approval.

B. Format and File Naming Convention for Electronic Files: The government requires use of the following file naming convention for all electronic file uploads. Project Name-Date-File Name-version.

C. Start file name with abbreviated job name. For example, abbreviate Ord Military Community to "Ord," abbreviate Dyess AFB to Dyess, and Camp Pendleton MCB to Pendleton. Do not use special characters in the filename (e.g. ! @ # $ % ^ & *) . Follow the name with the date YY-MM-DD. Always use two digits. Always use one space between the name and the date. A good example is as follows 08-08-13. Follow the date with a brief description such as this example, "Bakery-Deli Floor Tile."

D. Use the following sequencing when uploading photos of the same subject: add a space then a number such as 1, 2, or 3, etc. after the description. A good example is "West Point 08-05-12, Produce 1.jpg" and "West Point 08-05-12 Produce 2.jpg". Always use one space between the date and the description.

E. Submit all correspondence and document attachments in Adobe Acrobat's - Portable Document Format (PDF) and schedules in native formats as well as PDF.

F. Provide password-protected electronic signatures in all signature blocks requiring Contractor representative signatures to correspond with actual signatures in the duplicate companion paper documents.

G. Provide fillable PDF data blocks where appropriate on all forms and correspondence requiring further action by the Government.

H. When specifically requested by the Contracting Officer, provide additional data files in native formats, e.g. spreadsheet (Microsoft Excel (.xls)) and word processing (Microsoft Word (.doc)) files.

I. Identification: Identify all Contractor correspondence to the Government with a serial number. Prefix correspondence initiated by the Contractor's site office separately from that initiated by the Contractor's home office. Start serial numbering format from 0001.

1.4 PROJECT WEBSITE AVAILABILITY

A. The FACTSdocs software shall be available during all normal working hours in all CONUS time zones. Expect only minimum downtime of the FACTSdocs software for maintenance and or repairs.

B. FACTSdocs Software Maintenance: Performance of all periodic maintenance shall occur during non- working hours for the Project.

C. The name and contact information of the FACTSdocs Administrator will be provided by the Government at the pre-performance conference. This person will issue passwords and access rights to all Project participants, resolve site maintenance issues, and act as primary point of contact for the duration of the Project. This person shall be available to respond to technical or functional questions or issues with the site operations during all normal business hours or a minimum of 40 hours per week Mondays through Fridays.

D. In accordance with the Contract Documents, the Contractor shall enter and/or upload information in FACTSdocs by routing the information to the Technical Inspector and Government Team as follows: Route All documentation and required correspondence first to the Technical Inspector.

E. The Project Website shall be accessible via the internet by all Project members.

F. The Project data maintained by the FACTSdocs software shall be accessible to the Government for a period of five years after the Date of Beneficial Occupancy (BOD).

G. The Government will determine Access to specific data fields and reports in the FACTSdocs software.

1.5 DATA SUBMISSION VIA ELECTRONIC MEDIA

A. Whenever possible the Contractor is to provide all electronic file submissions in Adobe Acrobat .PDF format and unless otherwise specified only .PDF format.

1. Where electronic files are required to be delivered on data disk use the following: minimum 750 MB CR-R capable of running Microsoft Windows XP or newer. Alternatively, DVD-ROMs may be used. As an option 210MB CD-R medium may be used for small files. Ensure they conform to industry standards used in the United States. Provide all data in English.

B. Disk or CD/DVD-ROM Labels: Affix a permanent exterior label to each diskette and CD/DVD-ROM submitted. Indicate in English the file name(s), full Contract number, Project name, Project location, data date, name and telephone number of person responsible for the data.

1.6 IMPLEMENTATION

A. Contractor shall use electronic format as described in the preceding paragraphs. Contractor shall ensure that sufficient resources are available to maintain supporting data and databases.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

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SECTION 01 32 16

CONSTRUCTION PROGRESS DOCUMENTATION

(Edited from DeCA June 2011 Design Criteria)

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Administrative and procedural requirements for phasing (ADD/ALTER PROJECTS) and scheduling (all project types). Failure to maintain the Construction Schedule in an accepted status may result in the Contracting Officer withholding a monetary penalty against the Contractor until the schedule is accepted.

1.2 SUBMITTALS

A. Refer to Division 01 Section Administrative Requirements for procedures.

B. Submittal List:

Reference	Submittal Item	Quantity	Action
1.5	Preliminary Project Schedule	4+CD	R
1.6	Phasing Schedule (Add/Alter Projects)	4+CD	R
1.7	Project Schedules and Tables, Monthly Progress Updates, and major revisions to Project Schedule	4+CD	R
1.7M	Changes	4+CD	R
1.8	Short Interval Schedules	For Each Weekly Meeting Attendee	I

X Submit quantity specified in Division 01 Section Administrative Requirements.
R Review each submittal, mark to indicate action taken, and return.
I Submittal is for information or record purposes only. No action will be taken.

1.3 DEFINITIONS

A. Non-excusable Delay: Any delay caused by events within the control of the Contractor.

B. Excusable Delay: Any delay beyond the control of the Contractor or Government, caused by events such as strikes, acts of God, unusually severe weather, fires, floods, acts of Government, etc.

C. Critical (Prejudicial) Delay: a delay to any activity that impacts the project completion date (a delay to the critical path).

D. Non-Critical (Non-prejudicial) Delay: a delay to any activity that does not exceed the available float time, and thus, does not impact the project completion date (a delay to non-critical work).

E. Compensable Delay: Any delay beyond the control of the Contractor, but within the control of the Government, such as changes, differing site conditions, suspension of work, late approval of shop drawings, late delivery of Government Furnished Equipment, etc.

F. Concurrent Delay: Two or more delays that occur simultaneously or overlap in some way.

1.4 CONTRACTOR'S RESPONSIBILITY FOR COMPLETION

A. All schedules provided for herein shall be based on the Contract Time and shall show Beneficial Occupancy within the Contract Time, measured in calendar days after the effective date of the Notice to Proceed.

B. Furnish such manpower, materials, facilities, and equipment and work hours, including night shifts, overtime operations, to include Sundays and holidays as necessary to ensure completion of the Work in accordance with the approved Project Schedule. If the Contractor through non-excusable delay, misses a scheduled milestone by 14 days, a critical path activity start or completion date, or forecasts a delay to the overall project, the Contracting Officer may require the Contractor to take the following recovery actions:

1. Reschedule activities to achieve maximum practical concurrence of activities.
2. Increase manpower in such quantities and crafts as will substantially eliminate the backlog of work to the satisfaction of the Contracting Officer.
3. Increase the number of working hours per shift, shifts per working day, working days per week, or the amount of equipment utilized. Perform any combination, subject to the following:

   a. Approval from the Contracting Officer.
   b. Accommodate the Government’s Designated Inspector for required inspections.
   c. If any work is accomplished outside of normal working hours that requires inspection and or approval, then the work shall not be covered up unless the Contractor:

      1) Pays all costs for additional Government inspections to include Government per diem rates, and all costs for transportation to and from the project site.

4. Submit a revised Project Schedule demonstrating the Contractors proposed plan to make up the lag in schedule progress and to ensure completion of work within the Contract time. Refer to paragraph 1.7N.

1.5 PRELIMINARY PROJECT SCHEDULE

A. Submit within 20 calendar days from the Notice to Proceed a preliminary computer generated network defining the Contractor's planned operations during the first 120 calendar days. Indicate the general approach for the balance of the project. Include cost of activities expected to be complete or partially complete before submission and approval of the project schedule.

B. The Government will provide the Contractor with a Primavera or a Suretrak schedule template with all default program settings, codes, etc. Use the approved preliminary schedule for payment purposes not to exceed (120) calendar days.

1.6 PHASING PLANS AND SCHEDULES (ADD/ALTER PROJECTS)

A. Occupancy Requirements:

1. The commissary will remain in operation throughout the duration of this Contract.
2. Cooperate with the Contracting Officer in phasing and coordinating the work to minimize disruptions and interference with commissary daily operations.

B. Scheduling:

1. Submit a detailed schedule of work in accordance with this Section that conform to the priority and sequence of work shown on the Construction Phasing Plan indicated in the Contract Documents. Notify the Contracting Officer 14 days in advance of anticipated changes in the phasing plan or work schedule to permit the Contracting Officer's consideration of approval and for adjustment of store operations without adversely affecting the ability of the commissary to function as necessary. Obtain written notice to proceed before commencing phase changes or work that affects store operations.

C. Government Phasing Plan: The Government phasing plan is a floor plan of the store that shows areas the Contractor will be allowed to have at any one time. Combined with the Project Schedule, the Government can view what part of the store is being worked on at any given time. By definition, the Phasing Plan is not the same as the Project Schedule. The Government Phasing Plan indicated in the documents is a minimum guideline for developing detail in the Contractor's Project Schedule required by this Section. Any proposed change to the Government Phasing Plan must be approved by the Government. The Government Phasing Plan is intended to explain a potential phasing sequence. Some requirements must be adhered to for practical, operational, safety, or other reasons.

D. Contractor's Phasing Plan: The Contractor will develop a revised phasing plan (if it deviates from the Government phasing plan) from information gathered in a formal meeting, scheduled by the Contractor within 45 days from Notice to Proceed. Mandatory attendees are the Store Director (or authorized representative), the DeCA Project Manager, the Contracting Officer, the Government's Designated Inspector, key management of the Contractor, major Sub-Contractors and Suppliers. Submit the revised phasing plan to the Contracting Officer for approval at least 10 days prior to the meeting. Do not proceed onto future phases until the Contracting Officer approves the revised phasing plan. Once approved, the revised phasing plan will be the contractual 'Phasing Plan'. Use of the approved Phasing Plan in the Contractor's Project Schedule is required.

1. The Government Phasing Plan does not address all of the situations encountered in the construction process, nor does it address the Contractor's specific capabilities, means, or methods. It generally addresses Commissary operations and is to serve as a guidance document and as a basis for the Contractor to develop a detailed Phasing Plan. In developing the detailed Phasing Plan, prioritize Commissary operations as implied by the Government Phasing Plan. The Contractor shall take into account his and his subcontractor's means, methods, and capabilities and examine the Government Phasing Plan for potential improvement.
2. The Government has a sample computer-generated phasing plan available to the Contractor, upon request, at no cost.

E. Phase Turnover and conditions for proceeding to subsequent Phases: Comply with Division 01 Section Closeout Procedures.

F. Subsequent revisions to the Phasing Plan: If the Contractor deems revision to the Phasing plan to be prudent, the Contractor shall request permission from the Contracting Officer to revise it

and the make the corresponding changes to the Project Schedule. Prior to submission for approval, concurrence for the changes shall be obtained from the Government's Designated Inspector and the Store Director. Only after gaining the Contracting Officer's approval shall the Contractor proceed with instituting the revised Phasing Plan and Project Schedule.

G. GENERAL RESTRICTIONS AND LIMITATIONS

1. Work areas inside the commissary are normally available during hours the commissary closes to customers. Note that commissary operations personnel regularly work hours over and above those hours open to customers. Coordinate access and request approval from the Contracting Officer seven days in advance of the need to schedule after hours work.
2. Perform some work tasks during the commissary's normally closed hours. Potential tasks required for performance during those hours include, but are not limited to, painting, tasks involving disconnecting or rerouting electrical power, some demolition items, items of work which create excessive noise or generate fumes which irritate the customers, commissary employees, or put them at risk. Closely coordinate with the Contracting Officer, the Commissary Store Director and Base Security to identify these tasks and schedule them.
3. Schedule construction inside the commissary so interference to daily operations is minimal. Restrict operations that create dust, noise, and fumes inside an open-for-business commissary to its normally closed hours.
4. It is the intent of the Contract that the commissary does not close any days other than those it would normally. However, should the Contractor identify accomplishment of a task in a time period not to exceed 48 hours, and should this result in a benefit to the commissary in its operations, a one day closing is an option on either side of a normally closed day. The Contracting Officer is under no obligation to grant such a closing, but may consider if it would result in an enhancement to the overall project. Provide a minimum 30-day notice to the Contracting Officer and receive written notice to proceed before commencing work on the premise of a closed store.
5. Maintain utilities to all adjacent facilities at all times except as required during scheduled change over periods. Schedule outages and interruptions with, and obtain written approvals from, the Contracting Officer.
6. Coordinate the installation of the mechanical, fire detection and suppression, and electrical systems to maintain the existing building at its current levels while the new systems and new areas become on line.

1.7 PROJECT SCHEDULE AND REQUIREMENTS FOR MAINTAINING PROGRESS

A. Contract Time: Warrant and represent that the Work shall be complete within the Contract Time. Perform all work in an orderly and closely coordinated sequence and in conformance with the Contract Milestones and the Project Schedule. The Contract Time includes allowances for time lost due to foreseeable adverse weather conditions other than floods, hurricanes, tornadoes, and the like.

B. Effect of Schedules. Acknowledge that no Progress Schedule or any other update of any schedule (whether accepted by the Contracting Officer or not) shall extend the Contract Time, adjust the Contract Milestones or modify the Project Schedule unless and until such change is approved by the Contracting Officer in a written Contract Modification. If the Contracting Officer determines that the Contractor is not entitled to an extension of Contract Time or an adjustment of the Contract Milestones, comply with the then current Contract Milestones and achieve Beneficial Occupancy within the Contract Time. Take such action as necessary to bring the general progress of the Work into compliance with the Project Schedule. Bear entirely the cost and expense of such overtime, or any additional measures, including any costs or damages

incurred by the Government; such as the Government's Designated Inspector, or Government Contractors.

C. General Format:

1. Base schedules on the critical path method using the Precedence Diagram Method format ("PDM").

   a. For Contracts Greater Than $7,500,000 in Value: Use Primavera Project Planner (P3) Software, Version 3.01 or later for Windows Operating Systems.
   b. For Contracts $7,500,000 or Lower in Value: Use P3 or Suretrak Project Manager (current Version) for Windows Operating Systems.

2. Use the schedule template provided, including all default program settings, codes, calendars, etc. during all Project Schedule**/**Phasing Plan development.
3. The schedule is a requirement to assure adequate planning and execution of the work and to assist the Government in appraising the reasonableness of the schedule and evaluating progress of the work both before and during construction.
4. Schedule activity durations to allow for normal weather conditions such as precipitation, high or low temperature, wind, etc. Any activity duration, potentially impacted by normally anticipated weather shall include an adjustment for the anticipated weather effect. The Contractor shall use the National Oceanic and Atmospheric Administration's (NOAA) historical monthly averages for the Richmond, Va International Airport Weather Station as the basis for establishing a "Weather Calendar" showing the number of anticipated non-workdays for each month due to adverse weather. Saturdays, Sundays, and all Federal Holidays are non-work days. A lost workday caused by weather, is defined as a day in which the Contractor's workforce cannot work at least 50 percent of the day on the impacted activity(s) because of weather. The Contractor shall immediately notify the Contracting Officer when a lost day has occurred due to weather and will record on the Daily Reports the occurrence of the weather and the resultant impact to the normally scheduled work. If the number of actual lost workdays caused by weather exceeds the number of days anticipated, the Contracting Officer will convert any qualifying lost workdays to calendar days, giving full consideration for equivalent fair weather workdays and issue a modification in accordance with the Contract clauses.

D. Schedule Submittal Formats:

1. Submit tabular reports on 8-1/2-inch by 11-inch sheets.
2. Submit graphic reports on 11-inch by 17-inch sheets with the exception of the logic diagrams, in which case submit on 30-inch by 42-inch sheets.
3. Provide two (2) copies per submittal. On each page, clearly identify the Project, Contractor name, filename, and the data date of each project.
4. Submit schedule back-up information electronically.

   a. Each electronic file shall contain the Project Schedule (initial submittal), or the latest updated Progress Schedule (subsequent monthly submittals).
   b. Properly label each electronic file identifying the project, Contractor's name, filename, and the data date.

E. Contractor's Scheduling Representative: Before starting the Work, designate, in writing to the Contracting Officer, an individual, with previous experience of at least five (5) years creating and reviewing construction schedules, as the Contractor's Scheduling Representative. This representative shall monitor and maintain the Project Schedule and scheduling as defined in this Section and shall be able to revise, update, and recommend logic revisions to the Project Schedule as necessary for closely monitoring progress of the work. Include in the written

designation the name, qualifications and experience of the individual and request the Government's acceptance, which will not be unreasonably withheld. The Scheduling Representative shall be responsible for the coordination and implementation of all Contractor activities and responsibilities relating to the Project Schedule and scheduling as set forth in the Contract Documents.

F. Proposed Baseline Project Schedule: Within ninety (90) calendar days after the effective date of the Notice to Proceed, provide the Contracting Officer with a schedule to cover the entire Contract Time (Project Schedule). Prepare schedule in detail and format required by the items set forth below. The Project Schedule shall show the order, interdependence of activities, and the sequence of the plan to accomplish the work.

1. Review of Project Schedule: All submitted Schedule(s) shall be subject to the review by the Contracting Officer, and when accepted by the Contracting Officer, shall be identified as the Baseline Project Schedule. Allow the Contracting Officer fourteen (14) calendar days for review of each submittal. Within twenty-one (21) calendar days of the Project Schedule submittal, the Contracting Officer will conduct a teleconference with the DeCA PM, Government’s Designated Inspector, Government Scheduler, and Contractor to discuss any review comments issued. The Government will provide an advance set of comments to the Contractor three calendar days prior to the meeting. The PCO will return the disposition of the schedule to the Contractor on an AF Form 3000 one calendar day prior to the teleconference. If the Project Schedule is approved as submitted, a teleconference is not required.
2. By accepting the submitted Schedule(s) as the Baseline Project Schedule, the Contracting Officer is not assuming any of the Contractor's responsibility for the timely and orderly completion of the Work or the coordination of the performance of the Contractor's Work or its subcontractors with that of other Contractors. Any adjustments made in the Project Schedule necessitated by any error or inconsistency, or by reason of the requirements for the orderly performance of the Work, shall be made and the Work performed by the Contractor without additional compensation or extension of time.
3. The final proposed Project Schedule accepted by the Contracting Officer shall be identified as the Project Schedule and shall be the Project Schedule used by the Contractor and Government for monitoring progress of the work.
4. Clearly indicate any special sequencing, predetermined use of multiple shifts or overtime, all costs of which deemed included in the Contract Sum. Unless otherwise indicated, work hours shall be Monday through Friday, 8 hours per day (day shift). Schedule the work by days in the proposed Project Schedule to accurately reflect project activities occurring other than day shift such as, weekends, holidays, and second or third shifts. In addition, request information from major subcontractors before completing the proposed Project Schedule. The proposed Project Schedule submittal shall include, at a minimum, the following items:

   a. Provide a minimum of 80 activities per $1,000,000 of actual work. Each piece of equipment shall have a separate activity assignment. DO NOT consider refrigeration system as one piece of equipment. Each activity's assignment shall be identifiable to a single responsible party. This includes all procurement, design, submittal review, fabrication, and delivery activities. The Project Schedule shall indicate durations for all activities in working days, with durations of no less than one (1) nor more than twenty (20) days per activity, with the exception of activities such as design, submittals, fabrication, or deliveries.
   b. Include identification of all precedence relationships between the design, submittal, fabrication, delivery and Contractor's activities, as well as those of Subcontractors. Base the Project Schedule on a thorough review of the Contract Documents, showing the interface between separate Contractor's and subcontractor's work. Insure all definable features of the work are identified in the Project Schedule.

1) Procurement Activities: Include tasks related to the procurement of materials or equipment as separate activities. Examples of procurement process activities include, but are not limited to: submittals, approvals, procurement, fabrication, and delivery. Assign procurement activities to a 7-day calendar. DO NOT use fabrication and Delivery activities as "Stored Material" items. Stored Materials are allowed for specific items meeting the criteria listed in Division 01 Section Contract Modification Procedures.
2) Critical Activities: List the following activities as separate line activities on the Project Schedule:

a) Submission and approval of:
(1) Contractor Quality Control Plan.
(2) Safety Plan.
(3) CPM Schedule.
(4) Mechanical/electrical layout drawings.
(5) O & M manuals.
(6) As-built drawings.
(7) DD1354 data and installed equipment lists.
(8) Refrigeration submittal.
(9) Structural steel shop drawings.
(10) Fire protection shop drawings.
(11) Testing and balancing of HVAC, plus commissioning plans and data.
(12) Security System.
b) Implementation and termination of each temporary utility.
c) Implementation and termination of each temporary support facility.

d) Relocation dates (phases, etc.).
e) GFCI item dates.
f) GFGI item dates.
g) Air and water balance dates.
h) HVAC commissioning dates.
i) Controls testing plan.
j) Controls testing.
k) Performance Verification testing.
l) Other systems testing, (Commissioning).
m) Training.
n) Beneficial Occupancy/Move-in.
o) Move-out.
p) Pre-final inspection.
q) Correction of punch list from pre-final inspection.
r) Final inspection.
s) Notice to Proceed.
t) Project Completion.

c. Government Activities: Show Government and other agency activities that could impact progress. These activities include, but are not limited to: approvals, inspections, utility tie-ins, Government Furnished Equipment (GFE), each phase start and phase completion dates. "Logically link" government activities to the schedule.
d. Contract Milestones: In addition to any Contract Milestones set out in the Bid Documents, indicate on the Project Schedule no fewer than three and no more than eighteen Contract Milestones for the completion of various components of the Work. The Contract Milestones shall be confirmed by Contract Modification and cannot thereafter be changed except by Contract Modification.

e. Suggested Milestones:

1) HVAC start-up.
2) Phase Start to include Sub-Phase start.
3) Phase Completion to include Sub-Phase completion.
4) Telecommunications and IT systems installation.
5) POSM/Data installation by phase.
6) Refrigeration 100 percent ready for inspection.
7) Security system complete.
8) Fire Alarm system complete.
9) Government Furnished Equipment (GFE).

f. Constrain contractually specified milestones to show negative float if the early finish date of the last activity in that phase falls after the milestone date.

g. Date/time constraint(s), other than those required by the Contract, is not allowed unless accepted by the Contracting Officer. Identify all non-contractual constraints proposed (if any) and provide an explanation for the purpose of the constraint in the Narrative Report. The Government reserves the right to delete any such constraint when evaluating the effects of delays. Constrain contractually specified milestones to show negative float if the early finish date of the last activity in that phase falls after the milestone date.

h. All activities shall have at least one predecessor and successor except for two activities (the first and last).

i. All activities shall have a maximum float of 80 days.

j. Start and Finish dates: DO NOT automatically update by default mechanisms that may be included in scheduling software systems.

k. Actual Start and Finish dates on the schedule shall match those dates provided from Contractor Quality Control Reports or Contractor Daily Reports. Record the Actual Start and Finish dates on the Daily Reports or Quality Control Reports for every in-progress, or completed activity for the day of record.

l. Out-of-Sequence Progress: Activities that have posted progress without all preceding logic being satisfied (Out-of-Sequence Progress) is allowable on a case-by-case basis with the approval of the Contracting Officer. Propose logic corrections to eliminate all out-of-sequence progress, or justify not changing the sequencing, prior to submitting an updated Project Schedule for approval. Provide explanation in the Monthly Narrative.

m. Lag activities: Durations for Lag Activities shall not have a negative value. In conditions where start-to-start relationships exist, lag time shall not exceed the original duration of the preceding activity. Do not use lags when the creation of an activity will perform the same function (e.g., concrete cure time).

n. Critical Path Activities: Limit critical (0-day float) activities to 30 percent, and near-critical (<5-day float) activities to 40 percent or less. Minimize the use of Finish-to-Start relationships.

o. Log Comments: Comments inserted into the Project Schedule shall be for the Contractor's use only. Failure by the Government to address those comments is not an acceptance or rejection of such comments.

5. Provide a coding system that clearly identifies (as a minimum) the following items per each activity:

a. Responsibility Code: to identify General Contractor, Suppliers, Purchasing, Subcontractors, Government, etc. Identify all activities in the Project Schedule by the party responsible for that activity. Responsibility includes, but is not limited to, the subcontracting firm, Contractor work force, or Government agency performing

a given task. Activities shall not belong to more than one responsible party. Identify the responsible party for each activity by the Responsibility Code.

b. Area/Phase Code: defining major areas and locations of Work. Work Areas: Identify all activities in the Project Schedule by the work area (key plan) and Phase in which the activity occurs. DO NOT allow activities to cover more than one work area. Identify work area of each activity by the Area/Phase Code.

c. The appropriate CLIN code item for each activity.

d. A type of activity (submittal, fabrication, delivery, Contract milestone, etc.) code.

e. Activity descriptions, durations and coding for preparation and processing of submittals, Shop Drawings, Product Data and Samples, fabrication, delivery and installation/erection/assembly of products, materials and equipment.

f. Work Breakdown Structure (WBS) Code: Adjust the provided code to the specific project. Add or delete headings or sub-tiers as necessary.

6. All construction activities in the Project Schedule shall be cost loaded. The assigned dollar values for all activities shall cumulatively equal the total Contract Price and include the costs for mobilization, bonds and insurance. General requirements, overhead and profit, and other costs not attributable to specific activities shall be prorated throughout all construction activities shown in the Project Schedule.

7. Tabular reports shall contain the following: All reports in this paragraph shall contain activity identification, the original duration, remaining duration, percent completion, activity description, early dates, late dates, total float, added or deleted activities, and changes to logic and durations. An exception is the cost report which shall have the activity identification, activity description, original duration, remaining duration, the percent completion, values, total budget value, previous total value, this month value and remaining values per each item. This cost report total shall be the contract amount including approved Contract Modifications. In addition, the report should be subtotaled by Contract Modifications.

a. Cost Report: Contains columns providing activity ID numbers and activity descriptions for each activity, previous percent complete by activity, percent completed this period by activity, percent completed to date by activity, original budgeted amount by activity, earnings this period by activity, and earned to date by activity. This report shall be organized by CLIN item and sorted by activity ID numbers. Project and CLIN item totals shall be clearly displayed at the top of CLIN item group and project total.

b. Activity Report: Contains columns displaying activity ID numbers, activity descriptions, original durations, actual durations, remaining durations, early start, late start, early finish, late finish, actual start, actual finish, suspend dates, resume dates and percent complete for each activity. This report is to be organized by project, phase and area. Project shall be sorted by early start. Percent complete to date shall be displayed for each phase, area and activity.

c. Total Float Report: A list of all incomplete activities sorted in ascending order of Total Float. Activities which have the same amount of total float shall be listed in ascending order of Early Start Dates. Completed activities shall not be shown on this report.

8. Graphic diagrams of the following: All reports in this paragraph shall contain an activity identification, the original duration, remaining duration, percent completion, activity description, early dates, late dates and total float for each activity.

a. A logic diagram showing a continuous activity flow from left to right (11 inches by 17 inches and 30 inches by 42 inches). Show activity numbers, description, duration, and total float on the diagram. Graphically and clearly identify contract milestones and critical path.

b. A short interval schedule (3-week look ahead) chart as described in paragraph 1.8.

G. Monthly Reports: Contractor shall submit monthly, those reports detailed in paragraphs F.6 and 1.8 with the exception of the logic diagrams. These diagrams shall be submitted for approval when major logic changes are made to the Project Schedule or when the Contracting Officer deems necessary.

H. Revisions to Project Schedule: If Contractor requires major changes to the Project Schedule, by no fault of the Government, Contracting Officer or Government's Designated Inspector, the Contractor shall submit those changes for review and acceptance by the Contracting Officer, and shall follow the procedures outlined in the Articles above, at no cost to the Government. Contractor shall allow the Contracting Officer fourteen (14) calendar days for review. No changes to the Project Schedule or out-of-sequence work are allowed without a written authorization from the Contracting Officer.

I. Progress Schedules: On the 25th of each month, the Government's Designated Inspector and the Contractor shall inspect the work to determine percent complete for each activity in the Project Schedule. Generate the monthly Progress Schedule from the current month's accepted Project Schedule, in the retained logic mode, and shall show the actual progress of the Work (through the end of the current month). Throughout the term of the Contract, deliver a monthly Progress Schedule to the Contracting Officer on or before the 1st of the following month or as otherwise required by Contracting Officer. Record progress for each activity by entering the actual start and finish dates and, the percent complete for all activities worked for that period. In the event that the Contracting Officer and Contractor cannot agree on the monthly update, the Contracting Officer will direct the Contractor, at no cost to the Government, to update the schedule as the Contracting Officer deems necessary. The Contractor acknowledges that the Contracting Officer may not accept or process a payment request until the Contractor provides an updated Progress Schedule which is accepted by the Government.

J. Set the software's calculation method so that percent complete will determine remaining duration is not automatically calculated from the reported percent complete. All approved Contract Modifications shall be incorporated into the monthly update of the Progress Schedule. The latest accepted Progress Schedule shall become the current Project Schedule. Allow 5 calendar days for Government review of the Project Schedule Update. Sequentially number each monthly Progress Schedule and date for identification, in the form and substance requested by the Contracting Officer. The monthly Progress Schedule shall include all tabular and graphic reports and electronic media indicated above.

K. Progress Payment: At the discretion of the Contracting Officer, payment may be withheld without an approved Project Schedule. Use the Project Schedule to generate the monthly payment application based on actual work installed (percent complete). Base progress and earned value on work-in-place and project through the end of the month. Use this information to generate a Progress Payment Application. Submit the payment application no later than the 1st day of each month. Activities that do not have an approved budget line item are not payable.

L. Monthly Schedule Meetings: Cooperate with the Contracting Officer in all matters concerning the Project and/or Progress Schedules, and attend a monthly schedule review meeting with the Contracting Officer or Government's Designated Inspector. In the meeting describe on an activity-by-activity basis the following:

1. All proposed revisions and adjustments to the Project Schedule reflecting the status of the Project.
2. Actual start and actual finish dates for all activities in progress or completed, as appropriate.
3. The estimated percent complete for each activity in progress.

4. All logic changes pertaining to Project Modification activities sequencing or durations, and corrections to schedule logic to avoid out of sequence progress.
5. The purpose of this meeting is for evaluating the updated Progress Schedule and not for modifying previously reviewed durations or percentages. Do not make any changes to the schedule without a written acceptance by the Contracting Officer.
6. The monthly meeting described in this paragraph is in addition to the "weekly progress meetings" described in Division 01 Section Administrative Requirements.

M. Changes:

1. When changes in the work are necessary, submit for review by the Government a fragnet analysis along with a proposal for each individual change.
2. Illustrate in the fragnet how the Contractor proposes to incorporate the changed work and the time impact of the change into the overall completion date.
3. Additionally, demonstrate in the fragnet the time impact (based on the forecast Notice to Proceed date provided by the government and the status of construction at that point in time) and the event time computation of all affected activities using the latest approved Progress Schedule.
4. In cases where the Contractor does not submit a fragnet for a specific change or alleged delay then it is mutually agreed that the particular change or alleged delay has no time impact on the Contract completion date and no time extension is required.
5. In the event that the Contractor and the Contracting Officer cannot agree on the extension or reduction of time for a particular change, the Contracting Officer will have the option to provide suggested logic and/or duration times in all subsequent reports. The suggested logic and/or duration times shall remain in effect until the Contract Modification is executed or until the logic and durations are superseded.

    a. If the Contractor has any objections to the data furnished by Contracting Officer, so advise the Contracting Officer, in writing, fully supporting the objections with an alternate plan no later than 10 calendar days after receiving the information from the Contracting Officer.
    b. Use the data provided by the Contracting Officer until the alternate plan is reviewed and accepted by the Contracting Officer.
    c. If the Contractor does not submit an alternate plan in the stipulated time, the Contracting Officer will deem that the Contractor has concurred with the Contracting Officer’s suggested logic/duration time changes to the Project Schedule.

6. The approved fragnet shall be the basis of time performance of the work.
7. Include only Contract Modifications approved by the Contracting Officer in the Project Schedule submission.
8. The Monthly Progress Payment Narrative, as required in Division 01 Section Contract Modification Procedures, shall specifically reference, on an activity-by-activity basis, all changes made since the previous period and relate each change to documented, approved Project Schedule changes.

N. Schedule Delays:

1. If the Contractor determines that it will not be able to perform the Work in accordance with the Contract Milestones and achieve Beneficial Occupancy within the Contract Time, and:

    a. is behind in the Work based on the Progress Schedule and/or
    b. is, in the opinion of the Contracting Officer, delaying or failing to prevent delay by it or it's Subcontractors in the progress of the Work, then:

2. Promptly submit to the Contracting Officer a plan (no later than seven (7) calendar days after such determination), including proposed adjustments to the Progress Schedule, if any, showing how the Contractor plans.

    a. to mitigate impact upon other portions of the Work and the Project
    b. and how it plans to bring the Project back on the Project Schedule

3. If the Contracting Officer finds the proposed plan is not acceptable, submit a new plan. If the actions taken by the Contractor on the second proposed plan are not satisfactory to the Contracting Officer, take the actions set forth in paragraph 1.4.B without additional costs to the Government, to make up the lag in schedule progress.
4. If the Contractor feels that it is necessary to revise its critical path logic in order to achieve the Contract Milestones and Beneficial Occupancy within the Contract Time, submit a revised recovery plan for approval prior to commencing Work on said activities.
5. Unapproved out-of-sequence Work in the critical path is not allowed. The Government will not make payment for unapproved out-of sequence Work on the critical path. DO NOT start work until such alternate plan is approved by the Contracting Officer.
6. The Contracting Officer has the right to immediately order the Contractor to finish completion of late activities, and any activities which have been delayed by the late activities, by whatever means necessary, without any additional cost to the Government. Comply with the order.
7. If the Contractor works multiple shifts, extended overtime, Saturdays, Sundays or holidays as a means to recover lost time and/or to finish the Work for its own benefit, the Contractor will be responsible for the resultant costs incurred by the Government.

O. Schedule Float: The Contractor and Contracting Officer agree that float available in the schedule, at any time, is not for the exclusive use of either the Government or the Contractor. Use of Zero Free Float and Zero Total Float constraints is not allowed. Negative float is not allowed without a recovery plan to bring the project back to the current contract completion date. Use of float suppression techniques, such as; preferential sequencing (arranging critical path through activities more susceptible to Government caused delay), lag logic restraints, zero total or free float constraints, extended activity times, or imposing constraint dates other than as required by the contract, shall be cause for rejection of the project schedule or its updates. The use of Resource Leveling (or similar software features) used for the purpose of artificially adjusting activity durations to consume float and influence the critical path is expressly prohibited.

P. Expedited Work: The Government may request the Contractor to work overtime to expedite the completion of the Work or a portion of the Work at a time when the Contractor is otherwise in conformance with the Contract Documents and the Project Schedule. If such a situation should occur, a price for the expedited work shall be negotiated prior to commencement and covered in a contract modification.

Q. Time Extensions: For consideration of a time extension, the following criteria must occur:

1. The event in question impacts the critical path.
2. The event must change the contract end date.
3. There is an absence of a concurrent Contractor event causing impact to the critical path.
4. The Contractor is responsible for burden of proof (fragnet) and supplies such proof in writing.
5. The Contractor is not entitled to an extension of time or additional compensation for delays (of whatever nature) to non-critical path activities or for a schedule delay that does not extend the completion date beyond the Original Contract Completion Date. This applies regardless of whether the Contractor could have completed the Work prior to the Original Contract Completion Date or the Contractor submitted a schedule showing

completion of the Work prior to the Original Contract Completion Date. A compensable delay is applicable only for government-caused delays extending the Contract Completion Date.

1.8 SHORT INTERVAL SCHEDULES

A. Short Interval Schedules: Submit Short Interval Scheduling (SIS) or 3-week look-a-head for each Weekly Construction Meeting. Generate these reports using Primavera Filter, or the Tabular Report function from the current approved Progress Schedule.

B. The interval is a three-week projection that includes the week submitted and the following two weeks thereafter.

C. Provide sufficient detail to evaluate milestones and identify/tie into the current schedule. Detail this schedule to include all activities scheduled for the 3-week period. The short interval schedule shall reflect actual work planned for the three week time.

D. Submit in bar chart format on a daily scale, sorted by early start and responsibility, covering all activity work for the following 3 weeks.

E. The Contracting Officer will review the SIS, or 3 week look-a-head, and if necessary require revision.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

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SECTION 01 35 26

GOVERNMENT SAFETY REQUIREMENTS

(Edited from DeCA June 2011 Design Criteria)

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Fire Prevention.
2. Safety.
3. Security.

1.2 SUBMITTALS

A. Refer to Division 01 Section Administrative Requirements for procedures.

B. Submittal Schedule:

1. Provide the indicated quantity. Note that the Government will retain three copies and the pdf file.

C. Submittal action by reviewer:

1. R: Review each submittal, mark to indicate action taken, and return.

D. Submittal List:

Reference	Submittal Item	Quantity	Action
1.4B	Fire Prevention Plan	X	R
1.5C	Safety Plan	X	R
1.6	Security Plan	X	R

X Submit quantity specified in Division 01 Section Administrative Requirements.
R Review each submittal, mark to indicate action taken, and return.
I Submittal is for information or record purposes only. No action will be taken.

1.3 MANAGEMENT

A. The Contractor shall be responsible for initiating, maintaining and supervising all fire prevention, safety, and security precautions and programs in connection with the performance of the Contract.

1.4 FIRE PREVENTION

A. Standards: Comply with the requirements of the Installation's Fire Prevention Standards. Comply with NFPA 241 "Standards for Safeguarding Construction, Alterations, and Demolition Operations."

B. Submittals: Provide a Fire Prevention Plan which contains, but is not limited to, procedures for the following:

1. The supervisor's authority and responsibilities:

   a. The proper availability, operation and location of fire protection equipment and general supervision of safeguards.
   b. Coordination with installation fire chief on all matters of special permits such as burning or welding permits, fire prevention, fire reporting, and fire fighting.

2. Safeguards:

   a. Fire-resistant construction for offices, shops, and sheds located within the construction area and within 30 feet of building lines. Comply with the requirements of NFPA 241.
   b. Prohibition of smoking in the commissary and in the vicinity of hazardous operations and locations.
   c. Access for fire fighting vehicles to the immediate job site throughout the construction period.
   d. Vehicle parking control measures so as not to conflict with emergency vehicle site access.
   e. Control measures for combustion powered construction equipment (compressors, hoists, derricks, pumps, etc., dealing with both fire prevention and exhaust fumes.
   f. Temporary Fire protection: Until permanent fire protection is operational, install and maintain temporary fire protection facilities (including alarm and all suppression systems) of the types required to protect against reasonably predictable and controllable fire losses. Comply with NFPA 10 "Standard for Portable Fire Extinguishers" and NFPA 241 "Standard for Safeguarding Construction, Alterations, and Demolition Operations."
   g. Changes to exits or exits related to temporary construction. Inform and gain the approval of the Installation Safety and Fire Officers for the maintenance of exit requirements (both travel distance and exit numbers).

1.5 SAFETY

A. Standards: Comply with ANSI A10 Series standards for "Safety Requirements for Construction and Demolition." Comply with OSHA 1910 and 1926. Comply with USACE EM 385-1-1 Health and Safety Manual.

B. The Contractor shall take reasonable precautions for safety of, and shall provide reasonable protection to prevent damage, injury or loss to:

1. Employees on the Work and other persons who may be affected thereby;
2. The Work and materials and equipment to be incorporated therein, whether in storage on or off the site, under care, custody or control of the Contractor or the Contractor's Subcontractors or Sub-subcontractors; and
3. Other property at the site or adjacent thereto, such as trees, shrubs, lawns, walks, pavements, roadways, structures and utilities not designated for removal, relocation or replacement in the course of construction.

C. Submittals: Provide a Safety Plan and accident prevention policy for all personnel during the performance of the work. Requirements: The plan shall contain, but is not limited to, procedures for the following:

1. Individuals responsible for safety.
2. Subcontractor supervision.
3. Indoctrination of new employees.
4. Safety related signage and postings.
5. Safety gear (hardhats, tie-offs for persons and ladders, hearing and eye protection, etc)
6. Barriers.
7. "Tool Box" safety meetings.
8. Fire prevention and protection.
9. Housekeeping practices.
10. Electrical and mechanical equipment inspections.
11. Floor, platform, and/or roof loading (access and monitoring for overload).
12. Emergencies.
13. First aid and medical facilities.
14. Sanitation.
15. Safety promotions.
16. Accident Reporting. (Provide a copy of each accident report to the Contracting Officer within seven calendar days of the incident.)
17. Reporting a list of job safety actions taken and safety inspections conducted. Indicate that Contractor has met safety requirements including the results on the following:

    a. Did Contractor hold job safety meeting? (If YES, attach a copy of the meeting minutes.)
    b. Were there any lost time accidents? (If YES, attach a copy of the completed OSHA report.)
    c. Were there any non-lost time accidents? (If YES, attach a copy of the completed OSHA report.)
    d. Was trenching/scaffold/high voltage electrical work done? (If YES, attach a statement or checklist showing inspection performed.)
    e. Equipment Inspections: Attach a list of safety inspections on any equipment delivered to the site for construction purposes stating the equipment meets all OSHA operating requirements (e.g., fire extinguishers, back up alarms, etc.). Perform weekly inspections for compliance.

18. Confined Space Entry and Access Plan: Fort Lee has designated the access tunnel to refrigerated display cases under the existing Commissary building as a "CONFINED SPACE, PERMIT REQUIRED FOR ENTRY." Fort Lee's Ground Safety Office has indicated the OSHA 29 CFR 1926 requirements for "ENTER BY PERMIT ONLY CONFINED SPACE" will be required for entry into and work in the existing tunnel, including, but not limited to, the following:

    a. Personnel that enter the tunnel shall be trained accordingly.
    b. A Confined Space Access Plan shall be prepared.
    c. A Confined Space Permit shall be prepared.
    d. An attendant shall be stationed outside the confined space access.
    e. A communication system with personnel in the tunnel shall be established.
    f. The air quality in the tunnel shall be tested prior to entry and shall be monitored on a regular basis while personnel are in the tunnel.
    g. A supervisor shall be identified and that person shall sign the permit.
    h. The supervisor, attendant and personnel in the tunnel shall be aware of what to do in case of an emergency.
    i. The above information provided is for general guidance and may not comply with all regulatory criteria. The Contractor shall determine all OSHA and or other requirements by authorities in jurisdiction as they apply to this Project and include them in the plan as well as the associated costs in the Contract Amount.

D. Comply with all applicable requirements stipulated by the Occupational Safety and Health Act and General Provisions clause titled Accident Prevention for method of operation, work conditions, procedures, and equipment.

E. The Contractor shall not load or permit any part of the construction or site to be loaded so as to endanger its safety.

1.6 SECURITY

A. Submittals: Provide a Security Plan for persons and property during the performance of the Work.

B. Requirements: The Plan shall contain, but is not limited to, procedures for the following:

1. Security Clearances: Information for security clearances and compliance with security regulations as imposed by both the military installation and the building's occupying agency for all Contractor employees.
2. The Government's reservation of right to exclude or remove from the site or building any employee of the Contractor or Subcontractor whom the Government deems incompetent, careless, insubordinate, otherwise objectionable, or whose continued employment on the work is deemed by the Government to be contrary to public interest.
3. Identification Pass: While on the Installation, each employee of the Contractor and subcontractors shall have in his possession, an approved identification pass. Indicate the individual's name, and bear a picture of the individual. Coordinate with the Commissary Store Director for individual requirements regarding security badges while within the confines of the commissary building.
4. Security Enclosure and Lockup: Install substantial temporary enclosure of partially completed areas of construction unless otherwise directed by the Contracting Officer. Provide locking entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security.
5. Storage: For storage of materials and equipment that are of value or attractive for theft, provide a secure lockup. Enforce discipline in connection with the installation and release of material to minimize the opportunity for theft and vandalism. As alterations or construction on buildings progress, provide temporary security enclosures, doors and locks necessary to prevent unauthorized entrance.
6. Restricted Areas: Do not permit workers in restricted areas (as designated by the Contracting Officer).
7. Do not change over from use of temporary security to permanent security until the Contracting Officer accepts the work.
8. Restrictions on photographs at sensitive areas of the installation.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 01 35 40

ENVIRONMENTAL MANAGEMENT

(Edited from DeCA June 2011 Design Criteria)

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Special requirements for environmental management during construction operations.
2. Monitoring requirements.

B. Related Sections:

1. Division 01 Section Administrative Requirements.
2. Division 01 Section Sustainable Design Reporting.
3. Division 01 Section Quality Control.
4. Division 01 Section Environmental Procedures for Refrigerants.
5. Division 01 Section Indoor Air Quality Procedures.
6. Division 01 Section Closeout Procedures.

1.2 DEFINITIONS

A. Acronyms:

A/E	Architecture/Engineering Firm
ACM	Asbestos Containing Material
AFJMAN	Air Force Joint Manual
AFOSH	Air Force Occupational Health and Safety
AFI	Air Force Instruction
APCD	Air Pollution Control Division
APEN	Air Pollutant Emissions Notice
AST	Above Ground Storage Tank
BMP	Best Management Practice
CEV	Civil Engineering Environmental Flight
CFR	Code of Federal Regulations
COE	United States Army Corps of Engineers
DOD	Department of Defense
DODI	Department of Defense Instruction
DOT	Department of Transportation
DPHE	Department of Public Health and Environment
EO	Executive Order
EPA	Environmental Protection Agency
HAZMAT	Hazardous Material
HAZWOPER	Hazardous Waste Operations and Emergency Response
HW	Hazardous Waste
IATA	International Air Transport Association
ICAO	International Civil Aviation Organization
IMO	International Maritime Organization
LBP	Lead-based Paint

MSDS	Material Safety Data Sheet
NAF	Non-Appropriated Fund
NAVFAC	Navy Facilities Engineering Command
NOI	Notice of Intent
NOT	Notice of Termination
NPDES	National Pollutant Discharge Elimination System
ODC	Ozone Depleting Chemicals
OS	Operating Support
OSHA	Occupational Safety and Health Administration
PCB	Polychlorinated Biphenyls
PLS	Pure Live Seed
POC	Point of Contact
POL	Petroleum, Oil, and Lubricants
RCRA	Resource Conservation and Recovery Act
SARA	Superfund Amendments and Reauthorization Act
SPRP	Spill Prevention and Response Plan
SPCC	Spill Prevention Control and Countermeasure
SWPPP	Stormwater Pollution Prevention Plan
USACE	United States Army Corps of Engineers
USFWS	United States Fish and Wildlife Service

B. Certified Industrial Hygienist (CIH): An individual certified the American Board of Industrial Hygiene (ABIH) to have met ABIH requirements for education and experience, and through examination, has demonstrated the required level of knowledge in industrial hygiene.

C. Containment: The act of stopping the spread or propagation of hazardous substances spilled or released into the environment.

D. Contractor: Any company or individual contracted to work on the Project site.

E. Cleanup: The act of removing hazardous substances from the scene of a spill release or stabilizing or neutralizing hazardous substances to non-hazardous concentrations in accordance with established federal, state, local, and Installation procedures.

F. Construction Contractor: Any person or agency providing a material or a service to DeCA by authority of a Contract. Includes the prime Contractor and all subcontractors.

G. Contingency Plan: A document containing an organized, planned, and coordinated course of action designed to mitigate pollution incidents and limit pollution in the event of fire, explosion, or spill/release of hazardous substances.

H. Discharge: The release of hazardous waste/materials into the environment.

I. Disposal: The thermal or chemical destruction or permanent land filling of hazardous waste.

J. Environment: The natural surroundings that allow life to exist.

K. Environmental Service Provider: Environmental Consulting Firm contracted by the A/E or A/E Firm if environmental professionals are in-house.

L. Fugitive Particulates: Solid airborne particulate matter emitted from any source that channels the flow of air pollutants directly into the atmosphere by natural forces or by mechanical processes such as crushing, grinding, milling, drilling, demolishing, shoveling, conveying, covering, bagging, or sweeping.

M. Generator: Any person or agency that produces, creates, or discovers hazardous waste.

N. Hazardous Chemical: In relationship to laboratories, a chemical for which there is statistically significant evidence, based on at least one study conducted in accordance with established scientific principles, that acute or chronic health effects may occur in exposed employees (29 CFR 910.1450(b)).

O. Hazardous Material (HAZMAT):

1. Any item or chemical that is a "health hazard" or "physical hazard" as defined by OSHA in 29 CFR 1910.1200 or by the EPA at 40 CFR 370, 372, and 100-180, including the following:

   a. Chemicals which are carcinogens, toxic or highly toxic agents, reproductive toxins, irritants, corrosives, sensitizers, hepatotoxins, nephrotoxins, neurotoxins, agents which act on the hematopoietic system, and agents which damage the lungs, skin, eyes, or mucous membranes;
   b. Chemicals which are combustible liquids, compressed gases, explosives, flammable liquids, flammable solids, organic peroxides, oxidizers, pyrophorics, unstable (reactive) or water reactive;
   c. Chemicals which in the course of normal handling, use, or storage operations may produce or release dusts, gases, fumes, vapors, mists or smoke which may have any of the above characteristics;
   d. Any item or chemical which is reportable or potentially reportable as inventory under the reporting requirements of the hazardous chemical reporting section of 40 CFR (40 CFR part 370), or as an environmental release under the reporting of the toxic chemical release reporting community right-to-know (40 CFR part 372), including chemicals with special characteristics which in the opinion of the manufacturer can cause harm to people, plants, or animals when released by spilling, leaking, pumping, pouring, emitting, emptying, discharging, injecting, escaping, leaching, dumping, or disposing into the environment (including the abandonment or discarding of barrels, containers, and other receptacles).
   e. Any item or chemical which, when being transported or moved, is a risk to public safety or is an environmental hazard and is regulated as such by one or more of the following:

      1) Department of Transportation HAZMAT Regulations (40 CFR 100-180)
      2) Dangerous Goods Code of the International Maritime Organization(IMO)
      3) Dangerous Goods Regulations of the International Air Transport Association (IATA)
      4) Technical Instructions of the International Civil Aviation Organization (ICAO)
      5) US Air Force Joint Manual (AFJMAN), Preparing HAZMAT for Military Shipments (AFJMAN 24-2204)

P. Hazardous Substance: A material and its mixtures or solutions that is identified by the letter "E" in column (1) of the Hazardous Materials Table, 49 CFR Sec. 172.101 or as identified herein:

1. When offered for transportation in one package, or in a transport vehicle if not packaged, and when the quantity of the material therein equals the reportable quantity;
2. Any substance designated pursuant to Section 311 (b)(2)(A) of the Federal Water Pollution Control Act, and any element, compound, mixture, solution, or substance designated pursuant to Section 102 of this Act;
3. Any hazardous waste having the characteristics identified under or listed pursuant to Section 3001 of the Solid Waste Disposal Act;
4. Any toxic pollutant listed under Section 307(a) of the Federal Water Pollution Control Act;

5. Any hazardous air pollutant listed under Section 112 of the Clean Air Act;
6. Any imminently hazardous chemical substances or mixtures which the EPA Administrator has "taken action under" section 7 Toxic Substances Control Act;
7. Any element, compound, mixture, solution, or substance designated as hazardous under section 102 or CERCLA.

Q. Hazardous Waste: Any HAZMAT or hazardous chemical that has been used, contaminated, spilled, and recovered, and is impossible to reuse, recycle or treat. This term also refers to residues generated as a result of recycling activities and empty containers whose previous contents were hazardous.

R. Incompatible: Any two materials, which create a violent reaction when combined.

S. Installation: The military base, post, depot, etc. on which the Project is located.

T. Landfill: The disposal of waste by land burial.

U. Material Safety Data Sheet: A report detailing the hazardous characteristics and dangers of a specific material.

V. NAF Work Force: NAF employees or their Contractors who perform projects on the Installation.

W. Permitted: An activity approved by an authority with official control over the activity.

X. On-site: Presence within the boundaries of the work-site.

Y. Pollution: Contamination in the environment.

Z. Reportable Quantity: The quantity of spilled or released hazardous substances requiring notification as defined by federal, state, and local regulations.

AA. Resource Conservation and Recovery Act (RCRA: The Federal Act, which gives the EPA environmental protection regulation and enforcement authority concerning hazardous waste (HW) and associated activities.

BB. Safety: Freedom from man-equipment-material-environmental interactions that result in injury or illness.

CC. Solid Waste: Any discarded material in any physical state.

DD. Spill: An unintentional release to the environment.

EE. Training: Formal instruction, in addition to existing job knowledge, designed to protect human health and the environment by increased awareness and improved job proficiency.

FF. User/Owner: Any person, organization, or agency that stores or uses a hazardous material is classified as a user/owner of such hazardous materials.

1.3 QUALITY ASSURANCE

A. DOD Instructions, Policies, Guidance Documents, Memoranda, and Regulations: Comply with the following:

1. COE document EP 1165-2-314 (Flood Proofing Regulations).

2. Section 404 and Section 10 of Clean Water Act.
3. Department of Defense, Measure of Merit, Solid Waste Management.
4. US Department of Housing and Urban Development Guidelines for Evaluation and Control of Lead-based Paint Hazards in Housing.
5. DoD Guidance Document 4715.5-G "Overseas Environmental Baseline Guidance Document."
6. DoD Directive 6050.7 "Environmental Effects Abroad of Major Department of Defense Actions."
7. AFI 32-4002, "Hazardous Material Emergency Planning and Response Program."
8. AFI 32-7042, "Solid and Hazardous Waste Compliance."
9. AFI 32-7080, "Pollution Prevention Program."
10. AFI 32-7086, "Hazardous Materials Management."
11. SECNAVINST 5090.6A "Environmental Planning for Department of the Navy Actions."
12. SECNAVINST 5090.8 "Policy for Environmental Protection, Natural Resources and Cultural Resources Programs."
13. OPNAV Instruction 5090.1B "Navy Environmental and Natural Resources Program Manual."
14. UFGS 13280A, "Asbestos Hazard Control Activities."
15. UFGS 13281N, "Engineering Control of Asbestos Containing Materials."
16. UFGS 13283N, "Removal/Control and Disposal of Paint with Lead."

B. United States Environmental Protection Agency(EPA) Regulations: Comply with the following:

1. Resource Conservation and Recovery Act (RCRA) - 40 Code of Federal Regulation (CFR) Parts 148, 260, 261, 263, 264, 265, 266, 268, 270, 271, 272, 273, 279, 280, 281, 282, and 355.
2. Clean Water Act - 40 CFR Parts 112, 122, 123, 124, 125, 129, 130, 131, and 401–471.
3. EPA Document 832-R-92-005, Stormwater Management for Construction Activities.
4. Clean Air Act - 40 CFR Parts 50, 52, 61, 63, 68, 70, 71, 86-89, 745.
5. EPCRA - SARA Title III Sections 301, 302, 303, 304, 311, 312, and 313.

C. Occupational Safety and Health Administration (OSHA) Regulations: Comply with the following:

1. Hazard Communication - 29 CFR 1910.1200.
2. Hazardous Waste Operations and Emergency Reponses (HAZWOPER) - 29 CFR 1910.120.
3. Material Handling - 29 CFR 1910.176.
4. Toxic and Hazardous Substances - 29 CFR 1910.1030.

D. Department of Transportation (DoT) Regulations: Comply with the following:

1. 49 CFR Parts 171 - 173.

E. Other Federal Regulations: Comply with the following:

1. National Historic Preservation Act.
2. Archeological and Historic Preservation Act.
3. Endangered Species Act.
4. The American Indian Religious Freedom Act.
5. Archeological Resources Protection Act.
6. The Native American Graves Protection and Repatriation Act.
7. National Environmental Policy Act.
8. Executive Order 13423, Strengthening Federal Environmental, Energy, and Transportation Management, dated 24 JAN 2007.

F. Other State, Regional, Local and Installation Plans, Policies, Regulations, and Permitting Procedures: Comply with the following:

1. Installation Plans, Policies, and Procedures:

a. Installation Asbestos Management Strategy.
b. Installation Hazardous Waste Management Plan.
c. Installation Compliance Assurance Through Pollution Prevention Plan.
d. Installation Integrated Natural Resource Management Plan.
e. Installation Endangered Species Management Plan.
f. Installation Cultural Resources Management Plan.
g. Installation Spill Prevention and Response Plan.
h. Installation Storm Water Pollution Prevention Plan.
i. Installation Stormwater Training Manual.
j. Installation Air Quality Management Plan.

2. State Regulations:

a. Air Pollution Prevention and Control Act.
b. Hazardous Waste Regulations.
c. Water Quality and Wastewater Regulations.
d. Tank Regulations.
e. Oil and Petroleum Spill Prevention Regulations.
f. Solid Waste Regulations.
g. Special Pollutants.
h. Pesticides, Herbicides, and Fungicides.

3. Local and Regional Plans, Policies, and Regulations:

a. Local Policy Plan.
b. Drainage Criteria Manual.
c. Department of Health Fugitive Dust Regulations.
d. Floodplain Management.
e. Coastal Zone Management Regulations
f. Stormwater Discharge and Stormwater Pollution Prevention Regulations.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 ENVIRONMENTAL PROTECTION

A. Protection of natural resources: Comply with applicable regulations and these specifications. Preserve the natural resources within the Project boundaries and outside the limits of permanent Work performed under this Contract in their existing condition or restore to an equivalent or improved condition as approved by Owner.

B. Provide protection, operate temporary facilities, and conduct construction in ways and by methods that comply with environmental regulations, and minimize the possibility of contamination, pollution, or other undesirable effects.

C. Permitting: The Contractor shall notify Installation Environmental Representatives when a permit is required and requested as part of this Construction Contract. The Construction Contractor shall also notify the Installation Environmental Representative when the permit has been received.

3.2 AIR QUALITY

A. Contractors shall ensure all company-owned and employee owned gasoline and diesel vehicles driven on the Installation comply with the emissions inspection requirements of the Department of Public Health and Environment (DPHE) Motor Vehicle Emissions Inspection Program and Reduction of Diesel Vehicle Emissions.

B. The Contractor shall restrict emissions of all smoke and fugitive particulates, to levels less than 20 percent opacity at the point of emission, and to levels that do not visibly disperse beyond the Installation's property boundaries unless exempt.

C. The Contractor shall ensure any equipment containing ozone-depleting chemicals (ODC) are operated and maintained in accordance with State's Control of Emission of Ozone-Depleting Compounds requirements. Train and certify all contractors and subcontractor employees servicing ODC containing equipment.

D. The Contractor shall take active steps to prevent evaporation of all solid or liquid materials that have potential to become airborne including but not limited to fuels, solvents, paints, and other volatile chemicals under the Contractor's control. Close all containers holding solid or liquid materials that have potential to become airborne at all times, except when adding product to or removing product from the container.

E. The Contractor shall fully comply with the conditions of all applicable air quality permits and applicable air quality requirements. Local and State Regulations of Air Pollution Prevention and Control Act.

F. The Contractor shall comply with all requirements of Fugitive Particulate Control Plans required by and prepared for DPHE.

G. When a Fugitive Particulate Control Plan is not required, the Contractor shall perform all fugitive particulate control measures necessary to prevent emissions of over 20 percent opacity or visible emissions that cross the Installation's property boundaries.

H. The Contractor shall maintain a daily log of fugitive particulate emissions that exceed 20 percent opacity or that cause visible emissions crossing the Installation's property boundaries. The Contractor shall maintain a copy of this log on site at all times and shall make it available for review to the Installation upon request.

I. The Contractor shall not utilize cutback asphalt or any coating included in the definition of cutback asphalt during the months of March through September unless the cutback asphalt is used solely as a penetrating prime coat or if the user can demonstrate to DPHE Air Pollution Control Division that under the conditions of its intended use, there shall be no emissions of volatile organic compounds to the ambient air.

J. Contractors shall not apply sand or gravel to Installation roads without obtaining prior written approval from the Contracting Officer.

K. The Contractor shall submit copies of all fugitive particulate emission logs, and any other logs required by Fugitive Particulate Control Plans, to the Contracting Officer no later than seven working days after completion of work.

L. The Contractor shall properly re-vegetate all disturbed land to prevent fugitive particulate emissions following the completion of work.

3.3 WASTEWATER AND STORMWATER

A. Comply with regulations including but not limited to 40 CFR 122.26 (EPA NPDES Permit Regulations), state and local wastewater regulations, COE document EO 1165-2-304 (1976 Flood Plain Regulations for Flood Plain Management), EPA document 832-R-92-005 (Storm Water Management for Construction Activities), state and local Stormwater regulations, the County Drainage Plan and the City/County Drainage Criteria Manual.

B. Concerning wastewater discharges, Contractor shall:

1. Be familiar with all relevant requirements of permits held by the Installation. Applicable Installation permits include <***INSERT TITLE & NUMBER***>. These permits are available for review at <***INSERT LOCATION***>.
2. Not discharge wastewater or water (including surface discharges and underground injection) that could impact the quality of the surface water or groundwater of the state without prior approval of the Installation Environmental Office.
3. Implement basic housekeeping provisions of the applicable wastewater discharge permit including monitoring and sampling, inspections, reporting, and record keeping.
4. Dispose of sewage through existing connections to the Installation sanitary sewage system. Where such connections are not available, use chemical toilets or comparably effective units; periodically, have these toilets serviced by a licensed contractor in accordance with all applicable regulations. Do not dispose of sanitary waste into the sewage system without approval of the Installation.

C. Concerning construction projects that shall disturb greater than or equal to one (1) acres, Contractor shall:

1. Obtain the site specific Construction Storm Water Pollution Prevention Plan (SWPPP) prior to staging any facilities, equipment, or materials onsite. The SWPPP shall include appropriate Best Management Practices (BMPs) to minimize the discharge of pollutants from the site. A SWPPP has been prepared for this Project. The plan is available <***INSERT ATTACHMENT REFERENCE OR LOCATION***>.
2. Submit an EPA approved Notice of Intent (NOI) (EPA Form 3510-6) to the Contracting Officer prior to staging any facilities, equipment, or materials onsite. The NOI includes a certification that the activity shall not impact endangered or threatened species.
3. Install and operate all BMPs.
4. Review the Installation Storm Water Training Manual and complete and submit the associated test to the Contracting Officer or, if approved by the Contracting Officer and available, attend an annual 60-minute training class on storm water pollution prevention.
5. Maintain and post a copy of the SWPPP, NOI, and training certificates at the construction site.
6. Submit a Notice of Termination (NOT) (EPA Form 3510-7) to the Contracting Officer after:

   a. all construction debris, equipment, materials, and facilities are removed;
   b. the construction areas are inspected;
   c. all temporary storm water BMPs are removed;

d. ground cover is at 70 percent or when final stabilization of the site has been achieved as defined by the permit, and
e. the final inspection is performed.

7. Once approved by the Installation, the NOT shall be co-signed by the Installation and the Contractor, and the Installation shall submit it to the EPA or state permit authority.

D. Concerning construction projects that shall disturb less than one acre, the Contractor shall:

1. Comply with the requirements of the Installation's SWPPP.
2. As required, obtain a separate discharge permit (based upon an evaluation of Contractor proposed operations and the Installation's NPDES permit). Site activities disturbing less than 1 acre are also regulated as small construction activity if they are part of a larger common plan of development or sale with a planned disturbance of equal to or greater than 1 acre and less than 5 acres, or if the NPDES permitting authority designates them. The NPDES permitting authority may designate construction activities disturbing less than 1 acre based on the potential for contribution to a violation of a water quality standard or for significant pollutants to waters of the United States.

E. Regardless of the size of the project, storm water runoff from the Project site shall be restricted to historical flows during and after construction. The Contractor shall submit for approval devices/designs to comply with this condition to the Contracting Officer. Structural BMPs may include but are not limited to mulch, grass, stockpile covers, silt fences, inlet protection, check dams, stabilized construction entrances, and sediment traps. Non-structural BMPs may include but are not limited to minimizing disturbances, preserving natural vegetation, and good housekeeping practices.

1. Following each storm event of 0.1 inch or greater or at least weekly, the Contractor shall inspect erosion and pollution control devices and correct any deficiencies immediately. Record these inspections and records maintained onsite.
2. To ensure compliance with other Clean Water Act requirements, the Construction Contractor:

a. Shall not discharge any domestic, construction and/or industrial waste (including any hazardous material or hazardous waste) to the sanitary sewer system without first securing the approval of the Installation. This applies to glycol type wastes drained from heating, ventilation, and air conditioning facilities.
b. Shall not discharge any domestic, construction, and/or industrial waste (including any hazardous material or hazardous waste) to the ground, drainage areas, local bodies of water, or by underground injection.
c. Shall not use surface or underground water supplies for any Contract-related activities without approval from the Contracting Officer.
d. Shall not dispose of dredged materials in wetlands, dispose of excavated materials into waters of the U.S., use fill for road crossings, or dispose of similar dredge or fill materials in the waters of the U.S. without a permit obtained in coordination with the Contracting Officer.
e. Shall not discharge groundwater from trenches during construction without a dewatering permit from the EPA.

3.4 HAZARDOUS MATERIAL

A. All hazardous materials brought on-site by the Construction Contractor shall be subject to pre-approval by the Installation. The Installation reserves the right to prohibit the use of hazardous materials it deems to be especially hazardous to human health or the environment. The

Installation also reserves the right to prohibit the use of hazardous materials due to the type and/or quantity of hazardous wastes potentially generated from the materials. In the event of disapproval of a hazardous material for use on the Installation, the Installation may provide the Construction Contractor a list of suitable substitutes; however, the Construction Contractor shall retain responsibility for finding an acceptable substitute. The Installation promotes waste minimization and pollution prevention practices and all contractors shall take appropriate actions to comply with this policy.

B. Hazardous materials requirements are designed to ensure the Installation meets and maintains compliance with:

1. State and Local Hazardous Waste Regulations for Generators.
2. State and Local Hazardous Waste Regulations for Transporters.
3. AFI 32-7032, Solid and Hazardous Waste Compliance.
4. AFI 32-7080, Compliance Assurance through Pollution Prevention Program.
5. AFI 32-7086, Hazardous Materials Management.
6. AFI 32-4002; Hazardous Material Emergency Planning and Response Program.
7. OSHA Hazard Communication Regulation – 29 CFR Part 1910.1200.
8. OSHA General Handling Material Requirements – 29 CFR Part 1910.176.
9. EPA: SARA Title III (EPRCA) – EPA Document #550-B-01-003 "List of Lists".

C. Current Conditions:

1. Review of Installation documentation has identified that the following hazardous material conditions are currently present at the Project location: <***INSERT CONDITIONS***>.

D. Hazardous Material Reporting Requirements:

1. A minimum of ten working days prior to commencement of work on site, submit to the Contracting Officer a listing of hazardous materials on site during the performance of the Contract. Include estimated usage and estimated quantities for each hazardous material. The Contractor shall identify any "extremely hazardous substances" (40 CFR Part 355, Appendix A and B) to be used during the execution of the Contract and indicate if the amount of the chemical exceeds the threshold planning quantity. The construction Contractor shall also supply a Material Safety Data Sheet (MSDS) for each hazardous material. The Construction Contractor shall give a brief description of use of the hazardous material. The MSDS shall be OSHA Form 174 or equivalent, as directed by OSHA Hazard Communication requirements (29 CFR 1910.1200).
2. Maintain at all times a complete written hazard communication program including labels and forms of warning for chemicals, an up-to-date hazardous material inventory with copies of MSDSs for all materials used on the job site, and employee information and training on hazardous chemicals in their work area. If the Construction Contractor transports any hazardous wastes or hazardous materials, the Contractor shall classify the hazardous materials (Class 1 through Class 9) and comply with DOT requirements. Applicable requirements may include packing and repacking, labeling, marking, and placarding, handling, vehicle routing, and the manufacturing of packaging and transportation containers. The Construction Contractor shall transport all hazardous materials in accordance with all applicable Federal, state and local regulations. Transporters of hazardous wastes that operate and have a transfer facility are required to obtain an EPA identification number and comply with additional requirements cited at 6 CCR 1007-3, Part 263.
3. The Contractor and all subcontractors shall abide by and shall have contingency plans established in accordance with SARA Title III, Emergency Planning and Community Right-to-Know Act (EPCRA), and overall CERCLA, and shall manage all wastes and spills accordingly.

E. Hazardous Materials Usage Reports:

1. Contracts with a performance period of less than or equal to ninety (90) days: Construction Contractors shall immediately report hazardous materials used at any time during the execution of the Contract to the Contracting Officer. The report shall include a listing of the total amount hazardous materials used while performing work on site and a description of the disposition of each hazardous material (e.g., fully consumed during Contract/Project execution, saved for future use, or disposed of as hazardous waste in accordance with state and local hazardous waste regulations for generators, transporters, and treatment, storage, and disposal facilities).
2. Contracts with a performance period of greater than ninety (90) days: Every 90 days from the start of work on site, the Construction Contractor shall report to the Contracting Officer hazardous materials used in the previous 90 day period. The report, submitted ten (10) working days after the end of each ninety (90) day period, shall include a listing of all hazardous materials used while performing work on site, the total amount of each hazardous material used, and a description of the disposition of each hazardous material (e.g., fully consumed during Contract/Project execution, saved for future use, or disposed of as hazardous waste in accordance with state hazardous waste regulations for generators, transporters, and treatment, storage, and disposal facilities).

F. Final Report:

1. The Construction Contractor shall submit a final inventory of all hazardous materials used since the last hazardous usage report no later than ten working days after completion of work. The final inventory shall list all hazardous materials used, total amount of each used, and a description of the disposition of any remaining hazardous materials (e.g., fully consumed during Contract/Project execution, saved for future use, or disposed of as hazardous waste in accordance with state hazardous waste regulations for generators, transporters, and treatment, storage, and disposal facilities).

G. Hazardous Material Handling:

1. Construction Contractors shall transport and store all known or potentially hazardous materials in original containers with manufacturer labels meeting the OSHA Hazard Communication requirements (29 CFR 1910.1200). Repackage or place bulk materials and materials into different containers at the job site and clearly label in accordance with OSHA Hazard Communication requirements (29 CFR 1910.1200). Do not bring materials without proper, legible labeling to the Installation.
2. The Construction Contractor shall only use and store hazardous materials in areas that are free from obstructions or hazards such as tripping hazards, fire, standing water, or pests. All hazardous materials shall be separated in accordance with OSHA Material Handling requirements (29 CFR 1910.176[c]) and OSHA Hazard Communication requirements (1910.1200[b], and 1910.1200[f]).
3. The Construction Contractor shall store hazardous materials in containers that are in good condition, with no leaks or rust.

3.5 WASTE MANAGEMENT AND DISPOSAL

A. Construction and demolition debris consists of the materials generated during the construction, renovation, and demolition of buildings, roads, and bridges. Construction and demolition debris often contains bulky, heavy materials that include:

1. Concrete,
2. wood (from buildings),

3. asphalt (from roads and roofing shingles),
4. gypsum (the main component of drywall),
5. metals,
6. bricks,
7. glass,
8. plastics,
9. salvaged building components (i.e. doors, windows, and plumbing fixtures)
10. trees, stumps, earth, and rock from clearing sites.

B. Reducing and recycling construction and demolition debris conserves landfill space, reduces the environmental impact of producing new materials, creates jobs, and can reduce overall building Project expenses through avoided purchase/disposal costs. The overall intent of the recycling content of the Project shall be reconciled with the specific sustainable design requirements of the Project.

C. The waste requirements are designed to ensure the Installation meets and maintains compliance with:

1. OSHA's Toxic and Hazardous Substances requirements for bloodborne pathogens - 29 CFR 1910.1030.
2. State Solid Waste Regulations.

D. If the Construction Contractor generates solid wastes during the execution of a Contract, the Construction Contractor shall prepare a Solid Waste, Construction, and Demolition Debris Waste Management plan utilizing an outline provided by CEV and provide this plan to the Contracting Officer ten (10) working days before commencement of construction activities. Among other things, this plan shall document the extent to which waste materials can be recycled and identify the disposal/recycling pathway. In-house and troop forces shall comply with all the requirements contained in the Installation Solid Waste, Construction, and Demolition Debris Waste Management plan and do not need to write a separate plan. The Contractor shall:

1. Integrate generated solid waste into the Installation recycling process as appropriate. The Construction Contractor shall utilize local sources for recycling as much as possible.
2. Provide, as applicable, Installation with a plan for the disposal of medical waste.
3. Prepare and submit to the Contracting Officer a "Solid Waste Disposal Report" on a quarterly basis. This report shall itemize the type and amount of solid waste, by disposal category (e.g., recycled, land filled, reused) that was disposed of during the previous quarter.
4. Dispose of bulky wastes and demolition debris properly (e.g., automobile bodies, furniture, and appliances are required to be salvaged or crushed so as to minimum the volume of waste). Scrap tires may only be disposed of at approved solid waste disposal facilities.
5. Place all solid waste in a solid waste dumpster or roll-off provided by the Construction Contractor.
6. Place contaminated reusable sharps and other regulated wastes in puncture resistant, color coded, leak proof containers, as soon as possible after use and until properly reprocessed. Place specimens of blood or other potentially infectious materials in a container that prevents leakage during collection, handling, processing, storage, transport, or shipping. Specific labeling and handling requirements are to be followed (29 CFR 1910.1030[d]). The Construction Contractor shall also comply with the packaging, storage and labeling requirements specified in State's solid waste regulation if the Contractor generates infectious wastes.
7. To the extent practicable and as applicable, collect compost materials (organics, vegetation, grass, wood debris, etc.) and arrange with the Installation to utilize the

material in its composting program. To the extent practicable and as applicable and if economically feasible, sort and recycle wood debris by three categories: painted, pressure treated, or creosote treated.

8. Dispose of sewage through existing connections to the Installation sanitary sewage system. Where such connections are not available, use chemical toilets or comparably effective units; periodically, have these toilets serviced by a licensed Contractor in accordance with all applicable regulations. Do not dispose of sanitary waste into the sewage system without approval of the Installation.
9. For projects requiring offsite disposal of solid waste, disposal shall be to land fills holding a valid State Waste Disposal Permit.
10. The Installation has the following disposal facilities available for use by the Construction Contractor: <***INSERT FACILITY LOCATION, USE, RESTRICTIONS, AND CONTACT INFORMATION***>.

3.6 HISTORIC AND CULTURAL RESOURCES

A. The National Historic Preservation Act of 1966 (NHPA) Title 16 United States Code (U.S.C.) Section 470, establishes the role of the Federal government, in cooperation with other nations and in partnership with the States, local governments, Indian tribes, and private organizations and individuals regarding significant cultural resources. These specific roles are outlined in Sections 402, 110, 111, and 106. Among these are standing architectural features (districts, buildings, structures, and objects) and archaeological sites.

B. The Installation has determined that historic or cultural resources exist within the Project site. The following activities and precautionary measures shall be conducted to prevent harm to these resources: <***INSERT PROTECTIVE MEASURES***>.

C. If any artifacts over 50 years old are discovered during construction activities, the Construction Contractor shall cease work and contact the Contracting Officer for further instructions.

3.7 NATURAL RESOURCES

A. General:

1. Construction activities impacting wildlife habitat shall be planned outside of the primary breeding and nesting periods whenever possible. Impacts to aquatic resources shall be planned during low flow periods and outside of primary spawning seasons.
2. Workers shall not harm or harass any wildlife species.
3. Pesticide use shall be in accordance with the Installation's Pesticide Management Plan and according to all product labels. The Pesticide Management Plan may have restrictions not found on labels that protect sensitive habitats or endangered species.
4. The Construction Contractor shall return the staging area to its original condition upon completion of the work. Returning the staging area to its original condition may require, among other things, revegetation and remediation. Perform the work at the Construction Contractor's expense.
5. Construction Contractors shall minimize, to the extent possible, the creation of new roads and trails around Project areas. Any such trails/roads shall be rehabilitated and re-vegetated by the Construction Contractor when the Project is completed.

B. Wetlands and Other Waters of the United States:

1. Section 404 and Section 10 of the Clean Water Act regulate dredge and fill operations within Waters of the United States. The United States Army Corps of Engineers

(USACE) has jurisdiction over activities affecting Waters of the United States including special aquatic areas such as wetlands.

2. USACE Permit Number <***INSERT PERMIT NUMBER***> has been obtained for construction activities and is presented <***INSERT ATTACHMENT OR APPENDIX IDENTIFIER***>. The Construction Contractor will adhere to the conditions set forth in this permit.
3. All water crossings and wetland impacts shall be limited to the least amount possible.
4. Mats shall be used for large equipment working in wetlands. This will limit vegetation and soil disturbances.
5. Construction areas and staging areas near wetlands and streams shall contain ample storm water controls to avoid sediment or other pollutants from reaching these waters.
6. Construction within a designated 100-year floodplain is required to adhere to any local floodplain permits or ordinances.

C. Threatened and Endangered Species:

1. The Endangered Species Act of 1973, as amended, requires all federal actions be assessed for potential impacts to species designated as threatened or endangered by the Department of the Interior.
2. The Installation has identified that the following protected species may be present within the Project area: <***INSERT SPECIES NAMES***>. The following restrictions and protective measures shall be taken to ensure that construction activities do not affect these species <***INSERT RESTRICTIONS AND PROTECTIVE MEASURES***>.

    a. All site personnel shall be instructed by the Installation as to the reason for, and importance of, limiting impacts to vegetated habitat outside the work area.
    b. The Installation familiar with the habitat needs and identification of the species of concern may supervise Work at all times. This type of monitoring is usually only necessary for new construction projects and when the species of concern are likely to enter the work zone.
    c. The area of proposed impacts for any construction, maintenance, or repair actions shall be fenced with aesthetically pleasing fence or a similar visible barrier to prevent inadvertent impacts to habitat outside the construction footprint.
    d. In the unlikely event that a threatened or endangered species (dead, injured, or hibernating) is located during any activities, the USFWS, and Installation Natural Resources Point of Contact (POC) shall be contacted immediately.

D. Construction Timber:

1. All projects on the Installation for which removal of trees is a requirement shall be coordinated with and approved by the Installation's Natural Resource POC. In accordance with Department of Defense Instruction (DODI) 4715.3, DODI 7310.1, and AFI 32-7064 Section 8.3, forest products shall not be given away, abandoned, destroyed, or used to offset Contract costs.
2. All merchantable wood products [i.e. stems and limb wood equal to or greater than 4 (four) inches in diameter] that result from projects on the Installation proper shall have all limbs removed and be delivered to the Installation's wood yard if one exists. Such deliveries shall be coordinated with the Installation's Natural Resource POC to allow access to the wood yard. Leaving wood outside the wood yard fence is strictly prohibited.
3. All limb wood (to include stem wood) less than four inches in diameter produced in the completion of projects on Installation shall be delivered to the Installation's compost yard. Responsible parties shall contact the Installation's Natural Resource POC to coordinate delivery. Leaving limb wood outside of the compost yard fence is strictly prohibited. However, projects involving small amounts of limb wood may dispose of the wood by

broadcasting it at the site if prior coordination has been made with the Natural Resource POC. In such cases, the limbs shall be lopped so as not to exceed twelve inches above ground level.

4. If no compost or wood yard exists on the Installation, the Contractor shall coordinate proposed off-site disposal methods and locations with the Installation's Natural Resource POC.
5. Any and all stumps that are to remain on site shall be cut as close to ground level as practical, not to exceed six (6) inches above ground level. Tree branches that obstruct the movement of equipment shall be cut flush to the trunk. The remaining portions of limbs broken by the passage of equipment shall be cut back flush to the trunk.
6. Any and all stumps with attached root masses shall be disposed of off Installation property to an approved landfill unless specifically authorized by the Installation's Natural Resource POS. Proper disposal of such stumps is the exclusive responsibility of the Contractor responsible for the Project.
7. In the event of a bona fide emergency outside of normal duty hours, trees may be removed if absolutely necessary without consulting the Installation's Natural Resource POC. All other provisions, however, remain in effect with regard to disposal of wood products at the earliest opportunity.
8. Removal of forest products without a permit from the Installation constitutes theft of government property.

E. Native Revegetation of Disturbed Areas:

1. Consult the Installation's Vegetation Management Plan and Integrated Natural Resource Management Plan for seed mixes for re-vegetating disturbed areas. Construction Contractors or government workers shall consult with the Installation's natural resources staff to develop a Restoration Plan for Project areas. If such plans are not in existence and the Installation does not have a natural resource staff the local Natural Resource Conservation Commission (NRCS) shall be contacted for their recommendations. The goal of the Restoration Plan is to restore disturbed areas to their original natural condition unless otherwise stipulated by landscape designs.
2. Plant Materials: Special seed mixes may need to be developed for unique sites such as wetlands and riparian areas. Any modification of the recommended seed mixes shall be coordinated with the Contracting Officer and/or natural resource staff. All seed mixes shall use certified varieties, be free of noxious weeds, and have been tested for purity and germination within one year of the planting date. If possible, all seed shall originate from sources not more than 250 miles south, 150 miles north, and 200 miles east or west of the Installation.
3. Special consideration shall be taken on rangeland areas. For range management areas, Contractors shall use only certified weed-free hay on Installation property.
4. Site Preparation: Soil Preparation. Prior to disturbance activities every attempt shall be made to stockpile topsoil from disturbed areas for later use in restoration activities. The disturbed site shall be tilled to a minimum depth of six inches, then harrowed or raked to produce a firm seedbed for planting. Some sites may not require tillage to provide a suitable seedbed, but this determination will only be made by Installation personnel. Sites without suitable surface soils for plant growth shall be covered with 4-6 inches of weed-free native topsoil that shall be incorporated by disking. Large rocks (>6 inch diameter) and other debris shall be cleared from the site. Any necessary structures (e.g., water bars, turnouts) to reduce runoff and prevent soil erosion shall be constructed prior to seeding.
5. Seeding and Mulching:

    a. Seeding Dates: The type of seed mixtures to be used will be affected by the planting season. Normal seeding shall occur during seasons with ample rainfall and temperature to promote growth. If planting during the dry season supplemental

irrigation of 0.5 inches/week shall be provided during the first growing season to promote seedling survival, unless otherwise stated by the Installation.

b. Seeding Methods: Drill seeding or broadcast seeding shall be used depending on the slope of the disturbed site and the size of the area.

1) Slopes less than 3:1: Seed shall be drilled using a rangeland or grass drill with a small seed/legume box and an agitator box for fluffy or bulky seed. Seed rows shall be spaced 7-10 inches apart, and planted 0.5 to 0.75 inches deep. The drill shall have double disk furrow openers with depth bands and packer wheels. Seeding shall be accomplished by following the contour of the slope. The drill shall be calibrated each day or whenever changing seed mixes to ensure even seed distribution.

2) Slopes greater than 3:1 and areas less than 0.5 acre: Seed shall be broadcast by hand, mechanical spreader, or hydraulic equipment. Broadcast seeded areas shall be raked or harrowed to incorporate the seed into the soil at a depth not exceeding 0.75 inches. Seed shall not be mixed in a tank with hydromulch and broadcast.

3) Mulching: Weed-free native hay, weed-free straw, virgin wood fiber hydromulch, or erosion control blankets shall be used to promote germination and seedling establishment. Native hay, straw, or hydromulch shall be applied at 2000 pounds/acre on slopes less than 3:1. Native hay or straw shall be crimped into the soil to a depth of 3-4 inches, and shall protrude above the ground 3-4 inches. Hydromulch shall be applied using the recommended rate of an organic tackifier. Erosion control blankets shall be used whenever reclaiming slopes greater than 3:1 or along drainage areas where erosion is probable.

4) Reseeding: If a partial or total seeding failure is apparent after the second growing season, unvegetated areas shall be reseeded in the same manner described above. Appropriate site preparation practices shall be used to create a suitable seedbed for planting, but any established native vegetation shall be undisturbed. Areas that erode and lose seed before establishment can occur shall be immediately reseeded.

6. Trees and Shrubs:

a. Protection: Protect existing trees which are to remain from injury, bruise, defacing, or other damage from construction operations. Remove displaced rocks. By approved excavation, remove trees with 30 percent or more of their root systems destroyed.

b. Replacement: Remove trees and other landscape features scarred or damaged by construction operations, and replace with equivalent, undamaged trees and landscape features. Obtain Contracting Officer's approval before replacement.

c. On February 3, 1999, the President issued Executive Order 13112 to prevent the introduction of invasive species and provide for their control, and to minimize the economic, ecological, and human health impacts. All landscaping shall consist of native, non-invasive species.

3.8 Polychlorinated Biphenyls

A. Polychlorinated Biphenyls (PCBs) are mixtures of synthetic organic chemicals with the same basic chemical structure and similar physical properties ranging from oily liquids to waxy solids. Due to their non-flammability, chemical stability, high boiling point and electrical insulating properties, PCBs were used in hundreds of industrial and commercial applications including electrical, heat transfer, and hydraulic equipment; as plasticizers in paints, plastics and rubber

products; in pigments, dyes and carbonless copy paper and many other applications. More than 1.5 billion pounds of PCBs were manufactured in the United States prior to cessation of production in 1977.

B. Concern over the toxicity and persistence in the environment of PCBs led Congress in 1976 to enact §6(e) of the Toxic Substances Control Act (TSCA) that included among other things, prohibitions on the manufacture, processing, and distribution in commerce of PCBs. Thus, TSCA legislated true "cradle to grave" (i.e., from manufacture to disposal) management of PCBs in the United States.

C. Provide certification that all persons or entities under Contractor control have had awareness training to recognize the potential presence of PCBs that may be encountered during conduct of service or construction Contracts.

D. Contractor and all subcontractors shall prepare a written procedure outlining the notification process between their employees/subcontractors/agents and Contractor management and to the Contracting Officer informing of the presence of PCBs not identified beforehand. All construction workers that handle the PCBs and/or PCB wastes shall be trained of PCBs and hazards associated with PCBs and also trained in accordance with OSHA 40-hour HAZWOPER.

E. Construction Contractors shall be responsible for ensuring equipment or materials brought on the Installation do not contain PCBs. The Construction Contractor shall be required to obtain prior approval from the Contracting Officer for an exemption to this requirement.

F. Should the Contractor encounter previously unidentified or unanticipated suspect PCB items, that must be disturbed, the Contractor shall cease that work which would disturb the suspect items and shall immediately notify the Contracting Officer. The Installation shall evaluate the extent to which there are cost impacts to abatement and disposal and take steps as necessary to resolve the issue.

3.9 RADON

A. Radon (chemical symbol Rn) is a naturally occurring radioactive gas found in soils, rock, and water throughout the U.S. It has numerous different isotopes, but radon-220, and -222 are the most common. Radon causes lung cancer, and is a threat to health because it tends to collect in homes, sometimes to very high concentrations. As a result, radon is the largest source of exposure to naturally occurring radiation.

B. The Radon requirements are designed to ensure the Installation meets and maintains compliance with 40 CFR Part 61, Subpart I.

C. The Project site <DOES OR DOES NOT> have Radon concerns. The following measures will be taken to ensure public and worker safety: <INSERT MEASURES TO ENSURE PUBLIC AND WORKER SAFETY DURING CONSTRUCTION, AND POTENTIAL LONG-TERM MITIGATION MEASURES TO BE INCORPORATED INTO THE DESIGN>.

3.10 LEAD-BASED PAINT

A. The Hazardous Material Assessment for the Project indicates Lead Based Paint / Paint with Lead requiring remediation. Comply with Division 02 Section Lead Remediation.

B. The Hazardous Material Assessment for the Project indicates no Lead Based Paint / Paint with Lead (LBP/PWL) requiring remediation encountered in the investigation. Notify Government's Designated Representative immediately if LBP/PWL or suspected LBP/PWL is encountered.

3.11 ASBESTOS

A. The Hazardous Material Assessment for the Project indicates Asbestos Containing Material requiring remediation. Comply with Division 02 Section Asbestos Remediation.

B. The Hazardous Material Assessment for the Project indicates no Asbestos Containing Material (ACM) requiring remediation encountered in the investigation. Notify Government's Designated Representative immediately if ACM or suspected ACM is encountered.

3.12 SPILL PREVENTION AND RESPONSE PROCEDURE PLAN

A. General:

1. Spill prevention and response requirements are designed to ensure the Installation meets and maintains compliance with:

   a. AFI 32-4002; Hazardous Material Emergency Planning and Response Program.
   b. RCRA Contingency Planning Requirements - 40 CFR Part 264, Subpart D, 40 CFR Part 265 Subpart D, and 40 CFR 279.52.
   c. OSHA Hazardous Waste Operations and Emergency Response (HAZWOPER) Regulation - 29 CFR Part 1910.120.
   d. Spill Prevention Control and Countermeasure Plan - 40 CFR 112.7.

2. Spill response and reporting procedures and liability requirements are designed to ensure the Installation meets and maintains compliance with:

   a. AFI 32-4002; Hazardous Material Emergency Planning and Response Program.
   b. RCRA Contingency Planning Requirements - 40 CFR Part 264, Subpart D, 40 CFR Part 265 Subpart D, and 40 CFR 279.52.
   c. OSHA Hazardous Waste Operations and Emergency Response (HAZWOPER) Regulation - 29 CFR Part 1910.120.
   d. Spill Prevention Control and Countermeasure Plan - 40 CFR 112.7.
   e. Emergency Planning and Community Right-To-Know (SARA Title III) - Sections 301, 302, 303, and 304.

3. The Requirements for Petroleum, Oil, & Lubricants are designed to ensure the Installation meets and maintains compliance with:

   a. OSHA's Hazard Communication Regulation - 29 CFR 1910.1200.
   b. EPA SPCC Requirements - 40 CFR 112.
   c. Local and State Oil and Petroleum Spill Prevention Requirements.

B. Responsibility:

1. If Contractor manages, stores, or uses hazardous materials (including fuels) or produces hazardous waste, Contractor shall develop a Spill Prevention and Response Procedure (SPRP) Plan. The Construction Contractor's SPRP plan shall contain, as a minimum:

   a. General identification information including:

1) Contractor name.
2) Mailing address.
3) Primary and alternate contacts.
4) Contact's phone numbers (land line plus mobile if available).
5) Contact's pagers.
6) Contact's fax number.

b. A list of spill prevention and response equipment and materials with a corresponding map showing their location on-site.
c. A description of hazardous chemicals, HAZMAT, and their storage containers with a corresponding map showing their location on-site.
d. Actions the Construction Contractor shall take upon discovery of an incident including a statement of emergency response actions that the Construction Contractor will take based upon its training and capabilities.
e. Procedures for notification of the Installation after discovery of an incident.
f. Actions the Contractors shall take to contain and clean up spills as well as dispose of spill residue.
g. A description of how the Contractor shall coordinate and complete any required corrective actions.
h. A description of required employee hazardous material and spill response training. (Training to be provided to employees as required by all applicable Federal, state, and local regulations and copies of employee workplace hazard training program maintained on site at all times).

2. Submit the completed SPRP plan to the Contracting Officer a minimum of ten working days prior to commencement of work for review and approval. The Installation will make a copy of its SPRP plan available to the Construction Contractor, upon request, to use as a guide in preparing their SPRP. The Construction Contractor may not adopt the Installation's SPRP as the Construction Contractors SPRP without the addition of Construction Contractor specific information as outlined above.

C. Spill Response and Reporting Procedures and Liability:

1. The Construction Contractor shall manage, store, and use all hazardous materials (including fuels) in accordance with good engineering practices and implement best management practices in order to prevent spills and releases. The Construction Contractor shall report spills to the Installation and execute timely and appropriate actions to contain and cleanup all spills in accordance with the Contractor SPRP plan and the Installation SPRP. The Installation does not authorize the Construction Contractor employees to provide emergency response nor clean up actions beyond the level of training of their employees. Once a spill or release of a hazardous material managed, used, or stored by the Construction Contractor has been contained, the Installation shall determine if additional cleanup is required and the extent of the Contractor's responsibility. The Construction Contractor shall be liable for any direct and indirect costs incurred during spill response and clean-up, including but not limited to administrative costs, materials, labor, equipment, shipping, packaging, testing, replacement equipment and materials, and disposal.
2. Construction Contractor-owned tanks used for vehicle or equipment refueling shall only be allowed to exist at the Installation if approved by the Contracting Officer. Construction Contractors requesting permission to stage a fuel tank on the Installation shall do so in writing to the Contracting Officer. Construction Contractors shall prepare a Spill Prevention Control and Countermeasure Plan (SPCC) and submit it with their request to stage a fuel tank. The Construction Contractor shall not use aboveground tanks with an individual capacity of greater than 660 gallons.

3. During fuel transfers, the Contractor shall utilize spill containment devices and have spill containment materials available.
4. The Construction Contractor is prohibited from performing routine servicing of vehicles such as oil changes or brake fluid changes on Installation property.
5. The Construction Contractor is prohibited from using oil on roadways or other surface areas for dust suppression.
6. The Construction Contractor shall not release secondary containment water when oil sheen is present. The Contractor shall collect contaminated containment water and make arrangements with the Installation Environmental Office for its proper disposition.
7. If the Construction Contractor uses aboveground petroleum, oil, and lubricants (POL) storage tanks, they shall be Underwriters Laboratory-approved, double-walled, convolute-type tanks.
8. The Construction Contractor, if an owner or operator of an AST containing POLs, is subject to provisions of the OSHA Hazard Communication Standard cited at 29 CFR 1910.1200 and shall comply with labels and other forms of warning, MSDSs, and training.
9. The Construction Contractor, if a generator of used oil, is subject to management standards for used oil (40 CFR 279.1) and shall:

    a. Store used oil only in tanks and containers.
    b. Keep tanks and containers in good condition and free of leaks.
    c. Label tanks and containers with the words "used oil".
    d. Stop, contain and cleanup spills or releases to the environment.
    e. Use a transporter with an EPA identification number when shipping used oil off-site.

10. The Construction Contractor managing POLs at the Installation is subject to local and state oil and petroleum spill prevention requirements including but not limited to the following reporting requirements:
11. The Construction Contractor shall report a release of oil that enters or may enter "waters of the state" including surface waters, groundwater, dry gullies, or storm sewers leading to surface waters to Local and State Department of Public Health and Environment (DPHE) immediately, the Installation Environmental Office shall also be notified.
12. The Construction Contractor shall report releases of oil to land greater than 25 gallons to the state immediately and notify the Installation Environmental Office.
13. The Construction Contractor shall not mix used oil with characteristic hazardous waste (e.g. gasoline) since the mixing constitutes hazardous waste treatment and requires a permit.

END OF SECTION

APPENDIX A
CERTIFICATION OF COMPLETED ABATEMENT

As authorized representative of the contractor, I hereby certify and attest that I have completed abatement work on project _____
Description

at _____, Contract Number _____
Location Number

in accordance with the contract provisions, federal, state and local regulations and have disposed of all waste and debris associated with this work at a landfill or disposal site authorized and licensed to accept such wastes. Copies of project logs and documents, landfill receipts and waste manifests are attached. At completion of all work, the work are visually inspected and found to be free and clear of all visual signs of asbestos materials and that clearance air quality monitoring and sample analysis under aggressive air disturbance conditions was found to be within permissible levels for space re-occupancy.

The contractor's representative further accepts and acknowledges that the contractor assumes all responsibilities for latent defects attributable to his failure to follow prescribed procedures or failure to properly abate the required conditions as described in the contract.

by: _____
Signature, Contractor or Authorized Representative Date

_____
Printed Name

_____
Printed Title and Firm

GOVERNMENT INSPECTOR'S CERTIFICATION

The Government's Inspector hereby certifies that he has accompanied the Contractor's Representative on his visual inspection and reviewed the results of his final clearance air quality monitoring and verifies that, to the best of his knowledge and belief, the above representations by the Contractor's Representative are true and correct.

by: _____
Signature Date

_____
Printed Name

_____
Printed Title and Firm

APPENDIX B
ENVIRONMENTAL CERTIFICATION
ACCOMPANYING COMPLETION OF NEW CONSTRUCTION

As authorized representative of the Contractor, I hereby certify and attest, to the best of my knowledge, that the construction completed under the contract (Government Contract No._____) is free and clear of building materials and products containing regulated quantities of asbestos and/or lead-based paints. I have determined the above based on product labels, manufacturer's information, submittal documents for specified materials, and other information available to me. The Contractor's representative further acknowledges and accepts that if it is later found that the Contractor has intentionally defrauded or misrepresented these facts, then the Contractor assumes total and complete liability for fines, penalties and/or abatement and removal of these materials at the direction of the Government.

by: _____
Signature, Contractor or Authorized Representative Date

_____
Printed Name

_____
Printed Title and Firm

GOVERNMENT INSPECTOR'S CERTIFICATION

The Government's Inspector hereby certifies and attests that, to the best of knowledge and belief, the above representations by the Contractor's representative are true and correct.

by: _____
Signature Date

_____
Printed Name

_____
Printed Title and Firm

SECTION 01 35 43.19

ENVIRONMENTAL PROCEDURES FOR REFRIGERANTS

(Edited from DeCA June 2011 Design Criteria)

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Installation of refrigerant.
2. Removal of refrigerant.

B. Related Sections:

1. Division 01 Section Mechanical, Refrigeration, Food Service Equipment and Electrical Coordination.
2. Division 01 Section Quality Control.
3. Division 01 Section Closeout Procedures.
4. Division 23 Section Product Refrigeration Systems.

1.2 QUALITY CONTROL

A. The following publications form a part of this Specification to the extent they are applicable:

1. Division 01 Section Quality Control.

1.3 SUBMITTALS

A. Submittals at Project Closeout:

1. Division 01 Section Closeout Procedures.
2. Refrigerant log book.

1.4 QUALIFICATIONS

A. Installer: Company specializing in performing the work of this Section with minimum three years documented experience.

1.5 REGULATORY REQUIREMENTS

A. Conform to IMC.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 REFRIGERANT HANDLING

A. Refrigerant to be Added to Equipment:

1. All refrigerant added to equipment shall be Contractor Furnished, Contractor Installed, and new non-recycled.

B. Contractor Responsibilities for Safe Removal:

1. The Contractor is responsible for safe handling, dismantling, removal, and disposal of all refrigeration equipment identified for removal as part of the Contract Documents unless otherwise specified. Prior to dismantling and removal of refrigeration equipment, the Contractor will recover all refrigerants for recycling by transferring to an approved external vessel or certified recycling or recovery machine.

C. Ownership and Handling of Recovered Refrigerant:

1. Notification/Coordination: Provide the Contracting Officer a minimum of 30 days prior to the date for scheduled removal of refrigerant and a plan for disposal of recovered refrigerant in accordance with applicable federal, state and local laws, rules and regulations.
2. Recovery of Used Refrigerant: Recover all refrigerant from equipment being removed and transfer to appropriate containers. Provide approved containers for the recovery of used refrigerants. Complete all documents necessary to accompany transfer of removed refrigerant to appropriate government agencies or private entities legally designated to accept such refrigerants.
3. Contingency Plan: Prepare and implement a contingency plan during refrigerant recovery to prevent and minimize loss of refrigerant from connections, fittings, piping, and storage containers.
4. Ownership of Recovered Refrigerant: At the discretion of the government, the government may elect to retain ownership of the recovered refrigerant, at no additional cost. If the government elects to retain ownership of recovered refrigerant, it will designate a storage point on the installation for the Contractor to store the containers. In event the government elects to relinquish ownership of used refrigerants, the refrigerant will become the property of the Contractor. The Contractor will then be responsible for transporting and recycling or disposal of the refrigerant in accordance with applicable regulations, and shall bear any associated costs or credits.

D. Refrigerant Log Book:

1. Furnish and maintain a refrigerant log book for recording refrigerant transfers.
2. In the log book itemize services performed, actions taken, and amount of refrigerant added to or removed from each system installed, or affected, or removed by this Project.
3. The Refrigerant Log Book is a three-ring loose leaf binder containing a table of contents and a separate Refrigerant logging form for each piece of refrigeration and HVAC equipment (see sample form).

E. Execution of Record Keeping for Refrigerant Transfers:

1. Duration: Establish the Refrigerant Log Book at the start of construction and continuously maintain and keep current until completion of the warranty portion of the Contract.

2. Location of Refrigerant Log Book: During the construction period, keep the log book in the possession of the Contractor at the construction site. After construction is completed, keep the log book in the Commissary Store Director's Office.
3. Project Close-out: Upon completion of the construction portion of the Project, furnish two updated copies of the log book to DeCA/PM/FM. Then, turn the original log book over to the Commissary Store Director.

END OF SECTION

SERVICE DATE	TECHNICIAN NAME	COMPANY NAME	REASON FOR SERVICING	ACTIONS TAKEN	Lbs REF ADDED +	Lbs REF REMOVED -	DESTINATION RECOVERED REFRIGERANT	CORRECTIVE ACTIONS FOR LOSSES/ REMARKS

REFRIGERANT LOG BOOK

Location:_____ Refrigeration System:_____

Equipment Application:_____ Refrigerant Type:_____

Equipment designated as indicated on Construction Drawings:

Refrigeration Capacity:_____BTU/HR

Total amount of refrigerant initially installed in system:

Equipment manufacturer name:

Model number:_____ Serial number:

HVAC/refrigeration installing Contractor's name:

Name of installing Contractor's lead technician on site:

Date installed:

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SECTION 01 35 46

INDOOR AIR QUALITY PROCEDURES

(Edited from DeCA June 2011 Design Criteria)

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Special construction scheduling/sequencing requirements and procedures necessary to assure achievement of designed Indoor Air Quality (IAQ) levels for the completed project required by the EPA IAQ Program.
2. Ventilation during construction.

B. Related Sections:

1. Division 01 Section Sustainable Design Reporting for additional indoor air quality requirements.
2. Division 01 Section Environmental Management for definitions and general requirements.
3. Division 23 Section Testing, Adjusting, and Balancing for HVAC for baseline testing for Indoor Air Quality.

1.2 DEFINITIONS

A. Type 1 Finishes: Materials and finishes which have a potential for short-term levels of off gassing from chemicals inherent in their manufacturing process, or which are applied in a form requiring vehicles or carriers for spreading which release a high level of particulate matter in the process of installation and/or curing. Type 1 Finishes include, but are not limited to the following:

1. Composite wood products, specifically including particleboard from which millwork, wood paneling, doors or furniture may be fabricated.
2. Adhesives, sealants, and glazing compounds, specifically those with petrochemical vehicles or carriers.
3. Wood preservatives, finishes, and paint.
4. Control and/or expansion joint fillers.
5. All hard finishes requiring adhesive installation.
6. Gypsum board and associated finish processes.

B. Type 2 Finishes: "Fuzzy" materials and finishes which are woven, fibrous, or porous in nature and tend to adsorb chemicals off gassed by Type 1 finishes or may be adversely affected by particulates. These materials become chemical binder for organic/aromatic compounds which may be released much later, or collectors of contaminants that may promote subsequent bacterial growth. The chemicals off gassed by Type 1 finishes may combine with chemicals in Type 2 finishes to alter both chemical constituents or even polymerize. Type 2 Finishes include, but are not limited to the following:

1. Carpet and padding.

2. Fabric wallcovering.
3. Insulation exposed to the airstream.
4. Acoustic ceiling materials.
5. Fabric covered acoustic wall panels.
6. Upholstered furnishings.

C. Materials that can be categorized as both Type 1 and Type 2 materials shall be considered to be Type 1 materials.

1.3 SUBMITTALS

A. Supplementary Construction Schedule: Submit a schedule of construction showing compliance with requirements of this Section as a supplement to the schedule in accordance with applicable requirements of Division 01 Section Construction Progress Documentation.

1. Show sequence of finishes applications and allowances for curing times. Within each air zone identify finishes, indicating their type classifications.

a. An air zone is that part of any floor area served by a single air handling unit.

2. Indicate and schedule types and durations of temporary ventilations proposed. Show schedule for commissioning procedures and all temporary usages of building mechanical systems, identifying types of filtration used and schedule of filter replacement and changeouts.

B. Material Safety Data Sheets (MSDSs): Requirements for submittal of MSDSs are specified in the individual specification sections of this Project Manual as required.

1.4 QUALITY ASSURANCE

A. General: Perform the work of this Section as a supplement to and in accordance with applicable requirements of Division 01 Section Quality Control.

B. Finishes Installation Scheduling: As part of the Coordination and Mutual Understanding Meeting, discuss the Supplementary Construction Schedule required under this Section. The purpose of this agenda item is to assure understanding of the importance of sequencing of finishes to the overall Indoor Air Quality of the facility and to secure preliminary approval of the Contracting Officer for scheduling and installation requirements for on-site work.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 PREPARATION

A. Certify in writing to the Government's Designated Inspector that interior environmental control has been implemented as specified below and that required conditions are being maintained, and obtain the Government's Designated Inspector approval before starting installation of interior finishes.

B. Coordination: Schedule and coordinate the work of all finishes installers to assure compliance with the requirements of this Specification Section.

1. Define and control sequencing of finishes applications to ensure separation of Type 1 and Type 2 materials during off gassing and curing of Type 1 materials.
2. Schedule start up of ventilating systems or schedule and provide temporary ventilation systems to ensure required air change rates during the off gassing periods of Type 1 materials.

3.2 INTERIOR ENVIRONMENTAL CONTROL

A. Provide and maintain controlled interior environment in accordance with the following requirements before beginning installation of interior finish materials in order to dilute and exhaust vapors produced by solvents and other carriers from liquid applied materials, and particulate matter from residual manufacturing chemicals contained in solid products.

B. Implement guidelines as identified in the Sheet Metal and Air Conditioning Contractors' National Association, Inc. (SMACNA) – "IAQ Guidelines for Occupied Buildings Under Construction" – Current Edition. The intent is to prevent any indoor air quality problems to building occupants during construction. Isolate all areas of construction from Commissary operations. Remove all hazardous materials prior to starting work. If hazardous materials are found, identified, or suspect, cease work and mitigate the hazardous material concern. Do not continue with contract work until the space has been cleared by a PE or Certified Industrial Hygienist for occupancy.

C. Supply 100 percent outside air 24 hours a day. Supply airflow at 6 air changes per hour when outside temperature is between 55 deg F and 85 deg F and humidity is between 30 percent and 60 percent.

1. Supply a minimum of 1.5 air changes per hour when outside conditions are not within the range above. To meet desired volumetric air changes for dilution ventilation, Contractor may use the exhaust air as makeup air if the following requirements are met:

a. Ventilation is designed and stamped by a PE or Certified Industrial Hygienist using ANSI/AIHA Z9.7 "Recirculation of Air from Industrial Process Exhaust Systems" for design criteria.
b. All controls are implemented in accordance with the design. (See Division 23 Section Testing, Adjusting, and Balancing for HVAC.)

2. The supply air system shall have filters in place. Maintain filtration efficiency of 30 percent unless higher efficiency is required by other Contract Documents.
3. The HVAC system may be used to move both supply and return air if the following requirements are met:

a. Permanent return air ductwork and heating and cooling coils shall be cleaned per National Air Duct Cleaners Association standards upon completion of all construction and finish installation work and before beneficial occupancy of the Project or Phase by the Government.
b. No recirculating air is permitted unless designed and implemented in accordance with the provisions of ANS/IAIHA Z9.7 as referenced above. Temporary exhaust systems may be used to exhaust air directly to the outside from the construction area.

D. Begin construction ventilation when the building is substantially enclosed.

E. Pre-commissioning and commissioning procedures for HVAC systems, including duct cleaning and filter replacement prior to release of the Project or Phase to the Government for occupancy, are specified in Division 23 Sections and by reference above to SMACNA "IAQ Guidelines for Occupied Buildings Under Construction" - Current Edition.

END OF SECTION

SECTION 01 42 00

REFERENCES

(Edited from DeCA June 2011 Design Criteria)

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Definitions.
2. Specification format and content explanation.
3. Industry standards.

1.2 DEFINITIONS

A. "Indicated": The term "indicated" refers to graphic representations, notes, or schedules on the drawings, or paragraphs or schedules in the Specifications and similar requirements in the contract documents. The use of terms such as "shown," "noted," "schedule," and "specified" help the reader locate the reference. Location does not limit.

B. "Directed": Terms such as "directed," "requested," "authorized," "selected," "approved," "required," and "permitted" mean directed by the Contracting Officer, requested by the Contracting Officer, and similar phrases.

C. "Approved": The term "approved" when used in conjunction with the Contracting Officer's action on the contractor's submittals, applications, and requests, refers only to the Contracting Officer's duties and responsibilities as stated in the Conditions of the Contract.

D. "Regulations": The term "regulations" include laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, as well as rules, conventions, and agreements within the construction industry that control performance of the work.

E. "Furnish": The term "furnish" means supply and deliver to the project site, ready for unloading, inspection, inventory, unpacking, assembly, installation, and similar operations.

F. "Install": The term "install" describes operations at the project site including the actual unloading, temporary storage, unpacking, assembly, erecting, placing, anchoring, applying, working dimension, finishing, curing, protecting, cleaning, and similar operations.

G. "Provide": The term "provide" means to furnish and install, complete and ready for the intended use.

H. "Installer": An installer is the contractor or another entity engaged by the contractor, either as an employee, subcontractor, or contractor of lower tier, to perform a particular construction activity, including purchasing, installation, erection, application, or similar operations. Installers must possess experience in the operations they perform.

1. The term "experience" when used with the term "installer" means having a minimum of 5 previous projects similar in size and scope to this project, being familiar with the special

requirements indicated, and having complied with requirements of authorities having jurisdiction.

2. Trades: Using terms such as "carpentry" does not imply performance of certain construction activities by accredited or unionized individuals of a corresponding generic name, such as "carpenter." It also does not imply that requirements specified apply exclusively to trades- persons of the corresponding generic name.

I. "Project Site": The space available to the contractor for performing construction activities, either exclusively or in conjunction with others performing work as part of the project.

J. "Testing Agencies": A testing agency is an independent entity engaged to perform specific inspections or tests at either the project site or elsewhere. The agency reports and, if required, interprets results of these inspections or tests.

K. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or products that are similar to those indicated for this Project in material, design, and extent.

L. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance.

M. Products: Items purchased for incorporating into the work. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.

1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation, shown or listed in manufacturer's published product literature that is current as of date of the Contract Documents.
2. New Products: Items that have not previously been incorporated into another project or facility. Products salvaged or recycled from other projects are not considered new products.
3. Or Equal Product: Product that is demonstrated and approved through submittal process, or where indicated as a product substitution, to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.

N. Basis-of-Design Product Specification: Where a specific manufacturer's product is named and accompanied by the words "basis of design," including make or model number or other designation, to establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of other manufacturers.

1.3 SPECIFICATION FORMAT AND CONTENT EXPLANATION

A. Specification Format: The organization of these specifications into Divisions and Sections follow CSI's 48-Division format and Master Format numbering system.

B. Specification Content: This specification uses certain conventions regarding the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations or circumstances. These conventions are as follows:

1. Abbreviated Language: Abbreviations occur in languages used in specifications and other contract documents. Interpret words and meanings as appropriate. Interpolate

words implied, but not stated, as the sense required. Interpret singular words as plural and plural words interpreted as singular where applicable as the context of the contract documents indicates.

2. Streamlined Language: The specifications generally use the imperative mood and streamlined language. The contractor performs requirements expressed in the imperative mood. At certain locations in the text, subjective language is for clarity to describe responsibilities of the contractor or others when so noted.

   a. Imply the words "shall be" where a colon (:) is within a sentence or phrase.

1.4 INDUSTRY STANDARDS

A. Applicability of Standard: Except where the contract documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the contract documents to the extent referenced. Such standards are a part of the contract documents by reference.

B. Publication Dates: Comply with the standards in effect as of the issue date of the Solicitation except comply with standards having different revision dates as referenced in the Building Code indicated in Division 01 Section Summary of Work.

C. Conflicting Requirements: Where the contract documents specify compliance with 2 or more standards and the standards establishes different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Before commencing, refer to the Contracting Officer for a decision on requirements that are different but apparently equal, and where it is uncertain which requirements are the most stringent.

   1. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified is the minimum acceptable. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of the requirements. Refer uncertainties to the Contracting Officer for a decision before proceeding.

D. Copies of Standards: Require each entity engaged in construction on the project to be familiar with industry standards applicable to its construction activity. The contract documents do not contain bound copies of applicable standards.

E. Abbreviations and Names: Abbreviations frequently occur in trade association's names and titles of general standards. The use of such acronyms or abbreviations in the specifications or other contract documents, mean the recognized name of the trade association, standard-generating organization, authorities having jurisdiction, or other entity applicable to the context of the text provision. Refer to Thompson Gale's "Encyclopedia of Associations" or Columbia Books' "National Trade & Professional Associations of the U.S."

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

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SECTION 01 45 00

QUALITY CONTROL

(Edited from DeCA June 2011 Design Criteria)

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Quality control.
2. Field engineering.
3. Sample forms and reports.

1.2 REFERENCES

A. The publications listed below form a part of this Specification to the extent referenced. The publications refer to the text by the basic designation only.

1. American Society for Testing and Materials (ASTM).
2. ASTM C 1077: Practice for Laboratories Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Laboratory Evaluation.
3. ASTM D 3666: Specification for Minimum Requirements for Agencies Testing and Inspecting Road and Paving Materials.
4. ASTM D 3740-08: Practice for Minimum Requirements for Agencies Engaged in Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction.
5. ASTM E 329-08: Specification for Agencies Engaged in Construction Inspection and/or Testing.
6. ASTM E 543-08a: Specification for Agencies Performing Nondestructive Testing.

1.3 SUBMITTALS

A. Refer to Division 01 Section Administrative Requirements for procedures.

B. Submittal Schedule:

1. Provide the indicated quantity by the delivery date.

C. Submittal List:

Reference	Submittal Item	Quantity	Action
1.4	Quality Control Plan	X	R
1.4	Complete Submittal Register and Schedule	X	R
1.4	Quality Control Report	X	I
1.4	Testing Plan and Log	X	I
1.4	Monthly Summary Report of Field Tests	X	I
1.4	QC Meeting Minutes	X	I
1.4	Rework Items List	X	I
1.4	QC Certifications	X	I

1.4	QC Punch List	X	I

X Submit quantity specified in Division 01 Section Administrative Requirements.
R Review each submittal, mark to indicate action taken, and return.
I Submittal is for information or record purposes only. No action will be taken.

1.4 QUALITY CONTROL (QC)

A. QC Program Requirements:

1. Establish and maintain a QC program as described in this Section. The QC program consists of a QC Organization, a QC Plan, a Coordination and Mutual Understanding Meeting, QC meetings, three phases of control, submittal review and approval, and QC certifications and documentation. The program provides materials, equipment, workmanship, fabrication, construction, and operations which comply with the requirements of this contract. The QC program covers project construction operations on-site and off-site.

B. QC Organization:

1. QC Manager:

a. Duties: Provide a QC organization and on-site Manager at the work site to manage and implement the QC program. Restrict the duties and responsibilities of the QC Manager to managing and implementing the QC program only. Require the QC Manager to attend the Coordination and Mutual Understanding Meeting, conduct the QC meetings, perform the three phases of control, and perform submittal review and approval. Submittal review and approval includes those designated for Contracting Officer approval. Perform required testing and prepare QC certifications and documentation required in this contract. The QC manager shall be on site all times work is being performed. The QC Manager shall report directly to an officer or other top level official of the firm. The QC Manager shall not be the same individual as, nor be subordinate to, the project superintendent, the project Manager, or any other on-site personnel.

1) Qualifications: The on-site QC manager from this firm must have a minimum of 5 years experience as engineer, QC Manager, Project Manager, or architect on similar size and type construction contracts.
2) Provide resume. Submit to Contracting Officer for approval.

2. Alternate QC Manager Duties and Qualifications: Designate an alternate for the QC Manager at the work site to serve in the event of the designated QC Manager's absence. The QC Manager’s period of absence may not exceed two weeks at any one time, and not more than 30 work days during a calendar year. The qualification requirements for the alternate QC Manager are the same as for the QC Manager.

a. Submit resume to Contracting Officer for approval. Indicate qualifications, experience in area of responsibility, and frequency as alternate QC Manager.

C. Quality Control (QC) Plan.

1. Requirements: Within ten (10) from Notice to Proceed, provide for approval by the Contracting Officer, a QC plan that covers both on-site and off-site work and includes the following:

a. A chart showing the QC organizational structure and its relationship to the production side of the organization.
b. Names and qualifications, in resume format, for each person in QC organization.
c. Duties, responsibilities, and authorities of each person in the QC organization.
d. A listing of outside organizations such as, architectural, consulting engineering, and testing lab firms employed by the contractor and a description of the services these firms will provide.
e. A letter signed by an officer of the firm appointing the QC Manager and Alternate Manager and stating that he/she is responsible for managing and implementing the QC program as described in this contract. Include in this letter the QC Managers' authority to direct the removal and replacement of non-conforming work.
f. Procedures for reviewing, approving, and managing submittals. Provide name(s) of the person(s) in the QC organization authorized to review and certify submittals prior to approval.
g. Testing laboratory information required by paragraph entitled "Accredited Laboratories" or "Testing Laboratory Requirements," as applicable.
h. A Testing Plan and Log that includes the tests required, referenced by the specifications paragraph number requiring the test, the frequency, and the person responsible for each test.
i. Procedures to identify, record, track, and complete rework items.
j. Documentation procedures, including proposed report formats.
k. A list of the definable features of work. A definable feature of work is a task that is separate and distinct from other tasks and requires separate control requirements. As a minimum, if approved by the Contracting Officer, consider each section of the specifications as a definable feature of work. However, at times, there may be more than one definable feature of work in each section of the specifications.
l. A submittal register and schedule.

2. Preliminary Work Authorized Prior to Approval: The only work authorized to proceed prior to the approval of the QC Plan is mobilization of storage and office trailers and surveying subject to Division 01 Section Temporary Facilities and Controls.
3. Approval: Obtain approval of the QC Plan prior to the start of construction. The Contracting Officer reserves the right to require changes in the QC Plan and operations as necessary to ensure the specified quality of work. The Contracting Officer reserves the right to interview any member of the QC organization at any time to verify his/her submitted qualifications.
4. Notification of Changes: Notify the Contracting Officer, in writing, of any proposed changes, including changes in the QC organization personnel, a minimum of seven calendar days prior to a proposed change. The Contracting Officer must approve proposed changes and reserves the right to deny the proposed change.

D. Construction Management Plan:

1. Participate in the development of a Construction Management Plan, which will aid all project participants by detailing the communication and administrative procedures used to implement this contract.
2. The plan will include forms and formats to be used and appropriate instructions, specific addresses for mailing and delivery, and identification of expected decision points in the project. Nothing in the plan will replace the contract.
3. At the Pre-performance Conference, the Contracting Officer will furnish a draft of the plan to the Contractor for his review, markup, and comment. The Contractor and the Government’s Designated Inspector will meet to review suggested revisions.
4. The Contracting Officer or Government’s Designated Inspector will furnish one copy of the final approved plan for the Contractor's use.

E. Coordination and Mutual Understanding Meeting:

1. After submission of the QC Plan, but prior to the start of construction, meet with the Contracting Officer to discuss the QC program required by this contract. The purpose of this meeting is to develop a mutual understanding of the QC details. This includes forms used for documentation, administration for on-site and off-site work, and the coordination of the contractor's management, production, and QC personnel with the Contracting Officer. As a minimum, the contractor's personnel required to attend include the Project Manager, Project Superintendent, QC Manager, Assistant QC Manager, and QC Specialist. The QC Manager prepares the minutes of the meeting, and both the Contractor and the Contracting Officer signs this document.

F. QC Meetings:

1. After the start of construction, the QC Manager conducts weekly QC meetings at the work site with the project superintendent. The QC Manager prepares minutes of the meeting. Provide a copy to the Contracting Officer within 2 working days after the meeting. The Contracting Officer or Government's Designated Inspector may attend these meetings. Notify the Contracting Officer at least 48 hours before each meeting. This meeting requirement is solely for quality control and is in addition to the weekly construction meeting held by the Government's Designated Inspector or Contracting Officer and the QC manager's preparatory meetings. As a minimum, accomplish the following at each meeting:

a. Review the minutes of the previous meeting.
b. Review the schedule and the status of work:

1) Work or testing accomplished since last meeting.
2) Rework items identified since last meeting.
3) Rework items completed since last meeting.
4) Review the status of submittals:
5) Submittals reviewed and approved since last meeting.
6) Submittals required in the near future.

c. Review the work scheduled in the next week and documentation required. Schedule the three phases of control and testing:

1) Preparatory phases required.
2) Initial phases required.
3) Follow-up phases required.
4) Testing required.
5) Status of off-site work or testing.
6) Documentation required.
7) Establish completion dates for rework items.

d. Resolve QC and production problems.
e. Address items that may require revising the QC Plan.

1) Changes in QC organization personnel.
2) Changes in procedures.

G. Three Phases of Control: The QC Manager performs the three phases of control to ensure that work complies with contract requirements. The three phases of control cover both on-site and off-site work and include the following for each definable feature of work:

1. Preparatory Phase: Notify the Contracting Officer at least 2 work days before each preparatory phase meeting. Conduct the meeting with the QC specialist, the Superintendent, the foreman responsible for the definable feature of work, and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials. The Contracting Officer or Government's Designated Inspector may attend. The QC Manager prepares minutes of the meeting. Provide a copy to the Contracting Officer within 2 working days after the meeting. This meeting requirement is solely for quality control and is in addition to other quality meetings. Perform the following prior to beginning work on each definable feature of work:

   a. Review the progress of other construction activities and preparations for the particular activity under consideration at each meeting, including requirements for the following:

      1) Contract documents.
      2) Options.
      3) Related changes to the contract.
      4) Interface requirements.
      5) Sequences.
      6) Status of submittals.
      7) Off-site fabrication issues.
      8) Housekeeping.
      9) Status of RFI's.
      10) Purchases.
      11) Deliveries.
      12) Shop drawings, product data, and quality-control samples.
      13) Possible conflicts.
      14) Compatibility problems.
      15) Time schedules.
      16) Approved construction schedules
      17) Weather limitations.
      18) Manufacturer's recommendations.
      19) Warranty requirements.
      20) Compatibility of materials.
      21) Acceptability of substrates.
      22) Temporary facilities.
      23) Space and access limitations.
      24) Governing regulations.
      25) Inspecting and testing requirements.
      26) Required performance results.
      27) Recording requirements.
      28) Protection.

   b. Review each paragraph of the applicable specification sections.

      1) Review the Contract Drawings.
      2) Submittal and approval of appropriate shop drawings and submittals for materials and equipment. Verify receipt of approved factory test results, when required.
      3) Review the testing plan and provide the required QC testing.
      4) Examine the work area to ensure the completion of the required preliminary work.

5) Examine the required materials, equipment, and sample work to ensure that they are on hand and conform to the approved samples, shop drawings and submitted data.
6) Review the safety plan and appropriate activity hazard analysis to ensure the compliance of applicable safety requirements and the submittal of required Material Safety Data Sheets (MSDS).
7) Discuss construction methods.

c. Record significant discussions, agreements, and disagreements of each meeting. Promptly distribute the record of the meeting to everyone concerned, including the Contracting Officer.
d. Proceed with the installation only after successfully concluding the meeting. Initiate whatever actions are necessary to resolve impediments to performance of work and reconvene the meeting at the earliest feasible date.

2. Initial Phase: Notify the Contracting Officer at least 2 work days before each initial phase. When construction crews are ready to start work on a definable feature of work, conduct the initial phase with the QC specialist, the superintendent, and the foreman responsible for that definable feature of work. Observe the initial segment of the definable feature of work to ensure that the work complies with contract requirements. Document the results of the initial phase in the daily Contractor Quality Control Report. Repeat the initial phase for each new crew to work on site, or when specified quality is below acceptable levels. Perform the following for each definable feature of work:

a. Establish the quality of workmanship required.
b. Resolve conflicts.
c. Review the Safety Plan and the appropriate activity hazard analysis and ensure compliance to applicable safety requirements.
d. Ensure that the approved laboratory performs the required tests.

3. Follow-up Phase: Perform the following for on-going work daily, or more frequently as necessary until the completion of each definable feature of work and document in the daily Contractor Quality Control Report:

a. Ensure the work is in compliance with contract requirements.
b. Maintain the quality of workmanship required.
c. Ensure that the approved laboratory performs the required testing. Notify the Contracting Officer or Government's Designated Inspector within 48 hours prior to performance of the test.
d. Ensure that rework items are being corrected.
e. Additional tests directed by the Contracting Officer to establish materials and installation comply with the contract documents.

4. Notification of three phases of control for off-site work: Notify the Contracting Officer at least two weeks before the start of the preparatory and initial phases.

H. Testing:

1. Except as stated otherwise in the specification sections, perform sampling and testing required under this contract.

a. Testing Laboratory Requirements: Provide an independent testing laboratory or establish a laboratory qualified to perform sampling and tests required by this contract. When the proposed testing laboratory lacks accreditation by an acceptable accreditation program, as described by the paragraph entitled "Accredited Laboratories," submit data to the Contracting Officer for approval.

Provide certified statements signed by an official of the testing laboratory attesting that the proposed laboratory meets or conforms to the following requirements:

1) Perform sampling and testing under the technical direction of a Registered Professional Engineer (P.E.) with at least 5 years of experience in construction material testing.
2) Laboratories engaged in testing of concrete and concrete aggregates meet the requirements of ASTM C 1077.
3) Laboratories engaged in testing of bituminous paving materials meet the requirements of ASTM D 3666.
4) Laboratories engaged in testing of soil and rock, as used in engineering design and construction, meet the requirements of ASTM D 3740.
5) Government will evaluate laboratories engaged in inspection and testing of steel, stainless steel, and related alloys according to ASTM A 880. Laboratories shall meet the requirements of ASTM E 329.
6) Laboratories engaged in nondestructive testing (NDT) meet the requirements of OSHA and EPA.

b. Accredited Laboratories: Acceptable accreditation programs are the National Institute of Standards and Technology (NIST) National Voluntary Laboratory Accreditation Program (NVLAP), the American Association of State Highway and Transportation Officials (AASHTO) program and the American Association for Laboratory Accreditation (A2LA) program. Furnish to the Contracting Officer, a copy of the Certificate of Accreditation, Scope of Accreditation and latest directory of the accrediting organization for accredited laboratories. The scope of the laboratory's accreditation must include the test methods required by the contract.

c. Inspection of Testing Laboratories: Prior to approval of non-accredited laboratories, the proposed testing laboratory facilities and records may be subject to inspection by the Contracting Officer. Records subject to inspection include equipment inventory, equipment calibration dates and procedures, library of test procedures, audit and inspection reports by agencies conducting laboratory evaluations and certifications, testing and management personnel qualifications, test report forms, and the internal QC procedures.

d. Capability Check: The Contracting Officer retains the right to check laboratory equipment in the proposed laboratory and the laboratory technician's testing procedures, techniques, and other items pertinent to testing.

e. Test Results: Cite applicable contract requirements, tests, or analytical procedures used. Provide actual results and include a statement that the item tested or analyzed conforms or fails to conform to specified requirements. Conspicuously stamp the cover sheet for each report in large red letters "CONFORMS" or "DOES NOT CONFORM" to the specification requirements, whichever is applicable. A testing laboratory representative authorized to sign certified test reports must sign test results. Furnish the signed reports, certifications, and other documentation to the Contracting Officer via the QC Manager. Furnish a summary report of field tests at the end of each month. Attach a copy of the summary report to the last daily Contractor Quality Control Report of each month.

I. Special Inspections:

1. Retain third-party quality assurance agencies to conduct the special inspections required by the Project Building Code indicated in Division 01 Section Summary of Work. The inspecting agency shall provide reports of the special inspections directly to the Contracting Officer. These inspections are in addition to the inspections specified elsewhere in the Contract Documents.

a. The quality assurance agencies shall supervise qualified personal that are Registered Professional Engineers and demonstrate competence, to the satisfaction of the Contracting Officer, for inspection of the particular type of construction or operation requiring special inspection. Quality assurance agencies and professional engineers are subject to written approval of the Contracting Officer.
b. Quality assurance agencies shall conduct special inspections indicated in Statement of Special Inspections as indicated on Drawings and in individual Specification Sections, and as follows:

1) Verify that manufacturer maintains detailed fabrication and quality-control procedures and review the completeness and adequacy of those procedures to perform the Work.
2) Notify Contracting Officer and Contractor promptly of irregularities and deficiencies observed in the Work during performance of its services.
3) Submit a certified written report of each special inspection and similar quality-control service to Contracting Officer with copy to Contractor.
4) Submit a final report of special inspections at Substantial Completion, which includes a list of unresolved deficiencies.
5) Interpret inspections and state in each report whether inspected work complies with or deviates from the Contract Documents.
6) Re-inspect corrected work.

J. QC Certifications:

1. Contractor Quality Control Report Certification: Each Contractor Quality Control Report must contain the following statement: "On behalf of the Contractor, I certify that this report is complete and correct and equipment and material used and work performed during this reporting period is in compliance with the contract drawings and specifications to the best of my knowledge, except as noted in this report."
2. Invoice Certification: Furnish a certificate to the Contracting Officer with each payment request, signed by the QC Manager, attesting that as-built drawings are current and attesting that the work for which Contractor requests payment, including stored material, is in compliance with contract requirements.
3. Completion Certification: Upon completion of work under this contract, furnish a certificate to the Contracting Officer signed by the QC Manager attesting that "Contractor has completed, inspected, tested the work and is in compliance with the contract."

K. Documentation:

1. Contractor Quality Control Report: Provide reports for each day of work and for every seven consecutive calendar days of no-work and on the last day of a no-work period. Submit to the Government's Designated Inspector by 10 AM (local) the first workday following the date of the report. Account for each calendar day throughout the life of the contract. Report the work using terminology consistent with the construction schedule. QC Manager must prepare, sign, and date Contractor Quality Control Reports and include the following information:

a. Identify the control phase and the definable feature of work.
b. Results of the Preparatory Phase meetings held including the location of the definable feature of work and a list of personnel present at the meeting. Indicate in the report for this definable feature of work the topics listed in the paragraphs and subparagraphs titled "Three Phases of Control."
c. Results of the Initial Phase meetings held including the location of the definable feature of work and a list of personnel present at the meeting. Indicate in the

report for this definable feature of work Indicate in the report for this definable feature of work the topics listed in the paragraphs and subparagraphs titled "Three Phases of Control."

d. Results of the Follow-up Phase inspections held including the location of the definable feature of work. Indicate in the report for this definable feature of work that the work complies with the contract as approved in the Initial Phase and Contractor performed required testing. Include a list of who performed the tests.

e. Results of the three phases of control for off-site work, if applicable, including actions taken.

f. List the rework items identified, but not corrected by close of business.

g. List the rework items corrected from the rework items list along with the corrective action taken.

h. Include a "remarks" section in this report to document pertinent information including directions received, quality control problem areas, deviations from the QC plan, construction deficiencies encountered, QC meetings held, acknowledgment of as-built drawing updates, corrective directions given by the QC Organization, and corrective actions taken. Notify the Contracting Officer or Government's Designated Inspector of any construction deficiencies immediately upon discovery.

i. Contractor Quality Control Report certification.

1) Provide in the project website, electronically signed by the Contractor's QA representative and the Government's Designated Inspector. Refer to Division 01 Section Project Web Site for other requirements.

2. Testing Plan and Log: As Contractor performs tests, record on the "Testing Plan and Log" the date the test results sent to the Contracting Officer. Include remarks and acknowledgment of use of an accredited or approved testing laboratory. Attach a copy of the updated "Testing Plan and Log" to the last daily Contractor Quality Control Report of each month.

3. Rework Items List: Maintain a list of work that does not comply with the contract, identifying what items Contractor needs to rework, the date the item discovered, and the date Contractor corrected the item. There is no requirement to report a rework item corrected on the same day of discovery. Attach a copy of the "Contractor Rework Items List" to the last daily Contractor Quality Control Report of each month. Take responsibility for items on this list needing rework including those identified by the Contracting Officer.

4. Record ("As-Built") Drawings: The QC Manager shall review the as-built drawings as required by Division 01 Section Closeout Procedures. Ensure as-built drawings are kept current on a daily basis and marked to show deviations made from the contract drawings. Initial each deviation and each revision. Upon completion of work, furnish a certificate attesting to the accuracy of the as-built drawings prior to submission to the Contracting Officer.

5. Sample Report Forms:

a. Contractor Quality Control Report.

b. Contractor Quality Control Report Continuation Sheet.

c. Government Quality Assurance Report.

d. Testing Plan and Log.

1.5 FIELD ENGINEERING

A. Summary:

1. This Article specifies administrative and procedural requirements for field engineering services.

B. Examination:

1. Verify layout information shown on the drawings, with existing benchmarks, before proceeding to lay out the work. Locate and protect existing benchmarks and control points. Preserve permanent reference points during construction.
2. Existing Utilities and Equipment: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning work, investigate and verify the existence and location of underground utilities and other construction.
3. Coordinate between trades.

C. Performance:

1. Work from lines and levels established by the drawings. Establish benchmarks and markers to set lines and levels at each story of construction and elsewhere as needed to locate each element of the project. Calculate and measure required dimensions within indicated or recognized tolerances. Do not scale drawings to determine dimensions.

    a. Advise entities engaged in construction activities of marked lines and levels provided for their use.
    b. As construction continues, check control lines for every major element for line, level, and plumb.

2. Building Lines and Levels: Locate and lay out batter boards for structures, building foundations, column grids, and locations, and control lines and levels required for mechanical and electrical work.
3. Existing Utilities: Furnish information necessary to adjust, move, or relocate existing structures, utility poles, lines, service, or other appurtenances located in or affected by construction. Coordinate with local authorities having jurisdiction.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

CONTRACTOR PRODUCTION REPORT (ATTACH ADDITIONAL SHEETS IF NECESSARY)	DATE

CONTRACT NO.	TITLE AND LOCATION	REPORT NO.

CONTRACTOR	SUPERINTENDENT

AM WEATHER	PM WEATHER	MAX TEMP: ° F	MIN TEMP: ° F

WORK PERFORMED TODAY

WORK LOCATION AND DESCRIPTION	EMPLOYER	NO.	TRADE	HOURS

JOB SAFETY

WAS A JOB SAFETY MEETING HELD THIS DATE? o YES o NO
(If YES attach a copy of the meeting minutes)
WERE THERE ANY LOST TIME ACCIDENTS THIS DATE? o YES o NO
(If YES attach copy of completed OSHA report)
WAS TRENCHING/SCAFFOLD/HV ELECTRICAL/HIGH WORK DONE? o YES o NO
(If YES attach statement or checklist showing inspection performed)
WAS HAZARDOUS MATERIALS/WASTE RELEASED INTO THE ENVIRONMENT o YES o NO
(If YES attach description of incident and proposed action)

TOTAL WORK HOURS ON JOB SITE THIS DATE	
CUMULATIVE TOTAL OF WORK HOURS FROM PREVIOUS REPORT	
TOTAL WORK HOURS FROM START OF CONSTRUCTION	

LIST SAFETY ACTIONS TAKEN TODAY/SAFETY INSPECTIONS CONDUCTED		SAFETY REQUIREMENTS HAVE BEEN MET

EQUIPMENT/MATERIAL RECEIVED TODAY TO BE INCORPORATED IN JOB

CONSTRUCTION AND PLANT EQUIPMENT ON JOB SITE TODAY. INCLUDE NUMBER OF HOURS USED TODAY

REMARKS

CONTRACTOR/SUPERINTENDENT DATE

FORM 01400-1 6/91

SHEET OF

CONTRACTOR QUALITY CONTROL REPORT

(ATTACH ADDITIONAL SHEETS IF NECESSARY)

DATE

PHASE	Y-YES, N-NO, SEE REMARKS BLANK - NOT APPLICABLE	IDENTIFY DEFINABLE FEATURE OF WORK, LOCATION AND LIST PERSONNEL PRESENT
PREPARATORY	THE PLANS AND SPECS HAVE BEEN REVIEWED.	
	THE SUBMITTALS HAVE BEEN APPROVED.	
	MATERIALS COMPLY WITH APPROVED SUBMITTALS.	
	MATERIALS ARE STORED PROPERLY.	
	PRELIMINARY WORK WAS DONE CORRECTLY.	
	TESTING PLAN HAS BEEN REVIEWED.	
	WORK METHOD AND SCHEDULE DISCUSSED.	

INITIAL	PRELIMINARY WORK WAS DONE CORRECTLY.		TESTING PERFORMED & WHO PERFORMED TEST
	SAMPLE HAS BEEN PREPARED/APPROVED.		
	WORKMANSHIP IS SATISFACTORY.		
	TEST RESULTS ARE ACCEPTABLE.		
	WORK IS IN COMPLIANCE WITH THE CONTRACT.		
FOLLOW-UP	WORK COMPLIES WITH CONTRACT AS APPROVED IN INITIAL PHASE.		TESTING PERFORMED & WHO PERFORMED TEST

REWORK ITEMS IDENTIFIED TODAY (NOT CORRECTED BY CLOSE OF BUSINESS)	REWORK ITEMS CORRECTED TODAY (FROM REWORK ITEMS LIST)

REMARKS

On behalf of the contractor, I certify that this report is complete and correct and equipment and materials used and work perfomed during the reporting period is in compliance with the contract drawings and specifications to the best of my knowledge, except as noted in this report.

AUTHORIZED QC MANAGER AT SITE DATE

GOVERNMENT QUALITY ASSURANCE REPORT

DATE

QUALITY ASURANCE REPRESENTATIVE'S REMARKS AND/OR EXCEPTIONS TO THE REPORT

GOVERNMENT QUALITY ASSURANCE REPRESENTATIVE DATE

FORM 01400-1 6/91 *(Back)* Sheet Of

(Sample of Typical Contractor's Test Report)

TEST REPORT

STRUCTURE OR BUILDING: _____

CONTRACT NO.: _____

DESCRIPTION OF ITEM, SYSTEM, OR PART OF SYSTEM TESTED:

_____
_____
_____
_____
_____
_____
_____
_____
_____
_____

DESCRIPTION OF TEST:

_____
_____
_____
_____
_____
_____
_____
_____
_____
_____

NAME AND TITLE OF PERSON IN CHARGE OF PERFORMING TESTS FOR CONTRACTOR:

NAME: _____

TITLE: _____

SIGNATURE: _____

I HEREBY CERTIFY THAT THE ABOVE DESCRIBED ITEM, SYSTEM, OR PART OF SYSTEM HAS BEEN TESTED AS INDICATED ABOVE AND FOUND TO BE ENTIRELY SATISFACTORY AS REQUIRED IN THE CONTRACT SPECIFICATIONS.

SIGNATURE OF CONTRACTOR
QUALITY CONTROL INSPECTOR: _____

DATE: _____

REMARKS:

_____
_____
_____
_____
_____
_____

STANDARD REPORT FORMS AND USE

Form Number	Form Title	Form Use
-------	Compaction Test Data Sheet	Soil compaction tests. [1]
-------	Field Water Content and Density Tests, Data Sheet	Field density tests and respective moisture contents.
-------	Field Density and Grading Analysis Test (Washington Dens-o-Meter Method)	Field density tests and gradation.
DD 1206	Sieve Analysis Data	Sieve analysis data sheet for soils.
-------	Mechanical Analysis Test Data	Sieve analysis data sheet and hydrometer data sheet for soils.
-------	Gradation Curves	Gradation graph for soils and aggregates. (To include specification limits)
-------	Soil Moisture Content	Moisture content sheet for soils and/or aggregates.
-------	Specific Gravity and Absorption Test Data Sheet	Specific gravity and absorption test for soil and aggregates.
DD 1209	Atterberg Limits Determinations	Test and graph for Atterberg limits tests.
-------	Gradations of Blended Aggregate	Aggregate blending computation work sheet.
DD 1217	Bituminous Mix Design - Aggregate Blending	Aggregate blending sheet for asphaltic concrete.
-------	Asphaltic Concrete Mix Design Report	Asphaltic mix design and aggregate grading.
-------	Extraction Text, Hot Mix Asphalt and Concrete	Extraction test and grading sheet (include fracture face tests if specified).
DD 1218	Marshall Method - Computation of Properties of Asphalt Mixtures	Marshall Test form.
-------	Daily Plant Inspection Report - Asphalt	Asphalt plant production form (self carboning).
-------	Screen Analysis of Concrete Aggregates	Gradation test form for aggregates (self carboning).
-------	Mortar Strength of Fine Aggregate Data Sheet	Flexural and compressive strength test form for mortar.
-------	Report of Concrete Mixture Design	Mix design sheet for contractor mix submittal.
-------	Transit Mix Concrete Control Record	Transit or plant mix concrete report (can be substituted by other report with Contracting Officer's approval).
-------	Concreting Operations Record	Daily report for concrete placing and batch information (self carboning).
-------	Data Sheet - Compressive and Flexural Strengths of Concrete	Compressive and/or flexural strength testing (include averages per specification).
-------	Concrete Cylinder Test Record	Compressive strength testing for standard cured and field cured samples.
-------	Statistical Evaluation of Concrete Compression Tests	Summary sheet of concrete tests. Form can be used for flexural strengths if revised to conform to proper days specified. A separate sheet is to be used for each mix design.
-------	Test Data on Absorption and Moisture Condition of Masonry Blocks.	Absorption and moisture condition tests of masonry units.

Backfills, Subgrade, Subbase, and Base Course Material

Backfill for foundations and walls, trenches, streets, roads, and sidewalks	Gradation[1]	1 every 380 m^3 (500 CY) or 1 per day for quantities exceeding 20 m^3 (25 CY)/lift.
	In-Place Density[2/12]	1 every 380 m^3 (500 CY) or 1 per day for quantities exceeding 20 m^3 (25 CY).
	Moisture-Density Relationship[3]	1 prior to start of backfilling operations, 1 every 20 densities and any time material type changes.
Pipe Bedding	Gradation[1]	1 every 75 m^3 (100 CY)
Subgrade	In-Place Density[2/12]	1 every 1670 m^2 (2000 sy) of each type subgrade material.
	Moisture-Density Relationship[3]	1 for every 20 densities for each material.
	Gradation	1 for every moisture-density.
Subbase and Base	Gradation[1]	1 sample every 750 m^3 (1000 CY).
	In-Place Density[2/12]	1 sample every 750 m^3 (1000 CY).
	Moisture-Density Relationship[3]	1 initially and every 20 density tests.

Asphaltic Concrete and Pavements

Mix Design (by Contractor)	Submittal	Design Mix (include test results)[4]: Blended Aggregate: 45 kg (100 lbs.) Asphalt: 3.9 L (1 gal.) Mineral Filler: 4.5 kg (10 lbs.)
Asphalt (including and prime and tack coat)	Sample and certification. (viscosity, flash point, penetration)	Submit a 1 quart sample material certification with test results for each shipment or lot of asphalt. Retain a duplicate 1 quart sample until completion of Work.
Aggregates (from bins or source not to exceed 1/2")	Gradation	1 test prior to start of paving operation and every 360 t (1500 tons) or 750 m^3 (1000 CY).
	Fractured Faces	Same as gradation.
	LA Abrasion	1 test prior to start of paving and 1 test every 9070 t (10,000 tons) thereafter.
	Specific Gravity	Same as gradation.
Asphaltic concrete (including asphalt treated base)	Marshall Method Test	1 test (set of 2 specimens) per day for more than 90 t (100 tons) and 1 per 2720 t (3000 tons) thereafter.
	Specific Gravity	1 per each Marshall Test.
	Extraction	1 test per day for more than 90 t (100 tons) and every 900 t (1000

		tons) thereafter. 1 test for each Marshall Method.
	Gradation[5]	1 per each extraction test.
	Fracture Faces[5]	1 per each extraction test.
Cored or sawed specimens	Perform complete test (thickness, percent voids - total mix, percent voids - total filled with bitumen, in-place density and bulk specific gravity) on each cored or sawed sample.[12]	Take 1 set of 3 cored sawed specimens from locations in the pavement of each test batch from which Marshall specimens were prepared. Where joints were formed with previously placed new pavement, take one specimen from longitudinal joint. If no longitudinal joints, take specimen from transverse joint. Specified density - not more than 20% of all tests may fall below the specified density.

Portland Cement Concrete

	Submittal[b]	For each class of concrete submit:
Mix Design (by Contractor)	Submittal	Mix design for each class of concrete in accordance with ACI 211. Include all material, tests, and certifications below. Also, include proportions, slump, air content, and water cement ratio (include certification of compatibility for more than one admixture). Strength tests at 7, 28, and 90 days and for paving mixes include flexural strengths at 7, 14, 28, and 90 days if specifications require for control. Plant Data - include compressive strength data used to establish the standard deviation for each class of concrete with a minimum of 30 tests each, if available. Refer to ACI 214.
Portland Cement and Pozzolan	Chemical and Physical tests	Manufacturer's certificate of compliance with a test report for each delivery or lot. Submit a 4.5 kg (10 lb.) sample for every other certification.
Admixtures	Certification of compatibility and samples	Submit 1 quart samples during progress of Work upon request by Contracting Officer. Submit certification including test results for each lot.
Water	Sample and test	Sample and/or water quality test if requested by the Contracting Officer.
Coarse Aggregate (for each grading size)[7]	Gradation	1 test every 380 m^3 (500 CY) of concrete.
	Deleterious	1 test initially and thereafter when appearance makes the material

		suspect. (For concrete pavements see Technical Provisions.)
	Abrasion	1 every 4540 t (5,000 tons) of aggregate.
	Moisture, specific gravity and absorption[8]	1 initially and every 190 m^3 (250 CY) thereafter. 1 moisture test prior to any batching and more frequently if hauling and storage does not provide a consistent moisture content.
Fine Aggregate[7]	Gradation and fineness modules	1 every 190 m^3 (250 CY) of concrete.
	Deleterious Substances	(same as coarse aggregate).
	Moisture, specific gravity and absorption[8]	(same as coarse aggregate).
Concrete	Slump	Conduct test every 40 m^3 (50 CY) and more frequently if batching appears inconsistent. Conduct with strength tests.
	Entrained Air	Conduct with slump test.
	Ambient and concrete temperatures	Conduct with slump tests.
	Unit weight, yield, and water cement ratio	Conduct with strength tests. Check unit weight and adjust aggregate weights to insure proper yield.
	Flexural strength and evaluation of results.	For concrete pavements, take one set of 8 beams every 230 m^3 (300 CY) of concrete with a minimum of 1 set per day. Test two beams at 7 days, two at 14 days, two at 28 days, and two at 90 days. Evaluate per specifications.
	Compressive strength and evaluation of results per ACI 214. (includes unit weight of each cylinder)	For all concrete over 8 m^3 (10 CY), take one set of 3 cylinders every 115 m^3 (150 CY) for each class concrete. Test one cylinder at 7 days and two at 28 days. Maintain a plot and statistical evaluation in accordance with ACI 214 for compressive strength results. Make field cure cylinders when in-situ strengths need be ascertained.
Batching and mixing equipment tests	Contract Compliance	Contractor compliance with ASTM C 94 "Standard Specifications for Ready Mix Concrete", with documentation, reports, and certification of compliance.
Curing Compound	Certification and submittal	Initially submit a 1 gallon sample with certification and test results for each lot and type of curing compound.
Vibrators	Frequency and amplitude	Check frequency and amplitude initially and at any time vibration is questionable.

Masonry

Concrete Masonry Units[9]	Dry shrinkage[10]	1 set of 3 per 10,000 units and manufacturer's certification and test report.
	Airdry condition[11]	Same as dry shrinkage.
	Absorption	Same as dry shrinkage.
	Compressive strength	Same as dry shrinkage.
	Unit Weight	Same as dry shrinkage.
Mortar and grout	Gradation	1 test every 2,000 units (daily).
	Compressive	1 set of 3, every 2,000 units (1 test at 7 days and 2 tests at 28 days).

NOTES:

[1] All acceptance tests shall be conducted from in-place samples.

[2] Additional tests shall be conducted when variations occur due to the contractors operations, weather conditions, site conditions, etc.

[3] Classification (ASTM D-2487), moisture contents, Atterberg limits and specific gravity tests shall be conducted for each compaction test if applicable.

[4] Materials to be submitted only upon request by the Contracting Officer.

[5] Tests can substitute for same tests required under "Aggregates" (from bins or source), although gradations will be required when blending aggregates.

[6] Increase quantities by 50 percent for Paving mixes and by 100 percent for Government testing of admixtures. Include standard deviation for similar mixes from the intended batch plant and data from a minimum of 30 tests, if available. Refer to ACI 214.

[7] A petrographic report for aggregate is required with the sample for source approval. If the total amount of all types of concrete is less than 150 m^3 (200 CY), service records from three separate structures in similar environments which used the aggregates may substitute for the petrographic.

[8] Aggregate moisture tests are to be conducted in conjunction with concrete strength tests for w/c calculations.

[9] For less than 1,000 units, the above test may be waived at the discretion of the Contracting Officer and acceptance based on manufacturer's certification and test report.

[10] Additional tests shall be performed when changes are made either in the manufacturing processes or in materials used in the production of the masonry units.

[11] If adequate storage protection is not provided at the jobsite, additional tests shall be made to determine that the allowable moisture condition has not been exceeded before the blocks can be placed in the structure.

[12] THE NUCLEAR DENSIMETER, IF PROPERLY CALIBRATED, MAY BE USED BUT ONLY TO SUPPLEMENT THE REQUIRED TESTING FREQUENCY AND PROCEDURES. THE DENSIMETER SHALL BE CALIBRATED AND IS RECOMMENDED FOR USE WHEN THE TIME FOR COMPLETE RESULTS BECOMES CRITICAL.

SECTION 01 41 00

SPECIAL INSPECTIONS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section includes administrative and procedural requirements required for compliance with the International Building Code, Chapter 17, Structural Tests and Special Inspections.

B. Structural testing and special inspection services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with other construction document requirements.
   1. Specific quality-assurance and -control requirements for individual construction activities are specified in the Sections that specify those activities. Requirements in those Sections may also cover production of standard products.
   2. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and -control procedures that facilitate compliance with the construction document requirements.
   3. Requirements for Contractor to provide quality-assurance and -control services required by Contracting Officer are not limited by provisions of this section.

C. The Contractor shall engage one or more qualified special inspectors and / or testing agencies to conduct structural tests and special inspections specified in this section and related sections and as may be specified in other divisions of these specifications.

D. Related Sections include but are not limited to the following:

   1. 01 45 00 - Quality Control
   2. 05 50 13 - Metal Fabrications
   3. 09 51 00 - Acoustical Ceilings
   4. 22 10 00 - Plumbing Piping
   5. 26 05 48 – Vibration and Seismic Controls for Electrical Systems

1.03 DEFINITIONS

A. Approved Agency: An established and recognized agency regularly engaged in conducting tests or furnishing inspection services, subject to approval by the Contracting Officer.

B. Construction Documents: Written, graphic and pictorial documents prepared or assembled for describing the design, location and physical characteristics of the elements of a project necessary for obtaining a building permit. Construction Documents include all supplemental instructions, sketches, addenda, and revisions to the drawings and specifications issued by the registered design professional beyond those issued for a building permit.

C. Designated Seismic System: Those architectural, electrical and mechanical systems and their components that require design in accordance with Chapter 13 of ASCE 7 and for which the component importance factor, Ip, is greater than 1 in accordance with Section 13.1.3 of ASCE 7.

D. Registered Design Professional in Responsible Charge: The individual that prepares the

Statement of Special Inspections including a Schedule of Special Inspection Services as part of the general requirements Section 1704 of the Building Code. The Registered Design Professional for special inspections is typically the Architect or Engineer.

E. Shop Drawings / Submittal Data: Written, graphic and pictorial documents prepared and / or assembled by the contractor based on the Construction Documents.

F. Special Inspector: A qualified person who demonstrating competence, to the satisfaction of the Contracting Officer, for inspection of the particular type of construction or operation requiring special inspection. The special inspector shall be a licensed professional engineer or engineering intern or a qualified representative from the testing agency.

G. Special Inspection, Continuous: The full-time observation of work requiring special inspection by an approved special inspector who is present in the area where the work is being performed.

H. Special Inspection, Periodic: The part-time or intermittent observation of work requiring special inspection by an approved special inspector who is present in the area where the work has been or is being performed and at the completion of the work.

I. Testing Agency: A qualified materials testing laboratory under the responsible charge of a licensed professional engineer, approved by the Contracting Officer and the registered design professional in responsible charge, to measure, examine, test, calibrate, or otherwise determine the characteristics or performance of construction materials and verify confirmation with construction documents.

1.04 QUALITY ASSURANCE

A. Testing Agency Qualifications:
   1. Minimum qualifications of inspection and testing agencies and their personnel shall comply with ASTM E329-03 Standard Specification for Agencies in the Testing and / or Inspection of Materials Used in Construction.
      a. Inspectors and individuals performing tests shall be certified for the work being performed as outlined in the appendix of the ASTM E329. Certification by organizations other than those listed must be submitted to the Contracting Officer for consideration before proceeding with work.
   2. In addition to these requirements, local jurisdiction may have additional requirements. It is the responsibility of the testing and inspection agencies to meet local requirements and comply with local procedures.

1.05 CONFLICTING REQUIREMENTS, REPORTS, AND TEST RESULTS

A. General: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer uncertainties and requirements that are different, but apparently equal, to the registered design professional in responsible charge for a decision before proceeding.

B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to the registered design profession in responsible charge for a decision before proceeding.

C. The special inspector's reports and testing agencies results shall have precedence over reports and test results provided by the contractor.

D. Where a conflict exists between the construction documents and approved shop drawings /

submittal data, the construction documents shall govern unless the shop drawings / submittal data are more restrictive. All conflicts shall be brought to the attention of the Contracting Officer.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 SPECIAL INSPECTORS' RESPONSIBILITIES

A. The Special Inspectors shall:
   1. Notify the contractor of their presence and responsibilities at the job site.
   2. Observe assigned work for which they are responsible for conformance with the plans and specifications and approved submittals for work designed by the contractor.
   3. Report nonconforming items to the immediate attention of the contractor for correction.
   4. Write a discrepancy report about each nonconforming item containing:
      a. Description and exact location.
      b. Reference to applicable drawings and specifications.
      c. Resolution or corrective action taken and the date.
   5. If the discrepancies are not corrected, the discrepancies shall be brought to the attention of the Contracting Officer and to the registered design professional in responsible charge prior to the completion of that phase of the work.
   6. Provide timely reports in a daily format and furnish these reports directly to the Contracting Officer, Design Professional and the Contractor. The reports should:
      a. Describe the special inspection and tests made, with locations.
      b. Indicate nonconforming items and their resolution.
      c. List unresolved items and parties notified.
      d. Itemize any changes authorized by the Design Professional.
   7. Initial and date the “Date Completed” box in the Schedule of Special Inspection Services as the inspection and testing activities are completed.
   8. Submit a final signed report stating that all required special inspections and testing were fulfilled and reported and that any outstanding discrepancies have been corrected.

3.02 CONTRACTOR'S RESPONSIBILITY

A. The Contractor shall be familiar with Chapter 17 of the International Building Code.

B. The Contractor shall coordinate the inspection and testing services with the progress of the work. The Contractor shall provide sufficient notice to allow proper scheduling of all personnel. The Contractor shall provide safe access for performing inspection and on site testing.

C. The Contractor shall submit schedules to the Contracting Officer, registered design professionals and testing and inspecting agencies. Schedules will note milestones and durations of time for materials requiring structural tests and special inspections.

D. Provide Special Inspectors direct access to the approved plans and specifications for the project.

E. Deliver samples for testing when needed.

F. Maintain the Schedule of Special Inspection Services at the project site and submit a copy to the Contracting Officer when all the services are complete.

G. The Contractor shall repair and / or replace work that does not meet the requirements of the construction documents.
   1. Contractor shall engage a registered engineer / architect to prepare repair and / or replacement procedures.
   2. Engineer / architect shall be registered in the state of Pennsylvania. Engineer / Architect shall be acceptable to the Contracting Officer.
   3. Procedures shall be submitted for review and acceptance by the Contracting Officer before

proceeding with corrective action.

H. The Contractor shall be responsible for costs of:
   1. Re-testing and re-inspection of materials, work, and / or products that do not meet the requirements of the construction documents and shop drawings / submittal data.
   2. Review of proposed repair and / or replacement procedures by the registered design professional in responsible charge and the inspectors and testing agencies.
   3. Repair or replacement of work that does not meet the requirements of the construction documents.

I. The Contractor shall submit Fabricator's Certificates of Compliance for approved fabricators to the Contracting Officer after completion of fabrication.

3.03 TESTING AND INSPECTION

A. Testing and inspection shall be in accordance with the attached Schedule of Special Inspection Services.

B. Reference related specifications for the minimum level of inspections and testing. Provide additional inspections and testing as necessary to determine compliance with the construction drawings and as required by reference standards indicated in IBC Chapter 17.

3.04 SCHEDULES AND FORMS (ATTACHED)

A. STATEMENT OF SPECIAL INSPECTIONS.

   1. The Statement of Special Inspections is included as an attachment to this section. This form provides the general project information.
   2. The contractor shall submit the Statement of Special Inspections to the Contracting Officer, and keep a copy in the job site office.

B. SCHEDULE OF SPECIAL INSPECTION SERVICES.

   1. The Schedule of Special Inspection Services is included as an attachment to this section. This form provides a detailed and itemized list of which special inspection activities are required for the specific project and which individuals, firm, or agency will be performing the special inspection services associated with each required task.
   2. The contractor shall maintain the schedule at the project site. When an individual special inspection task in the schedule is completed for the last time on the project and the special inspector performed their final review, inspection, or test of that item for the project, the special inspector shall initial and date the cell in the "Completed" column adjacent to the task. The schedule shall be maintained by the Contractor at the project site.
   3. At the conclusion of the project a copy of the Schedule of Special Inspection Services form with the initials and date in the "Completed" column for each task relevant to the project shall be submitted, by the Contractor, to the Contracting Officer for comparison with the Final Reports of Special Inspections.

C. FINAL REPORT OF SPECIAL INSPECTIONS.

   1. The form for the final report of Special Inspections is included as an attachment to this section. This form is submitted by each inspector when all the special inspection requirements they are responsible for on the project have been fulfilled and all noted deficiencies have been corrected. Each special inspector corresponding to an agent number in the Schedule of Special Inspection Services will be required to complete a copy of this form.
   2. The special inspectors shall provide 3 bound copies of the special inspection, daily or

interim, reports with the final report of special inspections serving as the cover sheet. The copies shall be submitted to the Contracting Officer within 2 weeks of completion of the special inspection program. The special inspection program will not be considered complete until forms from all agents have been submitted and received.

D. FABRICATOR'S CERTIFICATE OF COMPLIANCE.

1. The form for the Fabricator's Certificate of Compliance is included as an attachment to this section.
2. Each approved fabricator that is exempt from Special Inspection of shop fabrication and implementation procedures per section 1704.2 of the Building Code must submit Fabricator's Certificate of Compliance at the completion of fabrication to the contractor.
3. The Contractor shall submit Fabricator's Certificates of Compliance for approved fabricators to the Contracting Officer.

E. MINIMUM SPECIAL INSPECTOR QUALIFICATIONS.

1. This document is included as an attachment to the this section.
2. This document lists the recommended minimum qualifications for special inspectors.
3. The final approval of an inspector shall be determined by the Contracting Officer.

F. OTHER SPECIAL INSPECTION REPORT AND NOTICE FORMS.

1. Forms for Special Inspection Daily Reports, Interim Reports and Discrepancy Notices are included as attachments to this section.

END OF SECTION

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STATEMENT OF SPECIAL INSPECTIONS

(to be completed by the General Contractor)

PROJECT: **Fort Lee Commissary**

LOCATION: **Fort Lee, Virginia**

GENERAL CONTRACTOR: _____

QUALITY CONTROL MANAGER: _____

GC ADDRESS: _____

_____

CONTRACTING OFFICER: _____

ARCHITECT/ENGINEER OF RECORD: **CROMWELL ARCHITECTS ENGINEERS**

This Statement of Special Inspections is submitted in accordance with Section 1704 of the 2006 International Building Code. It includes a *Schedule of Special Inspection Services* applicable to the above-referenced Project as well as the identity of the individuals, agencies, or firms intended to be retained for conducting these inspections. If applicable, it includes *Requirements for Seismic Resistance* and/or *Requirements for Wind Resistance*.

Are *Requirements for Seismic Resistance* included in the *Statement of Special Inspections*?	☐ Yes	☒ No
Are *Requirements for Tornado Resistance* included in the *Statement of Special Inspections*?	☐ Yes	☒ No

The Special Inspector(s) shall keep records of all inspections and shall furnish interim inspection reports to the Contracting Officer at a frequency as noted in this document. Discrepancies shall be brought to the immediate attention of the Contractor for correction. If the discrepancies are not corrected, the discrepancies shall be brought to the attention of the Contracting Officer. A *Final Report of Special Inspections* documenting required special inspections and corrections of any discrepancies noted in the inspections shall be submitted to the Contracting Officer at the conclusion of the project.

Frequency of interim report submittals to the Contracting Officer:

__Weekly _X__Bi-Weekly __Monthly Other; specify:_____

The Special Inspection program does not relieve the Contractor of the responsibility to comply with the Contract Documents. Jobsite safety and means and methods of construction are solely the responsibility of the Contractor.

Statement of Special Inspections Prepared by:

_____
Type or print name

_____
Signature Date

Contracting Officer's Acceptance:

_____
Signature Date

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SCHEDULE OF SPECIAL INSPECTION SERVICES

PROJECT	(Completed by the Registered Design Professional in Responsible Charge)				
		APPLICABLE TO THIS PROJECT			
MATERIAL / ACTIVITY	SERVICE	Y/N	EXTENT	AGENT*	DATE COMPLETED
1704.3 Steel Construction					
Material verification of high-strength bolts, nuts, and washers.	Review material markings and certificates of compliance	Y	Periodic	1	
Inspection of high-strength bolting:	Field inspection				
a. Bearing-type connections		Y	Periodic	1	
b. Pre-tensioned or slip-critical		Y		1	
1) Twist-off bolt		Y	Periodic	1	
Material verification of structural steel:					
a. Identification markings	Field inspection	Y	Periodic	1	
b. Certified mill test reports	Review submittals	Y	Each submittal	1	
Weld filler materials.	Review certificate of compliance and field verification	Y	Periodic and each submittal	1	

SCHEDULE OF SPECIAL INSPECTION SERVICES

PROJECT	(Completed by the Registered Design Professional in Responsible Charge)				
		APPLICABLE TO THIS PROJECT			
MATERIAL / ACTIVITY	SERVICE	Y/N	EXTENT	AGENT*	DATE COMPLETED
Structural steel welding:	Shop and field inspection				
a. Complete and partial penetration groove welds		Y	Continuous	1	
b. Multi-pass fillet welds		Y	Continuous	1	
c. Single-pass fillet welds > 5/16"		Y	Continuous	1	
d. Single-pass fillet welds ≤ 5/16"		Y	Periodic	1	
e. Deck welds		Y	Periodic	1	
Inspection of steel frame joint details for compliance with approved construction documents.	Field inspection				
a. Details such as bracing & stiffening		Y	Periodic	1	
b. Member locations		Y	Periodic	1	

SCHEDULE OF SPECIAL INSPECTION SERVICES

PROJECT	(Completed by the Registered Design Professional in Responsible Charge)				
		APPLICABLE TO THIS PROJECT			
MATERIAL / ACTIVITY	SERVICE	Y/N	EXTENT	AGENT*	DATE COMPLETED
1704.4 Concrete Construction					
Inspection of reinforcing steel installation.	Field inspection	Y	Periodic.	1	
Inspection of anchor bolts to be installed in concrete prior to and during placement of concrete.	Field inspection	Y	Continuous	1	
Inspection of anchors installed in hardened concrete	Field inspection	Y	Periodic	1	
Verification of required design mix.	Review submittals	Y	Periodic	1	
Fresh concrete sampling.	Field testing	Y	Continuous	1	
Inspection of concrete placement for proper application techniques	Field review	Y	Continuous	1	
Concrete curing operations.	Field review	Y	Periodic	1	
Evaluation of concrete strength.	Field testing and review of laboratory reports	Y	Periodic	1	

SCHEDULE OF SPECIAL INSPECTION SERVICES

PROJECT	(Completed by the Registered Design Professional in Responsible Charge)				
		APPLICABLE TO THIS PROJECT			
MATERIAL / ACTIVITY	SERVICE	Y/N	EXTENT	AGENT*	DATE COMPLETED
Verification of in-situ concrete strength.	Field testing and review of laboratory reports	Y	Periodic	1	
1704.7 Soils					
Verify materials below shallow foundations are adequate to achieve the design bearing capacity.	Field inspection	Y	Periodic	1	
Verify excavations are extended to proper depth and have reached proper material.	Field inspection	Y	Periodic	1	
Perform classification and testing of controlled fill materials.	Field inspection	Y	Periodic	1	

* INSPECTION AGENTS	FIRM	ADDRESS	TELEPHONE NO.
1. Agency approved by Architect/Engineer			
2.			
3.			
4.			
5.			
6.			
7.			
8.			

Notes: 1. The inspection and testing agent(s) shall be engaged by the Owner or the Owner's Agent, and not by the Contractor or Subcontractor whose work is to be inspected or tested. Any conflict of interest must be disclosed to the Building Official prior to commencing work. The qualifications of the Special Inspector(s) and/or testing agencies are subject to the approval of the Building Official and/or the Design Professional.

2. The list of Special Inspectors may be submitted as a separate document, if noted so above.

Encircle "Yes" or "No" as appropriate and date this document below:

Are *Requirements for Seismic Resistance* included in the *Statement of Special Inspections*? **Yes** **No**

Are *Requirements for Tornado Resistance* included in the *Statement of Special Inspections*? **Yes** **No**

DATE: 04/25/2012

FINAL REPORT OF SPECIAL INSPECTIONS

(Completed by each Special Inspector)

PROJECT: _____

LOCATION: _____

GENERAL CONTRACTOR: _____

GC QC CONTACT: _____

ADDRESS: _____

CONTRACTING OFFICER: _____

ARCHITECT/ENGINEER OF RECORD: _____**CROMWELL ARCHITECTS ENGINEERS**_____

To the best of my information, knowledge, and belief, which are based upon observations or diligent supervision of our inspection services for the above-referenced Project, I hereby state that the special inspections or testing required for this Project, and designated for this Agent in the *Schedule of Special Inspection Services*, have been completed in accordance with the Contract Documents.

The Special Inspection program does not relieve the Contractor of the responsibility to comply with the Contract Documents. Jobsite safety and means and methods of construction are solely the responsibility of the Contractor.

Interim reports submitted prior to this final report and numbered____to____form a basis for, and are to be considered an integral part of this final report. The following discrepancies that were outstanding since the last interim report dated _____ have been corrected:

_____

_____

_____

_____

_____

_____

_____

(Attach 8 ½"x11" continuation sheet(s) if required to complete the description of corrections)

Prepared By:

_____
Special Inspection Agent/Firm

_____
Address and Contact information

_____
Type and print name of Special Inspector

_____
Signature Date

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Contractor's Statement of Responsibility

Each contractor responsible for the construction or fabrication of a main wind or seismic force-resisting system, designated seismic system or wind or seismic-resisting component listed in the Statement of Special Inspections, Requirements for Seismic or Tornado Resistance, must submit a Statement of Responsibility, in accordance with the Building Code, Section 1706.

Project:_____

Contractor's Name:_____

Address:_____

License No.:_____

Description of building systems and components included in Statement of Responsibility:

_____
_____
_____
_____
_____
_____
_____

Contractor's Acknowledgement of Special Requirements

I hereby acknowledge that I have received, read, and understand the Statement of Special Inspections and Special Inspection program:

I hereby acknowledge that control will be exercised to obtain conformance with the approved construction documents.

_____
Name and Title (type or print)

_____ _____
Signature Date

Contractor's Provisions for Quality Control

Procedures for exercising control within the contractor's organization, the method and frequency of reporting and distribution of reports is attached to this Statement.

Identification and qualifications of the person(s) exercising such control and their position(s) in the organization are attached to this Statement

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Fabricator's Certificate of Compliance

Each approved fabricator that is exempt from Special Inspection of shop fabrication and implementation procedures per section 1704.2 of the Building Code must submit *Fabricator's Certificate of Compliance* at the completion of fabrication.

Project:_____

Fabricator's Name:_____

Address:_____

Certification or Approval Agency:_____

Certification Number:_____

Date of Last Audit or Approval:_____

Description of structural members and assemblies that have been fabricated:

_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____

I hereby certify that items described above were fabricated in strict accordance with the approved construction documents.

_____
Name and Title (type or print)

_____ _____
Signature Date

Attach copies of fabricator's certification or building code evaluation service report and fabricator's quality control manual.

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MINIMUM SPECIAL INSPECTOR QUALIFICATIONS

Category of Testing and Inspection	Minimum Qualifications (refer to key at end of Table)			
	Shop Inspection	**Field Testing /Inspection**	**Review Submittals**	**Review Testing, Certification, & Lab Reports**
1704.2 Inspection of Fabricators				
Pre-cast concrete	A, C, E			
Structural steel construction	C, F, G			
Wood construction	A			
Cold formed metal construction	A			
1704.3 & 1707.2 Steel Construction				
Welding	C, F, G	C, F, G	A	A
High strength bolting, inspection of steel frame joint details		A, C	A	A
1704.4 & 1708.3 Concrete Construction				
Reinforcing placement, cast-in-place bolts, post installed anchors, concrete and shotcrete placement and curing operations		A, C, H		
Pre-stressing steel installation		A, C, D, E		
Erection of pre-cast concrete members		A, C, H		
Concrete field testing		A, C, H, I, J		
Review certified mill reports and design mixes			A	
Verify use of required design mix		A, C, H, I, J		
Pre-stressed (pre-tensioned) concrete force application	A, C, E			
Post-tensioned concrete force application		A, C, D		
Review of in-situ concrete strength, prior to stressing of tendons in post-tensioned concrete and prior to removal of shores and forms from beams and structural slabs		A, C, D		
Reinforcing steel weldability, reinforcing welding, weld filler material		C, F, G		
1704.5 & 1708.1 Masonry				
Review f'_m prior to construction			A	
Mortar joint construction, grout protection and placement, materials proportion, type/size/location of reinforcement, structural elements, anchorage, and connectors		A, C, K		
Sampling/testing of grout/mortar specimens		A, C, K		
Observe preparation of masonry prisms for testing of compressive strength of masonry, f'_m		A, C, K		
Inspection of welding of reinforcing steel		C, F, G		
1704.7 & 1803 Soils				
Observe site preparation, fill placement and testing of compaction for compliance with the construction documents for the project		A, C, I		
Observe and test bearing materials below shallow foundations for ability to achieve design bearing capacity		A, L		

(Table continued on next page)

MINIMUM SPECIAL INSPECTOR QUALIFICATIONS *(continued)*				
Category of Testing and Inspection	**Minimum Qualifications (refer to key at end of Table)**			
	Shop Inspection	**Field Testing /Inspection**	**Review Submittals**	**Review Testing, Certification, & Lab Reports**
Review compaction testing for compliance with the construction documents for the project				A
1704.6 Wood Construction				
Observe structural panel sheathing, size of framing members, nail or staple diameter and length, number of fastener lines, and spacing of fastener lines and fasteners for compliance with construction documents for the project		A		
1704.8, 1704.9 & 1808 Pile and Pier Foundations				
Observe installation		A, L		
Observe load tests		A		
1704.10 Sprayed Fire-Resistant Materials				
Observe surface conditions, application, average thickness and density of applied material, and cohesive/adhesive bond		A, C		
1704.11 Mastic and intumescent fire-resistant coatings				
Observe application compliance with AWCI 12-B		A, C		
1704.12 Exterior Insulation and Finish Systems				
Inspect EIFS systems		A, B, C, M		
1704.13 Special Cases				
Work of unusual or special nature		A, B, M		
[F] 1704.14 Smoke Control	*See Requirements of Building Code Section [F] 1704.14.2.*			
1705, 1707 & 1708 Seismic and Wind Resistance				
Periodic inspection of fabrication, installation and/or anchorage of building systems and components		A		
(Table continued on next page)				

MINIMUM SPECIAL INSPECTOR QUALIFICATIONS *(continued)*

KEY:

A. Professional Engineer (PE) competent in the specific task area or graduate of accredited engineering/engineering technology program under the direct supervision of a PE.
B. Registered Architect (RA) or graduate of accredited architecture/architecture technology program under the direction of an RA.
C. International Code Council (ICC) Special Inspector Certification specific to the particular material and testing methodology applicable to each Category of Testing and Inspection listed in the table.
D. Post-tensioning Institute (PTI) Certification, Level 2.
E. Pre-stressed Concrete Institute (PCI) Plant Quality Personnel Certification – Level III.
F. American Welding Society (AWS) Certified Welding Inspector (CWI) or AWS Certified Associate Welding Inspector working under the direct on-site supervision of a CWI.
G. American Society for Nondestructive Testing (ASNT) Level II certification, or a Level III certification if previously certified as a Level II in the particular material and testing methodology applicable to each Category of Testing and Inspection listed in the table.
H. American Concrete Institute (ACI) Concrete Construction Special Inspector.
I. National Institute for Certification in Engineering Technologies (NICET) Level II or higher certification specific to the particular material and testing methodology applicable to each Category of Testing and Inspection listed in the table.
J. ACI Concrete Field Testing Technician with Grade 1 certification.
K. National Concrete Masonry Association (NCMA) Certified Concrete Masonry Testing Technician.
L. NICET Certified Engineering Technologist (CT).
M. Other Qualified Special Inspector as approved by the Building Official.

Notes:

1. *The Special Inspector shall meet one of the minimum qualifications listed for the applicable Category of Testing and Inspection.*
2. *Materials testing shall be done by an Approved Testing Agency meeting the requirements of the Building Code Section 1703 and ASTM E 32*9.

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SPECIAL INSPECTION DAILY REPORT

(Completed by Special Inspector)

PROJECT NAME / ADDRESS:
DATE OF INSPECTION:
INSPECTION TYPE(S) COVERAGE ☐ CONTINUOUS ☐ PERIODIC TIME BEGINNING INSPECTION: TIME ENDING INSPECTION:
DESCRIBE INSPECTIONS MADE, INCLUDING LOCATIONS:
LIST TESTS MADE:
LIST ITEMS REQUIRING CORRECTIONS, CORRECTIONS OF PREVIOUSLY LISTED ITEMS AND PREVIOUSLY LISTED UNCORRECTED ITEMS: PROVIDE COPIES OF DISCREPANCY NOTICES:
COMMENTS:
TO THE BEST OF MY KNOWLEDGE, WORK INSPECTED WAS IN ACCORDANCE WITH THE APPROVED DESIGN DRAWINGS, AND SPECIFICATIONS, EXCEPT AS NOTED ABOVE.

PRINTED FULL NAME	
NOTE BY "SPECIAL INSPECTOR" OR PROVIDE NAME OF TESTING AGENCY	

SIGNED:	DATE:
CERTIFICATION:	NUMBER:

One copy of this report to remain at job site with the contractor for review upon request.

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SPECIAL INSPECTION INTERIM REPORT

(Completed by Special Inspector)

PROJECT NAME / ADDRESS:

BEGINNING & END DATES INCLUDED IN THIS REPORT:

INSPECTION TYPE(S) COVERAGE

☐ CONTINUOUS ☐ PERIODIC

TIME BEGINNING INSPECTION: TIME ENDING INSPECTION:

DESCRIBE INSPECTIONS MADE, INCLUDING LOCATIONS:

LIST TESTS MADE:

TOTAL INSPECTION TIME EACH DAY	DATE							
	HOURS							

LIST ITEMS REQUIRING CORRECTIONS, CORRECTIONS OF PREVIOUSLY LISTED ITEMS AND PREVIOUSLY LISTED UNCORRECTED ITEMS: PROVIDE COPIES OF DISCREPANCY NOTICES:

COMMENTS:

TO THE BEST OF MY KNOWLEDGE, WORK INSPECTED WAS IN ACCORDANCE WITH THE APPROVED DESIGN DRAWINGS, AND SPECIFICATIONS, EXCEPT AS NOTED ABOVE.

PRINTED FULL NAME	
NOTE BY "SPECIAL INSPECTOR" OR PROVIDE NAME OF TESTING AGENCY	

SIGNED:	DATE:
CERTIFICATION:	NUMBER:

One copy of this report to remain at job site with the contractor for review upon request.

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DISCREPANCY NOTICE No. _____

SPECIAL INSPECTION DISCREPANCY NOTICE

(Completed by Special Inspector)

PROJECT NAME / ADDRESS:		
INSPECTION TYPE(S) COVERAGE ☐ CONTINUOUS ☐ PERIODIC		
AREA INSPECTED	TYPE OF INSPECTION	
NOTICE DELIVERED TO: O CONTRACTOR O ENGINEER/ARCHITECT O OWNER	DATE:	TIME:
MAKE THE FOLLOWING CORRECTIONS AND SECURE INSPECTION APPROVAL PRIOR TO PROCEEDING WITH THIS PHASE OF THE WORK.		

PRINTED FULL NAME	
NOTE BY "SPECIAL INSPECTOR" OR PROVIDE NAME OF TESTING AGENCY	

SIGNED:	DATE:
CERTIFICATION:	NUMBER:

One copy of this report to remain at job site with the contractor for review upon request.

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SECTION 01 50 00

TEMPORARY FACILITIES AND CONTROLS

(Edited from DeCA June 2011 Design Criteria)

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes requirements for construction facilities and temporary controls, including temporary utilities, support facilities, and security and protection.

B. Related Sections:

1. Division 01 Section Notice to Proceed.
2. Division 01 Section Administrative Requirements.
3. Division 01 Section Sustainable Design Reporting.
4. Division 01 Section Mechanical, Refrigeration, Food Service Equipment, and Electrical Coordination.
5. Division 01 Section Work Restrictions.
6. Division 01 Section Administrative Requirements.
7. Division 01 Section Construction Progress Documentation.
8. Division 01 Section Project Web Site.
9. Division 01 Section Environmental Management.
10. Division 01 Section Indoor Air Quality Procedures.
11. Division 01 Section Quality Control.
12. Division 01 Section Government-Furnished Products.
13. Division 01 Section Closeout Procedures.
14. Division 01 Section Government Safety Requirements.
15. Division 10 Section Signage for temporary Project construction sign.

1.2 SUBMITTALS

A. Refer to Division 01 Section Administrative Requirements for procedures.

B. Submittal Schedule:

1. Provide the indicated quantity.

C. Submittal List:

Reference	Submittal Item	Quantity	Action
1.4D.1	Temporary Utilities Plan	X	R
1.5B	Temporary Support Facilities Plan	X	R
1.5C.4	Temporary Administration Trailer	X	R
1.6B	Temporary Security and Protection Facilities Plan	X	R

X Submit quantity specified in Division 01 Section Administrative Requirements.
R Review each submittal, mark to indicate action taken, and return.
I Submittal is for information or record purposes only. No action will be taken.

1.3 MOBILIZATION AND TEMPORARY CONTROLS

A. Provide new materials. Provide new equipment. If acceptable to the Contracting Officer, the contractor may use undamaged, previously used equipment in serviceable condition for temporary use. Provide equipment suitable for use intended.

B. Use qualified personnel for installation of temporary facilities. Coordinate with the Contracting Officer on locating facilities where they will serve the project adequately and result in minimum interference with performance of the work.

C. Provide each facility ready for use to avoid delays. Maintain and modify as required. Do not remove until facilities are no longer necessary or replaced by authorized use of completed permanent facilities.

D. Protection of Property Markers and Official Datum Points: Protect from damage during construction. Remove only if necessary for construction and with approval of the Contracting Officer.

E. Conditions of Use: Keep temporary services and facilities clean and neat in appearance. Operate in a safe and efficient manner. Relocate temporary services and facilities as the work progresses. Do not overload facilities or permit them to interfere with progress. Take necessary fire prevention measures. Do not allow hazardous, dangerous, unsanitary conditions, or public nuisances to develop or persist on-site or off-site.

1. Protection of Existing On-site and Off-site Facilities:

a. Protect on-site and off-site facilities, utilities, streets, and curbs from damage, dust, and dirt. Restore affected areas to original state or better at no expense to the Government.
b. Protect and preserve, in operating condition, active utility services that traverse or border the project site. Repair damage resulting from this work at no expense to the Government.
c. Add/Alter Projects:

1) Protect, maintain, and weatherproof existing buildings and contents. Restore damage caused by work of this contract to original condition or better at no cost to the Government.
2) The existing building is in continuous operation and occupied during this contract. Provide safe continuous access to fire exits. Minimize disruption of normal commissary activity.

F. Verify areas available for access, parking, and material storage before starting work.

1. The construction documents indicate staging areas.
2. Barricades, Warning Signs, and Lights: Comply with standards for erection of structurally adequate barricades. Paint with appropriate colors, graphics, and warning signs to inform personnel and the public of the hazard protected against. Where appropriate, provide lighting including flashing red or amber lights.
3. Enclosure Fence: Before excavation begins, install an enclosure fence with lockable entrance gates. Locate where indicated, or enclose the portion determined sufficient to accommodate construction operations. Install in a manner that will prevent people and animals from easily entering the enclosure.
4. Covered Walkway: Where required for protection of persons accessing the commissary, erect a structurally adequate, protective covered walkway for passage of persons. Coordinate with entrances, other facilities, and obstructions. Comply with regulations of

authorities having jurisdiction. Provide handrails, barricades, warning signs, lights, safe and well-drained walkways, and similar provisions for protection and safe passage. Extend the back wall beyond the structure to complete the enclosure fence. Paint and maintain in a manner acceptable to the Contracting Officer.

G. Use of alternative construction facilities and temporary controls is contractor's option, subject to Contracting Officer's acceptance.

1.4 TEMPORARY UTILITIES

A. Temporary utilities include, but are not limited to, the following:

1. Water service and distribution.
2. Temporary electric power and light.
3. Temporary heat.
4. Ventilation.
5. Telephone service.
6. Sanitary facilities, including drinking water.

B. General: Where only part of utility services is available, provide the remainder with matching, compatible materials and equipment. Comply with installation recommendations.

1. Arrange with the Contracting Officer for service interruptions and connections for temporary services.
2. Use Charges: The contractor is responsible for all temporary utility fees and their connection, removal, and restoration (e.g., electricity, gas, telephone, and water). Provide metering devices with programmable use rates, appropriate for the utility being used, and acceptable to the Contracting Officer.
3. Use Charges: Subject to the approval of the Contracting Officer, reasonable amounts of utilities (exclusive of telephone) are available from the Government for use without metering and without payment of use charges. Provide connections and extensions of services as required for construction operations.

C. Regulations: Comply with industry standards and applicable laws and installation regulations and authorities having jurisdiction.

1. Standards: Comply with NEC Electrical Design Library "Temporary Electrical Facilities."
2. Inspections: Arrange for authorities having jurisdiction to inspect and test each temporary utility before use. Obtain required certifications and permits.

D. Submittals:

1. Provide a Temporary Utilities plan which identifies, but is not limited to, plans and procedures for the following:

a. Submit reports of tests, inspections, meter readings, and similar procedures performed on temporary utilities.
b. Implementation and Termination Schedule: Include in the CPM schedule (refer to Division 01 Section Construction Progress Documentation a sub-schedule indicating implementation and termination of each temporary utility.
c. Proposed utility connection and termination plan.
d. Items identified in subparagraphs of paragraph 1.4.

E. Water Service and Distribution:

1. Water Service: Install distribution piping of sizes and pressures adequate for construction operations.

F. Temporary Electric Power and Light:

1. Temporary Electric Power: Provide weatherproof, grounded electric power distribution system of sufficient size, capacity, and power characteristics during the construction period.
2. Temporary Lighting: Provide temporary lighting with local switching. Install and operate temporary lighting that will fulfill security and protection requirements without operating the entire system. Provide temporary lighting that will provide adequate illumination for construction operations and traffic conditions.

    a. In occupied buildings containing commissary operations provide emergency backup lighting and normal use lighting (a minimum of 75 foot candles in the sales areas and 50 foot candles in the warehouse areas (measured at 5 feet above the floor).
    b. For new construction maintain a minimum of 10 foot candles (or more if required by regulatory agencies) in all areas. Increase the lighting levels to a minimum of 75 foot candles when drywall, painting, and other finish operations begin.

3. Electrical Outlets: Provide properly configured, NEMA polarized outlets to prevent insertion of 110 to 120 volt plugs into higher voltage outlets. Provide receptacle outlets equipped with ground-fault circuit interrupters, reset button, and pilot light for connection of power tools and equipment.
4. Electrical Power Cords: Provide grounded extension cords. Use hard-service cords where exposed to abrasion and traffic. Provide waterproof connectors to connect separate lengths of electric cords if single lengths will not reach areas where construction activities are in progress. Do not exceed safe length-voltage ratio.
5. Lamps and Light Fixtures: Provide general service incandescent lamps of wattage required for adequate illumination. Provide guard cages or tempered-glass enclosures where exposed to breakage. Provide moisture resistant exterior fixtures.

G. Temporary Heat:

1. Provide temporary heat required by construction activities for curing or drying of completed installations or for protection of installed construction from adverse effects of low temperatures or high humidity. Select safe equipment that will not have a harmful effect on existing installation, newly completed installations, and elements being installed. Coordinate ventilation requirements to produce the ambient condition required and minimize consumption of energy.
2. Heating Units: Provide temporary heating units tested and labeled by UL, FM, or another recognized trade associated related to the type of fuel being consumed.
3. Heating Facilities: Except where the Government authorizes use of the permanent system, provide vented, self-contained, LP gas or fuel oil heaters with individual space thermostatic control.

    a. Prohibit the use of open flame, salamander, or burning space heating units.

H. Ventilation:

1. Temporary Ventilation: Ventilate enclosed areas to assist cure of materials, to dissipate humidity, and to prevent accumulation of dust, fumes, and gases. Locate exterior exhausts away from entrances and air intake equipment.

I. Telephone Service:

1. Temporary Telephones: Provide temporary telephone service throughout the construction period for all personnel engaged in construction activities. Install telephone on a separate line for each temporary office.

a. At each telephone, post a list of operational and emergency telephone numbers.

J. Sanitary Facilities, Including Drinking Water:

1. Sanitary facilities include temporary toilets, wash facilities, and drinking water fixtures. Comply with regulations and health codes for the type, number, location, operation, and maintenance of fixtures and facilities. Install where facilities will best serve the project needs (verify locations acceptable to the Contracting Officer before proceeding).

a. Toilets: Use of the Government's existing sanitary facilities is not permitted.

2. Water: Provide potable water approved by local health authorities.
3. Temporary Toilet Units: Provide self-contained, single-occupant toilet units of the chemical, aerated recirculation, or combustion type for construction personnel. Provide units properly vented and fully enclosed with a glass-fiber-reinforced polyester shell or similar non-absorbent material.

1.5 TEMPORARY SUPPORT FACILITIES

A. Provide any other equipment, facilities, or materials necessary to house office operations and protect stored construction materials or building equipment from the elements. This includes, but is not limited to: storage trailers, crating, etc. Support facilities include, but are not limited to, the following:

1. Field offices and storage sheds.
2. Temporary enclosures.
3. Temporary project identification signs and bulletin boards.
4. Waste disposal services.
5. Rodent and pest control.
6. Temporary Refrigerated Storage Trailers.

B. Submittals:

1. Provide a Temporary Support Facilities plan which identifies, but is not limited to, plans and procedures for the following:

a. Implementation and Termination Schedule: Include in the CPM schedule, (refer to Division 01 Section Construction Progress Documentation a sub-schedule indicating implementation and termination of each temporary support facility.
b. Proposed staging area plan.
c. Proposed site layout for temporary facilities and offices.
d. Floor plan for Government’s Designated Inspector’s facility.
e. Other items identified in subparagraphs of paragraph 1.5.

C. Government’s Designated Inspector's Field Office:

1. Provide a temporary office trailer (new or like new condition) for the use of the Government's Designated Inspector that is physically detached from the contractor's structure.
2. Install the office complete with utilities within three weeks after Notice to Proceed (NTP) in a location and orientation approved by the Government's Designated Inspector. Strap down the office to prevent shifting or dislocation by wind. Maintain office, including utilities and sanitary facilities, until completion of all punch list work at the end of the contract. This may require relocation, at contractor's expense, of the office and utilities to allow completion of the project. Place utilities to support office occupancy at any time of the day or night. Field office shall be "Williams Scottsman" model 46 feet by 10 feet, model 44 feet by 12 feet, "GE Capital" model GS-1260, or equal. Furnish and equip the office as follows:

   a. Furnish with:

      1) Two each 60 inch by 30 inch double pedestal desks with lockable drawers.
      2) One each 72 inch by 36 inch plan table.
      3) Two each legal size 4 drawer metal lockable file cabinets.
      4) Two desk type swivel chairs with arm rests.
      5) One stool to match plan table height.
      6) One waste basket.
      7) Electric water cooler including scheduled delivery of bottled drinking water and drinking cups, quantities on an as-needed basis.
      8) Twelve inch wide shelving and a minimum of 20 LF for reference books (installed by contractor at direction of the Government's Designated Inspector).
      9) Small conference table (minimum of 30 by 96 inches) and four chairs.
      10) One plan storage rack (Minimum capacity of six sets of full size project plans).
      11) Outside security light operated by photocell.

   b. Equip with:

      1) Fluorescent lighting with minimum of 550 lux at desk tops and plan table, incandescent lighting acceptable in restroom.
      2) Restroom complete with functional toilet, sink, and toilet accessories; with hot and cold potable water and connected to nearest water supply and sanitary sewer system. Insulate and heat trace water, sewer line, and holding tank (if applicable) to protect from freezing in cold climate areas.
      3) A minimum of 6 duplex 120 volt convenience outlets, distributed versus ganged.
      4) Two commercial telephone line (voice and data transmission quality without call waiting) and service with jacks in the office and the general room (cost of the monthly service charge and long distance call to be borne by the Government's Designated Inspector; installation paid by the contractor).
      5) One high speed internet connection.
      6) Window in general area and in the office areas.
      7) Blinds on all windows.
      8) Automatic heating and cooling sufficient to maintain 75 degrees F annually.
      9) Utilities inclusive of electricity, potable water, sewage collection and disposal, and telephone service. Make all utility connections and connection charges. Pay all monthly utility service charges except for the Government's Designated Inspector's monthly telephone and long distance service.

10) Security in the form of steel bars on the windows and steel (versus sheet metal) hasp capable of receiving a padlock on doors.
11) Sturdy and safe access to the building free from water, mud, and other obstacles, with mud scraper outside entrance.

c. Meet all contract codes. All furnishings new or like new condition.

3. Late Provision of Government's Designated Inspector's Field Office: Failure to provide the facility within the time period allotted shall subject the contractor to a deductive modification to the contract for all reasonable costs incurred by the Government for the provision of a temporary office facility for the Government's Designated Inspector for each day of contractor delay in providing the facility on site. Additionally, the deductive modification will cover temporary office facilities (leased motel room, 7 days per week), mileage, cellular communication, reproduction, and datafax costs incurred in the course of business by the Government's Designated Inspector during the applicable period of contractor delay. The Government's Designated Inspector will maintain mileage logs, phone logs, datafax logs, and receipts.

D. Temporary Administration Trailer(s):

1. Provide temporary administration trailer(s) (new or like new condition) for the use of store administration personnel during phased construction.
2. Install the trailer(s) complete with utilities in the location and orientation indicated. Strap down the trailer to prevent shifting or dislocation by wind. Provide support of trailer that do not distort or mar paving surface. Maintain trailer, including utilities, sanitary facilities, and cleaning, until completion of phased construction. Provide utilities to support trailers' occupancy at any time of the day or night. Temporary administration trailer shall be "Williams Scottsman" Sales Office trailer, size 48 feet by 24 feet (actual size 44 feet by 23 feet-6 inches), or equal. 1-800-782-1500 or www.willscot.com. Equip each office area in trailer as follows:

a. Fluorescent lighting with minimum of 550 lux at desk tops.
b. Restroom to be complete with functional self-contained toilet and lavatory units, and toilet accessories; with hot and cold potable water.
c. A minimum of one duplex 120 volt convenience outlet on each wall.
d. Windows.
e. Blinds on all windows.
f. Automatic heating and cooling sufficient to maintain 75 deg F annually.
g. Utilities inclusive of electricity, potable water, sewage collection and disposal, and telephone service. Make all utility connections and connection charges. Pay all monthly service charges except for long distance service.
h. Security in the form of steel bars on the windows and steel (versus sheet metal) hasp capable of receiving a padlock on doors.
i. Sturdy and safe access to the trailer free from water, mud, and other obstacles, and in compliance with requirements for accessibility for the disabled.

3. Meet all contract codes.
4. Submit proposed temporary administration trailer for approval by Contracting Officer prior to installation of trailer.

E. Temporary Field Offices and Sheds:

1. Field Offices: Within 21 days from notice to proceed, provide insulated, weather tight temporary offices of sufficient size to accommodate required office personnel at the project site. Keep the office clean and orderly for use for small progress meetings, etc.

a. Provide prefabricated or mobile units with lockable entrances, operable windows, and serviceable finishes. Provide heated and air conditioned units on foundations adequate for normal loading.

2. Locate field offices, storage sheds, and other temporary construction and support facilities for easy access.

a. Coordinate and obtain approval of location of field offices and storage sheds with the Contracting Officer.

F. Temporary Enclosures and Barriers:

1. Implement guidelines as identified in the Sheet Metal and Air Conditioning Contractors' National Association, Inc. (SMACNA) - "IAQ Guidelines for Occupied Buildings Under Construction" - Current Edition. The intent is to prevent any indoor air quality problems to building occupants during construction. Isolate all areas of construction from Commissary operations. Remove all hazardous materials prior to starting work. If hazardous materials are found, identified, or suspect, cease work and mitigate the hazardous material concern. Do not continue with contract work until the space has been cleared by a PE or Certified Industrial Hygienist for occupancy.
2. Provide temporary enclosures to seal operational portions of the commissary from areas of construction and for protection of construction in progress and completed, from exposure, foul weather, other construction operations, and similar activities. Construct temporary enclosures to withstand typical loading conditions, such as impact from carts, wind loads, and commissary operations.

a. Provide temporary enclosures where there is no other provision for containment of heat. Coordinate enclosure with ventilating and material drying or curing requirements to avoid dangerous conditions and effects.
b. Close openings of 25 sq. ft. or less with plywood or similar materials.
c. Close openings through floors or roof decks and horizontal surfaces with load bearing, wood framed construction.
d. Where temporary wood or plywood enclosures exceed 100 sq. ft. in area, use UL labeled, fire-retardant-treated materials for framing and main sheathing.
e. Dust barriers: Provide a temporary framework from floor to roof deck, covered with 6 mil, minimum, tarpaulin. Tape joints and anchor framework as required for maximum stability.
f. Sound Barriers. When noise levels from construction operations reach 82db in patron areas, provide sound attenuation batts and other construction as necessary or perform work after store hours to prevent noise levels in patron areas from reaching 82db or higher.
g. Design the temporary enclosures to meet applicable wind loading and security requirements.

3. Doors in Barriers: Provide gates in barriers for the contractor's access to the work, of similar construction to the barrier in which it occurs. Provide gates with hinges, braces, and locks.
4. Customer Access Protection Through Construction Areas: Provide patron access protection through the construction area consisting of temporary enclosures, walkways, and when required, roofs. Comply with ADA guidelines for accessibility by individuals with disabilities. Construct walkways a minimum of 8 feet wide and with a hard walking surface, smooth enough for the easy passage of shopping carts. Do not install steps and vertical offsets of greater than 1/4 inch and excessive inclines. Construct these barriers of 2 inch by 4 inch wood or metal stud, adequately braced, and covered with 1/2 inch plywood on the exterior side. When work is overhead, provide adequately braced roofs

of 2 inch by 4 inch wood or metal studs with 1/2 inch plywood on the exterior side for patron protection. Relocate or rebuild temporary facilities throughout the construction period to provide safe patron access to the commissary.

a. The commissary will remain in operation during the construction period; therefore, construct barriers by the contractor as work progresses. Provide barriers as specified and in locations as required, from floor to ceiling or from floor to underside of the roof deck, to seal the operational portions of the commissary from the area of construction.
b. Construct barriers of wood or metal studs with finished surfaces. Determine the stud sizes and the spacing of the studs (2 feet maximum). Construct barriers to withstand typical loading conditions such as impact loading from carts, wind loads, commissary operations, and construction operations.
c. Provide adequate lighting.
d. Construct barriers of single length members. If splicing is necessary due to the height of the wall, design the splice to provide adequate strength to withstand typical loading conditions.

1) Dust Barriers. Provide a temporary framework covered with 6 mil clear polyethylene, fiberglass reinforced film. Tape joints and anchor framework as required for maximum stability.

5. Customer Access Through Weather Tight Temporary Enclosures:

a. Provide automatic operating doors at temporary access points. Existing vestibules and doors not used due to construction are available for the contractor to relocate and use as temporary entrances and exits. Provide adequate lighting. Provide temporary security alarm connection if using automatic doors on the exterior.
b. Construct temporary access points to use two sets of doors to create a vestibule. It is preferable that vestibules be constructed with door openings at 90 degrees to each other. If straight vestibules are necessary due to construction constraints, place the sets of doors at least ten feet apart, but not greater than fifteen feet apart.

G. Temporary Project Identification Signs and Bulletin Boards:

1. Project Identification and Temporary Signs: Prepare project identification and other signs of size indicated. Install signs where indicated to inform the public and persons seeking entrance to the project. Support on posts or framing of preservative-treated wood or steel. Do not permit installation of unauthorized signs.

a. Project Identification Signs: Engage an experienced sign painter to apply graphics. Comply with requirements contained in Division 10 Section Signage.
b. Temporary Signs: Prepare signs to provide directional information to construction personnel and visitors.
c. No other signs permitted without the Contracting Officer's permission except those required by law.

2. Plywood: For signs and directory boards, provide exterior-type, Grade B-B high density concrete form overlay plywood, unless otherwise indicated, of size and thickness indicated.
3. Paint: For sign panels and applying graphics, provide exterior-grade alkyd gloss enamel over exterior primer unless otherwise indicated.

H. Waste Disposal Services:

1. Collection and Disposal of Waste: Collect waste from the construction areas and elsewhere on a daily basis.

I. Rodent and Pest Control:

1. Rodent and Pest Control: Retain a local exterminator or pest control company to recommend practices to minimize attraction and harboring of rodents, roaches, and other pests. Employ this service to perform extermination and control procedures at regular intervals so the project will be free of pests and their residues at completion of the project. Perform control operations lawfully, using environmentally safe materials.

J. Grounds Maintenance:

1. Perform routine grounds maintenance to prevent accumulation of debris and overgrowth of grounds cover and vegetation. Mow as required when weeds and grasses reach 3 inches in height.

1.6 TEMPORARY SECURITY AND PROTECTION FACILITIES

A. Security and protection facilities include, but are not limited to, the following:

1. Temporary fire protection.
2. Barricades, warning signs, and lights.
3. General lighting.
4. Enclosure fence for the site.
5. Covered walkways.
6. Security enclosure and lockup.
7. Environmental protection.

B. Submittals:

1. Provide a Temporary Security and Protection Facilities plan which identifies, but is not limited to, procedures for the following:

a. Implementation and Termination Schedule: Include in the CPM schedule (refer to Division 01 Section Construction Progress Documentation a sub-schedule indicating implementation and termination of each temporary facility.
b. Proposed layout and construction materials for items in paragraph 1.6A.

C. Temporary Fire Protection:

1. Fire Extinguishers: Provide hand carried, portable, UL rated, Class A fire extinguishers for temporary offices and similar spaces. In other locations, provide hand carried, portable, Ul rated, Class ABC, dry chemical extinguishers or a combination of extinguishers of NFPA recommended classes for the exposure.

a. Comply with NFPA 10 and NFPA 241 for classification, extinguishing agent, and size required by location and class of fire exposure.

D. Barricades, Warning Signs, and Lights:

1. Tarpaulins: Provide waterproof, fire resistant, UL labeled tarpaulins with a flame spread rating of 15 or less. For temporary enclosures, provide translucent, nylon reinforced, laminated polyethylene or polyvinyl chloride, fire retardant tarpaulins.

2. Lumber and Plywood:

   a. For vision barriers, provide minimum 3/8 inch thick exterior plywood.
   b. For safety barriers, sidewalk bridges, and similar uses, provide minimum 5/8 inch thick exterior plywood. Paint sides facing sales area two coats gloss white.

3. Wind Damage Control: Provide properly designed and constructed temporary bracing of adequate strength to prevent damage to project and component parts due to normal and excessive wind forces. Replace or repair damaged portions of project and component parts at no additional cost to the Government.

E. Enclosure Fence for the Site:

1. Site Limit Barrier: Provide a site limit barrier constructed of a temporary chain link fence, at least 6 feet high, on steel posts with a steel top rail and bottom tension wires.
2. Open-Mesh Fencing 6 Foot High: Provide 0.120 inch thick, galvanized 2 inch chain link fabric fencing and galvanized steel pipe posts, 1-1.2 inch I.D. for line posts and 2 inch I.D. for corner posts. Provide gates of similar construction.

   a. Provide vision barrier of <**Insert vision barrier requirements**>.

F. Covered Walkways:

1. Provide walkway roofs with adequately braced 2 inch by 4 inch wood or metal studs with 5/8 inch plywood on the exterior side.

G. Security Enclosure and Lockup:

1. Security Dust Barriers: Provide security dust barriers as required, similar in all respects to the dust barrier, except that the security dust barrier has, in addition to the tarpaulin, a layer of 5/8 inch plywood attached full height to the opposite side of the studs from the tarpaulin.
2. Security Weather tight Temporary Enclosure: Where security weather tight temporary enclosures are required, provide a temporary framework with 5/8 inch plywood on the exterior side and 5/8 inch gypsum wallboard or plywood on the interior. Install a tarpaulin over exterior surfaces subject to the weather, taped and secured to provide a weather tight enclosure. Construct to comply with wind load requirements. Maintain weather tight throughout the time in use.
3. Provide doors in temporary enclosures for access to the work, of similar construction to the temporary enclosure in which it occurs. Provide doors with hinges, braces, and locks.

   a. Security Weather tight Barriers: Where security Weather tight barriers are required, provide a temporary framework with 5/8 inch plywood on the exterior side and 5/8 inch gypsum board or plywood on the interior side. Provide one layer of polyethylene fiberglass reinforced film on exterior surfaces subject to the weather. Tape and secured to provide a weather tight enclosure. Maintain weather tight throughout the construction period.

1.7 OPERATION, TERMINATION, AND REMOVAL

A. Supervision: Enforce strict discipline in use of temporary facilities. Limit availability of temporary facilities to essential and intended uses to minimize waste and abuse.

B. Maintenance: Maintain facilities in good operating condition until removal. Protect from damage by the elements.

C. Maintain support facilities until near project final acceptance. Remove prior to project final acceptance.

1. Maintain operations of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24 hour basis where required to achieve indicated results and to avoid possibility of damage.
2. Protection: Prevent water-filled piping from freezing.

D. Termination and Removal: Unless the Contracting Officer requests longer maintenance, remove each temporary facility when the need ends or when replaced by authorized use of a permanent facility. Complete or, if necessary, restore permanent construction delayed because of interference with the temporary facility. Repair damaged work, clean exposed surfaces, and replace irreparable construction.

1. Materials and facilities that constitute temporary facilities are the contractor's property. The government reserves the right to take possession of project identification signs.
2. For areas intended for landscape development, remove soil and aggregate fill that do not comply with requirements for fill or subsoil in the area. Remove materials contaminated with road oil, asphalt and other petrochemical compounds, and other substances that might impair growth of plant materials or lawns.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 01 56 39

TEMPORARY TREE AND PLANT PROTECTION

(Edited from DeCA June 2011 Design Criteria)

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. The protection and trimming of existing trees that interfere with, or are affected by, execution of the Work, whether temporary or permanent construction.

1.2 DEFINITIONS

A. Tree Protection Zone: Area surrounding individual trees or groups of trees to remain during construction, and defined by the drip line of individual trees or the perimeter drip line of groups of trees, unless otherwise indicated.

1.3 SUBMITTALS

A. Product Data:

1. Tree Pruning Schedule: Written schedule from arborist detailing scope and extent of pruning of trees to remain that interfere with or are affected by construction.

B. Qualification Data:

1. For tree service firm and arborist.

C. Certification:

1. From arborist, certifying that trees indicated to remain have been protected during construction according to recognized standards and that trees were promptly and properly treated and repaired when damaged.

D. Maintenance Recommendations:

1. From arborist, for care and protection of trees affected by construction during and after completing the Work.

E. Submittal List:

Reference	Submittal Item	Quantity	Action
1.3A	Product Data	X	R
1.3B	Qualification Data	X	R
1.3C	Certification	X	I
1.3D	Maintenance Recommendations	X	I

X Submit quantity specified in Division 01 Section Administrative Requirements.
R Review each submittal, mark to indicate action taken, and return.
I Submittal is for information or record purposes only. No action will be taken.

1.4 QUALITY ASSURANCE

A. Tree Service Firm Qualifications:

1. An experienced tree service firm that has successfully completed tree protection and trimming work similar to that required for this Project and that will assign an experienced, qualified arborist to Project site during execution of tree protection and trimming.

B. Arborist Qualifications:

1. An arborist certified by ISA or licensed in the jurisdiction where Project is located.

C. Tree Pruning Standard:

1. Comply with ANSI A300 (Part 1), "Tree, Shrub, and Other Woody Plant Maintenance--Standard Practices (Pruning)."

D. Preinstallation Conference:

1. Conduct conference at Project site to comply with requirements in Division 01 Section Administrative Requirements.

a. Before tree protection and trimming operations begin, meet with representatives of the Installation, consultants, and other concerned entities to review tree protection and trimming procedures and responsibilities.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Drainage Fill:

1. Selected crushed stone, or crushed or uncrushed gravel, washed, ASTM D 448, Size 24, with 90 to 100 percent passing a 2-1/2-inch sieve and not more than 10 percent passing a 3/4-inch sieve.

B. Topsoil:

1. Natural or cultivated surface-soil layer containing organic matter and sand, silt, and clay particles; friable, pervious, and black or a darker shade of brown, gray, or red than underlying subsoil; reasonably free of subsoil, clay lumps, gravel, and other objects more than 2 inches in diameter; and free of weeds, roots, and toxic and other nonsoil materials.
2. Obtain topsoil only from well-drained sites where topsoil is 4 inches deep or more; do not obtain from bogs or marshes.

C. Filter Fabric:

1. Manufacturer's standard, nonwoven, pervious, geotextile fabric of polypropylene, nylon, or polyester fibers.

PART 3 - EXECUTION

3.1 PREPARATION

A. General:

1. Temporary Fencing: Install temporary fencing around tree protection zones to protect remaining trees and vegetation from construction damage. Maintain temporary fence and remove when construction is complete.
2. Protect tree root systems from damage caused by runoff or spillage of noxious materials while mixing, placing, or storing construction materials. Protect root systems from ponding, eroding, or excessive wetting caused by dewatering operations.
3. Do not store construction materials, debris, or excavated material inside tree protection zones. Do not permit vehicles or foot traffic within tree protection zones; prevent soil compaction over root systems.
4. Maintain tree protection zones free of weeds and trash.
5. Do not allow fires within tree protection zones.

3.2 EXCAVATION

A. General:

1. Install shoring or other protective support systems to minimize sloping or benching of excavations.
2. Do not excavate within tree protection zones, unless otherwise indicated.
3. Where excavation for new construction is required within tree protection zones, hand clear and excavate to minimize damage to root systems. Use narrow-tine spading forks and comb soil to expose roots.

    a. Redirect roots in backfill areas where possible. If encountering large, main lateral roots, expose roots beyond excavation limits as required to bend and redirect them without breaking. If encountered immediately adjacent to location of new construction and redirection is not practical, cut roots approximately 3 inches back from new construction.
    b. Do not allow exposed roots to dry out before placing permanent backfill. Provide temporary earth cover or pack with peat moss and wrap with burlap. Water and maintain in a moist condition. Temporarily support and protect roots from damage until they are permanently relocated and covered with soil.

4. Where utility trenches are required within tree protection zones, tunnel under or around roots by drilling, auger boring, pipe jacking, or digging by hand.

    a. Root Pruning: Do not cut main lateral roots or taproots; cut only smaller roots that interfere with installation of utilities. Cut roots with sharp pruning instruments; do not break or chop.

3.3 REGRADING

A. Grade Lowering:

1. Where new finish grade is indicated below existing grade around trees, slope grade beyond tree protection zones. Maintain existing grades within tree protection zones.

B. Grade Lowering:

1. Where new finish grade is indicated below existing grade around trees, slope grade away from trees as recommended by arborist, unless otherwise indicated.

a. Root Pruning: Prune tree roots exposed during grade lowering. Do not cut main lateral roots or taproots; cut only smaller roots. Cut roots with sharp pruning instruments; do not break or chop.

C. Minor Fill:

1. Where existing grade is 6 inches or less below elevation of finish grade, fill with topsoil. Place topsoil in a single uncompacted layer and hand grade to required finish elevations.

D. Moderate Fill:

1. Where existing grade is more than 6 inches but less than 12 inches below elevation of finish grade, place drainage fill, filter fabric, and topsoil on existing grade as follows:

a. Carefully place drainage fill against tree trunk approximately 2 inches above elevation of finish grade and extend not less than 18 inches from tree trunk on all sides. For balance of area within drip-line perimeter, place drainage fill up to 6 inches below elevation of grade.
b. Place filter fabric with edges overlapping 6 inches minimum.
c. Place fill layer of topsoil to finish grade. Do not compact drainage fill or topsoil. Hand grade to required finish elevations.

3.4 TREE PRUNING

A. General:

1. Prune trees to remain that are affected by temporary and permanent construction.
2. Prune trees to remain to compensate for root loss caused by damaging or cutting root system. Provide subsequent maintenance during Contract period as recommended by arborist.
3. Pruning Standards: Prune trees according to ANSI A300
4. Cut branches with sharp pruning instruments; do not break or chop.
5. Chip removed tree branches and dispose of off-site.

3.5 TREE REPAIR AND REPLACEMENT

A. General:

1. Promptly repair trees damaged by construction operations within 24 hours. Treat damaged trunks, limbs, and roots according to arborist's written instructions.

2. Remove and replace trees indicated to remain that die or are damaged during construction operations that the Contracting Officer or Installation determines are incapable of restoring to normal growth pattern.

   a. Provide new trees of same size and species as those being replaced; plant and maintain as specified in Division 32 Section Planting.
   b. Provide new trees of 6-inch caliper size and of a species selected by Government's Designated Representative when damaged trees more than 6 inches in caliper size, measured 12 inches above grade, are required to be replaced. Plant and maintain new trees as specified in Division 32 Section Planting.

3. Aerate surface soil, compacted during construction, 10 feet beyond drip line and no closer than 36 inches to tree trunk. Drill 2-inch- diameter holes a minimum of 12 inches deep at 24 inches o.c. Backfill holes with an equal mix of augured soil and sand.

3.6 DISPOSAL OF WASTE MATERIALS

A. Burning is not permitted. Remove excess excavated material and displaced trees from Government's property.

END OF SECTION

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SECTION 01 64 00

GOVERNMENT-FURNISHED PRODUCTS

(Edited from DeCA June 2011 Design Criteria)

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Relocation of Government products.
2. Government Furnished, Contractor Installed products.
3. Government Furnished, Government Installed products.

B. Related Sections:

1. Division 01 Section Administrative Requirements.
2. Division 01 Section Mechanical, Refrigeration, Food Service Equipment, and Electrical Coordination.
3. Division 01 Section Construction Progress Documentation.
4. Division 01 Section Quality Control.
5. Division 01 Section Temporary Facilities and Controls.
6. Division 01 Section Environmental Management.
7. Division 01 Section Closeout Procedures.

1.2 RELOCATION OF GOVERNMENT PRODUCTS

A. The Drawings indicate government equipment requiring relocation. The work includes providing support systems (including mechanical and electrical connections) for the government's relocated equipment.

1. Identify relocation dates of items requiring relocation in the Contractor's CPM Schedule.
2. Remove, relocate, and erect items as required.
3. Protect items from damage, including damage from exposure to the elements to include rain, heat and/or cold. Repair or replace items damaged as a result of construction operations.

B. Quality Assurance:

1. Installer qualifications: Engage an experienced installer who has installed products similar to those required for this project and with a construction record of successful in-service performance.

C. Materials, General: Use new materials that match existing to the fullest extent possible if identical existing materials are unavailable. Use materials whose installed performance will equal or surpass that of existing materials.

D. Inspection: Verify that substrates are sound and free of irregularities interfering with installation. Correct unsatisfactory conditions prior to installation.

E. Installation: Securely attach relocated products to resist required earthquake and product use loads.

1.3 GOVERNMENT-FURNISHED, CONTRACTOR INSTALLED PRODUCTS

A. The government will furnish items indicated on the drawings as Government-Furnished, Contractor Installed (GFCI). The Contractor's work includes providing support systems (including mechanical and electrical connections) for the government's equipment.

1. The government will provide necessary manufacturer's product data to the contractor, upon request.
2. The government will arrange for delivery of Government-Furnished items.
3. Identify delivery dates of Government-Furnished items in the Contractor's Construction Schedule per Division 01 Section Administrative Requirements.

a. Notify the Government one-month prior to any delay affecting the delivery date of Government-Furnished items. Notify the Government two months prior to any acceleration affecting the delivery date of Government-Furnished items. After providing the Government with the initial delivery dates, and to which the Government agrees, the Government will attempt to meet, but is not obligated to change the delivery dates as requested by the Contractor.

4. Review shop drawings, product data, and samples and return them to the Contracting Officer noting discrepancies or problems anticipated in the use of the product.

B. Protect Government-Furnished items from damage, including damage from exposure to the elements to include rain, heat and/or cold. Repair or replace, as determined by the Contracting Officer, items damaged as a result of construction operations.

1.4 GOVERNMENT-FURNISHED, GOVERNMENT INSTALLED PRODUCTS

A. The government will furnish and install items indicated on the drawings as Government-Furnished, Government Installed (GFGI). Unless otherwise indicated, GFGI operations will occur simultaneously with work under this Contract. The Contractor's work includes preparation of areas and providing support systems, as indicated, to receive GFGI equipment.

1. The government will provide necessary manufacturer's product data to the contractor, upon request.
2. The government will arrange for delivery of GFGI items.
3. Delete option below if no project phasing required.
4. Identify delivery dates of GFGI items in the Contractor's Construction Schedule per Division 01 Section Construction Progress Documentation.

a. Notify the Government one-month prior to any delay affecting the delivery date of Government-Furnished items. Notify the Government two months prior to any acceleration affecting the delivery date of Government-Furnished items. After providing the Government with the initial delivery dates, and to which the Government agrees, the Government will attempt to meet, but is not obligated to change the delivery dates as requested by the Contractor.

5. Prior to installation of GFGI items and **phase turnover or** contract close-out, examine areas that are to receive GFGI items with the Government Installer.

6. Protect GFGI items from damage, including damage from exposure to the elements to include rain, heat and/or cold. Repair or replace, as determined by the Contracting Officer, items damaged as a result of construction operations. All GFGI equipment shall be stored in a storage enclosure or trailer in accordance with Division 01 Section Temporary Facilities and Controls.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

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SECTION 01 73 29

CUTTING AND PATCHING

(Edited from DeCA June 2011 Design Criteria)

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Administrative and procedural requirements for cutting and patching.
2. Products and installation for patching and extending work.
3. Transition and adjustments.
4. Repair of damaged surfaces, finishes, and cleaning.

1.2 CUTTING AND PATCHING

A. Requirements for Structural Work: Do not cut and patch structural elements in a manner that would change their load-carrying capacity or load-deflection ratio.

1. Where cutting and patching involves welding or adding reinforcement to existing structural elements, submit details and engineering calculations (by a structural engineer licensed in the state of the project location) showing integration of reinforcement with original structure. Obtain approval to proceed from the Contracting Officer.

B. Operational Limitations: Do not cut and patch operating elements or related components in a manner that would result in reducing their capacity to perform as intended. Do not cut and patch operating elements or related components in a manner that would result in increased maintenance or decrease operational life or safety. Maintain fire resistance ratings of members and systems.

C. Existing Services: Where existing services are required to be removed, relocated, or abandoned, bypass such services before cutting to eliminate interruption of services to occupied areas.

D. Cutting and Patching Roofs: Determine from the government which roofing manufacturer is responsible for the roof bond or guarantee. Subcontract all cutting and patching to the roofing manufacturer's approved local contractor. Provide the government with a letter confirming his authority to perform such work prior to commencing the work.

E. Exterior Building Enclosure: Close openings in exterior surfaces to protect existing work from weather and extremes of temperature and humidity. Insulate ductwork and piping to prevent condensation in exposed areas. Maintain the security system and secure openings nightly.

F. Visual Requirements: Do not cut and patch construction exposed on the exterior or in occupied spaces in a manner that would, in the Contracting Officer's opinion, reduce the buildings aesthetic qualities. Do not cut and patch construction in a manner that would result in visual evidence of cutting and patching. Remove and replace construction cut and patched in a visually satisfactory manner.

1.3 WARRANTY

A. Existing Warranties: Replace, patch, and repair material and surfaces cut or damaged by methods and with materials in such a manner as not to void warranties required or existing.

1.4 MATERIALS

A. Use materials identical to existing materials. For exposed surfaces, use materials that visually match existing adjacent surfaces to the fullest extent possible. If identical materials are unavailable or Contractor cannot find, use materials whose installed performance will equal or surpass that of existing materials.

1. New Materials: As specified on product Sections; match existing products for patching and extending work. Install work according to manufacturer and special standards.
2. Type and quality of existing products; determine by inspection and testing products where necessary, install work according standards.

B. Plaster: Comply with ASTM C 842.

1. Base Coat: Ready-mixed, sand aggregate, gypsum plaster base.
2. Finish Coat: Ready-mixed gypsum finished plaster.

1.5 INSPECTION

A. Examine surfaces Contractor will cut and patch and conditions under which Contractor will cut and patch before cutting. If unsafe or unsatisfactory conditions exist, take corrective action before proceeding.

B. Verify demolition is complete and areas are ready for installation of new work.

1.6 PREPARATION

A. Arrange work for a minimum of cutting.

B. Temporary support: Provide temporary support of work to be cut.

C. Protection: Protect existing construction during cutting and patching to prevent damage. Provide protection from adverse weather for portions of the project exposed during cutting and patching operations.

D. Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.

E. Verify and identify the existence of underground or hidden conduits, plumbing, or voice/data circuits.

F. Do not cut active pipe, conduit, or ductwork scheduled for removal or relocation and serving an occupied building until Contractor either bypasses them or provides alternate services to the affected areas of the building.

G. Examine surfaces to be cut and patched and conditions under which cutting and patching are to be performed.

H. Compatibility: Before patching, verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.

I. Proceed with installation only after unsafe or unsatisfactory conditions have been corrected.

J. Cut, move or remove items as necessary for access to alterations and renovation work. Replace and restore at completion.

K. Remove unsuitable material not marked for salvage, such as rotted wood, corroded metals, and deteriorated masonry and concrete. Replace materials as specified for finished work.

L. Prepare surface and remove surface finishes to provide for proper installation of new work and finishes.

1.7 PERFORMANCE

A. General: Employ skilled workmen to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time and complete without delay.

1. Cut existing construction to provide for installation of other components or performance of other construction activities and the subsequent fitting and patching required to restore surfaces to their original condition.

1.8 CUTTING

A. Verify underground or hidden electrical conduits, piping etc. have been identified before cutting.

B. Cut existing construction using methods least likely to damage elements retained or adjoining construction. Where possible, review proposed procedures with the original installer; comply with the original installer's recommendations.

C. When cutting, use hand or small power tools designed for sawing or grinding, not hammering and chopping. Cut holes and slots as small as possible, neatly to size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.

D. To avoid marring existing finished surfaces, cut or drill from exposed or finished side into concealed surfaces.

E. Cut through concrete and masonry using a cutting machine, such as a carborundum saw or a diamond-core drill.

1. Core drill all required small masonry openings.

F. Comply with requirements of applicable Division 31 Section Earthwork where cutting and patching requires excavating and backfilling.

G. Except as otherwise indicated in Divisions 23 and 26, comply with the following:

1. Cut-off pipe or conduit in floors, walls or partitions to be removed. Cap, valve, or plug and seal the remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after by-passing and cutting.

1.9 PATCHING

A. Patch with durable seams that are as invisible as possible. Comply with specific tolerances.

B. Where feasible, inspect and test patched areas to demonstrate integrity of the installation.

C. Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other Work. Patch with durable seams that are as invisible as possible. Provide materials and comply with installation requirements specified in other Sections of these Specifications.

D. Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.

E. Where removing walls or where partitions extends one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform color and appearance. Remove existing floor and wall coverings and replace with new materials as required by the contract documents to achieve uniform color and appearance.

1. Where patching occurs in a smooth painted surface, extend final paint coat over entire unbroken surface containing the patch after the area has received primer and second coat.
2. Where new work abuts or aligns with existing, perform a smooth and even transition. Patch work to match existing adjacent work in texture and appearance.
3. When finished surfaces are cut so that a smooth transition with new work is not possible, terminate existing surface along a straight line at a natural line of division. Make corrective action recommendations to the Contracting Officer.

F. Patch, repair, or re-hang existing ceilings as necessary to provide an even-plane surface of uniform appearance.

1. Patch or replace damaged, lifted, discolored, or imperfect portions of existing surfaces.
2. Repair substrate prior to patching finish.
3. Comply with United States Gypsum Company's "Gypsum Construction Handbook," 6th Edition, recommendations or corrective remedies for damaged gypsum board.

G. Plaster Installation: Comply with the manufacturer's instructions and installation thickness and coats as indicated.

1. Unless otherwise indicated, provide 3 coats work.
2. Finish plaster to match existing adjacent surfaces. Grind or sand lightly to remove trowel marks and arises.
3. Cut, patch, point-tip, and repair plaster to accommodate other construction.

1.10 FINISHES

A. Finish surfaces as specified in individual Product Sections.

B. Finish patches to uniform finish and texture over entire area. When Contractor cannot match finish, refinish entire surface to nearest intersections.

C. Cleaning:

1. Remove debris and abandoned items from the area and from concealed spaces.

2. Clean areas and spaces where cutting and patching are performed. Completely remove paint, oils, putty, and similar items. Thoroughly clean piping, conduit, and similar features before applying paint or other finishing materials. Restore damaged pipe covering to its original condition.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

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SECTION 01 77 00

CLOSEOUT PROCEDURES

(Edited from DeCA June 2011 Design Criteria)

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Administrative and procedural requirements for contract close-out, including but not limited to:

a. Phase Cleanup.
b. Phase Inspection.
c. Operating and Maintenance manuals and instruction.
d. Warranties and Bonds.
e. Record documents.
f. Final cleanup.
g. Final inspection.
h. Real property records.
i. Final acceptance.

1.2 SUBMITTALS

A. Refer to Division 01 Section Administrative Requirements for procedures.

B. Submittal Schedule:

1. Provide the indicated quantity.

C. Submittal List:

Reference	Submittal Item	Quantity	Action
1.5A	Maintenance Manuals	X	R
1.6C	Instruction Certificate	X	R
1.7H	Warranties	X	R
1.8B	Record Drawings	X	R
1.8C	Record Specifications	X	R
1.10A	QC Punch List	X	R
1.11	Real Property Records	X	R
1.11B	Equipment List	X	R

X Submit quantity specified in Division 01 Section Administrative Requirements.
R Review each submittal, mark to indicate action taken, and return.
I Submittal is for information or record purposes only. No action will be taken.

1.3 PHASE CLEANING (ADD/ALTER PROJECTS)

A. Prior to request for phase inspection, perform all necessary quality control and final clean actions. This includes working off all QC program punch list items and cleaning areas to a condition suitable for government occupancy.

B. Employ experienced workers for final cleaning. Clean each surface to the condition expected in a commercial building cleaning and maintenance program. Complete the following before requesting a phase inspection.

1. Remove labels that are not permanent labels.
2. Clean transparent materials. Remove glazing compound. Replace chipped or broken glass.
3. Clean exposed hard-surfaces finishes to a dust-free condition, free of stains, films and similar foreign substances. Restore reflective surfaces to their original reflective condition. Leave concrete floor broom clean. Vacuum and shampoo carpeted surfaces. Clean and prepare all floors according to the manufacturer's recommended procedures.
4. Wipe surfaces of mechanical and electrical equipment. Remove excess lubrication. Clean plumbing fixtures to a sanitary condition. Clean light fixtures and lamps.
5. Clean the site of rubbish, litter, and other foreign substances. Sweep paved areas and remove stains, spills, and other foreign deposits. Clean tire tracks from pavements and walks. Rake unpaved or unplanted grounds to a smooth even-textured surface.
6. Removal of Protection: Remove temporary protection and facilities.
7. Compliance: Comply with regulations of authorities having jurisdiction and safety standards for cleaning.
8. Remove waste materials from the installation and dispose of lawfully.

1.4 PHASE INSPECTION AND TURNOVER (ADD/ALTER PROJECTS)

A. Prior to turn over of any phase to the Government, submit a written request for an acceptance inspection to the Government. Do not submit request less than two weeks prior to the proposed inspection date. The Government will not accept a phase unless all construction, finishes, equipment, and systems are fully operational and there are no limits to the intended use of the area and systems in that phase or previously accepted phases. At their discretion, the Government may accept a phase with minor incomplete punch list items. If so, complete all punch list items in each phase accepted within two weeks of the date of acceptance.

B. At the conclusion of each phase's QC and final clean actions, submit, in writing, to the Contracting Officer, a request for phase inspection and turnover.

C. Commensurate with the request for phase inspection and turnover, provide the Contracting Officer with the following:

1. The CQC punch list and its current status. Include on a separate punch list all outstanding administration items required to complete the Work. The CQC punch list submitted in conjunction with the request for final inspection of a completed phase of the Work may list incomplete construction items as well as those completed construction items requiring minor adjustment or correction. However, the government will not perform the actual formal inspection until all construction items are complete and only minor adjustments or corrections remain to finish the Work.
2. Warranty dates.
3. Target punch list completion date.
4. A list of equipment with cost, model, and serial number.

D. A government team will inspect the areas, verify the Contractor's CQC punch list, and make any necessary corrections or additions to it. The punch list as modified by the government team shall represent a conformed punch list. The Contracting Officer will determine the Work to be complete only after the contractor completes all punch list items to the Contracting Officer's satisfaction.

E. Do not proceed with a subsequent phase until completion of all punch list and administration items on this current phase.

1.5 OPERATING AND MAINTENANCE

A. Maintenance Manuals: Furnish for approval six complete maintenance manuals for all materials and equipment. Organize maintenance data into sets of manageable size. Make each manual 8-1/2 inches by 11 inches, heavy-duty vinyl hard cover, 3 ring, loose leaf style, with pocket folders for folded sheet information and divider leafs with index tabs; be fully labeled in large, KROY or MERLIN letters on edge and front, etc. Insert master Index and tab by section in each binder. Mark identification on front and spine of each binder. Include the following information:

1. Part 1:

a. Photocopy of Project Manual Table of Contents with notations of submittals included in each maintenance manual.
b. Supplementary Index.
c. A master list of General Contractor and installing firms in each binder containing points of contact, e.g., names, telephone and fax numbers, addresses, etc.

1) Name, address, and telephone number of:

a) Architect.
b) Engineer.
c) Contractor.
d) Subcontractor.

2. Part 2:

a. Operating and Maintenance Instructions arranged by Specification Division with cross references to Project Manual. For each Division include:

1) Copies of warranties.
2) Appropriate design criteria.
3) Listing of equipment.
4) Parts list.
5) Spare parts list.
6) Operating instructions.
7) Manufacturer letters of certification.
8) Maintenance instructions - equipment.
9) Maintenance instructions - finishes.
10) Shop drawings and product data (government's copy of all accepted submittals).
11) Wiring diagrams.
12) Test reports (including, but not limited to):

a) Water purity.
b) Test and Balance report.

c) Water treatment.
d) Sound system.
e) Fire alarm system.
f) Sprinkler system.

13) Emergency instructions.
14) Recommended "turn around" cycles.
15) Inspection procedures.
16) Fixture lamping schedule.
17) Valve tag system.
18) Commissionable items.

a) Commissioning Pre and Functional checklists. See Commissioning specification for required documentation to be included.

1.6 OPERATIONAL AND MAINTENANCE TRAINING - CONTRACTOR PROVIDED EQUIPMENT AND SYSTEMS

A. Instructional time by manufacturer's representatives for special systems is in addition to below specified instructional time.

B. Notify the Government's Designated Inspector seven days prior to instruction sessions so he may be present.

C. Submit an Instruction Certification Letter prepared by the contractor and signed by the Contracting Officer and the contractor certifying that the below instruction is satisfactorily complete.

D. After the systems are fully operational and Government approval for O&M manual distribution and completed HVAC test and balance reports have been received, instruct the government's representatives in the operation and maintenance of the systems. The approximate number of trainees will typically number about 20. Coordinate with the Government's Designated Inspector. Provide trainers with at least 5 years experience in training operators and technical persons on the same system. Provide instructional material as handouts for each of these classes. This service includes:

E. Operating and Maintenance Instructions:

1. Arrange for the installer of equipment that requires regular maintenance to meet with the Government's personnel to provide instruction in proper operation and maintenance. Include a detailed review of the following:

a. Maintenance manuals.
b. Spare parts and materials.
c. Tools.
d. Lubricants.
e. Control sequences.
f. Hazards.
g. Warranties and bonds.
h. Maintenance agreements and similar continuing commitments.

2. As part of instruction for operating equipment, demonstrate the following procedures:

a. Start-up and shut-down.

b. Emergency operations.
c. Noise and vibration adjustments.
d. Safety procedures.

Discipline	Minimum number of trips to project	Minimum hours of instruction
Plumbing	2	4
HVAC	2	4
Electrical	2	4
Fire Protection	2	4
Refrigeration & RMCS	Comply with Division 23 Sections Product Refrigeration Systems, Refrigeration Monitoring and Control Systems (RMCS), and others as applicable	Comply with Division 23 Sections Product Refrigeration Systems, Refrigeration Monitoring and Control Systems (RMCS), and others as applicable

F. See Division 01 Section Demonstration and Training for additional operational and training requirements.

1.7 WARRANTIES AND BONDS

A. Warranty Dates:

1. Add/Alter Projects: The warranty periods for Add/Alter projects begin the date the government begins beneficial occupancy of that phase. Warranties for items such as refrigeration racks and piping, mechanical, and other electrical systems begin the day of beneficial occupancy (not component installation date) and acceptance of the last part of the system as a whole. The warranty period remains in effect for not less than one year. Refer to other sections of the specifications for particular items requiring warranty duration in excess of one year.
2. New Stores: The warranty periods begin on the date of beneficial occupancy (not component installation date) of the entire building. The warranty period remains in effect for not less than one year. Refer to other sections of the specifications for particular items requiring warranty duration in excess of one year.

B. Warranty Inspection:

1. Approximately nine months after the date acceptance, return to the Project with the Contracting Officer or Government's Designated Inspector, to conduct an inspection to determine whether the work completed by the Contractor is performing according to the requirements of the Contract Documents. Work not conforming to these requirements may be considered defective. The Contracting Officer or Government's Designated Inspector will prepare a comprehensive list of items for correction and, in cooperation with the Contractor, fix the time to correct or furnish all items on the list. Proceed promptly to correct items on the list.

C. Required Documentation. Provide the following:

1. See Divisions 02 through 33 Sections for specific requirements for warranties on products and installations.

2. The Contract Documents specify certifications and other commitments and agreements for continuing services to Government.

D. Disclaimers and Limitations: Manufacturer's disclaimers and limitations on product warranties do not relieve the Contractor of the warranty on the Work that incorporates the products. Manufacturer's disclaimers and limitations on product warranties do not relieve suppliers, manufacturers, and subcontractors required to countersign special warranties with the Contractor.

E. Definitions:

1. Standard product warranties are warranties published by individual manufacturers preprinted for particular products and specifically endorsed by the manufacturer to the Government.
2. Special written warranties required by or incorporated in the Contract Documents, either to extend time limits provided by standard warranties or to provide greater rights for the Government.

F. Warranty Requirements:

1. Related Damages and Losses: When correcting failed or damaged warranted construction, remove and replace construction damaged as a result of such failure.
2. Reinstatement of Warranty: When Work covered by a warranty has failed and been corrected by replacement or rebuilding, reinstate the warranty by written endorsement.
3. Replacement Cost: Upon determination that Work covered by a warranty has failed, replace or rebuild the Work to an acceptable condition complying with requirements of the Contract Documents. The Contractor is responsible for the cost of replacing or rebuilding defective Work regardless of whether the Government has benefited from use of the Work through a portion of its anticipated useful service life.
4. Government's Recourse: Expressed warranties made to the Government are in addition to implied warranties and do not limit the duties, obligations, rights, and remedies otherwise available under the law. Do not interpret expressed warranty periods as limitations on the time in which the Government can enforce such other duties, obligations, rights, or remedies.

    a. Rejection of Warranties: The Government reserves the right to reject warranties and to limit selection to products with warranties not in conflict with requirements of the Contract Documents.
    b. Where the Contract Documents require a special warranty, or similar commitment on the Work or part of the Work, the Government reserves the right to refuse to accept the Work, until the Contractor presents evidence that entities required to countersign such commitments are willing to do so.

G. Warranty Process:

1. Instruct and train the commissary staff on the warranty and notification process.

    a. Should the commissary require warranty service, the commissary will list in writing the symptom then Fax to the general contractor <u>and</u> the appropriate trade or supplier (if ascertainable by the commissary).
    b. The General Contractor within 24 hours, unless an emergency exists, follows up with the commissary and appropriate trade.
    c. The warranty item remains open until the subcontractor or supplier making the repair submits documentation and certification of warranty completion for signature to the Commissary Store Director.

H. Submittals:

1. Submit written warranties to the Contracting Officer prior to the final inspection.

a. When a designated portion of the Work is complete and occupied or used by the Government, by separate agreement with the Contractor during the construction period, submit properly executed warranties to the Contracting Officer within 15 days of completion of that designated portion of the Work.
b. When the Contract Documents require the Contractor, or the Contractor and a subcontractor, supplier or manufacturer to execute a special warranty, prepare a written document that contains appropriate terms and identification, ready for execution by the required parties. Submit a draft to the Government, through the Contracting Officer, for approval prior to final execution.
c. Refer to Divisions 02 through 33 Sections for specific content requirements and particular requirements for submitting special warranties.
d. Upon completion of construction, ownership of the building will be transferred to the Installation upon which the facility is located, via DD Form 1354 "Transfer and Acceptance of Military Real Property". Special warranties shall be issued to the Installation as identified in this Section, under paragraph "Real Property Records".
e. Form of Submittal: At final completion, compile each required warranty properly executed by the Contractor, or by the Contractor, subcontractor, supplier, or manufacturer. Organize the warranty documents into an orderly sequence based on the table of contents of the project manual. Include extended Warranties (for specific equipment with more than one year guarantee) such as:

1) Heat exchangers.
2) Refrigeration compressors.
3) Battery units.
4) Roof.

f. Bind warranties and bonds in heavy-duty, commercial-quality, durable 3-ring, vinyl-covered loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch paper.

1) Provide heavy paper dividers with tabs for each separate warranty. Mark the tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product, and the name, address, and telephone number of the installer.
2) Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project title or name, and name of the Contractor.
3) List in each binder a master list of the General Contractor and installing firms points of contract, including firm names, contact person, address, telephone, and FAX number.
4) When warranted construction requires operation and maintenance manuals, provide additional copies of each required warranty, as necessary, for inclusion in each required manual.

1.8 RECORD DOCUMENTS

A. General: Do not use record documents for construction purposes; protect from loss in a secure location; provide access to record documents for the Contracting Officer's reference.

B. As-Built (Record) Drawings: Maintain one clean, undamaged set of blue or black line prints of Contract Drawings and Shop Drawings at the job-site. Using red ink, mark up these drawings to

show the actual installation. Mark whichever drawing is most capable of showing conditions accurately. Give particular attention to concealed elements that would be difficult to measure and record later.

1. Update the set each month with all changes taking place during the previous period.
2. The Construction Contract Inspector will review the status of the Record Field Data monthly, prior to processing the Contractor's invoice for progress payment. The Contracting Officer may hold retention against any invoice should the data not be current at the time of the invoice.
3. At final completion of the work, submit for approval, record documents reflecting all additions, and revisions which vary from the Contract Documents.
4. Show all deviations in actual construction from the Contract Drawings, and note the type of material used whenever a material option is specified. Show these deviations in the same general detail utilized in the Contract Drawings.
5. Maintain full size marked-up drawings, survey notes, sketches, nameplate data, description, and serial numbers of all installed equipment. Maintain this information in a current condition at all times until completion of the work. The resulting field marked prints shall be referred to and marked as "Record Field Data," and shall be used for no other purpose.
6. Make set available for inspection by the Construction Contract Inspector whenever requested during construction, and submit them for approval at the completion of construction.
7. Delineate and locate dimensionally on the prints features not already shown on the Contract Drawings which are encountered by the Contractor during construction and which might interfere with future construction, such as pipes, conduits, electrical cables, or the like buried in the ground, in concrete, or otherwise hidden. Specifically record the following information:

    a. Locations of all Work buried under or outside each building, such as plumbing and electrical lines and conduits, points of connection with existing utilities, changes in direction, valves, manholes, catch basins, capped stub outs, invert elevations, etc
    b. Actual numbering of each electrical circuit.
    c. Locations of significant Work concealed inside each building whose general locations change from those shown on the Contract.
    d. Locations of all items, not necessarily concealed, which vary from the Contract Documents.
    e. Installed location of all cathodic protection anodes.
    f. Deviations from the sizes, locations, and other features of installations shown in the Contract Documents.
    g. Sufficient information to locate Work concealed in each building with reasonable ease and accuracy. In some instances, this may be by dimension, in others it may be in relation to the nearby building.

C. Store Record Documents apart from documents used for construction:

1. Provide files and racks for storage of Record Documents.
2. Maintain Record Documents in a clean, dry, legible condition and in good order. Do not store in work vehicles.
3. Organize record drawing sheets into manageable sets, bind with durable paper cover sheets, and print.
4. Place suitable titles, dates and other identification on the cover of each set.
5. Fifteen days prior to Request for Final Inspection, submit record drawings and specifications to the Contracting Officer review and approval.

D. Record Specifications:

1. Maintain one copy of the Project Manual, including addenda.
2. Mark to show variations in actual Work performed in comparison with the Specifications and modifications.
3. Give particular attention to substitutions, selection of options, and similar information on concealed or not readily discernible elements.
4. Note related record drawing information and Product Data.

E. Record Document Deliverable: Contractor shall provide the project records, specifications, and As-built Drawings in AutoCAD format on CD. Contractor shall ask the Contracting Officer what version of AutoCAD is acceptable prior to developing electronic version of As-Built Drawings.

1.9 FINAL CLEANING

A. Employ experienced workers for final cleaning. Clean each surface to the condition expected in a commercial building cleaning and maintenance program. Use cleaning products recommended by the manufacturer of the surface to be cleaned that comply with Green Seal's GS-37, or if GS-37 is not applicable use products that comply with California Code of Regulations maximum allowable VOC levels. Complete the following before requesting final inspection.

1. Remove labels that are not permanent labels.
2. Clean transparent materials. Remove glazing compound. Replace chipped or broken glass.
3. Clean exposed hard-surfaces finishes to a dust-free condition, free of stains, films and similar foreign substances. Restore reflective surfaces to their original reflective condition. Leave concrete floor broom clean. Vacuum and shampoo carpeted surfaces. Clean and prepare floors according to the manufacturer's recommended procedures.
4. Wipe surfaces of mechanical and electrical equipment. Remove excess lubrication. Clean plumbing fixtures to a sanitary condition. Clean light fixtures and lamps.
5. Clean the site of rubbish, litter, and other foreign substances. Sweep paved areas and remove stains, spills, and other foreign deposits. Rake unpaved or unplanted grounds to a smooth even-textured surface.
6. Removal of Protection: Remove temporary protection and facilities.
7. Compliance: Comply with regulations of authorities having jurisdiction and safety standards for cleaning.
8. Remove waste materials from the installation and dispose of lawfully.

1.10 FINAL INSPECTION

A. Before requesting final inspection, complete the following:

1. Restore permanent facilities consumed during the construction period including, but not limited to, the following:

   a. Replace filters and clean inside of ductwork and housings.
   b. Replace significantly worn parts and parts subject to unusual operating conditions.
   c. Replace lamps burned out or noticeably dimmed by hours of use.

2. Generate a QC management team punch list, submit the list to the Government's Designated Inspector, and then work off the list in its entirety.

3. Submit specific warranties, maintenance agreements, final certifications and similar documents.
4. Submit record drawings, maintenance manuals, equipment brochures, warranties and bonds, and similar final record information.
5. Change over permanent locks and transmit keys to the Contracting Officer.
6. Complete start-up testing of systems, commissioning, and Government's personnel training. Remove temporary facilities from the site, along with construction tools, mock-ups, and similar elements.
7. Complete final clean. Touch up, repair, and restore marred exposed finishes.

B. Inspection Procedures:

1. Certify the following, in writing:

a. The contractor has inspected its work.
b. All punchlist work is complete.
c. All work is complete and the facility is ready to occupy.

2. Attach the written certification to a request for final inspection and forward to the Contracting Officer.
3. The Contracting Officer will arrange for Government inspection personnel to perform the inspection. After the inspection, the Contracting Officer will advise the contractor of the work necessary before the Government can accept the project and the work remaining for the contractor to complete the project.

C. Results of the completed inspection will form the basis of requirements for final acceptance.

1.11 REAL PROPERTY RECORDS

A. 30 Days prior to Beneficial Occupancy and under the direction of the Real Property Accounting Officer from the military installation of the project site, prepare the DD Form 1354, "Transfer and Acceptance of Military Real Property" and submit to the Contracting Officer.

B. As an attachment to the DD Form 1354, provide a list of Government-furnished / Contractor-installed items and Contractor-furnished / Contractor-installed items.

1. List the following for each item:

a. The complete nomenclature of each item.
b. Manufacturer.
c. Model number.
d. Serial number.
e. Electrical rating, all nameplate data.
f. Capacity.
g. Other pertinent information.
h. Cost of each item.

2. List items including but not necessarily limited to, the following:

a. Electrical equipment (transformers, lighting fixtures, metering equipment, overhead door operators, exterior floodlights and poles, fire alarm and burglar alarm systems, etc., including the cost of each item).

b. Mechanical equipment (commercial refrigeration equipment, heating equipment, air conditioning system equipment, pumps, boilers, boilers, sprinkler, meters, and other items of mechanical equipment, including the cost of each item).
c. Other items considered Real Property Installed Equipment, including the cost of each item.

3. The following attachment is at the end of this Section:

a. DD Form 1354 Preparation File. This file contains a link to a fillable PDF 1354 form. Instructions on how to fill out each block of the form and a DD Form 1354 Check list.

1.12 PARTS

A. Provide written receipt signed by Commissary Store Director for all "loose" items turned over such as:

1. Electric panel keys.
2. Extra air filters.
3. Special wrenches, tools, etc.
4. Extra fuses.
5. Extra chemicals.
6. Extra sprinkler heads.

1.13 FINAL ACCEPTANCE

A. Before requesting inspection for certification of final acceptance and final payment, submit a copy of the final inspection list stating that each item is complete or otherwise resolved for acceptance.

B. Re-inspection Procedure: The Contracting Officer will re-inspect the Work upon receipt of notice that the Work is complete, except items whose completion delayed because of circumstances acceptable to the Contracting Officer.

C. Upon completion of re-inspection, the Contracting Officer will prepare a certificate of final acceptance, or advise the Contractor of Work that is incomplete or obligations unfulfilled.

D. If necessary, the government will repeat re-inspection. Contractor will bear all expenses the Government incurs, including repeat travel, for re-inspection if the Government determines phase or final inspection was not ready for inspection.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

DD FORM 1354 CHECKLIST

General Data Required:

1. Building:

1.1. Outside dimensions: SM _____
- A. Main building: SM _____
- B. Wings SM _____
- C. Offsets SM _____

1.2. Number of floors:

1.3. Construction:
- A. Foundations (such as concrete) TYPE _____
- B. Floors (such as wood, concrete) TYPE _____
- C. Walls (such as wood siding) TYPE _____
- D. Roof (such as built-up, shingle) TYPE _____

1.4. Utilities entering building:
- A. Water (size of pipe) _____
- B. Gas (size of pipe) _____
- C. Sewer (size of pipe) _____
- D. Electric (phase, voltage, wire, connected load) _____

1.5. Landscape:

2. Systems in building:

2.1. Fire Protection:

Category Code	Nomenclature	Unit of Measure	Quantity		Cost
880-211	Clsd Hd Auto Spklers	SM			
	Number of Sprinkler Heads	EA			N/A
880-212	Open Hd Deluge Sys	SM			
	Number of Sprinkler Heads	EA			N/A
880-221	Auto Fire Detection Sys	SM			
	(Heat Detectors)	EA			
	(Horns)	EA			
	(Alarm Bells)	EA			
	(Smoke Detectors) (____)	EA			
	(Manual Pull Station)	EA			
880-222	Manual Fire Alarm Sys	EA			
880-231	CO_2 Fire Sys	EA			
880-232	Foam Fire Sys	EA			
880-233	Other Fire Sys	EA			
	(Smoke Detectors) (___)				
	(Standpipe Connections) (___)				
	(Dry Chemical Sys) (___)				

Category Code	Nomenclature	Unit of Measure	Quantity		Cost
2.2. Security:					
872-841	Security Alarm Sys	EA			

3. Plants in Building:

Category Code	Nomenclature	Unit of Measure	Quantity		Cost
890-126	A/C Window Units	TN			
890-125	A/C Plt < 5 TN	TN			
		SM			
890-121	A/C Plt 5 to 25 TN	TN			
826-122	A/C Plt 25 to 100 TN	TN			
821-115	Heating Plt 750-3500 MB	MB			
821-116	Heating Plt > 3500 MB	MB			
811-147	Elect Emergency Power Generator	KW			
	Strg Tank for Heat	GA			

4. Real Property Installed Equipment:

Category Code	Nomenclature	Unit of Measure	Quantity		Cost
890-126	A/C Window Units	TN			

Item	Size		Amount	Description
Evaporative Coolers		L/S/M²		
Hot Water Heater				
Exhaust Fans				
Lavatory				
Water Closet				
Urinal				
Utility Sink				
Refrigerated Drinking Fountain				
Heating Plt < 750 MB		MB		
Forced Air Heating				
Other Heating				
Dehumidifiers				
Elevator				
Other				

5. Related Facilities:

Category Code	Nomenclature	Unit of Measure	Amount	Cost	Description
812-223	Prim Distr Line OH	LM			
	Transformer	KVA			
	Power Poles	LM			
812-224	Sec Distr Line OH	LM			
812-225	Prim Distr Line UG	LM			
812-226	Sec Distr Line UG	LM			
812-926	Exterior Lighting (Street or Parking Area Lights)	EA			
824-464	Gas Mains	LM			
831-169	Sewage Septic Tank	KG			
832-266	Sanitary Sewer	LM			
842-245	Water Distr Mains	LM			
843-315	Fire Hydrants	EA			
851-143	Curbs and Gutters	LM			
851-145	Driveway	SY			
851-147	Road	SY			
		LM			
852-262	Vehicle Parking	SY			
871-183	Storm Drain	LM			
872-247	Fence, Security	LM			
872-247	Fence, Interior	LM			
852-289	Sidewalk	SY			
890-187	Utility Vault (4 or more transformers)	SF			
135-583	Tel Duct Facility	LM			
135-586	Tel Pole Facility	LM			

6. Other project equipment for which real property accountability will be transferred to the installation.

Nomenclature	Unit of Measure	Amount	Cost
Built-in Furniture (Seating, Cabinets, Counters, Shelving, etc.)	EA		
Garbage Disposers	EA		
Automatic Doors	EA		
Dock Levelers and Seals	EA		
Fire Extinguishing Sys	EA		
Alarm Systems	EA		
Dehumidification Sys	EA		

7. Equipment which DeCA retains possession and accountability for:

Nomenclature	Unit of Measure	Amount	Cost
All refrigerated and non-refrigerated display cases and shelving units, display units, and display carts and tables.	EA		
All operating equipment, furniture and machines including processing and storage racks and equipment tables, scales, ovens, grinders, slicers, saws, labelers, wrappers, testers, tenderizers, mixers, proofers, retarders, glazers, icing centers, office furniture, and equipment, systems furniture.	EA		
All checkout equipment including scanners, cash registers, scales, checkout counters, checkout stand lights, queuing directors, and assorted equipment.	EA		
All product refrigeration and storage systems including walk-in coolers and freezers, assorted refrigeration systems, controls and monitoring devices.	EA		
Communication systems.	EA		
Background music system.	EA		
Emergency generators and transfer switch.	KW		

8. Cost of planning and design and other costs associated with the provision of architectural and engineering services for design and construction of a commissary facility.

Nomenclature	Unit of Measure	Amount	Cost

9. Cost of construction management activities, other than in-house efforts, to provide construction surveillance and oversight management during construction.

Nomenclature	Unit of Measure	Amount	Cost

10. Alteration or Rehabilitation of a Building or Facility

Nomenclature	Unit of Measure	Amount	Cost
Demolition cost	SF		
Addition or Deletion of	SF		
Related Facilities	SF		

EXCERPTS FROM UFC1-300-08-EDITED FOR DeCA
CHAPTER 1
GENERAL INFORMATION PERTAINING TO THE DD FORM 1354

The most important aspect of the revised procedure is the requirement for the construction contractor to provide the PMAC provider and the PMAC provider to provide the client with an 'interim' DD Form 1354 with all relevant data 30 days prior to the Beneficial Occupancy. This form must contain details of the construction project sufficient to establish or update a real property record. When the project is complete, both DeCA and the installation will update their facility records and CIP accounts to reflect transfer and acceptance of the new capital asset.

The DD Form 1354 functions in government as the deed and is often the most important source document for the records. It binds the transaction.

REFERENCE. For a complete itemization of the DD Form 1354, the UFC 1-300-08 in its entirety is available via the web. This document describes all aspects and requirements for the proper completion and submission of the DD Form 1354. Chapter 1 covers the target audience for this UFC, the various usages of the DD Form 1354, and who prepares it. Chapter 2 describes the data required to prepare a completed form. Chapter 3 describes the three different versions of the DD Form 1354 and when to use each version. Chapter 4 explains how the Realty Specialist uses the data from the completed form to enter data into the real property database and how the construction contractor uses the data to manage the CIP Account. Chapter 4 also explains how to document various real estate transactions. Chapter 5 provides guidance to the construction contractor to ensure that total project cost equals the sum of individual facilities costs. Chapter 6 lists the standard attachments to the 1354 and sets acceptance standards for completeness, timeliness and accuracy to help the accepting official know whether the DD Form 1354 should be accepted or rejected based on objective standards. There is a glossary of terms and appendices showing the DD Form 1354, instructions for each block or data field, a building information checklist, and several lists of codes. Although related to the transfer and acceptance of military real property, this UFC does not address USACE/NAVFAC/DPW/FacMgr/BCE/DIS procedures for:

- How to track planning and design costs for a construction project or
- How to enter project costs in the CIP or work-in-progress account.

OVERVIEW. This UFC handbook describes five different job positions that perform the required tasks. The five positions are: construction contractor who is responsible for the preparation of the DD Form 1354 (DeCA/ PMFM) RPAO who accepts and accounts for individual facilities, Realty Specialist who enters real property data into the real property database, DPW/ FacMgr/ BCE who is involved in master planning, construction, real property maintenance, and real property accountability; and the funding organization/activity who is the customer for the facility or project (HQ DeCA). The term construction contractor means the designated person to whom the construction organization assigns the responsibility to prepare the DD Form 1354. Under DeCA/PMFM contracts the person responsible to complete the 1354 is the construction contractor.

WHO PREPARES THE DD FORM 1354? For DeCA/PMFM construction projects the Construction contractor prepares the draft DD Form 1354. The Contractor submits the form to the Technical Inspector who in turns submits the form to the PMAC Core Team manager for processing through the DeCA/PMFM office.

CHAPTER 2
PREPARING THE DD FORM 1354

This chapter provides detailed block-by-block instructions for each data element, with examples and a description of "where the data come from."

FORMAT AND INSTRUCTIONS. The DD Form 1354, Transfer and Acceptance of Military Real Property, was revised to better meet the requirements of the CFOA, implement audit recommendations, and ensure consistent reporting of the cost of facilities. The DD Form 1354 is provided as Appendix B. Note that the backside of the form provides a brief description for each block on the form. Appendix C of this UFC replaces the instructions for filling out the DD Form 1354 that are currently contained in FMR 7000.14-R, Volume 3, Chapter 17, Appendix B. These FMR Appendix B instructions contain more detail than the form backside instructions, but less than the detailed instructions in this chapter, which are the most comprehensive and contain examples.

REQUIRED DATA. The essential information required for the transfer and acceptance of real property is documented on the DD Form 1354 and this information supports entries into the installation's real property accounting system. The format has 28 data blocks. Because this form is used for the variety of purposes, not all of the data blocks are required for each usage. When a block is not to be filled out for a particular usage, enter N/A for "not applicable." There should be no blank data fields except in the block 23, Item Remarks column, where blanks are allowed.

Installations should review and approve the draft DD Form 1354 as part of their review of other the construction contractor's submittal prior to submission to the PMAC Core Team.

The DD Form 1354, Transfer and Acceptance of Military Real Property, requires the preparer to provide specific information about the project. Information such as description of the real property facilities, category codes and sizes, costs, fund source(s), contract number(s), facility numbers, and as built drawing numbers, is typically required. For real estate transactions, the real estate instrument (document) contains much of the required information.

For Military Construction projects the DD Form 1391, Military Construction

Project Data and the project folder contain some of the information that is needed on the DD Form 1354. The Table below shows a crosswalk from equivalent data fields in the DD Form 1391 to the DD Form 1354. The latest DD Form

1391 should be validated by the DeCA/PM prior to use in preparing a DD Form 1354. The DD Form 1391 is available as an attachment on the DeCA FACTS Website.

Table 2-1. Crosswalk from 1391 to 1354

DD Form 1391		DD Form 1354	
Block Number	**Block Name**	**Block Number**	**Block Name**
3	INSTALLATION & LOCATION	6	SITE/INSNO/NAME
6	CATEGORY CODE	12	CATEGORY CODE
7	PROJECT NUMBER	3	PROJECT/JOB NUMBER
9	COST ESTIMATES		
	ITEM	10	ITEM NO.
	U/M	15/17	UNIT OF MEAS.-1 or 2
	QUANTITY	16/18	TOTAL QUANTITY 1 or 2
	COST	19	COST
10	DESCRIPTION OF PROPOSED CONSTRUCTION	28	PROJECT REMARKS. Helps overall project understanding

INSTRUCTIONS TO PREPARE DD FORM 1354 DATA FIELDS. The page number and the total number of pages comprising each 1354 project or transaction shall be shown in the space provided at the top right-hand corner of the form. When two or more pages are required to describe the information required for blocks 1 through 23, then blocks 24 through 26 (signatures and voucher number) shall be completed only on the first or signature page. Signing officials should initial subsequent or unsigned pages and line through the Property Voucher Number block on all except the signed page. The remainder of this chapter explains in detail what the data are and where data come from to complete the individual data element blocks on the DD Form 1354. A single example is used for all the example entries to the DD Form 1354 data fields in the remainder of this chapter. The example is a Military Construction, Army (MCA) project to construct a new battalion headquarters and classroom, and associated structures and utilities. A summary of these instructions is provided as Appendix C for quick reference and for publishing in the next update of the FMR.

Block 1. [FROM]. Enter in block 1 Defense Commissary Agency (DeCA). You should include the full address and zip code.

Example: Defense Commissary Agency (DeCA)
2250 Foulois Street
Lackland AFB, TX 78236

Block 2. [DATE PREPARED]. Enter the date the DD Form 1354 is prepared. Use the DoD standard YYYYMMDD format for all dates. This is the date used to track different editions when revisions are necessary. The form is considered prepared when it is ready for signatures in blocks 24 and 25.

Example: Use 20040115 for date: 15 JAN 2004

Block 3. [PROJECT/JOB NUMBER]. Enter the project number assigned to identify the project on a DD Form 1391 for new military construction (MILCON) or the job order number for other projects.

Examples: DD Form 1391 project number might be EA01MP01.

Block 4. [SERIAL NUMBER]. This is the document number assigned to the 1354 by DeCA/ PMFM. This shall be left blank by the construction contractor and PMAC.

Block 5. [TO]. Enter the name of the receiving organization or agency to which the transfer will be made. This receiving organization could be the DPW/FacMgr/BCE/DIS on a DoD installation that has been assigned the responsibility for accounting for the real property. Always include the address, zip code, and installation number – the unique identifier of the installation - which the RPAO represents. Installation numbers are available from individual service databases of installations or can be provided by the gaining installation Realty Specialist.

Example: Engineering Plans & Services Division
Directorate of Public Works
Fort Riley, KS 66442-6000
INSNO 20605

Block 6. [SITE/INSNO/NAME]. Site number or installation number of the actual facility physical location is one of the first points of entry into the database. Enter in block 6 the site number identifier or installation number (INSNO) and site name where the facility being transferred/accepted is physically located. Enter this number and name regardless of whether it is the same or different from the location of the RPAO (which is identified in block 5).

Example: 20605/Riley (In this example it happens to be the same as the identifier in block 5).

Block 7. [CONTRACT NUMBER(S)]. Enter the construction contract number (multiple contract numbers if applicable) in this block. Include the delivery order number in addition to the contract number if the contract could authorize work under different delivery orders that are not related to the project described in the final DD Form 1354.

Example: DACA31-98-D-0052.

Block 8. [DRAWING NUMBER(S)]. Enter the drawing number(s) or CAD identifier(s) of the project components. All drawing numbers that may be needed as a future reference to the project should be identified in this block.

NOTE. There is not a one-to-one correspondence between drawings and Item Numbers in column 10. For example, HVAC system drawings should be identified in block 8, but the HVAC system is not listed as a separate Item Number. Identify the facility or system associated with the drawing number or use a range of drawing numbers if consecutive and more than one drawing. Use Project Remarks, block 28, for additional space.

Example: B-9301 through B-9309; 47-018-1234; F 711-13-01

Block 9. [TRANSACTION DETAILS]. This block is divided into four subparts. Subpart A identifies the type of construction activity for this project. Subpart B identifies the reason that the DD Form 1354 is being issued in terms of an event. You must explain an "other" check for either section A or B in block 28, Project Remarks, on the back of the form. Subpart C identifies the version of this DD Form 1354. Subpart D identifies the Effective Date for the transaction described by the checkboxes in block 9.

Subpart A of Block 9 Type of Construction Activity. Insert an X in the appropriate box of subpart A to indicate whether the transaction involves acceptance of new construction, transfer of existing facilities, capital improvements to existing facilities, or some other type transaction. Check only one box. Definitions follow:

New construction. Acceptance of accountability for a facility that did not previously exist

Existing facility. Transfer of accountability for an existing facility

Capital improvement of an existing facility. Increases the facility size or capacity, useful life, or operating efficiency of an existing facility

Other. If the "Other" checkbox is checked, the preparer explains the transaction in Project Remarks (block 28), on the back of the DD Form 1354. Examples for marking "Other" are for occurrences such as real property inventory adjustment or capital decrease.

Subpart B of Block 9 When/Event. Insert an X in the appropriate box of subpart B to indicate when (in terms of an event) the DD Form 1354 is issued. The checkboxes are arranged in order of which box you should use with the first box being the most desirable, if it applies. Check only one box and the first box that applies.

PHYS COMPL/AVAIL – (Physical Completion/Available for Use).

Check this box when the entire facility(ies) described on the DD Form 1354 is substantially complete (except for deficiencies noted on the back) and the entire facility(ies) is being made available for use at the time of transfer. Beneficial occupancy usually occurs at this point. If beneficial occupancy occurs before the facility is complete, check BENF/O or Partial BOD as explained below.

BENF/O – (Beneficial Occupancy). Check this box when the transfer or acceptance of the whole facility occurs at the time of beneficial occupancy by the tenant, but the facility is not considered physically complete. Partial Beneficial Occupancy (BOD) is explained below.

Partial BOD – (**Partial Beneficial Occupancy)**. Check this box when the transfer or acceptance documented by this interim DD Form 1354 is for only a portion of a facility (such as one wing of a new hospital) or is for a phased turnover of one or more facilities in a multiple facilities project. Turnover of each phase at partial BOD would have its own interim 1354 and unique Army Property Voucher Number. Air Force and Navy Partial BOD DD Forms 1354 will all have the same Voucher Number. Partial BOD DD Forms 1354 will all have the same project number for all services.

Financial Completion. Check this box when the DD Form 1354 is used to change costs on an interim 1354 to reflect the final costs against the project. Project financial completion occurs after the entire project costs have been accumulated. This may occur many months or years after a project's physical completion. Checking financial completion means that the contractors have received final payment for the project, all project management costs are included, and no additional costs will be incurred against this project. If final costs are available at physical completion or BOD, you would only check the box "Physical Completion" or "BENF/O" in subpart 9B. Therefore indicate final costs by checking "Final" in subpart C.

Other. Check the "Other" box when the transfer or acceptance occurs at an
event time other than the four cases described above; explain the "Other" checkbox for the event in Project Remarks (block 28) on the back of the DD Form 1354.

Subpart C of Block 9 Version. Use the DD Form 1354 subpart C to
indicate whether the DD Form 1354 is a draft, interim, or final version. Normally costs are recorded on an interim 1354. Costs on an interim 1354 are assumed to be preliminary costs. Costs on the final DD Form 1354 are the final costs. If the 1354 were issued for financial completion only, use the checkbox for financial completion in subpart 9B and check "Final" in subpart 9C. If the 1354 is issued at Physical Completion with final costs, then check Physical Completion in 9B and check "Final" in 9C; there would be no reason to create an additional 1354 for financial completion since the final costs would already be documented.

Subpart D of Block 9 Effective Date of Transaction. Enter the effective date for the transfer or acceptance in standard format YYYYMMDD. NOTE. The effective date of the transaction is the earlier of BOD or Date Available For Use, and is the date from which the accounting system should depreciate the cost of the facility. If the project has multiple facilities, each facility may have a different effective date.

Example: Use 20040115

Block 10. [ITEM NUMBER]. A key step in the preparation of a DD Form 1354 is to identify the various components or items of the project. Enter a separate Item Number line for each new facility, and for each facility addition, capital improvement, or deletion, including additions to or deletions from utility systems or other previously existing facility records. If there are more items than fit on a single page, use additional DD Forms 1354.

Do not create an excessive level of detail in the item listings. As a minimum, observe the following rules for determining individual items.

- Identify each facility with a unique item number.
- If the facility has more than one usage, identify each usage of the multi-purpose facility with the appropriate facility category code and units of measure. List these multiple uses such that the multi-purpose facility has one item number and several different lines, one for each category code.
- If land is purchased as part of the project, show land as a separate line item.

There are two ways to account for the demolition portion of the project and to document the reduction of real property. You may either attach an Authorization for Demolition (e.g., DA Form 337 or equivalent form for other Services) to document category codes and quantities of demolished real property separately from constructed/transferred Item Numbers or, in lieu of this attachment, indicate as additional DD Form 1354 Item Numbers, all demolished real property facility numbers and category codes using negative numbers (shown in parenthesis) for units of measure and N/A for costs in Item 19.

Do not show demolished facilities on the 1354 if the attached demolition document has all the required information to subtract demolished facilities from the real property inventory.

Attach separate lists of installed building equipment (IBE) (real property) and equipment in place (EIP) (personal property equipment such as bakery/deli equipment, cases etc that remain property of DeCA) to the DD Form 1354. This allows for the detailed equipment listings without cluttering up the 1354. The preparer, in conjunction with the Realty Specialist, should use judgment in determining the amount of detail provided for equipment.

Block 11. [FACILITY NUMBER]. Enter the Facility Number (FACNO)
assigned to each Item Number. The Facility Number is a unique, real property accountability alphanumeric, for each facility on an installation according to the Installation/Base Master Numbering Plan. Some installations have consolidated records for pavements and utilities and the additional pavements and utility distribution lines must be added to an existing facility number. The installation RPAO provides these numbers to the construction agent early in the construction phase.

Block 12. [CATEGORY CODE]. In block 12, record the five or six digit design use category code for each affected facility usage itemized in block 10. When a constructed facility has more than one design use, each usage over 1,000 SF must be identified as a separate line under the same Item Number. Facilities listed may be land, buildings, utilities, or structures and must be classified as the correct facility category in accordance with the service implementation of DODI 4165.3 (e.g., Army real property classification system prescribed in DA Pamphlet 415-28, Guide to Army Real Property Category Codes; NAVFAC P-72, Facility Category Codes; or Air Force Handbook 32-1084, Facility Requirements). These reference documents provide the facility category code, category description, and the various units of measures associated with each facility category. Prior to initiating any work on a DD Form 1354, the construction agent should coordinate with the receiving agency RPAO and develop a draft category code/real property classification plan that can be used for development of the various items on the DD Form 1354 for this project. A draft 1354 shall be provided as a submittal for review and approval by the installation DPW/FacMgr/BCE.

Block 13. [CATEGORY CODE DESCRIPTION]. Use the service implementation of DODI 4165.3 (e.g., DA PAM 415-28, NAVFAC P-72, or Air Force Handbook 32-1084) to determine the correct facility category code short title as the verbatim description that corresponds to the category code entered in block 12.

Block 14. [TYPE]. Indicate the type of construction: P = Permanent, S = Semi-permanent, and T = Temporary. For definitions of each type of construction see Draft DODI 4165.14, DOD Real Property Inventory Reporting and Forecasting, or Service real property regulations.

NOTE is for Blocks 15 through 18. Each Service category code reference stipulates an area or a capacity/other unit of measure, or both. If both units of measure are stipulated in the reference, then both are required on the DD Form 1354. If only one measure is required, place N/A in the other two columns.

Block 15. [UNIT OF MEASURE-1; AREA]. Enter in this column the appropriate Unit of Measure for area for each design use category code for each item of real property, i.e., only SF, SY, or AC. The service implementation of DODI 4165.3 (e.g., DA PAM 415-28, NAVFAC P-72, or Air Force Handbook 32-1084) identifies the appropriate area unit of measure for each real property category code.

Block 16. [TOTAL QUANTITY-UM 1]. Enter the total quantity of area for the Unit of Measure-1 for each item of real property. For buildings, enter the gross area. For demolition, enter negative numbers in parenthesis or attach an Authorization for Demolition.

Block 17. [UNIT OF MEASURE-2; CAPACITY/OTHER]. Enter in this column the appropriate Unit of Measure for capacity/other for each design use category code for each item of real property. The service implementation of DODI 4165.3 (e.g., DA PAM 415-28, NAVFAC P-72, or Air Force Handbook 32-1084) identifies the appropriate capacity/other unit of measure for each real property category code.

Block 18. [TOTAL QUANTITY-UM 2]. Enter the total quantity of capacity/other for the Unit of Measure-2 for each item of real property. For demolition, enter negative numbers in parenthesis or attach an Authorization for Demolition.

Block 19. [COST]. One of the primary purposes of the DD Form 1354 is to identify the cost of individual facilities contained in the construction project. These costs are required as part of the Service's Financial Statements. The preparer must identify the total project cost as well as costs assigned to each facility that is part of the project. Only one cost per item number (facility) is allowed in column 19. All costs of a multi-purpose facility should be shown against the primary category code for that facility, and the other categories of the multi-purpose facility should be annotated as N/A in column 19. The construction agent must provide distinct break out costs for each different building, utility, and structure constructed as part of this project. For example, if the project consists of two buildings, parking, sidewalks, water supply branch lines, sewer branch lines, and exterior lighting, you need different costs for the seven items in block 10. Each building and structure (parking and sidewalks) and each utility would have a cost in block 19.

The real property accounting system should record only capital costs in the
general ledger Plant, Property, and Equipment (PP&E) account for financial statements. Therefore, for capital improvements to existing facilities, preparers should only record the capital costs for the capital improvements to the existing facility. Do not enter any repair work costs on the 1354 since repair costs are not capitalized.

If demolition is within the footprint of a new construction project, then demolition costs are considered site preparation costs and included as part of the individual new facility costs. If demolition is not in the footprint of new construction, the demolition cost is expensed and does NOT get included as part of the capitalized cost of the project.

Costs provided in a DD Form 1354 can be either preliminary or final. Costs on the draft (if any) and interim version DD Forms 1354 are preliminary costs. Costs on a final version DD Form 1354 are the final costs. The office preparing an interim 1354 must maintain a suspense file to ensure that the accepting RPAO is furnished an updated DD Form 1354 with the final construction costs upon financial closeout. Final costs are generally available in several months or, if legal claims are involved, one or more years after physical completion and facility transfer. Use estimated costs only for real property assets found on post, or for other existing facilities with unknown original construction costs. In these cases, the estimates are the final costs.

To comply with the CFOA, the preparer should place the total project cost in Project Remarks (block 28) broken out in four components of total project cost as:

(1) planning and design (P&D) including project management costs (pre-award), (2) construction contract supervision and administration (S&A) (also known as supervision, inspection, and overhead (SIOH) and including post-award project management costs);

(3) the construction costs (including site preparation which also includes demolition of footprint facilities), and

(4) project funded equipment costs. The sum of these four cost components is the total project cost and should equal the sum of the individual facility costs shown in column 19 on the front of the 1354 plus the equipment-in-place costs that are transferred as personal property and shown only in Project Remarks (block 28). The construction agent prorates P&D and S&A costs among the facilities comprising the project and includes the prorated P&D and S&A costs in the facility costs in column 19 for each facility. Estimated costs may be used to prorate P&D and S&A costs to the individual Item Number in column 10.

For real estate acquisitions, the preparer should list the cost in column 19 as the sum of real estate transaction costs and the actual purchase or fee costs. Show these two components of real estate costs in Project Remarks (block 28).

For real estate transfers, the preparer should list the cost in column 19 as the sum of real estate transaction costs and the actual costs that were on the losing agency's facility records. Show these two components of real estate costs in Project Remarks (block 28).

Block 20. [FUND SOURCE]. When recording costs, the preparer needs to identify the types of funds obligated or lines of accounting for the funds. It is important for compliance with CFOA to identify the DoD fund source in this column for each facility. Each Item Number could be funded from a different fund source and some facilities could even have a combination of fund sources. When there is more than one fund source for a single facility, show both fund sources with percentages of each. The construction authorization document usually identifies the fund source(s) or lines of accounting. Appendix E provides the complete list of standard abbreviations for DoD fund sources. Use space in Project Remarks (block 28) for continuation of data that does not fit in column 20.

Example: MILCON 75%/O&M 25%

Block 21. [FUNDING ORGANIZATION]. Identify the organization responsible for replacing this facility at the end of its useful life (e.g., Army, Air Force, Navy, Marine Corps (specify component for each service), DLA, DeCA, TMA, etc.). Appendix F provides the complete list of standard abbreviations for DoD Funding Organizations.

Example: ARMY

Block 22. [INTEREST CODE]. Document the government's interest or ownership in the facility (e.g., DoD owned, leased, State owned, privately owned, etc.). Interest reflects ownership from a legal perspective, not who has control of, or accountability for, the facility. Appendix G provides the complete list of DoD Interest Code descriptions and abbreviations. Use the abbreviation rather than the code since the Services has similar interest codes that could indicate a different ownership.

Example: DoD-owned

Block 23. [ITEM REMARKS]. Use this column to note any information or remarks about the specific Item Number from column 10. There is no need to duplicate the project level remarks that appear in the Project Remarks (block 28) on the back. You should explain any prorating of costs among various items. Also explain any removals or demolitions, such as demolition to make room for footprint construction. Also use space in Project Remarks (block 28) for continuation of data that does not fit in column 23.

Block 24. [STATEMENT OF COMPLETION]. This block is for the signature and title of DeCA/ PMFM. The signing authority is certifying that the following Statement of Completion printed on the DD Form 1354 is true: "The facilities listed hereon are in accordance with maps, drawings, and specifications and change orders approved by the authorized representative of the using agency except for the deficiencies listed on the reverse side." Enter the title of the signing official. Enter the date at the time of signature. The date must be prior to, or the same as, the date of acceptance in block 25 on the DD Form 1354 in order to transfer simultaneously property responsibility and accountability. Use the standard date format YYYYMMDD.

Block 25. [ACCEPTED BY]. This block is for the signature and title of the individual, normally the RPAO, responsible for accepting accountability for the properties described on the DD Form 1354. Enter the title of the actual signing official. Enter the date at the time of signature. The date must be after, or the same as, the date of transference in block 24 on the DD Form 1354. Use the standard date format YYYYMMDD. Once the 1354 is signed, the RPAO will provide the 1354 to the Realty Specialist on the day of acceptance for entry into the real property database. The signing authority is accepting accountability for the real property facilities described on this DD Form 1354 in the quantities and for the costs listed in columns 10 through 22. The facilities accepted should have been inspected and determined to meet standards except for the deficiencies listed in block 27 on the reverse side. For real property adjustments signed by the RPAO in block 24, enter N/A in the three blocks for acceptance (Accepted by, Title, and Date Signed).

Block 26. [PROPERTY VOUCHER NUMBER]. The preparer of the document should leave this field blank. The receiving installation RPAO will fill in the property voucher number when the DD Form 1354 information is recorded in the installation real property voucher register, such as a Register of Vouchers to a Stock Record Account, DA Form 272 for the Army. This voucher number is the next sequential number assigned in the register by the Real Property Office. For additional information concerning vouchers and voucher registers, see DA PAM 405-45, Real Property Inventory Management or other service publication.

Example: V-20040023 where V indicates a voucher number and the first four digits (2004) is the fiscal year and the last four digits (0023) is a four-digit sequence number.

Block 27. [CONSTRUCTION DEFICIENCIES]. Enter any significant construction deficiencies for the project. Do not list any perceived deficiencies in the scope or design of the project on this document, as this transfer document identifies only deficiencies in the awarded construction contract performance that the Government needs completed before declaration of completion of the contracted work. If there are more entries than fit on a single page, use additional DD Forms 1354.

Examples: Restore all grassed areas disturbed by construction
Replace/repair iron rod fence that was damaged during construction

Block 28. [PROJECT REMARKS]. This block is primarily for project level remarks. Enter any project explanations that would help others understand the real property transaction identified on the 1354. Fully describe any capital improvements. Remarks that pertain to only one Item should be listed in column 23, not in Project Remarks. In addition, if the "Other" checkbox is checked in block 9 (subpart A or B) an explanation is mandatory in this "Project Remarks" block. Also use Project Remarks (block 28) for continuation of data that does not fit in blocks 1 through 8, and columns 20 through 23. Also, enter in Project Remarks (block 28) the total project cost and four individual components of total project cost: P&D, S&A, construction, and equipment as described for Cost [block 19]. Use Project Remarks (block 28) to indicate which attachments are included with the 1354 (e.g., Building Information Checklist). If there are more remarks than fit in block 28 on a single page, use additional DD Forms 1354. The preparer should also list his/her name and phone number in the Project Remarks (block 28) space in case there are questions.

Examples: Military Construction, Army (MCA) project to construct a new battalion headquarters and classroom, and associated structures and utilities on Fort Riley, KS.
P&D Costs $ 1,250,000
S&A Costs $ 1,000,000
Construction Costs $25,000,000
Subtotal $27,250,000
Equipment Costs $ 2,500,000
Total Project Cost $29,750,000
Subtotal matches sum of individual item costs in column 19.
Equipment hand receipted to CWO Anthony Gerard, PBO for 24th INF DIV (M).
Block 8 Drawing Numbers continued: 47-018-1235, 47-018-1236, and 47-018-1237.
Attachments to this 1354: Building Information Checklist prepared by Jawhawk Constructors, Inc.
DD Form 1354 was prepared by Thomas Gerard, 703-683-7100.

CHAPTER 3

DRAFT, INTERIM AND FINAL VERSIONS OF THE DD FORM 1354

WHY DIFFERENT VERSIONS? For real property transfers, only the final version DD Form 1354 is normally required. The losing organization should prepare the form to be ready for signature at the time of transfer. An interim version 1354 with estimated costs may be prepared if the final costs associated with the transferred real property are not determined as of the date of the transfer.

Because final costs for new construction and revitalization projects are typically not available when the facility is available for use (beneficial occupancy), this handbook has established three versions: a draft, interim, and final; for the DD Form 1354 for a single construction/revitalization project. The draft version, prepared during the design process, has no accounting impact and may be updated as often as necessary during construction. This version is not used by DeCA. Both the interim and final 1354 versions do impact accounting. All three versions must have the same project/job number (block 3) to cross reference all versions of the DD Forms 1354 associated with the single project. However, all three versions must have their own unique serial number (block 4) so that the preparing agency can track all versions of the DD Form 1354. This chapter explains the usage for each version. To help the accepting official quickly identify the version of the DD Form 1354, there is a subpart C (checkbox for Draft/Interim/Final) of Block 9 (Transaction Details) to identify the version type.

There can be only one final version of a DD Form 1354 for a single construction/revitalization project. If there are updates to the draft version, you simply have an adjusted draft version with a later date prepared (block 2) and the same serial number (block 4). However, you can have multiple valid interim DD Forms 1354 for a phased turnover of facilities, each with its own serial number (block 4).

DRAFT VERSION. Not Used by DeCA.

INTERIM VERSION. The purpose of the interim DD Form 1354 is to provide in writing to the accepting RPAO, a transfer and acceptance document with auditable costs on the day of facility transfer. The interim DD Form 1354 is prepared prior to beneficial occupancy of construction, in preparation for the facility transfer on the Date Available For Use and before, or coincident with, beneficial occupancy.

The requirement is to have a complete interim DD Form 1354 signed by the transferring and accepting officials on the Date Available for Use or the Beneficial Occupancy Date (BOD), whichever comes first. The interim form includes actual P&D costs, actual project management costs, actual S&A costs, and actual construction contract costs to date. The actual construction costs are what has been obligated and expended (accrued) to date and therefore are not estimates. The interim 1354 should also have the Construction Deficiencies, on the back of the form in block 27, filled out based on the acceptance inspection with the construction contractor.

The construction contractor prepares the interim form and sends it to the technical inspector for review at least 30 calendar days prior to the anticipated transfer. The construction contractor should follow up with the accepting agency to ensure that the DD Form 1354 is complete and acceptable prior to the facility turnover day. The procuring contracting officer determines the Date Available For Use as the day the facility is physically complete except for correction of deficiencies documented in Construction Deficiencies (block 27) of the 1354.

A large construction project may contain multiple facilities, each with its own date of substantial physical completion and turnover, or beneficial occupancy for only a portion of a single large facility (i.e., Partial BOD). For these situations, the construction contractor prepares one and only one interim DD Form 1354 for each project phase, building, or portion of a building to be turned over and accepted separately. Use the same project/job number for each interim 1354 so that it is possible to correlate all the interim DD Forms 1354 for a single project. Each interim 1354 would have its own unique Serial Number (block 4) and Effective Date of Transaction (block 9D) and would show only costs for the facilities turned over, including their P&D and S&A costs. The construction agent project manager uses the signed interim 1354 to document credit to the CIP account appropriate for the accepted phase. The installation uses the interim DD Forms 1354 to record, in the real property system database, the real property assets as they are turned over and accepted in piecemeal fashion.

FINAL VERSION. When the final project costs are not known at the time of transfer, the construction contractor provides an interim DD Form 1354 based on the costs obligated and expended (accrued) to date. When the actual cost of construction is ascertained, the construction contractor furnishes the final DD Form 1354, which reflects the actual cost of construction, to replace the preliminary cost vouchered by the interim DD Form 1354 previously furnished.

There is only one final project 1354, even where there are multiple interim DD Forms 1354. The purpose of the final DD Form 1354 is to establish in writing the final total cost for each facility in a project. This final accounting can occur only after all costs are final and known. Prior to determining the final costs, the construction contractor, in conjunction with the project delivery team, corrects the deficiencies noted on the punch list, ensures warranties are in place, processes claims, resolves any labor or legal issues, and ensures final payments to the contractors. The importance of the final 1354 is that it documents the final facility cost, which may be different from that listed on the interim 1354, and such difference would cause the Realty Specialist to make a correction to the real property database facility cost.

After receipt of the final DD Form 1354 from the PMAC Core Team, the DeCA/ PMFM PM ensures that all financial accounts are balanced and closed and then completes the final DD Form 1354 for the project. The final project cost contains the final/actual P&D, S&A, and construction costs. The DeCA/ PMFM PM updates the costs from the interim DD Form 1354 with the final actual total costs and provides a signed (block 24) final 1354 to the RPAO of the accepting organization. The RPAO signs the final 1354 in block 25. The accepting official's signature on the final

1354 indicates that he/she accepts the final costs and provides feedback to the preparer that the final 1354 has been received. The RPAO gives the final DD Form 1354 to the Realty Specialist to establish as a voucher and ensures that the Realty Specialist inputs the final facility cost into the real property database. Upon receipt of the final 1354, the installation Realty Specialist will adjust the costs in the real property database which were based on the interim and voucher the final DD Form 1354.

The interim and final DD Forms 1354 refer to the same Transaction Type (i.e., new construction or capital improvement as shown in block 9A), will have the same Effective Date (block 9D), and the same Project/Job Number (block 3). The Realty Specialist can identify all 1354 versions pertaining to the same capitalization event by the Project/Job Number. The interim and final versions will have different Dates Form Prepared (block 2) and different Serial Numbers (block 4), and possibly different item costs (column 19).

The Effective Date (block 9D) on the final DD Form 1354 for a project consisting of multiple individual facility turnovers on different dates must include the different effective date for each facility. These different dates may be shown in Project Remarks (block 28) with a "See Remarks" in block 9D. The Effective Date for a single facility with a phased turnover is the date the construction contractor declares the entire facility is available for use.

CHAPTER 4

REFER TO UFC1-300-08 FOR ADDITIONAL INFORMATION-

CHAPTER 5

PROJECT COST VERSUS FACILITIES COSTS

5-1 **PROJECT COSTS**. This chapter provides guidance to the construction agent project manager on how to determine the capitalization costs which are accrued against the facilities described on the DD Form 1354. Facility acquisition and capital improvement data in the real property accounting system must be substantiated by the costs on DD Forms 1354, and the costs on the 1354 must be reconcilable to the overall project costs. This chapter provides a methodology to ensure that DoD uses a consistent method of calculating these costs and to ensure correlation between costs recorded in the real property database for real property and 1354-documented project costs. The preparer of the DD Form 1354 must allocate or prorate P&D and S&A costs among the facilities in the project. Only facility costs appear as items in column 10 of the 1354. Indicate P&D, S&A, construction, equipment-in-place (EIP) costs, and total project costs in Project Remarks (block 28). The total project cost must equal the sum of the costs of individual facilities plus project-funded EIP costs. The preparer must explain any difference. Depending on the method of item pricing on the construction contract, some facility costs may translate directly from the contractor's facility cost. Other costs, such as total project P&D and S&A may have to be prorated or allocated among several facilities.

COST METHODOLOGY. The following step-by-step procedure is recommended:

- The construction contractor shall Identify all the facilities on the DD Form 1354 and their associated construction costs, i.e., within the 5-foot line of the facility.
- The construction contractor shall Identify any site preparation costs including footprint demolition, equipment (if project funded), or other costs that roll up with the costs directly attributable to those facilities.
- The construction contractor shall Identify costs associated with those facilities that should be rolled up to existing consolidated facility records, such as utility lines or pavements.
- The DeCA/ PMFM PM will allocate the total planning and design (P&D) and supervision and administration (S&A) costs (including project management costs) among the facilities listed on the 1354. If P&D and S&A costs are known for the entire project but are not known for individual facilities, prorate total P&D and S&A costs among the different facilities. Prorate based on either individual area of the facility or individual facility construction working estimates. Annotate in Project Remarks (block 28) which basis you used to prorate or allocate P&D and S&A costs to individual facilities.

Compute the individual facility and incremental consolidated facility costs by summing the actual and allocated costs computed in steps one through four.

Check to ensure the sum of the individual facility costs (column 19) equals the total project cost. List in Project Remarks (Block 28) the total project cost and the individual total project cost contributions of construction, P&D, S&A, EIP, and any non-capitalizing costs, i.e., non-footprint demolition. If the sum of the individual facilities on the 1354 does not equal the project total, explain in the Project Remarks (Block 28).

CHAPTER 6

STANDARDS FOR INTERIM AND FINAL DD FORMS 1354

REFER TO UFC1-300-08 FOR ADDITIONAL INFORMATION-

APPENDIX B DD FORM 1354 FRONT AND BACK Figure B-1.
A fillable adobe file of the DD Form 1354 is located at:
http://www.dtic.mil/whs/directives/infomgt/forms/eforms/dd1354.pdf
Complete instructions on how to fill out this form can be found at:
http://www.hnd.usace.army.mil/techinfo/UFC/UFC1-300-08/UFC1-300-08.pdf

APPENDIX C
SUMMARY INSTRUCTIONS FOR DD FORM 1354

ITEM NUMBER	ITEM NAME	DESCRIPTION
ITEM 1	FROM	Name and address of the transferring agency: organization, installation, USACE District, NAVFAC Division/Activity, etc. Include zip code.
ITEM 2	DATE FORM PREPARED	Date the DD Form 1354 is actually prepared. Use the standard date format YYYYMMDD.
ITEM 3	PROJECT/JOB NUMBER	The project number assigned to identify the project on a DD Form 1391 for new construction and the DPW/FacMgr/BCE/DIS Individual Job Order (IJO) Number from work management system. Use both numbers when they exist.
ITEM 4	SERIAL NUMBER	Serial number assigned in sequence by the preparing organization. Identify the fiscal year, and sequence number; for example, 2004-0001, 2004-0002, etc.
ITEM 5	TO	Name and address of the receiving installation, activity, and service. Include zip code and installation number (INSNO) of receiving installation, which the RPAO represents.
ITEM 6	SITE/INSNO/ NAME	Site or installation number and site name where the facility being constructed/transferred/accepted is located.
ITEM 7	CONTRACT NUMBER(S)	Contract number(s) if any project work is performed under a contract.
ITEM 8	DRAWING NUMBER(S)	Enter the drawing number(s) or CAD identifier(s) for the project components.
ITEM 9	TRANSACTION DETAILS	Has four subparts
SUBPART 9A	TYPE of TRANSACTION	Checkbox to indicate whether the DD Form 1354 applies to acceptance of new construction, transfer of existing facilities, a capital improvement to existing facilities, or other. Enter remarks in block 28 "Project Remarks" if "other" is specified. Mark only one box.
SUBPART 9B	WHEN/EVENT	Checkbox to indicate when, in terms of event type, the transfer and acceptance documented by this 1354 occurs, e.g., at the time of physical for use date, beneficial occupancy date (BOD), partial completion/available BOD, financial completion or "other." Enter remarks in block 26 "Project Remarks" if "other" is specified. Mark only one box.

ITEM Number	ITEM NAME	DESCRIPTION
SUBPART 9C	VERSION	Checkbox to indicate whether this version is a draft, interim, or final DD Form 1354. Mark only one box.
SUBPART 9D	EFFECTIVE DATE	Effective date for the transaction being described in block 9. This is the start date for depreciation. Also known as the Capitalization Date. Use the standard date format YYYYMMDD.
ITEM 10	ITEM NUMBER	Use a separate Item Number for each facility. Do not use more than one Item Number for multiple category codes within the same facility. Assign item numbers in column 10 sequentially starting with the number one (1).
ITEM 11	FACILITY NUMBER	The unique 5-character facility alphanumeric to be assigned to a new facility, or existing facility number for existing or consolidated facilities. This alphanumeric is assigned by the installation and provided to the construction agent early in the design process.
ITEM 12	CATEGORY CODE	The category code that appropriately describes the facility (land, building, structure, utility or portion thereof) design-use. List only one category code per line and do not add another item number (column 10) for multi-use facilities. Category codes and descriptions should be consistent with service implementation of DODI 4165.3, Department of Defense Facility Classes and Construction Categories (e.g., DA PAM 415-28, "Guide to Army Real Property Category Codes" and Air Force Handbook 32-1084, Facilities "Requirements").
ITEM 13	CATCODE DESCRIPTION	The category code name that corresponds to the category code for the item number (Item 10).
ITEM 14	TYPE	The type of construction: use "P" for permanent, "S" for semi permanent, or "T" for temporary.
ITEM 15	AREA: UNIT OF MEAS-1	The area unit of measure 1. Use abbreviations "SF" for square feet, "SY" for square yards, and "AC" for acres per DODI 4165.3 with Service implementation thereof (e.g., DA PAM 415-28).
ITEM 16	TOTAL QUANTITY-UM1	The total area for the measure identified in Item 15. Use negative numbers for demolition.
ITEM 17	OTHER: UNIT OF MEAS-2	The Unit of Measure 2 for capacity or other measurement unit. Use abbreviations, such as "MB" for millions of BTU, found in DODI 4165.3.

ITEM Number	ITEM NAME	DESCRIPTION
ITEM 18	TOTAL QUANTITY-UM2	The total capacity/other for the measure identified in Item 17. Use negative numbers for demolition
ITEM 19	COST	The cost for each facility (Item-block 10). For capital improvements to existing facilities, enter only the amount by which the general ledger balance is to be increased. Costs on interim DD Forms 1354 are actual costs to date, but considered preliminary; costs on final DD Forms 1354 are always final costs.
ITEM 20	FUND SOURCE	Fund source for this Item. Use the Item Remarks (column 23) to explain funding for this item if necessary. See Appendix E.
ITEM 21	FUNDING ORGANIZATION	The organization responsible for replacing this facility at the end of its useful life (e.g., Army, Air Force, Navy, Marine Corps (specify component for each service), DLA, DeCA, TMA, etc.). See Appendix F.
ITEM 22	INTEREST CODE	Indicator of the government's interest or ownership in the facility (e.g., DoD owned, leased, State owned, privately owned, etc.). See Appendix G.
ITEM 23	ITEM REMARKS	Include any clarifying remarks pertaining only to the item number identified in column 10. Also summarize any cost sharing or prorating logic that would document how you derived the item cost.
ITEM 24	STATEMENT OF COMPLETION	Name, signature, title and date of signature by the individual responsible for the transfer of the properties.
ITEM 25	ACCEPTED BY	Name, signature, title and date of signature by the RPAO or delegated individual responsible for accepting the property.
ITEM 26	PROPERTY VOUCHER NUMBER	Next sequential number assigned by the RPAO in the Register of Vouchers to a Stock Record Account (e.g., DA Form 272 or Navy system assigned number).
ITEM 27	CONSTRUCTION DEFICIENCIES	All construction deficiencies in the project known or identified during the construction contractor turnover inspection.
ITEM 28	PROJECT REMARKS	Any information to explain "other" entries in blocks 9A or 9B and other information that would be helpful in understanding the transaction. Also used for project level remarks and continuation where more space is needed.

APPENDIX D
BUILDING INFORMATION CHECKLIST

Use Appendix D as a checklist of required information to be entered into the real property database. Provide this information for each Real Property Facility listed on the DD Form 1354 in a format that allows easy data entry into the real property system. Normally this information is provided by the A-E electronically, often in XML format or GIS compatible format.

BUILDING IDENTIFICATION for this 5-Part CHECKLIST				
Facility Number	**Building Name**	**Number of Floors**	**Gross SF**	**Net SF**

1. Building Dimensions and Construction Materials

Building Outside Dimensions	**Length (LF)**	**Width (LF)**
Main Building		
Wings		
Offsets		
Basement		
Attic		
Porches, covered		
Roof		
Foundation		

Other Building Data	**Feet**
Ceiling Height Main Bldg	
Ceiling Height Basement	
Door Height	
Door Width	
	Code
Fire Rating Code	

Construction Materials	**Type**
Principal Structural Material	
Secondary Structural Material	
Exterior Wall Material	
Interior Wall Material	
Floor Surface Material	
Sub-Floor Material	

Additional Construction Materials	**Type**	
	Foundation Form	**Pile or Foundation Material**

Foundation		
	Roof Type	**Roofing Material**
Roof Support		
Roof Deck		
Roof Surface		

Construction Materials (Pavements)	**Type**
Surface Course Materials	
Base Course Materials	

1. **2. Utility Connections, Information and Fuel Data**
2. **3. Building Systems**
3. **4. Installed Building Equipment (Real Property)**
4. **5. Checklist for Associated Utilities and Structures to be specifically listed as an item on DD Form 1354, column 10, if part of the project**

Utility Connections	**Number of pipes**	**Diameter of each pipe**	**Capacity of all inlet pipes**	**Available or Connected? (Yes/No)**
Water				
Gas				
Sewer Pipe				
Storm Sewer Pipe				
Steam				
Condensate				
Communications				
System	**Energy Type**	**Source Location**	**Fuel Description**	**Air Circulation**
Heating				
Air Conditioning				
Hot Water				
Steam				
Electrical				

Electric	**Phase**	**Voltage**	**Wire Size**	**Connected Load - AMPS**	**Connected Load - KVA**
UFC 1-300-08 30 JUNE 2004					

UFC 1-300-08 30 JUNE 2004 Nomenclature	UM	Amount of UM	Description
Fire Protection System			
Closed Head Auto Sprinkler	HD		
Open Head Deluge System	HD		
Auto Fire Detection System	HD		
Manual Fire Alarm System	EA		
CO2 Fire System	EA		
Foam Fire System	EA		
Other Fire System	EA		
Halon 1301 Fire System	EA		
Security System			
Security Alarm System	EA		
Heating System			
Heating Plant	MB		
Storage Tank for Heating Fuel	GA		
Air Conditioning System			
Central A/C Plant	TN		
Electrical System			
Emergency Electric Power Generator	KW/KVA		
Storage Tank for Generator Fuel	GA		
Hot Water			

Item	Size/Quantity	Units	Model	Description
Evaporative Coolers		CFM		
Hot Water Heater		GA		
Exhaust Fan		CFM		
Wash Basin		EACH		
Water Closet		EACH		
Urinal		EACH		
Utility Sink		EACH		
Refrigerated Drinking Fountain		EACH		
Heating Plant under 750 MB/Hr		MB		
Forced Air Heating		BTU		
Other Heating		BTU		
Dehumidifiers		GPM		
Elevators		LBS & PN		
Theater-type Seats, bolted to floor		PN		
Other (SPECIFY)				

UFC 1-300-08 30 JUNE 2004 Nomenclature	UM	Amount of UM	Cost	Comments
Primary Elec. Dist Line OH	LF			
Transformers	KVA			
Power Poles	EA			
Secondary Elec. Dist Line OH	LF			
Primary Elec. Dist Line UG	LF			
Secondary Elec. Dist Line UG	LF			
Exterior Street Lighting or Parking Area Lights	EA			
Gas Mains	LF			
Septic Systems	KG			
Sanitary Sewer	LF			
Water Dist Mains	LF			
Fire Hydrants	EA			
Curbs & Gutters	LF			

Driveway	SY			
Roadway	SY			
Vehicle Parking	SY			
Storm Drain	LF			
Fence, Security	LF			
Fence, Interior	LF			
Sidewalk	SY			
Transformer Vault (four or more transformers)	SF			
Telephone Duct	LF			
Telephone Pole	LF			

FUND SOURCE

Choose the correct Fund Source for block 20 from Appendix E.

APPENDIX E Code	Abbreviation	Fund Source Full Name
01	MILCON	Military Construction
02	BRAC	Base Realignment and Closure
03	O&M	Operations and Maintenance
04	RDTE	Research, Development, Test, and Evaluation
05	FH Const	Family Housing Construction
06	FH Opns	Family Housing Operations
07	MILPER	Military Personnel
08	PROCURE	Procurement
09	WCF	Working Capital Fund
10	FOREIGN	Foreign Funds
11	NAF	Nonappropriated Funds (NAF)
12	PRIVATE	Private/Donation
13	OTHER	Other Funds

FUNDING ORGANIZATION

Choose the Funding Organization abbreviations for block 21 from Appendix F.

APPENDIX F Code	Abbreviation	Funding Organization Full Name
00	ARMY	Army Active
01	USAR	Army Reserve
02	ARNG	Army National Guard
03	AIR F	Air Force Active
04	AIR R	Air Force Reserve
05	ANG	Air National Guard
06	NAVY	Navy Active
07	NAVRES	Navy Reserve
08	USMC	Marine Corps Active
09	MCR	Marine Corps Reserve
		Unified Commands
10	USCENTCOM	Central Command (USCENTCOM)
11	USEUCOM	European Command (USEUCOM)
12	JFCOM	Joint Forces Command
13	USPACOM	Pacific Command (USPACOM)
14	USSOUTHCOM	Southern Command (USSOUTHCOM)
15	USSOCOM	Special Operations Command (USSOCOM)
16	USSPACECOM	Space Command (USSPACECOM)
17	USSTRACOM	Strategic Command (USSTRACOM)
18	USTRANSCOM	Transportation Command (USTRANSCOM)
		Defense Agencies
21	BMDO	Ballistic Missile Defense Organization (BMDO)
22	DARPA	Defense Advanced Research Projects Agency (DARPA)
23	DECA	Defense Commissary Agency (DeCA)
24	DCAA	Defense Contract Audit Agency (DCAA)
25	DCMA	Defense Contract Management Agency (DCMA)
26	DFAS	Defense Finance and Accounting Service (DFAS)
27	DISA	Defense Information Systems Agency (DISA)
28	DIA	Defense Intelligence Agency (DIA)
29	DLSA	Defense Legal Services Agency (DLSA)
30	DLA HQ	Defense Logistics Agency (DLA) – Other (HQ, etc)
31	DDC	DLA Defense Distribution Center (DDC)
32	DRMS	DLA Defense Reutilization and Marketing Service (DRMS)
33	DESC	DLA Defense Energy Support Center (DESC)
34	DSCP	DLA Defense Supply Center Philadelphia (DSCP)
35	DSCC	DLA Defense Supply Center Columbus (DSCC)
36	DSCR	DLA Defense Supply Center Richmond (DSCR)

37	DAPS	DLA Defense Automation and Production Service (DAPS)
38	DNSC	DLA Defense National Stockpile Center (DNSC)
39	DSCA	Defense Security Cooperation Agency (DSCA)
40	DTRA	Defense Threat Reduction Agency (DTRA)
41	NIMA	National Imagery and Mapping Agency (NIMA)
42	NSA	National Security Agency (NSA)
		DoD Field Activities
50	AFIS	American Forces Information Service
51	DODEA	DoD Education Activity (DoDEA)
52	DODHRA	DoD Human Resources Activity
53	TMA	TRICARE Management Activity (TMA)
54	WHS	Washington Headquarters Services (WHS)
		Other Organizations
60	OTHER FED	Other Federal Agencies
61	STATE	State and Local Agencies
62	NATO	North Atlantic Treaty Organization (NATO)
63	OTHER NAT	Other Nations
64	PRIVATE	Private Organizations

APPENDIX G
INTEREST CODE

Choose the Interest Code abbreviations for block 22 from Appendix

Code	Interest Abbreviation	Description
01	Owned by DoD	Real property facilities where ownership is held by a Military Department or WHS. Example: Base HQ at Bolling AFB.
02	Owned by Federal Government (Non-DoD)	Federal Government-owned real property facilities (other than DoD) that are licensed or permitted to the DoD. Example: Laboratory facility at the National Institutes of Health occupied by TRICARE Management Activity. Do not include facilities acquired from the General Services Administration (GSA) under this code. See Code 3 below.
03	Owned by Private Sector-Leased to DoD Component	A lease is a written agreement that conveys an interest, based on possession, in real property, usually exclusive, for a period of time for a specified consideration. Include under this code all General Services Administration (GSA) leases for use by DoD. Example: Office of the Secretary of Defense at 400 Army-Navy Drive
04	Owned by Other Than DoD - Land Easement	An easement is a real estate instrument that grants the right to use property (land only) for a specific purpose. It may be temporary or permanent. Example: permission for an Air Force installation to cross private property and/or public domain property with a utility line either underground or overhead.
05	Owned by Foreign Government	Foreign Government-owned real property facilities that are licensed or permitted to DoD. Example: US Army barracks in Heidelberg, Germany or Navy NATO facilities in Italy.
06	Owned by Other Foreign Source	Real property facilities leased from a foreign private sector for use by DoD. Example: US Marine Corps apartment complex located in Okinawa, Japan, and leased from a private realtor.
07	Privately Owned and Operated	Real property facilities on DoD sites that are owned and operated by the private sector. Examples: Burger King Restaurant or a privatized utility.
08	Owned by State or Local Government	Real property facilities owned by a state or local government or other public entity. Examples: Army National Guard maintenance facility at Camp Blanding, FL, a state owned military site.

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TRANSFER AND ACCEPTANCE OF DoD REAL PROPERTY

Form Approved
OMB No. 0704-0188

PAGE OF PAGES

The public reporting burden for this collection of information is estimated to average 30 minutes per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing the burden, to the Department of Defense, Washington Headquarters Services, Executive Services Directorate, Information Management Division, 1155 Defense Pentagon, Washington, DC 20301-1155 (0704-0188). Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to any penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number.

PLEASE DO NOT RETURN YOUR COMPLETED FORM TO THE ABOVE ORGANIZATION.

1. FROM *(Organization Name)*	2. DATE PREPARED *(YYYYMMDD)*	3. PROJECT/JOB NUMBER	4. SERIAL NUMBER
5. TO *(Organization - Installation Code and Name)*	6. RPSUID/SITENAME/ INSTCODE/INSTNAME	7. CONTRACT NUMBER(S)	7a. PLACED-IN-SERVICE DATE *(YYYYMMDD)*

8. TRANSACTION DETAILS

a. METHOD *(X all that apply)*
- ☐ ACQUISITION BY CONSTRUCTION
- ☐ TRANSFER BETWEEN SERVICES
- ☐ CAPITAL IMPROVEMENT
- ☐ INVENTORY ADJUSTMENT

b. WHEN/EVENT *(X one)*
- ☐ TOTAL ASSET PLACED-IN-SERVICE
- ☐ PARTIAL ASSET PLACED-IN-SERVICE

c. TYPE *(X one)*
☐ DRAFT ☐ FINAL ☐ INTERIM

9. ITEM NO.	10a. FACILITY NO.	10b. RPUID	11. CATEGORY CODE	12. CATCODE DESCRIPTION	13. TYPE CODE	AREA 14. PRIMARY UM	AREA 15. PRIMARY UM QUANTITY	OTHER 16. SECONDARY UM	OTHER 17. SECONDARY UM QUANTITY	18. COST	19. FUND SOURCE	20. FUND ORG	21. INTER-EST CODE	22. ITEM REMARKS

23. STATEMENT OF COMPLETION. The facilities listed hereon are in accordance with maps, drawings, and specifications and change orders approved by the authorized representative of the using agency except for the deficiencies listed on the reverse side.

a. TRANSFERRED BY *(Typed Name and Signature)*

b. DATE SIGNED *(YYYYMMDD)*

c. TITLE *(Area Engr./Base Engr./DPW/Construction Agent)*

24.a. ACCEPTED BY *(Typed Name and Signature)*

b. DATE SIGNED *(YYYYMMDD)*

c. TITLE *(DPW/RPAO)*

25. PROPERTY VOUCHER NUMBER

26. CONSTRUCTION DEFICIENCIES *(Attach blank sheet for continuations)*	27. PROJECT REMARKS *(Attach blank sheet for continuations)*

INSTRUCTIONS

GENERAL. This form has been designed and issued for use in connection with the transfer of military real property between the military departments and to or from other government agencies. It supersedes ENG Forms 290 and 290B (formerly used by the Army and Air Force) and NAVDOCKS Form 2317 (formerly used by the Navy).

Existing instructions issued by the military departments relative to the preparation of DD Form 1354 are applicable to this revised form to the extent that the various items and columns on the superseded forms have been retained. The military departments may promulgate additional instructions, as appropriate.

For detailed instructions on how to fill out this form, please refer to Unified Facilities Criteria (UFC) 1-300-08, dated 16 April 2009 or later.

SPECIFIC DATA ITEMS.

1. **From.** Name of the transferring agency.

2. **Date Prepared.** Date of actual preparation. Enter all dates in YYYYMMDD format (Example: March 31, 2010 = 20100331).

3. **Project/Job Number.** Project number on a DD Form 1391 or Individual Job Order Number.

4. **Serial Number.** Sequential serial number assigned by the preparing organization (e.g., 2010-0001).

5. **To.** Name and address of the receiving installation, activity, and Service of the Real Property Accountable Officer (RPAO).

6. **RPSUID/SITENAME/INSTCODE/INSTNAME.** Real Property Site Unique Identifier and Site Name or Installation Code and Installation Name where the constructed facility is located.

7. **Contract Number(s).** Contract number(s) for this project.

7a. **Placed-In-Service Date.** RPA Placed In Service Date. This is the date the asset is actually placed-in-service.

8. **Transaction Details.**
   a. Method of Transaction. Mark (X) as many boxes as apply.
   b. When/Event. When or event causing preparation of DD Form 1354. X only one box.
   c. Type. Draft, interim, or final DD Form 1354. X only one box.

9. **Item Number.** Use a separate item number for each facility, no item number for additional usages.

10a. **Facility Number.** Assigned in accordance with the Installation/Base Master Numbering Plan.

10b. **RPUID.** Real Property Unique Identifier - Identified in Real Property Inventory.

11. **Category Code.** The category code describes the facility usage.

12. **Catcode Description.** The category code name which describes the facility usage.

13. **Type Code.** Construction Type Code - Type of construction: P for Permanent; S for Semi-permanent; T for Temporary.

14. **Primary Unit Of Measure.** Area unit of measure; use the unit of measure associated with the category code selected in 11.

15. **Primary Unit of Measure Quantity.** The total area for the measure identified in Item 14. Use negative numbers for demolition.

16. **Secondary Unit of Measure.** Unit of Measure 2 is the capacity or other measurement unit (e.g., LF, MB, EA, etc.).

17. **Secondary Unit of Measure Quantity.** The total capacity/other for the measure identified in Item 16.

18. **Cost.** Cost for each facility; for capital improvements to existing facilities, show amount of increase only. If there is no increase for the capital improvement, enter N/A.

19. **Fund Source.** Enter the Fund Source Code for this item.

20. **Funding Organization.** Enter the code for the organization responsible for acquiring this facility.

21. **Interest Code.** RPA Interest Type Code. Enter the code that reflects government interest or ownership in the facility.

22. **Item Remarks.** Remarks pertaining only to the item number identified in Item 9; show cost sharing.

23. **Statement of Completion.** Typed name, signature, title, and date of signature by the responsible transferring individual or agent.

24. **Accepted By.** Typed name, signature, title, and date of signature by the RPAO or accepting official.

25. **Property Voucher Number.** Next sequential number assigned by the RPAO in voucher register.

26. **Construction Deficiencies.** List construction deficiencies in project during contractor turnover inspection.

27. **Project Remarks.** Project level remarks and continuation of blocks.

SECTION 01 79 00

DEMONSTRATION AND TRAINING

(Edited from DeCA June 2011 Design Criteria)

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. This Section includes administrative and procedural requirements for instructing Government personnel, including the following:

a. Demonstration of operation of Contractor-Furnished, Contractor-Installed systems, subsystems, and equipment.
b. Training in operation and maintenance of Contractor-Furnished, Contractor-Installed systems, subsystems, and equipment.
c. Demonstration and training videotapes.

B. Related Sections:

1. Division 01 Section Closeout Procedures for additional operational and maintenance training.
2. Division 01 Section General Commissioning Requirements for administrative and procedural requirements for demonstration and training as part of building systems commissioning.
3. Divisions 02 through 33 Sections for additional requirements for demonstration and training for products in those Sections.

1.2 SUBMITTALS

A. Instruction Program: Submit two copies of outline of instructional program for demonstration and training, including a schedule of proposed dates, times, length of instruction time, and instructors' names for each training module. Include learning objective and outline for each training module.

1. At completion of training, submit one complete training manual(s) for Government's use.

B. Qualification Data: For instructor.

C. Attendance Record: For each training module, submit list of participants and length of instruction time.

1. Require attendees to sign in and out of all training meetings.

D. Evaluations: For each participant and for each training module, submit results and documentation of performance-based test.

E. Demonstration and Training Videotapes: Submit two copies within seven days of end of each training module.

1. Identification: On each copy, provide an applied label with the following information:

   a. Name of Project.
   b. Name and address of photographer.
   c. Name of DeCA Program Management Assistance Contract Inspector (PMAC).
   d. Name of Contractor.
   e. Date videotape was recorded.
   f. Description of vantage point, indicating location, direction (by compass point), and elevation or story of construction.

2. Transcript: Prepared on 8-1/2-by-11-inch paper, punched and bound in heavy-duty, 3-ring, vinyl-covered binders. Mark appropriate identification on front and spine of each binder. Include a cover sheet with same label information as the corresponding videotape. Include name of Project and date of videotape on each page.

1.3 QUALITY ASSURANCE

A. Instructor Qualifications: A factory-authorized service representative experienced in operation and maintenance procedures and training.

   1. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

B. Photographer Qualifications: A professional photographer who is experienced photographing construction projects.

C. Pre-instruction Conference: Conduct conference at Project site. Review methods and procedures related to demonstration and training including, but not limited to, the following:

   1. Review and finalize instruction schedule and verify availability of educational materials, instructors' personnel, audiovisual equipment, and facilities needed to avoid delays.
   2. Review required content of instruction.
   3. For instruction that must occur outside, review weather and forecasted weather conditions and procedures to follow if conditions are unfavorable.

1.4 COORDINATION

A. Coordinate instruction schedule with PMAC and Store Director. Adjust schedule as required to minimize disrupting Government's operations.

B. Coordinate instructors, including providing notification of dates, times, length of instruction time, and course content.

C. Coordinate content of training modules with content of approved emergency, operation, and maintenance manuals. Do not submit instruction program until operation and maintenance data has been reviewed and approved by PMAC.

PART 2 - PRODUCTS

2.1 INSTRUCTION PROGRAM

A. Program Structure: Develop an instruction program that includes individual training modules for each system and equipment not part of a system, as required by individual Specification Sections, and as follows:

1. Motorized doors, including overhead coiling doors and automatic entrance doors.
2. Equipment, including loading dock equipment, grease hoods and food-service equipment.
3. Fire-protection systems, including fire alarm and fire-extinguishing systems.
4. Intrusion detection systems.
5. Conveying systems, including elevators.
6. HVAC systems, including air-handling equipment, air distribution systems and terminal equipment and devices.
7. HVAC instrumentation and controls.
8. Electrical service and distribution, including transformers, switchboards, panelboards, uninterruptible power supplies and motor controls.
9. Packaged engine generators, including transfer switches.
10. Lighting equipment and controls.
11. Communication systems, including intercommunication, surveillance, clocks and programming, voice and data, and television equipment.

B. Training Modules: Develop a learning objective and teaching outline for each module. Include a description of specific skills and knowledge that participant is expected to master. For each module, include instruction for the following:

1. Basis of System Design, Operational Requirements, and Criteria: Include the following:

   a. System, subsystem, and equipment descriptions.
   b. Performance and design criteria if Contractor is delegated design responsibility.
   c. Operating standards.
   d. Regulatory requirements.
   e. Equipment function.
   f. Operating characteristics.
   g. Limiting conditions.
   h. Performance curves.

2. Documentation: Review the following items in detail:

   a. Emergency manuals.
   b. Operations manuals.
   c. Maintenance manuals.
   d. Project Record Documents.
   e. Identification systems.
   f. Warranties and bonds.
   g. Maintenance service agreements and similar continuing commitments.

3. Emergencies: Include the following, as applicable:

   a. Instructions on meaning of warnings, trouble indications, and error messages.
   b. Instructions on stopping.
   c. Shutdown instructions for each type of emergency.

d. Operating instructions for conditions outside of normal operating limits.
e. Sequences for electric or electronic systems.
f. Special operating instructions and procedures.

4. Operations: Include the following, as applicable:

a. Startup procedures.
b. Equipment or system break-in procedures.
c. Routine and normal operating instructions.
d. Regulation and control procedures.
e. Control sequences.
f. Safety procedures.
g. Instructions on stopping.
h. Normal shutdown instructions.
i. Operating procedures for emergencies.
j. Operating procedures for system, subsystem, or equipment failure.
k. Seasonal, weekend and unoccupied modes of operation operating instructions.
l. Required sequences for electric or electronic systems.
m. Special operating instructions and procedures.

5. Adjustments: Include the following:

a. Alignments.
b. Checking adjustments.
c. Noise and vibration adjustments.
d. Economy and efficiency adjustments.

6. Troubleshooting: Include the following:

a. Diagnostic instructions.
b. Test and inspection procedures for collecting specific performance data.

7. Maintenance: Include the following:

a. Inspection procedures.
b. Types of cleaning agents to be used and methods of cleaning.
c. List of cleaning agents and methods of cleaning detrimental to product.
d. Procedures for routine cleaning.
e. Procedures for preventive maintenance.
f. Procedures for routine maintenance.
g. Instruction on use of special tools.

8. Repairs: Include the following:

a. Diagnosis instructions.
b. Repair instructions.
c. Disassembly; component removal, repair, and replacement; and reassembly instructions.
d. Instructions for identifying parts and components.
e. Review of spare parts needed for operation and maintenance.

PART 3 - EXECUTION

3.1 PREPARATION

A. Assemble educational materials necessary for instruction, including documentation and training module. Assemble training modules into a combined training manual.

B. Set up instructional equipment at instruction location.

3.2 INSTRUCTION

A. Engage qualified instructors to instruct Government's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.

1. PMAC and Store Director will furnish Contractor with names and positions of participants.

B. Scheduling: Provide instruction at mutually agreed on times. For equipment that requires seasonal operation, provide similar instruction at start of each season.

1. Schedule training with PMAC and Store Director with at least seven days' advance notice.

C. Evaluation: At conclusion of each training module, assess and document each participant's mastery of module by use of a written performance-based test.

D. Cleanup: Collect used and leftover educational materials and give to PMAC and Store Director. Remove instructional equipment. Restore systems and equipment to condition existing before initial training use.

3.3 DEMONSTRATION AND TRAINING VIDEOTAPES

A. General: Engage a qualified commercial photographer to record demonstration and training videotapes. Record each training module separately. Include classroom instructions and demonstrations, board diagrams, and other visual aids, but not student practice.

1. At beginning of each training module, record each chart containing learning objective and lesson outline.

B. Videotape Format: Provide high-quality VHS color videotape in full-size cassettes.

C. Recording: Mount camera on tripod before starting recording, unless otherwise necessary to show area of demonstration and training. Display continuous running time.

D. Narration: Describe scenes on videotape by audio narration by microphone while videotape is recorded or dubbing audio narration off-site after videotape is recorded. Include description of items being viewed. Describe vantage point, indicating location, direction (by compass point), and elevation or story of construction.

E. Transcript: Provide a typewritten transcript of the narration. Display images and running time captured from videotape opposite the corresponding narration segment.

END OF SECTION

SECTION 01 91 13

GENERAL COMMISSIONING REQUIREMENTS

(Edited from DeCA June 2011 Design Criteria)

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Description of the commissioning process and responsibilities common to all parties.
2. Schedule of Systems to be commissioned.

B. Related Sections:

1. Division 08 Section Commissioning of Openings.
2. Division 10 Section Commissioning of Specialties.
3. Division 11 Section Commissioning of Equipment.
4. Division 13 Section Commissioning of Special Construction.
5. Division 22 Section Commissioning of Plumbing Systems.
6. Division 23 Section Commissioning of HVAC.
7. Division 26 Section Commissioning of Electrical Systems.
8. Division 27 Section Commissioning of Communications.
9. Division 28 Section Commissioning of Electronic Safety and Security.
10. Division 32 Section Commissioning of Exterior Improvements.
11. Division 33 Section Commissioning of Utilities.

1.2 DESCRIPTION

A. Commissioning:

1. This project will have selected building systems commissioned. The commissioning process will be directed by the Contractor and monitored by the Government Commissioning Representative (GCR) whose services will be provided by the Government.
2. Commissioning is a systematic process of ensuring that all building systems perform interactively according to the design intent and the Government's operational needs. This is achieved by actual verification of performance. The commissioning process encompasses and coordinates the functions of system documentation, equipment startup, control system calibration, testing and balancing, performance testing and training. Commissioning during the construction phase is intended to achieve the following specific objectives according to the Contract Documents:

   a. Verify that applicable equipment and systems are installed according to the manufacturer's recommendations and to industry accepted minimum standards and that they receive adequate operational checkout by installing contractors.
   b. Verify and document proper performance of equipment and systems.
   c. Verify that O&M documentation is complete.
   d. Verify that the Government's operating personnel are adequately trained.

B. The commissioning process does not reduce the responsibility of the system designers or installing contractors to provide a finished and fully functioning product in accordance with the Contract Documents.

C. Abbreviations. The following are common abbreviations used in the Specifications and in the Commissioning Plan.

A/E-	Architect and Design Engineers	GC-	General Contractor (prime)
CA-	Commissioning Agent	MC-	Mechanical Contractor
CC-	Controls Contractor	PC-	Prefunctional Checklist
GCR-	Government Commissioning Representative (Same as CA)	PM-	Project Manager (of the Government)
PCO-	Contracting Officer	Subs-	Subcontractors to General
EC-	Electrical Contractor	TAB-	Test and Balance Contractor
ES-	Electronic Security Contractor	TI-	Technical Inspector
FT-	Functional Performance Test	QC-	Contractor's Quality Control Manager

1.3 COMMISSIONING TEAM

A. The Systems Commissioning Team shall include the following members:

1. Government Commissioning Representative - Contracting Officer’s designated Government Representative for Commissioning.
2. General Contractor Superintendent.
3. Contractor Quality Control Manager.
4. Mechanical Subcontractor Representative.
5. Electrical Subcontractor Representative.
6. Testing, Balancing, and Adjusting Subcontractor Representative.
7. Instrumentation and Controls Subcontractor Representative.
8. DeCA Project Manager.
9. DeCA A-E.
10. DeCA Technical Inspector.
11. Government Furnished Equipment Manufacturer’s Representatives.
12. DeCA Store Maintenance Contractor Representatives after BOD.
13. Construction Store Maintenance Contractor Representative.
14. User Group representative (Commissary representative and/or Installation maintenance personnel).

B. Provision of a fully commissioned system of all materials required under the construction contract is the responsibility of the General Contractor. Therefore, Contractor Group members of the Systems Commissioning Team, through participation in the planning, management, and oversight of all construction activities related to equipment approvals, performance testing, and commissioning of the systems identified herein must be able to assure the Government that all systems have been properly tested and commissioned. The Government and User members are intended to participate fully as adjuncts to the Contractor Group Team members. It is intended that through this participation, the Contractor Group Team members will be provided timely access to all design information necessary to resolve questions as to intended performance of the systems specified. In addition, the Government will be sufficiently involved in the development of commissioning and performance testing programs to assure timely review of plans and procedures submitted by the Contractor. The purpose of this process will be to provide fully functional systems which interact to meet all contract performance requirements. The participation of the Government Commissioning Team members shall not relieve the General Contractor of any responsibility for compliance with the requirements of the contract.

C. Management:

1. The Contractor shall coordinate the commissioning.
2. The GCR is hired by and represents the Government. The GCR monitors and verifies the commissioning activities.
3. The Contractor Quality Control Manager shall witness all required tests.
4. The TI will witness all required tests and certify the results.

D. Scheduling:

1. The GCR will work with GC according to established protocols to schedule the commissioning activities. The GCR will review the Construction Schedule and verify that prefunctional and functional testing is properly scheduled. The GC will integrate all commissioning activities into the master schedule.
2. Commissioning inspections and testing will be accomplished in the presence of a representative of the Contracting Officer.

1.4 OVERVIEW OF THE COMMISSIONING PROCESS

A. Commissioning Plan:

1. An initial Commissioning Plan has been developed for this project and is included elsewhere in the Bid Documents. The commissioning plan provides guidance and further details the requirements in the execution of the commissioning process. The Specifications take precedence over the Commissioning Plan in the event of a conflict. The Contractor shall ensure that the initial commissioning plan is complete. Any missing or incomplete Pre-functional Checklists or Functional Checklists shall be provided or completed by the construction contractor.

B. Commissioning Process: The following narrative provides a brief overview of the typical commissioning tasks during construction and the general order in which they occur.

1. Commissioning during construction begins with a scoping meeting conducted by the Contractor and monitored by the GCR where the commissioning process is reviewed with the commissioning team members during a scheduled weekly contractors' meeting. This meeting will occur prior to the completion of the first Prefunctional Checklist.

   a. Most Prefunctional Checklists to be completed during the startup process are included in the Commissioning Plan. The construction contractor shall identify any missing checklists and provide as necessary.
   b. The QC will witness and the TI will monitor to ensure the Prefunctional Checklists are completed.

2. Additional meetings will be required throughout construction, scheduled by the QC and TI with necessary parties attending, to plan, scope, coordinate, schedule future activities and resolve problems. These will be part of the weekly contractors' meetings.
3. Equipment documentation, including Shop Drawings and installation instructions, is submitted to the TI through the normal submittals process.
4. In general, performance verification proceeds from component level to systems and intersystem levels with prefunctional checklists being completed before functional testing.
5. The Subs, under their own direction, execute and document the prefunctional checklists with the QC verifying and the TI monitoring conformance.
6. Prior to commencement of functional testing, the Commissioning Team shall perform a systems activation inspection to ensure the systems are ready to be functionally tested.

a. Functional Checklists are included in the Commissioning Plan. The construction contractor shall identify any missing checklists and provide as necessary.
b. The QC will witness and ensure the Functional Checklists are completed. The TI will be present to monitor activities to ensure functional checklists are completed.

7. The Subs, under their own direction, execute and document the Functional checklists with the QC verifying and the TI monitoring conformance.
8. Items of non-compliance in material, installation or setup are noted for the Contractor to correct. Non-complying systems will then be retested and functional performance verified by the QC and monitored by the TI.
9. All functional performance tests are completed before Beneficial Occupancy Date.
10. The QC and TI review the O&M documentation for completeness.
11. The QC and TI review the training plan provided by the Subs. The QC and TI will witness training session(s) to verify that acceptable training was provided.

1.5 GOVERNMENT COMMISSIONING REPRESENTATIVE (GCR) DUTIES AND RESPONSIBILITIES

A. Duties and responsibilities of the GCR are set forth in the Commissioning Plan.

1.6 DEFINITIONS

Acceptance Phase - phase of construction after startup and initial checkout when functional performance tests, O&M documentation review and training occurs.

Government Commissioning Representative (GCR), same as Commissioning Agent (CA) - an independent party, not otherwise associated with the A/E team members or the Contractor, though he/she may be hired as a subcontractor to them. The GCR directs and coordinates the day-to-day commissioning activities. The GCR does not take an oversight role.

Commissioning Plan - an overall plan, developed before bidding, that provides the structure, schedule, and coordination planning for the commissioning process.

Datalogging - monitoring flows, currents, status, pressures, etc. of equipment using stand-alone dataloggers separate from the control system.

Deferred Functional Tests - FTs that are performed later, after substantial completion, due to partial occupancy, equipment, seasonal requirements, design or other site conditions that disallow the test from being performed.

Deficiency - a condition in the installation or function of a component, piece of equipment or system that is not in compliance with the Contract Documents (that is, does not perform properly or is not complying with the design intent).

Functional Completion - All TAB and commissioning responsibilities of the Contractor, (except for seasonal or approved deferred testing and controls training), must be completed.

Functional Performance Test (FT) - test of the dynamic function and operation of equipment and systems using manual (direct observation) or monitoring methods. Functional testing is the dynamic testing of systems (rather than just components) under full operation (e.g., the chiller pump is tested interactively with the chiller functions to see if the pump ramps up and down to maintain the differential pressure setpoint). Systems are tested under various modes, such as during low cooling or heating loads, high loads, component failures, unoccupied, varying

outside air temperatures, fire alarm, power failure, etc. The systems are run through all the control system's sequences of operation and components are verified to be responding as the sequences state. Traditional air or water test and balancing (TAB) is not functional testing. TAB's primary work is setting up the system flows and pressures as specified, while functional testing is verifying that which has already been set up. The Government Commissioning Representative develops the functional test procedures in a sequential written form, coordinates, oversees and documents the actual testing, which is usually performed by the installing contractor or vendor. FTs are performed after prefunctional checklists and startups are complete.

Indirect Indicators - indicators of a response or condition, such as a reading from a control system screen reporting a damper to be 100% closed.

Manual Test - using hand-held instruments, immediate control system readouts or direct observation to verify performance (contrasted to analyzing monitored data taken over time to make the "observation").

Monitoring - the recording of parameters (flow, current, status, pressure, etc.) of equipment operation using dataloggers or the trending capabilities of control systems.

Over-written Value - writing over a sensor value in the control system to see the response of a system (e.g., changing the outside air temperature value from 50F to 75F to verify economizer operation). See also "Simulated Signal."

Phased Commissioning - commissioning that is completed in phases due to the size of the structure or other scheduling issues, in order to minimize the total construction time.

Prefunctional Checklist (PC) - a list of items to inspect and elementary component tests to conduct to verify proper installation of equipment, provided by the GCR to the Sub. Prefunctional checklists are primarily static inspections and procedures to prepare the equipment or system for initial operation (e.g., belt tension, oil levels OK, labels affixed, gages in place, sensors calibrated, etc.).

Sampling - functionally testing only a fraction of the total number of identical or near identical pieces of equipment.

Seasonal Performance Tests - FT that are deferred until the system(s) will experience conditions closer to their design conditions.

Simulated Condition - condition that is created for the purpose of testing the response of a system (e.g., applying a hair blower to a space sensor to see the response in a VAV box).

Simulated Signal - disconnecting a sensor and using a signal generator to send an amperage, resistance or pressure to the transducer and DDC system to simulate a sensor value.

Startup - the initial starting or activating of dynamic equipment, including executing prefunctional checklists.

Test Procedures - the step-by-step process which must be executed to fulfill the test requirements. The test procedures are developed by the GCR.

Test Requirements - requirements specifying what modes and functions, etc. shall be tested. The test requirements are not the detailed test procedures. The test requirements are specified in the Contract Documents.

Trending - monitoring using the building control system.

PART 2 - PRODUCTS

2.1 TEST EQUIPMENT

A. All testing equipment required to perform startup and initial checkout and required functional performance testing shall be provided by the construction contractor for the equipment being tested.

B. Special equipment, tools and instruments (only available from vendor, specific to a piece of equipment) required for testing equipment, according to these Contract Documents shall be included in the base bid price to the Contractor and shall be left on site for use by the Government.

C. All testing equipment shall be of sufficient quality and accuracy to test and/or measure system performance with the tolerances specified in the Specifications.

2.2 UTILITIES AND ACCESSORIES

A. Provide utilities necessary to execute testing and commissioning, including water, fuels, chemicals, batteries and other similar expendable items.

B. Provide any equipment or device required for access, such as ladders, and platforms.

PART 3 - EXECUTION

3.1 MEETINGS

A. During regular contractor meetings, the QC and TI will be available to answer questions about the Commissioning process and assist subcontractors in the completion of prefunctional and functional test sheets.

3.2 SUBMITTALS

A. Submittal Requirements for Commissioning:

1. The Government Commissioning Representative will review submittals during regular site visits. The Government Commissioning Representative will review the final approved submittal located in the GC's trailer on site. The GC will maintain this filing system.
2. The Government Commissioning Representative will review normal Contractor submittals applicable to systems being commissioned and adjust prefunctional and functional test sheets as appropriate based on equipment being supplied.

B. Data for Commissioning:

1. Typically submittals should include detailed manufacturer installation and start-up, operating, troubleshooting, and maintenance procedures, full details of any Government-contracted tests, fan and pump curves, full factory testing reports, if any, and full warranty

information, including all responsibilities of the Government to keep the warranty in force clearly identified. In addition, copies of the installation and checkout materials that are actually shipped inside the equipment and the actual field checkout sheet forms to be used by the factory or field technicians shall be maintained on site in the filing system set up and maintained by the GC. The Government Commissioning Representative will review this data on site and adjust prefunctional and functional test sheets as required.

3.3 START-UP AND PREFUNCTIONAL CHECKLISTS

A. General: Prefunctional checklists ensure that the equipment and systems are properly installed and operational. They ensure that functional performance testing (in-depth system checkout) may proceed without unnecessary delays. Each piece of equipment receives full prefunctional checkout. The prefunctional testing for a given system must be successfully completed prior to formal functional performance testing of equipment or subsystems of the given system.

B. Execution of Prefunctional Checklists:

1. The Subs and vendors shall execute startup and provide the TI, through the QC, with a signed and dated copy of the completed start-up and prefunctional tests and checklists.
2. Only individuals that have direct knowledge and witnessed that a line item task on the prefunctional checklist was actually performed shall initial or check that item off.
3. The QC and TI shall witness prefunctional tests and checklist completion by reviewing prefunctional checklist reports and by selected site observation.

C. Deficiencies:

1. List any outstanding items of the initial start-up and prefunctional procedures that were not completed successfully, at the bottom of the procedures form or on an attached sheet. The procedures form and any outstanding deficiencies shall be provided to the TI through the QC within two days of test completion. The QC will review and the TI will monitor outstanding deficiencies.

3.4 PHASED COMMISSIONING

A. When startup and initial checkout are required to be executed in phases, this phasing will be planned and scheduled in a coordination meeting of the GCR, mechanical, plumbing, TAB and controls contractor, and the GC. The GC shall modify the construction schedule to reflect phased commissioning.

3.5 FUNCTIONAL TESTING

A. Objectives and Scope:

1. The objective of functional testing is to demonstrate that each system is operating according to the Contract Documents. Functional testing facilitates bringing the systems to full dynamic operation. During the testing process, areas of deficient performance are identified and corrected, improving the operation and functioning of the systems.
2. In general, each system should be operated through all modes of operation (seasonal, occupied, unoccupied, warm-up, cool-down, part- and full-load) where there is a specified system response. Verifying each sequence in the sequences of operation is required. Proper responses to such modes and conditions as power failure, freeze condition, low oil pressure, no flow, equipment failure, etc. shall also be tested.

3. Functional testing is intended to begin upon completion of a system. Functional testing may proceed prior to the completion of systems or sub-systems at the discretion of the GCR and GC. Beginning system testing before full completion does not relieve the Contractor from fully completing the system, including all prefunctional checklists as soon as possible.

B. Documentation and Non-Conformance:

1. Documentation: The QC and TI will witness and the QC will document the results of all functional performance tests using the specific procedural forms developed for that purpose.
2. Non-Conformance:

a. The QC will record the results of the functional test on the procedure or test form. The TI will witness the test. All deficiencies or non-conformance issues shall be noted.
b. Corrections of minor deficiencies identified may be made during the tests. In such cases the deficiency and resolution will be documented on the procedure form.
c. Every effort will be made to expedite the testing process and minimize unnecessary delays, while not compromising the integrity of the procedures.
d. Any required retesting shall not be considered a justified reason for a claim of delay or for a time extension.

3.6 OPERATION AND MAINTENANCE MANUALS

A. O&M Manuals:

1. The specific content requirements for O&M manuals are described elsewhere in Division 01. Special requirements for the controls contractor and TAB contractor are found in Division 23 Section Commissioning of HVAC.
2. The QC will verify and the TI will witness that O&M Manuals have been provided. The QC will review and the TI will verify O&M Manuals to ensure they meet the requirements of the Specifications.

B. Commissioning Record:

1. Compile, organize and index commissioning data into labeled, indexed and tabbed, three-ring binders and deliver two copies to the GCR for review.
2. Final Report Details:

a. The final commissioning report shall include an executive summary, list of participants and roles, brief building description, overview of commissioning and testing scope and a general description of testing and verification methods. For each piece of commissioned equipment, the report shall contain:

1) Completed Prefunctional and Functional Checklists.
2) Certified and approved factory start-up and testing reports.
3) Certification letters from the RMCS and display case manufacturers certifying proper installation.
4) Records of all required tests and inspections for code compliance and Contract Document compliance, and documentation of approved permits and licenses to operate components of the systems.
5) Final HVAC Test and Balance Report.

6) Checklist of all inventory items required by the Contract Documents, signed by the Commissary representative.
7) Checklist of all keys turned over to the User for doors, cabinets, access doors, toilet accessories, plumbing fixtures, equipment, etc., signed by the Commissary representative.
8) Training Plan, training procedure and documentation used to support training.

b. All outstanding non-compliance items shall be specifically listed. Recommendations for improvement to equipment or operations, future actions, commissioning process changes, etc. shall also be listed. Each non-compliance issue shall be referenced to the specific functional test, inspection, trend log, etc. where the deficiency is documented. The functional performance and efficiency section for each piece of equipment shall include a brief description of the verification method used (manual testing, BAS trend logs, data loggers, etc.) and include observations and conclusions from the testing.

3.7 TRAINING OF GOVERNMENT PERSONNEL

A. The GC shall coordinate the operator training. Training requirements are shown in each Section specifying commissioning and in Sections specifying items or systems to be commissioned.

B. The GCR will review the content of the training plan and adequacy of the training of Government personnel for commissioned equipment.

1. Each Sub and vendor responsible for training shall submit a written training plan to the GCR for review prior to training. The plan shall cover the following elements:

   a. Equipment included in training.
   b. Intended audience.
   c. Location of training.
   d. Objectives.
   e. Subjects covered (description, duration of discussion, special methods, etc.)
   f. Duration of training on each subject.
   g. Instructor for each subject.
   h. Methods (classroom lecture, video, site walk-through, actual operational demonstrations, written handouts, etc.).
   i. Instructor and qualifications.

2. For the primary HVAC equipment, the Controls Contractor shall provide a short discussion of the control of the equipment during the mechanical or electrical training conducted by others.
3. Video taping of the training sessions will be provided by the subcontractor with tapes cataloged by the subcontractor and added to the O&M manuals. The QC and TI will witness the taped sessions and the GCR will review the cataloged tapes.
4. The mechanical design engineer shall, at the first training session, present the overall system design concept and the design concept of each equipment section.

3.8 DEFERRED TESTING

A. Unforeseen Deferred Tests. If any check or test cannot be completed due to the building structure, required occupancy condition or other deficiency, execution of checklists and functional testing may be delayed upon approval of the Contracting Officer.

B. Seasonal Testing. During the warranty period, seasonal testing (tests delayed until weather conditions are closer to the system's design) shall be completed as part of this contract. The GC shall coordinate this activity. Tests shall be executed, documented and deficiencies corrected by the appropriate Subs, with facilities staff and the GCR witnessing. Make any final adjustments to the O&M manuals and as-builts due to the testing.

3.9 PREREQUISITES TO SUBSTANTIAL COMPLETION

A. The commissioning must be complete, except for training, prior to Beneficial Occupancy Date, unless approved in writing by the Contracting Officer.

3.10 SCHEDULE OF SYSTEMS TO BE COMMISSIONED

A. The above systems will be commissioned and associated Prefunctional Testing Checklists and Functional Testing Checklists are provided in the Commissioning Manual.

B. Depending upon the phasing of construction, checklists may be copied and completed for that section of the work. Portions of the systems may be commissioned in stages. Once an entire system is completed all test sheets for that system shall be submitted for review by the QC and TI. Only when the entire system is completed shall the functional test of the entire system be completed.

3.11 CHECKLISTS

A. The following table lists checklists for each item and system to be commissioned, and corresponds to the table found in the Commissioning Plan. In case of conflict or discrepancy, the table in the Commissioning Plan takes precedence.

SYSTEM/COMPONENT	**PRE-FUNCTIONAL TESTING**	**FUNCTIONAL TESTING**
Division 08 - Openings		
Overhead Coiling Doors	None	FT-083323
Sectional Doors	None	FT-088613
Automatic Entrance Doors	None	FT-084229
Windows	None	FT-085000
Door Hardware	None	FT-087100
Storage Equipment	PC-087913	None
Division 11 - Equipment		
Battery Equipment		
Refrigerated Display Cases	PC-110000 -1	None
Equipment, Generic	PC-110000 -2	None
Bakery Equipment	PC-114000-13	None
Loading Dock Equipment	PC-111300	None
Pedestrian Control Equipment	PC-111400	FT-111400

SYSTEM/COMPONENT	PRE-FUNCTIONAL TESTING	FUNCTIONAL TESTING
Safes	PC-111616	None
Grocery Equipment	PC-114000.16	None
Meat Department Equipment	PC-114000.23	None
Produce Department Equipment	PC-114000.26	None
Seafood Department Equipment	PC-114000.29	None
Baler	PC-118236	None
Division 13 - Special Construction		
Cold Storage Rooms	PC-132126	None
Division 21 - Fire Suppression Systems		
Fire Suppression	PC-211300	FT-211300
Division 22 - Plumbing Systems	None	
Pumps (Plumbing)	None	FT-220000-1
Plumbing Fixtures	None	FT-220000-2
Facility Sanitary Sewerage	PC-221300	None
Domestic Water Filtration	PC-223200	None
Sanitary Waste and Vent Piping	PC-220000-1	None
Storm Drainage Piping	PC-220000-2	None
Fuel Piping	PC-220000-3	None
Domestic Water Piping	PC-220000-4	None
Domestic Water Heaters	PC-220000-5	FT-220000-3
Water Distribution	PC-221100-1	None
Water Metering	PC-221100-2	None
Division 23 - Mechanical Systems		
Packaged Cooling Towers		
Evaporative Coolers		
Humidifiers		
Air Terminal Units		
Testing, Adjusting, and Balancing	PC-230593-1	FT-230593-1
Calibration and Leak-By Test Procedure	PC-230593-2	FT-230593-2
Control Devices for HVAC	PC-230913	FT-230913
Refrigerant Monitoring System	PC-230916	FT-230916
Gas Metering	PC-231125	None
Hydronic Piping	PC-232113	None
Split-System Air Conditioners	PC-232113	None
HVAC Pumps	PC-232223	FT-232223
Ducts	PC-233113	None
Fans	PC-233423-1	FT-233423-1
Air Curtains	PC-233423-2	FT-233423-2
Makeup Air Units	PC-233423-3	FT-233423-3
Diffusers Registers and Grilles	PC-233713	None
Kitchen Exhaust / Makeup Air Unit	PC-233813	None
Heat Pumps	PC-236213	FT-236213
Packaged Water Chillers	PC-236400	FT-236400
Air Handling Units	PC-237413-1	None
Split System Heat Pumps	PC-237413-2	None

SYSTEM/COMPONENT	PRE-FUNCTIONAL TESTING	FUNCTIONAL TESTING
Fan Coil Units	None	FT-238216
Air Handling Units	PC-238416-1	FT-238416-1
Dehumidifiers	PC-238416-2	FT-238416-2
Refrigeration Compressors	PC-239000-1	FT-239000
Air Cooled Condenser	PC-239000-2	
Division 26 - Electrical Systems		
Equipment		
Medium Voltage Cables	PC-260513	None
Grounding & Bonding	PC-260526	FT-260526
Dry Type Transformers	PC-261219-1	None
Liquid Filled Transformers	PC-261219-2	None
Electric Metering	PC-261600	None
Switchboards	PC-262300	FT-262300
Panelboards	PC-262416	FT-262416
Motor Control Centers	PC-262419	FT-262419
Safety Switches	PC-262816	None
Generator Assemblies	PC-263214	FT-263214
Battery Equipment	PC-263343	None
Cathodic Protection	PC-264213	None
Emergency Lighting	PC-265100-1	FT-265100-1
Interior Lighting	PC-265100-2	FT-265100-2
Exterior Lighting	PC-265600	FT-265600
Division 27 - Communication		
Voice and Data Communications Cabling	PC-271000-1	None
Boxes, Panels And Control Centers	PC-271116	None
Data Communication Systems	PC-272000	FT-272000
Voice Communications Systems	PC-273000	FT-273000
Public Address and Music Systems	PC-275116	FT-275116
Processing Area Signaling Systems	PC-278000	None
Division 28 - Electronic Safety and Security		
Intrusion Detection	PC-281600	FT-281600
Video Surveillance	PC-282300	FT-282300
Fire Alarm	PC-283100	FT-283100
Division 32 - Exterior Improvements		
Irrigation Systems	PC-328400	FT-324840
Division 33 - Utilities		
Storm Drainage	PC-334000	None
Electric Utility Services	PC-337100	None

END OF SECTION

SECTION 03 30 00

CAST-IN-PLACE CONCRETE

(Edited from DeCA June 2011 Design Criteria)

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. This Section specifies cast-in-place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes, for the following:

   a. Footings.
   b. Foundation walls.
   c. Slabs-on-grade. (Do not place floor slabs until building spaces are enclosed and weathertight).
   d. Procedures and timing for saw cutting contraction joints in slabs-on-grade.
   e. Procedures and timing for application of liquid floor treatments.

B. Related Sections:

1. Division 01 Section Sustainable Design Reporting for recycled content of steel products.
2. Division 03 Section Polished Concrete Finishing for concrete floor slabs receiving a polished finish.
3. Division 09 Sections for floor finishes requiring specially finished cast-in place concrete floor slabs.

1.2 REFERENCES

A. NRMCA:

1. National Ready Mixed Concrete Association: Concrete In Practice, Technical Series, 900 Spring Street, Silver Spring, Maryland 20910, (301) 587-1400, ext.101, www.nrmca.org.

B. PCA:

1. Portland Cement Association: Concrete Slab Surface Defects: Causes, Prevention, Repair, 5420 Old Orchard Road, Skokie, IL 60077, (847) 966-6200, www.cement.org.

1.3 DEFINITIONS

A. Cementitious Materials:

1. Portland cement alone or in combination with one or more of the following: fly ash, subject to compliance with requirements.

B. Drainage Course:

1. Course supporting the slab-on-grade that also minimizes upward capillary flow of pore water.

1.4 SUBMITTALS

A. Product Data:

1. Admixtures.
2. Vapor retarders.
3. Floor slab treatments.

B. Design Mixtures:

1. For each concrete mixture. Submit data and test documentation on materials and mixture proportions. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.

C. Ready-Mixed Concrete:

1. Furnish batch ticket information, prepared and distributed in accordance with ASTM C 94.
2. Statement of Material Content and Proportions Selected: Prior to actual delivery of concrete, furnish a statement giving the dry masses of cement and saturated surface-dry-masses of fine and coarse aggregate and quantities, type, and name of admixtures (if any) and of water per cubic yard or cubic meter of concrete that will be used in the manufacture of each class of concrete specified. Furnish evidence that the materials to be used and proportions selected will produce concrete of the quality specified.

D. Shop Drawings:

1. Shop and placing Drawings that detail fabrication, bending, and placement of steel reinforcement. Include bar sizes, lengths, material, grade, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, splices and laps, mechanical connections, tie spacing, hoop spacing, and supports for concrete reinforcement.

E. Samples:

1. Vapor retarder.

F. Field Quality-Control Tests and Inspection Reports.

G. Submittal Requirements in ACI 301:

1. "Specification for Structural Concrete" Sections 1 through 5.

H. Special Inspection Reports.

I. Saw-cutting system to be used.

J. Submittal List:

Reference	Submittal Item	Quantity	Action
1.4A	Product Data	X	R
1.4B	Design Mixtures	X	R
1.4C	Ready-Mixed Concrete	X	R
1.4D	Shop Drawings	X	R
1.4E	Samples	X	R
1.4F	Field Tests and Reports	X	R
1.4G	ACI Submittals	X	R
1.4H	Special Inspection Reports	X	R
1.4I	Saw-cutting System	X	R

X Submit quantity specified in Division 01 Section Administrative Requirements.
R Review each submittal, mark to indicate action taken, and return.
I Submittal is for information or record purposes only. No action will be taken.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications:

1. A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.

a. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."

B. Concrete Testing Service: Engage a qualified independent testing agency to perform material evaluation tests and to design concrete mixtures.

C. Testing Agency Qualifications:

1. An independent agency, qualified according to ASTM C 1077 and ASTM E 329 for testing indicated, as documented according to ASTM E 548.

a. Personnel conducting field tests shall be qualified as ACI certified Concrete Field Testing Technician, Grade 1, according to ACI CP-01 or an equivalent certification program.
b. Personnel performing laboratory tests shall be ACI-certified Concrete Strength Testing Technician and Concrete Laboratory Testing Technician - Grade I. Testing Agency laboratory supervisor shall be an ACI-certified Concrete Laboratory Testing Technician - Grade II.

D. Source Limitations:

1. Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from one source, and obtain admixtures through one source from a single manufacturer.

E. ACI Publications (other applicable construction industry standards indicated throughout this Section have the same force and effect as if listed below):

1. Comply with the following unless modified by requirements in the Contract Documents:

a. ACI 301, "Specification for Structural Concrete," Sections 1 through 5.
b. ACI 302.1, "Guide for Concrete Floor and Slab Construction."
c. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."

F. ASTM Publications:

1. Comply with the following unless modified by requirements in the Contract Documents (other applicable construction industry standards indicated throughout this Section have the same force and effect as if listed below):

a. ASTM E 96, "Test Methods for Water Vapor Transmission of Materials."
b. ASTM E 1155, "Standard Test Method for Determining F(F) Floor Flatness and F(L) Floor Levelness Numbers."
c. ASTM E 1643, "Standard Practice for Installation of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs."
d. ASTM E 1745, "Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs."

G. Special Inspector Qualifications:

1. Special inspections for reinforced concrete shall be performed under the direct supervision of a Professional Engineer registered in the State in which the project is located. The personnel performing the inspections shall be ICC-certified Reinforced Concrete Special Inspector or an equivalent certification program.

H. Floor Finisher Qualifications:

1. The concrete floor finishing subcontractor, Lead Finisher and two additional members of the finishing crew, shall be certified under the Concrete Flatwork Finisher Training and Certification Program as granted by the American Concrete Institute.
2. The concrete floor finisher subcontractor shall have experience in finishing interior floors of similar size and scope in at least 5 previous projects.

I. Preinstallation Conference:

1. Conduct conference at Project site to comply with requirements in Division 01 Section Administrative Requirements.

a. Before submitting design mixtures, review concrete design mixture and examine procedures for ensuring quality of concrete materials. Require representatives of each entity directly concerned with cast-in-place concrete to attend, including the following:

1) Contractor's superintendent.
2) Independent testing agency responsible for concrete design mixtures.
3) Ready-mix concrete manufacturer.
4) Concrete subcontractor.
5) Concrete floor finishing subcontractor.
6) Special concrete floor finish installer (attendance may be telephonically).
7) Special concrete floor finish system manufacturer (attendance may be telephonically).

b. Review special inspection and testing and inspecting agency procedures for field quality control, concrete finishes and finishing, cold- and hot-weather concreting procedures, curing procedures, construction contraction and isolation joints, joint-

filler strips, semirigid joint fillers, forms and form removal limitations, shoring and reshoring procedures, vapor-retarder installation, anchor rod and anchorage device installation tolerances, steel reinforcement installation, floor and slab flatness and levelness measurement, concrete repair procedures, and concrete protection. Unacceptable floor slab finishes include blisters, cracking, crazing, curling, delamination, surface discoloration, dusting, efflorescence, popouts, scaling, and spalling. Sources available to the Contractor identifying causes, prevention, and repair of concrete slab surface defects are available from the Portland Cement Association and the National Ready Mix Concrete Association as identified in Paragraph 1.2 "References".

c. Review protection precautions relating to the special concrete floor finish system as specified in Division 03 Section Polished Concrete Finishing including, but not limited to, the following:

1) No satisfactory chemical or cleaning procedure is available to remove petroleum stains from the concrete floor surface. Prevention is therefore essential.
2) Diaper hydraulic powered equipment to avoid staining concrete.
3) Do not park vehicles on concrete floor slab. Place drop cloths under vehicles if it is necessary to park vehicles on concrete slab to complete work.
4) Do not use pipe cutting machines on the concrete floor slab.
5) To avoid rust staining do not place steel on concrete floor slab.
6) Do not allow acids and acidic detergents to come into contact with concrete floor slab.
7) Inform all trades that the concrete floor slab must be protected at all times.
8) Equip lifts with non-marking tires.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle steel reinforcement to prevent bending and damage.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Products: To establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of other manufacturers, a specific manufacturer's product is named and accompanied by the words "basis of design," including make or model number or other designation. Subject to compliance with requirements, provide either the named products or equal products.

2.2 DRAINAGE COURSE BENEATH SLAB-ON-GRADE

A. Narrowly graded mixture of washed crushed stone, or crushed or uncrushed gravel; ASTM D 448; coarse-aggregate grading Size 57; with 100 percent passing a 1-1/2-inch sieve and 0 to 5 percent passing a No. 8 sieve.

2.3 FORM-FACING MATERIALS

A. Smooth-Formed Finished Concrete:

1. Form-facing panels that will provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.

a. Plywood, metal, or other approved panel materials.

B. Rough-Formed Finished Concrete:

1. Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.

C. Form-Release Agent:

1. Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.

a. Formulate form-release agent with rust inhibitor for steel form-facing materials.

D. Form Ties:

1. Factory-fabricated, removable or snap-off metal or glass-fiber-reinforced plastic form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.

2.4 STEEL REINFORCEMENT

A. Reinforcing Bars:

1. ASTM A 615/A 615M, Grade 60, deformed.

B. Plain-Steel Wire:

1. ASTM A 82, as drawn.

2.5 CONCRETE MATERIALS

A. Cementitious Material:

1. Portland Cement: ASTM C 150, Type I, of the same type, brand, and source, throughout Project:

B. Normal-Weight Aggregates:

1. ASTM C 33, Class 3S coarse aggregate or better, graded. Provide aggregates from a single source.
2. Maximum Coarse-Aggregate Size: As indicated.
3. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.

C. Water:

1. ASTM C 94/C 94M and potable.

D. Fly Ash:

1. ASTM C 618, Type F.

2.6 ADMIXTURES

A. General:

1. Do not use admixtures unless specifically indicated or approved by Contracting Officer.

B. Air-Entraining Admixture:

1. ASTM C 260.

2.7 VAPOR RETARDERS

A. Vapor Retarder:

1. Vapor Retarder: ASTM E 1745, Class B or A, with the following minimum criteria:

a. Thickness: Minimum 15 mil per ACI 302.1R, section 3.2.3.
b. Water-vapor permeance: Maximum 0.3 Perms as tested per ASTM E 96.
c. Basis-of-Design Products:

1) "Stego Wrap" (15 mil) Vapor Barrier by Stego Industries LLC.
2) "Griffolyn Vaporguard" by Reef Industries.
3) "Dura-Skrim" 10HUV by Raven Industries.
4) "Soco-Shield" VB-15 or PL-15 by Socopac Company.
5) "Plasmatic Core" pre-molded membrane by W.R. Meadows.

B. Accessories:

1. Seam Tape: Minimum 4-inch width, of high density polyethylene with pressure sensitive adhesive on one side, or as recommended by the product manufacturer.
2. Barrier Penetration Boots: Constructed of the vapor retarder product or as recommended by the product manufacturer.

2.8 FLOOR AND SLAB TREATMENTS

A. Acrylic Liquid Floor Sealing Treatment (interior concrete only):

1. Waterborne solution, VOC compliant, 15 percent to 20 percent total solids, that dries to form a clear, glossy, protective film that seals concrete surfaces.
2. Basis-of-Design Products:

a. Dress & Seal WB; L&M Construction Chemicals, Inc.
b. Aqua Cure VOX; Euclid Chemical Co.
c. Kure-N-Seal W; Sonneborn, Div. of ChemRex, Inc.

2.9 CURING MATERIALS

A. Evaporation Retarder:

1. Waterborne, monomolecular film forming, manufactured for application to fresh concrete.
2. Basis-of-Design Products.

a. Burke by Edoco; BurkeFilm.
b. ChemMasters; Spray-Film.
c. Conspec Marketing & Manufacturing Co., Inc., a Dayton Superior company; Aquafilm.
d. Dayton Superior Corporation; Sure Film.

B. Absorptive Cover Curing Materials:

1. AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. when dry.

C. Moisture-Retaining Cover:

1. ASTM C 171, polyethylene film or white burlap-polyethylene sheet.

D. Potable Water.

2.10 RELATED MATERIALS

A. Expansion- and Isolation-Joint-Filler Strips:

1. ASTM D 1751, asphalt-saturated cellulosic fiber.

B. Semirigid Polyurea Joint Filler:

1. Rapid setting, 100 percent solids, flexible, two part polyurea joint filler with a Type A Shore durometer hardness of at least 85 per ASTM D 2240 when cured. Designed to fill and protect joints in industrial floors that are subject to traffic such as trucks, forklifts or steel wheeled carts.
2. Color: Manufacturer's standard gray.
3. Basis-of-Design Product: Advanced Floor Products, Inc.; Crete-Fill Pro 85; (773) 622-2444 and www.retroplatesystem.com.
4. Performance Criteria:

a. Tensile Strength: 1160psi per ASTM D 412-98.
b. Can set rapidly and consistently in application temperatures ranging from minus 40 deg F to 130 deg F.

5. Elongation: Minimum of 300 percent.

C. Saw-cutting System:

1. Power saw equipped with shatter-proof abrasive or diamond-rimmed blades. Cut 1/8-inch-wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface before concrete develops random contraction cracks. Use the following saw cutting system appropriate to procedures and timing for saw cutting contraction joints in slabs-on-grade.

a. Early-Entry Dry-Cut Saws:

1) Basis-of-Design Products. "Soff-cut" early drycut saws by Soff-Cut International, Inc.

b. Conventional Saws.

2. Saw-Cut Control Joint Dust Collection:

a. Connect a dust collection system directly to each saw being used.

1) Basis-of-Design: ProVac Dust Collection System PVG-55 by Glad Tech Inc.

2.11 REPAIR MATERIALS

A. Repair Underlayment:

1. Where repair material for concrete floor and slab areas is required beneath floor coverings, provide cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch and that can be feathered at edges to match adjacent floor elevations in accordance with the following:

a. Cement Binder: ASTM C 150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
b. Primer: Product of underlayment manufacturer recommended for substrate, conditions, and application.
c. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by underlayment manufacturer.
d. Compressive Strength: Not less than 4100 psi at 28 days when tested according to ASTM C 109/C 109M.

B. Repair Overlayment:

1. Where repair material for concrete floor or slab areas is required to remain exposed and not receive floor coverings, provide cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch and that can be feathered at edges to match adjacent floor elevations in accordance with the following:

a. Cement Binder: ASTM C 150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
b. Primer: Product of topping manufacturer recommended for substrate, conditions, and application.
c. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by topping manufacturer.
d. Compressive Strength: Not less than 5000 psi at 28 days when tested according to ASTM C 109/C 109M.

2.12 CONCRETE MIXTURES, GENERAL

A. Design Mixture Preparation:

1. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301.

a. Use a qualified independent testing agency for preparing and reporting proposed mixture designs based on laboratory trial mixtures.
b. Use Option A, ASTM C 94, as a basis for determining the proportions of the concrete to produce the required quality.

B. Cementitious Materials:

1. Limit percent by weight of cementitious materials other than Portland cement in concrete as follows:

a. Fly Ash; 5 percent maximum in floors receiving special concrete floor finish, 15 percent maximum elsewhere.

C. Concrete Mixtures:

1. Subject to compliance with requirements, proportion normal-weight concrete mixtures and provide floor and slab final finishes for each mix type in accordance with the Concrete Mixture Schedule at the end of Part 3.

D. Chloride-Ion Content:

1. Limit water-soluble, in hardened concrete to 0.30 percent by weight of cement.

E. Admixtures:

1. Where indicated or approved, use admixtures according to manufacturer's written instructions.

2.13 FABRICATING REINFORCEMENT

A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

2.14 CONCRETE MIXING

A. Ready-Mixed Concrete:

1. Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M, and furnish batch ticket information.

a. When air temperature is between 85 and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.

PART 3 - EXECUTION

3.1 FORMWORK

A. General:

1. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.
2. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117 and ACI 301 except as specified herein.
3. Limit concrete surface irregularities, designated by ACI 347R as abrupt or gradual, as follows:

    a. Class A, 1/8 inch for smooth-formed finished surfaces.
    b. Class C, 1/2 inch for rough-formed finished surfaces.

4. Construct forms tight enough to prevent loss of concrete mortar.
5. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.

    a. Install keyways, reglets, recesses, and the like, for easy removal.
    b. Do not use rust-stained steel form-facing material.

6. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.
7. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.
8. Chamfer exterior corners and edges of permanently exposed concrete.
9. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.
10. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.
11. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.
12. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.
13. Provide slab side forms, of form materials specified, full depth, with beveled, level, and smooth top surface for all slabs where SOV is greater than FF 35 / FL 25.
14. Provide slab side forms such that by placing a 10-foot straightedge, form does not exceed 1/8 inch variation.

3.2 EMBEDDED ITEMS

A. General:

1. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting Drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

   a. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC's "Code of Standard Practice for Steel Buildings and Bridges."
   b. Install loading dock leveler pit framing angles and anchors in accordance with dock leveler manufacturer's written instructions.

3.3 REMOVING AND REUSING FORMS

A. General:

1. Formwork for sides of beams, walls, columns, and similar parts of the Work that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F for 24 hours after placing concrete, if concrete is hard enough to not be damaged by form-removal operations and curing and protection operations are maintained.
2. Remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores.

B. Reused Forms:

1. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material will not be acceptable for exposed surfaces. Apply new form-release agent.

   a. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets.

3.4 VAPOR RETARDERS

A. Vapor Retarder Installation:

1. Place, protect, and repair vapor-retarders over the prepared subgrade in accordance with ACI 302.1R and ASTM E 1643, as applicable.
2. Place the vapor retarder sheeting over the prepared base with the longest dimension parallel with the direction of the concrete slab.
3. Lap joints 6 inches and seal with seam tape (or manufacturer's recommended adhesive).
4. Lap vapor retarder over footings or onto foundation walls, or both, and seal around all penetrations such as utilities and columns in order to create a monolithic membrane between the moisture source below the slab and the slab.

B. Vapor Retarder Protection:

1. Take precautions to protect vapor retarder from damage during installation of utilities, and during drainage course placement.
2. Avoid use of stakes driven through the retarder.

3. Inspect and repair all punctures, damage or opened seams in the membrane retarder immediately prior to subsequent placement of drainage course.

3.5 DRAINAGE COURSE MATERIAL PLACEMENT OVER VAPOR RETARDER

A. Inspect and repair all punctures, damage or opened seams in the membrane retarder immediately prior to drainage course placement.

B. Place drainage course on vapor retarder free of mud, frost, snow, or ice.

1. Place drainage course 6 inchesor less in compacted thickness in a single layer.
2. Place drainage course that exceeds 6 inchesin compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches thick or less than 3 inches thick.

a. Compact each layer of drainage course to required cross sections and thicknesses to not less than 95 percent of maximum dry unit weight according to ASTM D 698.

3.6 STEEL REINFORCEMENT

A. General:

1. Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.
2. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.
3. Use concrete brick type reinforcing bar supports or steel bar support chairs.
4. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that would reduce bond to concrete.
5. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.

a. For slabs-on-grade space reinforcing bar supports not to exceed 4 feet on center in each direction.

6. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.

3.7 JOINTS

A. General:

1. Construct joints true to line with faces perpendicular to surface plane of concrete.
2. Provide construction, isolation and contraction joints as indicated on Drawings and as noted below.
3. Bulkheads for construction joints shall be 1-1/2 inch minimum lumber. Do not use permanent preformed metal bulkheads.
4. Provide bulkheads full depth of member.
5. Space joints to allow one continuous placement between bulkheads.
6. Unless otherwise shown on Drawings, maximum spacing between contraction, construction, or isolation joints in slabs on grade shall be lesser of the following:

a. 36 x slab thickness in inches.
b. Length-to-width ratio of 1-1/2: 1.

7. Unless otherwise shown on the Drawings, do not extend reinforcement, corner protection angles, bars or other fixed metal items through construction joints in slabs on grade or pavements or through joints between slabs on grade and vertical surfaces.

B. Construction Joints:

1. Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Contracting Officer.
2. Do not use keyed joints in floors.

C. Contraction Joints (Shrinkage/Crack Control Joints) in Slabs-on-Grade:

1. Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints as follows:

a. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch- wide joints into concrete before concrete starts to cool, when cutting action will not tear, abrade, or otherwise damage surface, and before concrete develops random contraction cracks.

1) Early-Entry Dry-Cut Saw Cutting: Saw cut slab within 1 hour in hot weather to 2 hours in cold weather after completing finishing of the slab in that joint location. Minimum saw cut depth of 1 inch within time limits. Clean out joints with a diamond impregnated saw blade equipped with a dustless vacuum system to ensure sides of joint walls are clean so that joint filler can bond with them.
2) Conventional Saw Cutting: Saw cut slab within 4 hours in hot weather to 12 hours in cold weather after the slab has been finished in an area. Depth of saw cut using conventional saw shall be at least one-quarter of slab depth or minimum of 1 inch, whichever is greater.

D. Isolation Joints in Slabs-on-Grade:

1. After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.
2. Extend joint-filler strips full width and depth of joint, terminating top of strip below finished concrete surface as indicated.
3. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.
4. Form isolation joints of preformed joint-filler strips (PMEJ) where indicated.

a. Place top of joint filler flush with finished concrete surface if joint sealant is not indicated.
b. Protect top edge of joint filler during concrete placement with metal, plastic, or other temporary preformed cap. Remove protective cap after concrete has been placed on both sides of joint.

3.8 CONCRETE PLACEMENT

A. General:

1. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed.

2. Before test sampling and placing concrete, no water shall be added to the design mix after leaving the batch plant without approval from the Contracting Officer.
3. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.

    a. Deposit concrete in horizontal layers of depth to not exceed formwork design pressures and in a manner to avoid inclined construction joints.
    b. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.
    c. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.

4. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.

    a. Slab on Grade Thickness: Plus (+) as required to conform to slab finished surface flatness and levelness tolerances specified, and minus (-) 1/4 inch, with the average of all thickness samples equal to or greater than the specified slab thickness.
    b. Where floor slab is to be used as casting bed for tilt-up concrete, provide materials and methods compatible with those specified for tilt-up concrete work.
    c. Consolidate concrete during placement operations so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
    d. Maintain reinforcement in position on chairs during concrete placement.
    e. Screed slab surfaces with a straightedge and strike off to correct elevations.
    f. Slope surfaces uniformly to drains where required.
    g. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface. Do not further disturb slab surfaces before starting finishing operations.

B. Cold-Weather Placement:

1. Comply with ACI 306.1. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
2. When average high and low temperature is expected to fall below 40 deg F for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.
3. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
4. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.
5. Immediately before placing concrete, metal embedments and other metal items in contact with concrete shall be at temperature above 32 deg F if one or more of the following conditions are met:

    a. Metal item weighs more than 15 pounds per lineal foot.
    b. Metal item is compact and weighs more than 50 pounds total.
    c. Items noted on Drawings.

6. Subgrade shall be thawed to depth of 12 inches immediately before placing concrete.
7. Measure and record concrete temperature during protection period in each placement at regular time intervals, but not less than 3 times per 24-hour period.
8. Do not place concrete on subgrade, subbase, base or forms that have a temperature less than 35 deg F. Warm subgrade, subbase, or base to a temperature of 35 deg F or more, but not more than 65 deg F.
9. Do not use combustion heaters during first 48 hours without precautions to prevent exposure of concrete to exhaust gases containing carbon dioxide and carbon monoxide.

C. Hot-Weather Placement:

1. Comply with ACI 301 and as follows:

a. Maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
b. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.
c. Concreting in Hot, Dry or Windy Weather:

1) When the concrete's rate of evaporation exceeds 0.2 pounds per square foot per hour, as determined by analysis, or any combination of concrete materials and weather conditions are favorable for the formation of plastic shrinkage cracks, the Contractor shall employ all necessary precautions to avoid cracking.
2) Maintain an accurate reading thermometer at the job site to check temperature of concrete.
3) Reject concrete based on following criteria: For slabs, reject concrete if its temperature before placement is 95 deg F or above unless otherwise approved by Contracting Officer. During hot weather, mixing and delivery (discharge) time shall be shorter than specified in ASTM C94 as follows unless otherwise approved by the Contracting Officer:

a) When air temperature is between 85 deg F and 90 deg F, reduce allowable mixing and delivery time from 90 minutes to 75 minutes.
b) When air temperature is over 95 deg F, reduce allowable mixing and delivery time to 60 minutes.

4) Do not place concrete when forms, subgrade, subbase or reinforcing bars are more than 120 deg F or the temperature differential between the forms, subbase, base, or reinforcing bars and concrete will create conditions favorable for settlement cracks or thermal cracking.
5) Cool with water or water-soaked burlap as necessary, but allow no standing water on surface on which concrete is placed.

D. Precipitation Protection: Protect surfaces of exposed concrete from precipitation until adequate strength is gained to prevent damage.

E. Enclosed Environment: Limit internal combustion sources to prevent carbonation of slab surface.

3.9 FINISHING FORMED SURFACES

A. Rough-Formed Finish:

1. As-cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched. Remove fins and other projections that exceed specified limits on formed-surface irregularities.

a. Apply to concrete surfaces not exposed to public view.

B. Smooth-Formed Finish:

1. As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defects. Remove fins and other projections that exceed specified limits on formed-surface irregularities.

a. Apply to concrete surfaces exposed to public view.

C. Related Unformed Surfaces:

1. At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces, unless otherwise indicated.

3.10 FINISHING FLOORS AND SLABS

A. General:

1. Comply with ACI 302.1R recommendations for screeding, restraightening, and finishing operations for concrete surfaces.

a. Subject to compliance with requirements, and recommendations of floor surfacing materials manufactures, provide floor and slab final finishes indicated for each floor and slab Mix Type in the Concrete Mixture Schedule at the end of Part 3.

2. Do not add water to slab surface during finishing operations.
3. Do not add cement to slab surface during finishing operations.
4. Perform no finishing operation while water is present on slab surface.
5. If concrete is firm enough for floating but substantial amount of bleed water is still on surface, water may be removed by one of the following methods:

a. Fans or blower heaters, provided that the airflow does not dry, dust, or crust the surface or cause cracking.
b. If concrete surface is stiff enough to not be damaged, rubber hose may be dragged slowly over surface one time without disturbing surface.

6. Initial Leveling: Complete bull floating, darbying and straight-edging before any bleed water is present on slab surface.
7. Hand and Power Floating:

a. Do not start floating until following conditions are met:

1) Bleeding is finished.

2) Bleed water is gone, including water sheen on slab surface.
3) Concrete will sustain the weight of finishers without creating more than 1/8 to 1/4 inch indentations.
4) Mortar is not thrown by rotating blades of power float.

b. Do not use following tools for floating:

1) Power troweling machines with trowel blades.
2) Fresno or other type of wide metal trowel.
3) Power floating machine with water attachment for wetting concrete.

c. Float three times minimum with each floating at right angles to previous floating, and final pass at 45 deg to previous pass.

8. Normal Trowel Finish:

a. Hand or power float floor before starting troweling.
b. Plastic (Nylon, etc.) blades will not permitted unless otherwise specified.
c. For first troweling, keep blade as flat as possible and use low speed, minimizing "washboard" or "chatter marks" and "pitting".
d. Trowel two times minimum with first two trowelings at right angles. Some burn marks are acceptable. Cease troweling before trowel blades scratch surface.
e. Allow time between trowelings for concrete to stiffen and water sheen to disappear.
f. Do not add water to slab surface during troweling.

1) Do not ride trowels on existing slabs. Trowels shall be carried off of slab surfaces. When parking power trowels on fresh concrete, place on top of plywood or spray area with evaporation retarder before placing trowel on top of slab.

B. Hard Trowel Finish:

1. After applying normal trowel finish, apply hard trowel finish by hand and power-driven trowel. Power trowel a minimum of three times and finally hand trowel to render finished surface essentially free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings. Unless otherwise indicated follow the finishing operations described in ACI 302.1R, for Floor Classification, Class 5.

a. Apply a hard trowel finish to surfaces indicated.
b. Where "Special Concrete Floor Finish" is indicated follow the finishing operations described in ACI 302.1R, for Floor Classification, Class 9 and as follows:

1) Construct slabs in long strips less than 20 feet in width.
2) Adjust the slump on site to within plus or minus 1/2 inch of the target slump.
3) Provide concrete with sufficient slump at the point of deposit to permit use of a modified highway straightedge to close the floor surface without difficulty after the initial strikeoff.
4) The "window of finishability" shall be sufficient to perform necessary finishing operations.
5) Use enough trucks to ensure an uninterrupted concrete supply.

C. Floor Slab Finish Tolerances:

1. Finish surfaces to the following tolerances, according to ASTM E 1155, for a randomly trafficked floor surface:

   a. Unless otherwise indicated: Specified Overall Values (SOV) of flatness, F(F) 35; and of levelness, F(L) 25; with Minimum Local Values (MLV) of flatness, F(F) 26; and of levelness, F(L) 19 tolerance for troweled floors in accordance with ACI 117. An ACI certified Flatwork Finisher will not be required for finishing of these floors.
   b. Where "Special Concrete Floor Finish" is indicated: Specified Overall Values (SOV) of flatness, F(F) 50 and of levelness, F(L) 40; with Minimum Local Values (MLV) of flatness, F(F) 38; and of levelness, F(L) 26 tolerance for troweled floors in accordance with ACI 117.
   c. Remedies for out-of-tolerance work:

      1) Remove and replace slabs-on-grade measuring below either (or both) of specified minimum local F-numbers. Do not use repair materials specified in Part 2 to correct out of tolerance work.
      2) Remove and replace slab-on-grade areas containing craze cracking.
      3) Remedy other out-of-tolerance work as required by Contracting Officer.
      4) Slab areas requiring removal shall be removed to established joint pattern indicated on Drawings.

D. Broom Finish:

1. Apply a broom finish to exterior concrete platforms, steps, and ramps, and elsewhere as indicated.
2. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route.

3.11 MISCELLANEOUS CONCRETE ITEMS

A. Filling In:

1. Fill in holes and openings left in concrete structures, unless otherwise indicated, after work of other trades is in place. Mix, place, and cure concrete, as specified, to blend with in-place construction. Provide other miscellaneous concrete filling indicated or required to complete the Work.

B. Curbs:

1. Provide monolithic finish to interior curbs by stripping forms while concrete is still green and by steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.

C. Equipment Bases and Foundations:

1. Provide machine and equipment bases and foundations as shown on Drawings. Set anchor bolts for machines and equipment at correct elevations, complying with diagrams or templates from manufacturer furnishing machines and equipment.

3.12 CONCRETE PROTECTING AND CURING

A. General:

1. Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 301 for hot-weather protection during curing.
2. Start curing as soon as concrete surface will not be damaged by curing operations.
3. Continuously cure concrete for at least 7 consecutive days.
4. During curing period, do not allow any part of the concrete to become dry.
5. Do not use polyethylene sheets on exposed interior floors.

B. Evaporation Retarder:

1. Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.
2. Do not use evaporation retarder on floor slabs receiving floor finish specified in Division 03 Section Polished Concrete Finishing unless approved by special concrete floor finish manufacturer

C. Formed Surfaces:

1. Cure formed concrete surfaces. Keep forms in contact with concrete wet during curing period unless type of form is impervious to water, such as metal or fiberglass. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing for the remainder of the curing period with other approved methods.

D. Unformed Surfaces:

1. Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, and other surfaces.

E. Curing:

1. Cure concrete according to ACI 308.1, by one or a combination of the following methods:

   a. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:

      1) Water.
      2) Continuous water-fog spray.
      3) Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.

   b. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period using cover material and waterproof tape.

3.13 JOINT FILLING OF EXPOSED CONCRETE SLAB-ON-GRADE FLOORS

A. General:

1. Install semirigid polyurea joint filler only in joints of concrete slab-on-grade floors that are indicated to remain exposed.
2. Prepare, clean, and install semirigid joint filler according to manufacturer's written instructions.
3. Defer joint filling until concrete has aged for time period recommended by joint filler manufacturer. Do not fill joints until construction traffic has permanently ceased.
4. Remove all foreign material from joint substrates that could interfere with adhesion of joint filler, including dust, paints (except for permanent, protective coatings tested and approved for filler adhesion and compatibility by joint filler manufacturer), old joint sealants and fillers, grease, dirt, debris, saw cuttings, and sealers from joints; leave contact faces of joint clean and dry.

B. Installation:

1. Install semirigid joint filler full depth in saw-cut joints and at least 2 inches deep in formed joints in accordance with manufacturer’s written recommendations. Overfill joint and trim joint filler flush with top of joint after hardening.

3.14 LIQUID FLOOR TREATMENTS

A. Acrylic Liquid Floor Sealing Treatment:

1. Apply two coats of sealer in accordance with manufacturer's recommendations. Apply first coat of sealer after concrete has cured to the extent required by the floor sealer manufacturer. Apply second coat of sealer just before completion of project.

3.15 CONCRETE SURFACE REPAIRS

A. Defective Concrete:

1. Repair and patch defective areas when approved by Contracting Officer. Remove and replace concrete that cannot be repaired and patched to Contracting Officer’s approval.

B. Patching Mortar:

1. Mix dry-pack patching mortar, consisting of one part portland cement to two and one-half parts fine aggregate passing a No. 16 sieve, using only enough water for handling and placing.

C. Repairing Formed Surfaces:

1. Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.

a. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch in any dimension in solid concrete, but not less than 1 inch in depth. Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush-coat holes and voids with bonding agent. Fill and compact

with patching mortar before bonding agent has dried. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.

b. Repair defects on surfaces exposed to view by blending white portland cement and standard portland cement so that, when dry, patching mortar will match surrounding color. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.

c. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by Contracting Officer.

D. Repairing Unformed Surfaces:

1. Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.

a. Repair finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01 inch wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.

b. After concrete has cured at least 14 days, correct high areas by grinding.

c. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.

d. Correct other low areas scheduled to receive floor coverings with a repair underlayment. Prepare, mix, and apply repair underlayment and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface. Feather edges to match adjacent floor elevations.

e. Correct other low areas scheduled to remain exposed with a repair topping. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch to match adjacent floor elevations. Prepare, mix, and apply repair topping and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.

f. Repair defective areas, except random cracks and single holes 1 inch or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least a 3/4-inch clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mixture as original concrete except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.

g. Repair random cracks and single holes 1 inch or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.

3.16 FIELD QUALITY CONTROL

A. Testing and Inspecting:

1. The Contractor shall engage a testing agency to perform concrete tests.
2. The Contractor shall employ a concrete special inspector to perform special inspections.

B. Inspections:

1. The inspection program by the Special Inspector shall comply with Table 1704.4 of the 2009 International Building Code.

C. Concrete Tests:

1. Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:
2. Testing Frequency: Obtain at least one composite sample for each 100 cu. yd. or fraction thereof of each concrete mixture placed each day.
3. When frequency of testing will provide fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
4. Slump: ASTM C 143/C 143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.
5. Air Content: ASTM C 231, pressure method, for normal-weight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
6. Compression Test Specimens: ASTM C 31/C 31M.

    a. Cast and laboratory cure two sets of two standard cylinder specimens for each composite sample.

7. Compressive-Strength Tests: ASTM C 39/C 39M; test one set of two laboratory-cured specimens at 7 days and one set of two specimens at 28 days.

    a. Test one set of two field-cured specimens at 7 days and one set of two specimens at 28 days.
    b. A compressive-strength test shall be the average compressive strength from a set of two specimens obtained from same composite sample and tested at age indicated.

8. Strength of each concrete mixture will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi.
9. Test results shall be reported in writing to Contracting Officer, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.
10. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Contracting Officer. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42/C 42M or by other methods as directed by Contracting Officer.
11. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

    a. Correct deficiencies in the Work that test reports and inspections indicate dos not comply with the Contract Documents.

D. Floor Flatness F(F)and Levelness F(L):

1. Test floor slab finished surface areas for flatness and levelness in accordance with ASTM E 1155 within 72 hours of finishing.
2. F-Number requirements shall be as follows for all interior floor slabs.

   a. Slabs on Grade: F(F)/F(L) minimum overall for composite of measured values (SOV) for entire day's concrete placement; F(F)/F(L) minimum for any individual floor section (MLV) as specified in Finishing Floors And Slabs article in Part 3 above.
   b. A test section shall consist of any subdivision of a test surface satisfying the following criteria:

      1) No test section shall measure less than 8 feet on a side, nor comprise an area less than 320 square feet.
      2) No portion of the test surface shall be associated with more than one test section.
      3) When testing a concrete floor no test section boundary shall cross any construction joint.
      4) No sample measurement line shall measure less than 11 feet in length.
      5) No portion of any sample measurement line shall fall within 2 feet of any slab boundary, construction joint, isolation joint, block-out, penetration, or other similar discontinuity (Exception: Shrinkage crack control joints formed either by partial depth saw cuts or by partial depth inserts shall be ignored).

   c. Complete testing, identify defective areas, and submit written report within 24 hours after testing.

END OF SECTION

CONCRETE MIXTURE SCHEDULE

Mix Type	Use	fc Min at 28 Days, psi	Agg Size Max[a] inches	Slump Limit, inches	w/c Ratio Max	Air Content, percent	Floor/Slab Final Finish
	Footings	3000	1-1/2	4	0.68	None	NA
	Foundation Walls Not Subject to Freezing and Thawing	3000	1-1/2	4	0.68	None	NA
	Foundation Walls Subject to Freezing and Thawing - Retaining Walls	4000	1-1/2	4	0.48	5.5	NA
	Interior Slabs-on-Grade Unless Otherwise Indicated, Floor Classification 5	4000	1	4	0.47 to 0.53	None	Hard trowel finish
	Interior Slabs-on-Grade Slab Special Concrete Floor Finish, Floor Classification 9	4000	1	4	0.47 to 0.53	None	Hard trowel finish
	Freezer Floor	4000	1	4	0.45	None	Hard trowel finish
	Interior Miscellaneous Concrete, Non-Structural, Exposed Surface	2500	1	4	0.47 to 0.53	None	Hard trowel finish
	Interior Equipment Pads, Non-Structural, Exposed Surface	2500	1	4	0.47 to 0.53	None	Hard trowel finish
	Exterior Miscellaneous Concrete, Exposed Surface	4000	1	4	0.40	6	Broom finish
	Exterior Equipment Pads, Exposed Surface	4000	1	4	0.40	6	Broom finish

Concrete Mixture Schedule Notes:

a. Maximum size of coarse aggregates: Comply with ACI 301 for minimum clearance between reinforcing bars, sides of forms, and slab or topping thickness (except in unbonded topping maximum aggregate size shall not exceed one-quarter topping thickness).

NA: Not applicable.

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SECTION 04 20 00

UNIT MASONRY

(Edited from DeCA June 2011 Design Criteria)

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Concrete masonry units (CMUs).
2. Mortar and grout.
3. Reinforcing steel.
4. Masonry joint reinforcement.
5. Ties and anchors.
6. Miscellaneous masonry accessories.

1.2 REFERENCES

A. Specification for Masonry Structures: ACI 530.1-08 /ASCE 6-08 /TMS 602-08.

1.3 DEFINITIONS

A. Reinforced Masonry: Masonry containing reinforcing steel in grouted cells.

1.4 PERFORMANCE REQUIREMENTS

A. Unit Masonry Compressive Strength:

1. Provide units with minimum average net area compressive strengths as follows:
2. For Concrete Masonry Units: 1900 psi.

B. Determine net-area compressive strength (f'm) of masonry from average net-area compressive strengths of masonry units and mortar types (unit-strength method) according to Tables 1 and 2 in ACI 530.1/ASCE 6/TMS 602. Provide Type S mortar at all locations.

1.5 SUBMITTALS

A. Shop Drawings:

1. Reinforcing Steel: Detail bending and placement of unit masonry reinforcing bars. Comply with ACI 315, "Details and Detailing of Concrete Reinforcement" showing bar schedules, stirrup spacing, diagrams of bend control joints, framing or special conditions affecting the work. Provide 1/4 inch scale elevations of all walls with all openings and reinforcing shown. Coordinate with mason the type of grouting techniques to be used and provide bar lengths accordingly.

B. Material Certificates:

1. Include statements of material properties indicating compliance with requirements including compliance with standards and type designation within standards. Provide for each type and size of the following:

a. Masonry Units:

1) Include material test reports substantiating compliance with requirements.

b. Cementitious materials. Include brand, type, and name of manufacturer.
c. Reinforcing bars.
d. Joint reinforcement.
e. Anchor, ties, and metal accessories.
f. Aggregate certificates for mortar and grout.
g. Preblended, dry mortar mixes. Include description, type, and proportions of ingredients.

C. Mix Designs:

1. For each type of mortar and grout. Include description of type and proportions of ingredients.

D. Statement of Compressive Strength of Masonry:

1. For each combination of masonry unit type and mortar type, provide statement of average net-area compressive strength of masonry units, mortar type, and resulting net-area compressive strength of masonry determined according to Tables 1 and 2 in ACI 530.1/ASCE 6/TMS 602.

E. Field Quality-Control Tests and Inspection Reports.

F. Special Inspection Reports.

G. Submittal List:

Reference	Submittal Item	Quantity	Action
1.5A	Shop Drawings	X	R
1.5B	Material Certificates	X	R
1.5C	Mix Designs	X	R
1.5D	Statement of Compressive Strength of Masonry	X	I
1.5E	Field Tests and Reports	X	R
1.5F	Special Inspection Reports	X	R

X Submit quantity specified in Division 01 Section Administrative Requirements.
R Review each submittal, mark to indicate action taken, and return.
I Submittal is for information or record purposes only. No action will be taken.

1.6 QUALITY ASSURANCE

A. Source Limitations for Masonry Units:

1. Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, through one source from a single manufacturer for each product required.

B. Source Limitations for Mortar Materials:

1. Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from a single manufacturer for each cementitious component and from one source or producer for each aggregate.

C. Fire-Resistance Ratings:

1. Where indicated, provide materials and construction identical to those of assemblies with fire-resistance ratings determined per ASTM E 119 by a testing and inspecting agency, by equivalent concrete masonry thickness, or by other means, as acceptable to authorities having jurisdiction.

D. Testing Agency Qualifications:

1. Qualified according to ASTM C 1093 for testing indicated.

a. Personnel conducting field tests shall be qualified as ACI-certified Concrete Field Testing Technician, Grade I, or an equivalent certification program.
b. Personnel performing laboratory tests shall be ACI-certified Concrete Strength Testing Technician, Grade I, or an equivalent certification program. Testing agency laboratory supervisor shall be an ACI-certified Concrete Laboratory Testing Technician - Grade II, or an equivalent certification program.

E. Special Inspector Qualifications:

1. Special inspections for structural masonry shall be performed under the direct supervision of a Professional Structural Engineer registered in the state in which the project is located. The personnel performing the inspections shall be ICC-certified Structural Masonry Special Inspector or an equivalent certification program.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Storage:

1. Store masonry units on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied. If units become wet, do not install until they are dry.
2. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.
3. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.
4. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

B. Preblended Dry Mortar Mix:

1. Deliver preblended, dry mortar mix in moisture-resistant containers designed for lifting and emptying into dispensing silo. Store preblended, dry mortar mix in delivery

containers on elevated platforms, under cover, and in a dry location or in a metal dispensing silo with weatherproof cover.

1.8 PROJECT CONDITIONS

A. Protection of Masonry:

1. During construction, cover tops of walls, projections, and sills exposed to weather with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.
2. Extend cover a minimum of 24 inches down both sides and hold cover securely in place.

B. Applied Loads:

1. Do not apply uniform floor or roof loads for at least 12 hours and concentrated loads for at least 3 days after building masonry walls.

C. Stain Prevention:

1. Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.
2. Protect base of walls from rain-splashed mud and from mortar splatter by spreading coverings on ground and over wall surface.
3. Protect sills, ledges, and projections from mortar droppings.
4. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.
5. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt onto completed masonry.

D. Cold-Weather Requirements:

1. Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.

E. Cold-Weather Cleaning:

1. Use liquid cleaning methods only when air temperature is 40 deg F and above and will remain so until masonry has dried, but not less than 7 days after completing cleaning.

F. Hot-Weather Requirements

1. Comply with hot-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Products: To establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of other manufacturers, a specific manufacturer's product is named and accompanied by the words "basis-of-design," including make or model number or other designation. Subject to compliance with requirements, provide either the named products or equal products.

2.2 MASONRY UNITS, GENERAL

A. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to exceed tolerances and to contain chips, cracks, or other defects exceeding limits stated in the standard. Do not uses units where such defects, including dimensions that vary from specified dimensions by more than stated tolerances, will be exposed in the completed Work or will impair the quality of completed masonry.

2.3 CONCRETE MASONRY UNITS (CMUs)

A. Shapes:

1. Provide shapes indicated.
2. Provide special shapes for lintels, corners, jambs, sashes, movement joints, headers, bonding, and other special conditions.
3. Provide square-edged units for outside corners, unless otherwise indicated.

B. Concrete Masonry Units: ASTM C 90.

1. Weight Classification: Normal weight.
2. Standard face dimensions of:

a. Length: 16 inches nominal; 15-5/8 inches actual.
b. Height: 8 inches nominal; 7-5/8 inches actual.

C. Decorative Concrete Masonry Units: ASTM C 90.

1. Weight Classification: Normal weight.
2. Standard face dimensions of:

a. Length: 16 inches nominal; 15-5/8 inches actual.
b. Height: 8 inches nominal; 7-5/8 inches actual.

3. Exposed Faces of Decorative Units: Normal-weight aggregate, split-face finish with integral special color and integral water repellent.

a. Basis-of Design Product: Northfield Block Co., Prairie stone Masonry Units.

D. Integral Water Repellent: Provide decorative units made with liquid polymeric, integral water-repellent admixture that does not reduce flexural bond strength. Units made with integral water repellent, when tested as a wall assembly made with mortar containing integral water-repellent

manufacturer's mortar additive according to ASTM E 514, with test period extended to 24 hours, show no visible water or leaks on the back of the test specimen.

1. Basis-of Design Product: Dry-Block; W. R. Grace & Co., Construction Products Division.

2.4 MASONRY LINTELS AND BOND BEAMS

A. Built-in-place horizontal grouted masonry element made from concrete masonry units with reinforcing bars placed as indicated and filled with coarse grout. Temporarily support built-in-place element until cured.

2.5 MORTAR AND GROUT MATERIALS

A. Portland Cement:

1. ASTM C 150, Type I or II, except Type III may be used for cold-weather construction.

B. Hydrated Lime:

1. ASTM C 207, Type S.

C. Portland Cement-Lime Mix:

1. Packaged blend of portland cement complying with ASTM C 150, Type I or Type III, and hydrated lime complying with ASTM C 207. Mix proportions shall be per ASTM C270, proportion specification based on volume.

D. Aggregate for Mortar:

1. ASTM C 144; except for joints less than 1/4 inch thick, use aggregate graded with 100 percent passing the No. 16 sieve.

E. Aggregate for Grout:

1. ASTM C 404.

F. Cold-Weather Admixture:

1. Nonchloride, noncorrosive, accelerating admixture complying with ASTM C 494, Type C, and recommended by the manufacturer for use in masonry mortar of composition indicated.

G. Water-Repellent Admixture:

1. Liquid water-repellent mortar admixture intended for use with decorative concrete masonry units, containing integral water repellent by same manufacturer.
2. Basis-of Design Product: Dry-Block; W. R. Grace & Co., Construction Products Division.

H. Water: Potable.

I. Colored Cement Product: Packaged blend made from portland cement and lime or mortar cement and mortar pigments, all complying with specified requirements, and containing no other ingredients.

1. Formulate blend as required to produce color indicated or, if not indicated, as selected from manufacturer's standard colors.
2. Premix cement and pigment at plant. Do not mix cement and pigment at job site.
3. Pigments shall not exceed 10 percent of portland cement by weight.
4. Pigments shall not exceed 5 percent of mortar cement by weight.
5. Products:

    a. Colored Portland Cement-Lime Mix:

        1) Capital Materials Corporation; Riverton Portland Cement Lime Custom Color.
        2) Holcim (US) Inc.; Rainbow Mortamix Custom Color Cement/Lime.
        3) Lafarge North America Inc.; Eaglebond Portland & Lime.
        4) Lehigh Cement Company; Lehigh Custom Color Portland/Lime Cement.

    b. Colored Mortar Cement: Lafarge North America Inc.; Magnolia Superbond Mortar Cement.

6. Mortar Color:

    a. Concrete Masonry Units: Natural color unless otherwise indicated.

2.6 REINFORCEMENT

A. Uncoated Steel Reinforcing Bars:

1. ASTM A 615 or ASTM A996, Grade 60.

B. Masonry Joint Reinforcement, General:

1. ASTM A 951.
2. Interior Walls: Mill-galvanized, carbon steel wire.
3. Exterior Walls (including backup wythes): Hot-dip galvanized, carbon steel wire.
4. Wire Size for Side, Cross, and Veneer Rods: W1.7 or 0.148-inch (9 gage) diameter.
5. Spacing of Cross Rods, Tabs, and Cross Ties: Not more than 16 inches o.c.
6. Provide in lengths of not less than 10 feet, with prefabricated corner and tee units.

C. Masonry Joint Reinforcement for Single-Wythe Masonry:

1. Either ladder or truss type with single pair of side rods.

2.7 TIES AND ANCHORS

A. Materials:

1. Provide ties and anchors specified in subsequent paragraphs that are made from materials that comply with subparagraphs below, unless otherwise indicated.
2. Interior Walls: Mill-Galvanized, Carbon-Steel Wire: ASTM A 82; with ASTM A 641/A 641M, Class 1 coating.
3. Exterior Walls: Hot-Dip Galvanized, Carbon-Steel Wire: ASTM A 82; with ASTM A 153/A 153M, Class B-2 coating.
4. Galvanized Steel Sheet: ASTM A 653/A 653M, Commercial Steel, G60 zinc coating.

5. Steel Sheet, Galvanized after Fabrication: ASTM A 1008/A 1008M, Commercial Steel, hot-dip galvanized after fabrication to comply with ASTM A 153/A 153M.
6. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

B. Wire Ties, General:

1. Unless otherwise indicated, size wire ties to extend at least halfway through veneer but with at least 5/8-inch cover on outside face. Outer ends of wires are bent 90 degrees and extend 2 inches parallel to face of veneer.

C. Adjustable Anchors for Connecting to Structure: Provide anchors that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to plane of wall.

1. Anchor Section for Welding to Steel Frame:

a. Crimped 1/4-inch- diameter, wire.
b. Tie Section for Steel Frame: Triangular-shaped wire tie, sized to extend within 1 inch of masonry face, made from 0.188-inch- diameter, wire.

D. Rigid Anchors:

1. Fabricate from steel bars 1-1/2 inches wide by 1/4 inch thick by 24 inches long, with ends turned up 2 inches or with cross pins, unless otherwise indicated. Connect T-intersections of CMU shear walls with rigid anchors in lieu of masonry bonding or bond beams, unless otherwise indicated.
2. Corrosion Protection: Hot-dip galvanized to comply with ASTM A 153/A 153M.

E. Adjustable Masonry-Veneer Anchors for Attachment to Cold-Formed Metal Framing:

1. General: Provide anchors that allow vertical adjustment but resist tension and compression forces perpendicular to plane of wall, for attachment over sheathing to metal studs, and as follows:

a. Structural Performance Characteristics: Capable of withstanding a 100-lbf load in both tension and compression without deforming or developing play in excess of 0.05 inch.

2. Screw-Attached, Masonry-Veneer Anchors: Units consisting of a wire tie and a metal anchor section.

a. Anchor Section: Sheet metal plate, 1-1/2 incheswide by 6 incheslong, with screw holes top and bottom and with raised rib-stiffened strap stamped into center to provide a slot between strap and plate for inserting wire tie.
b. Fabricate sheet metal anchor sections and other sheet metal parts from 0.067-inch-nominal 14 gage thick, steel sheet, galvanized after fabrication.
c. Fabricate Triangular wire ties from 0.187-inch-diameter, hot-dip galvanized steel wire.
d. Basis-of-Design Product: Dayton Superior Corporation, Dur-O-Wal Division; DA210 Veneer Anchor Screw On Plate with DA700 Series Triangular Ties.

3. Polymer-Coated, Steel Drill Screws for Steel Studs: ASTM C 954 except manufactured with hex washer head and neoprene washer, No. 10 diameter by length required to penetrate steel stud flange with not less than 3 exposed threads, and with organic polymer coating with salt-spray resistance to red rust of more than 800 hours per ASTM B 117.

a. Basis-of-Design Product: Dayton Superior Corporation, Dur-O-Wal Division; D/A 807.

2.8 MISCELLANEOUS ANCHORS

A. Anchor Bolts:

1. Headed or L-shaped steel bolts complying with ASTM A 307, Grade A; with ASTM A 563 hex nuts and, where indicated, flat washers; hot-dip galvanized to comply with ASTM A 153/A 153M, Class C; of dimensions indicated.

B. Post-Installed Anchors:

1. Provide chemical or torque-controlled expansion anchors, with capability to sustain, without failure, a load equal to six times the load imposed when installed in solid or grouted unit masonry and equal to four times the load imposed when installed in concrete, as determined by testing per ASTM E 488 conducted by a qualified independent testing agency.
2. Corrosion Protection: Carbon-steel components zinc plated to comply with ASTM B 633, Class Fe/Zn 5 (5 microns) for Class SC 1 service condition (mild).

2.9 EMBEDDED FLASHING MATERIALS

A. Flexible Flashing: For flashing not exposed to the exterior, use one of the following, unless otherwise indicated:

1. Copper-Laminated Flashing: 5-oz./sq. ft. copper sheet bonded with asphalt between 2 layers of glass-fiber cloth. Use only where flashing is fully concealed in masonry.

a. Available Products:

1) Advanced Building Products Inc.; Copper Fabric Flashing.
2) AFCO Products Inc.; Copper Fabric.
3) Hohmann & Barnard, Inc.; H & B C-Fab Flashing.
4) Phoenix Building Products; Type FCC-Fabric Covered Copper.
5) Polytite Manufacturing Corp.; Copper Fabric Flashing.
6) Sandell Manufacturing Co., Inc.; Copper Fabric Flashing.
7) York Manufacturing, Inc.; York Copper Fabric Flashing.

2. Rubberized-Asphalt Flashing: Composite flashing product consisting of a pliable, adhesive rubberized-asphalt compound, bonded to a high-density, cross-laminated polyethylene film to produce an overall thickness of not less than 0.030 inch.

a. Available Products:

1) Advanced Building Products Inc.; Peel-N-Seal.
2) Carlisle Coatings & Waterproofing; CCW-705-TWF Thru-Wall Flashing.
3) Dayton Superior Corporation, Dur-O-Wal Division; Dur-O-Barrier-44.
4) Grace Construction Products, a unit of W. R. Grace & Co. - Conn.; Perm-A-Barrier Wall Flashing.
5) Heckmann Building Products Inc.; No. 82 Rubberized-Asphalt Thru-Wall Flashing.
6) Hohmann & Barnard, Inc.; Textroflash.

7) Polyguard Products, Inc.; Polyguard 300.
8) Polytite Manufacturing Corp.; Poly-Barrier Self-Adhering Wall Flashing.
9) Williams Products, Inc.; Everlastic MF-40.

3. Elastomeric Thermoplastic Flashing: Composite flashing product consisting of a polyester-reinforced ethylene interpolymer alloy as follows:

a. Monolithic Sheet: Elastomeric thermoplastic flashing, 0.040 inch thick.
b. Self-Adhesive Sheet: Elastomeric thermoplastic flashing, 0.025 inch thick, with a 0.015-inch- thick coating of rubberized-asphalt adhesive.
c. Self-Adhesive Sheet with Drip Edge: Elastomeric thermoplastic flashing, 0.025 inch thick, with a 0.015-inch- thick coating of rubberized-asphalt adhesive. Where flashing extends to face of masonry, rubberized-asphalt coating is held back approximately 1-1/2 inches from edge.
d. Accessories: Provide preformed corners, end dams, other special shapes, and seaming materials produced by flashing manufacturer.
e. Available Products:

1) Hyload, Inc.; Hyload Cloaked Flashing System.

4. EPDM Flashing: Sheet flashing product made from ethylene-propylene-diene terpolymer, complying with ASTM D 4637, 0.040 inch thick.

a. Available Products:

1) Carlisle Coatings & Waterproofing; Pre-Kleened EPDM Thru-Wall Flashing.
2) Firestone Building Products; FlashGuard.
3) Heckmann Building Products Inc.; No. 81 EPDM Thru-Wall Flashing.

B. Metal Drip Edge:

1. Provide metal drip edge, where flashing is exposed or partly exposed and where indicated, complying with SMACNA's "Architectural Sheet Metal Manual."
2. Stainless Steel: ASTM A 240/A 240M, Type 304, 0.016 inch thick.
3. Fabricate continuous flashings in sections 96 inches long minimum, but not exceeding 12 feet. Provide splice plates at joints of formed, smooth metal flashing.
4. Extend at least 3 inches into wall and 1/2 inch out from wall, with outer edge bent down 30 degrees and hemmed.

C. Adhesives, Primers, and Seam Tapes for Flashings: Flashing manufacturer's standard products or products recommended by flashing manufacturer for bonding flashing sheets to each other and to substrates.

2.10 MISCELLANEOUS MASONRY ACCESSORIES

A. Compressible Filler:

1. Premolded filler strips complying with ASTM D 1056, Grade 2A1; compressible up to 35 percent; of width and thickness indicated; formulated from neoprene, urethane, or PVC.

B. Preformed Control-Joint Gaskets:

1. Made from styrene-butadiene-rubber compound, complying with ASTM D 2000, Designation M2AA-805 or PVC, complying with ASTM D 2287, Type PVC-65406 and

designed to fit standard sash block and to maintain lateral stability in masonry wall; size and configuration as indicated.

C. Bond-Breaker Strips:

1. Asphalt-saturated, organic roofing felt complying with ASTM D 226, Type I (No. 15 asphalt felt).

D. Reinforcing Bar Positioners:

1. Wire units designed to fit into mortar bed joints spanning masonry unit cells with loops for holding reinforcing bars in center of cells. Units are formed from 0.142-inch steel wire, hot-dip galvanized after fabrication. Provide units with either two loops or four loops as needed for number of bars indicated.
2. Basis-of-Design Product: Dayton Superior Corporation, Dur-O-Wal Division; D/A 810, D/A 812 or D/A 817.

E. Weeps:

1. Wicking Material: Absorbent rope, made from cotton or UV-resistant synthetic fiber, 1/4 to 3/8 inch in diameter, in length required to produce 2-inch exposure on exterior and 18 inches in cavity between wythes.

F. Pea Gravel:

1. Rounded, river run granular material of mineral composition; non-compactable; approximately 3/8 inch in diameter.

2.11 CAVITY-WALL INSULATION

A. Extruded-Polystyrene Board Insulation:

1. ASTM C 578, Type IV, closed-cell product extruded with an integral skin.

B. Adhesive:

1. Type recommended by insulation board manufacturer for application indicated.

2.12 MASONRY CLEANERS

A. Cleaning Solutions:

1. Not harmful to masonry work or adjacent materials; expressly approved for intended use by manufacturers of masonry units and mortar being cleaned.

2.13 MORTAR AND GROUT MIXES

A. General:

1. Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures, unless otherwise indicated.

2. Do not use calcium chloride in mortar or grout.
3. Limit cementitious materials in mortar for exterior and reinforced masonry to portland cement, mortar cement, and lime.

B. Preblended, Dry Mortar Mix:

1. Furnish dry mortar ingredients in form of a preblended mix. Measure quantities by weight to ensure accurate proportions, and thoroughly blend ingredients before delivering to Project site.

C. Mortar for Unit Masonry:

1. Comply with ASTM C 270, Proportion Specification. Provide Type S mortar unless another type is indicated or needed to provide required compressive strength of masonry.

D. Pigmented Mortar:

1. Use colored cement product.

E. Grout for Unit Masonry:

1. Comply with ASTM C 476, delete reference to mix proportion per compressive strength in Paragraph 5.2 of ASTM C476.
2. Use grout of type indicated or, if not otherwise indicated, of type (fine or coarse) that will comply with Table 1.15.2 in ACI 530.1/ASCE 6/TMS 602 for dimensions of grout spaces and pour height.
3. Provide grout with a slump of 8 to 11 inches as measured according to ASTM C 143/C 143M.

PART 3 - EXECUTION

3.1 EXAMINATION

A. General:

1. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.
2. Verify that foundations are within tolerances specified.
3. Verify that reinforcing dowels are properly placed.
4. Before installation, examine rough-in and built-in construction for piping systems to verify actual locations of piping connections.
5. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

A. Thickness:

1. Build masonry construction to full thickness shown. Build single-wythe walls to actual widths of masonry units, using units of widths indicated.

B. Chases and Recesses:

1. Build chases and recesses to accommodate items specified in this and other Sections.

C. Openings For Equipment:

1. Leave openings for equipment to be installed before completing masonry. After installing equipment, complete masonry to match the construction immediately adjacent to opening.

D. Cutting of Units:

1. Use full-size units without cutting if possible. If cutting is required to provide a continuous pattern or to fit adjoining construction, cut units with motor-driven saws; provide clean, sharp, unchipped edges. Allow units to dry before laying unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.

E. Blending of Colors and Textures:

1. Select and arrange units for exposed unit masonry to produce a uniform blend of colors and textures.
2. Mix units from several pallets or cubes as they are placed.

F. Retempering of Colored Mortar:

1. Do not retemper colored mortar unless samples of retempered colored mortar have been made and no significant change in appearance of the color of the mortar is evident, as acceptable to the Contracting Officer.

G. Tolerances:

1. Comply with construction tolerances in ACI 530.1/ASCE 6/TMS 602 and with the following:

a. For conspicuous vertical lines, such as external corners, door jambs, reveals, and control joints, do not vary from plumb by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2 inch maximum.
b. For conspicuous horizontal lines do not vary from level by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2 inch maximum.
c. For exposed bed joints, do not vary from thickness indicated by more than plus or minus 1/8 inch, with a maximum thickness limited to 1/2 inch. Do not vary from bed-joint thickness of adjacent courses by more than 1/8 inch.
d. For faces of adjacent exposed masonry units, do not vary from flush alignment by more than 1/16 inch.

3.3 LAYING MASONRY WALLS

A. General:

1. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.

B. Bond Pattern for Exposed Masonry:

1. Unless otherwise indicated, lay exposed masonry in running bond; do not use units with less than nominal 4-inch horizontal face dimensions at corners or jambs.

C. Concealed Masonry:

1. Lay concealed masonry with all units in a wythe in running bond or bonded by lapping not less than 4-inches. Bond and interlock each course of each wythe at corners. Do not use units with less than nominal 4-inch horizontal face dimensions at corners or jambs.

D. Stopping and Resuming Work:

1. Stop work by racking back units in each course from those in course below; do not tooth. When resuming work, clean masonry surfaces that are to receive mortar, remove loose masonry units and mortar, and wet brick if required before laying fresh masonry.

E. Built-in Work:

1. As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.

F. Steel Frames:

1. Fill space between steel frames and masonry solidly with mortar, unless otherwise indicated.
2. If additives are used in mortar, field coat steel door frames in contact with mortar with a bituminous compound to prevent corrosion.

G. Built-In Items:

1. Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal lath, wire mesh, or plastic mesh in the joint below and rod mortar or grout into core.

H. Grouting of CMU's:

1. Fill cores in hollow concrete masonry units with grout 24 inches under bearing plates, beams, lintels, posts, and similar items, unless otherwise indicated.

I. Interior Partitions:

1. Build non-load-bearing interior partitions full height of story to underside of solid floor or roof structure above, unless otherwise indicated.
2. Install compressible filler in joint between top of partition and underside of structure above.
3. At fire-rated partitions, treat joint between top of partition and underside of structure above to comply with Division 07 Section Firestopping.

3.4 MORTAR BEDDING AND JOINTING

A. Lay Hollow Masonry Units As Follows:

1. With face shells fully bedded in mortar and with head joints of depth equal to bed joints.
2. With webs fully bedded in mortar in all courses of piers, columns, and pilasters.

3. With webs fully bedded in mortar in grouted masonry, including starting course on footings.
4. With entire units, including areas under cells, fully bedded in mortar at starting course on footings where cells are not grouted.

B. Solid Masonry Units:

1. Lay solid masonry units with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not deeply furrow bed joints or slush head joints.

C. Joints:

1. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness, unless otherwise indicated.
2. Rake out mortar in preparation for application of sealants where sealants are indicated in mortar joints.

3.5 COMPOSITE MASONRY

A. Corners: Provide interlocking masonry unit bond in each wythe and course at corners, unless otherwise indicated.

1. Provide continuity with masonry joint reinforcement at corners by using prefabricated L-shaped units as well as masonry bonding.
2. Intersecting and Abutting Walls: Unless vertical expansion or control joints are shown at juncture, bond walls together as follows:

a. General:

1) Provide continuity with masonry joint reinforcement by using prefabricated T-shaped joint reinforcement units spaced at a maximum vertical distance of 16 inches and extending at least 30 inches in each direction at the intersection.
2) Provide rigid metal anchors not more than 48 inches o.c. If used with hollow masonry units, embed ends in mortar-filled cores.
3) Connect T-intersections of CMU shear walls with rigid anchors in lieu of masonry bonding or bond beams, unless otherwise indicated.

b. Provide joint reinforcement spaced at a maximum vertical distance of 16 inches.

3.6 CAVITY WALLS

A. Cavities:

1. Keep cavities clean of mortar droppings and other materials during construction. Bevel beds away from cavity, to minimize mortar protrusions into cavity. Do not attempt to trowel or remove mortar fins protruding into cavity.

B. Installing Cavity-Wall Insulation:

1. Place small dabs of adhesive, spaced approximately 12 inches o.c. both ways, on inside face of insulation boards, or attach with plastic fasteners designed for this purpose. Fit

courses of insulation between wall ties and other confining obstructions in cavity, with edges butted tightly both ways. Press units firmly against inside wythe of masonry or other construction as shown.

2. Fill cracks and open gaps in insulation with crack sealer compatible with insulation and masonry.

3.7 MASONRY JOINT REINFORCEMENT

A. General:

1. Install entire length of longitudinal side rods in mortar with a minimum cover of 5/8 inch on either side of walls, 1/2 inch elsewhere. Lap reinforcement a minimum of 6 inches.
2. Space reinforcement not more than 16 inches o.c.
3. Provide reinforcement not more than 8 inches above and below wall openings and extending 12 inches beyond openings.

   a. Reinforcement above is in addition to continuous reinforcement.

4. Interrupt joint reinforcement at control joints.
5. Provide continuity at wall intersections by using prefabricated T-shaped units.
6. Provide continuity at corners by using prefabricated L-shaped units.

3.8 ANCHORING MASONRY TO STRUCTURAL MEMBERS

A. Anchoring to Structural Members:

1. Anchor masonry to structural members where masonry abuts or faces structural members to comply with the following:

   a. Anchor masonry to structural members with anchors embedded in masonry joints and attached to structure.
   b. Space anchors as indicated, but not more than 16 inches o.c. vertically.

3.9 ANCHORING MASONRY VENEERS TO COLD-FORMED METAL FRAMING

A. Anchor Masonry Veneers To Wall Framing With Adjustable Masonry-Veneer Anchors:

1. Fasten screw-attached anchors through sheathing to wall framing with metal fasteners of type indicated. Use two fasteners unless anchor design only uses one fastener.
2. Insert anchor sections in metal studs as sheathing is installed. Provide one anchor at each stud in each horizontal joint between sheathing boards.
3. Locate anchor sections to allow maximum vertical differential movement of ties up and down.
4. Space anchors not more than 16 inches o.c. vertically and 16 inches o.c. horizontally with not less than 1 anchor for each 1.77 sq. ft. of wall area. Install additional anchors within 12 inches of openings and at intervals, not exceeding, 16 inches around perimeter.

3.10 CONTROL AND EXPANSION JOINTS

A. General:

1. Install control and expansion joint materials in unit masonry as masonry progresses. Do not allow materials to span control and expansion joints without provision to allow for in-plane wall or partition movement. If locations of vertical expansion and control joints are not shown, locate as follows:

    a. In concrete masonry unit single-wythe walls and in the CMU wythe of cavity walls space control joints at 1.5 times the wall height or 25 feet on center, whichever is lesser, unless noted on Drawings.
    b. Provide vertical joints at one side of wall openings 6 feet or less in width and at both sides of wall openings over 6 feet in width.
    c. Provide vertical joints at abutment of walls and columns, where wall thickness changes, at chases and recesses in walls, at pilasters, at return or reverse corners of walls, approximately 4 feet from corners, and where wall height changes.
    d. Provide movement joints in accordance with the foregoing if locations shown on Drawings exceed the preceding specified movement joint spacings.
    e. Verify locations of field-located movement joints and revised movement joint locations with Contracting Officer before proceeding.

2. Form control joints in concrete masonry using one of the following methods unless otherwise indicated:

    a. Install preformed control-joint gaskets designed to fit standard sash block.
    b. Install interlocking units designed for control joints. Install bond-breaker strips at joint. Keep head joints free and clear of mortar or rake out joint for application of sealant.

3. Form expansion joints in brick made from clay or shale as follows unless otherwise indicated:

    a. Build flanges of metal expansion strips into masonry. Lap each joint 4 inches in direction of water flow. Seal joints below grade and at junctures with horizontal expansion joints if any.
    b. Build flanges of factory-fabricated, expansion-joint units into masonry.
    c. Build in compressible joint fillers where indicated.
    d. Form open joint full depth of brick wythe and of width indicated, but not less than 1 inch for installation of sealant and backer rod specified in Division 07 Section Joint Sealants.

3.11 LINTELS

A. Steel Lintels:

1. Provide steel lintels where indicated and where openings of more than 12 inches for brick size units and 24 inches for block size units are shown without structural steel or other supporting lintels.
2. Steel Lintel Angles Per Masonry Wythe: 3-1/2 inches by 3-1/2 inches by 1/4 inch. Verify size of angles with Contracting Officer before proceeding.
3. Provide minimum bearing of 8 inches at each jamb, unless otherwise indicated.

B. Masonry Lintels:

1. In concrete masonry walls provide masonry lintels where shown and where openings of more than 8 inches for brick-size units and 16 inches for block-size units are shown

without structural steel or other supporting lintels. Match color and texture of adjacent units.

2. Reinforcement Bars: Two No. 5 steel reinforcement bars unless otherwise indicated. Verify size of reinforcement bars with Contracting Officer before proceeding.

3.12 FLASHING, WEEP HOLES, AND CAVITY DRAINAGE

A. General:

1. Install embedded flashing and weep holes in masonry at shelf angles, lintels, ledges, other obstructions to downward flow of water in wall, and where indicated.

B. Flashing and Metal Edge Drip Installation:

1. Prepare masonry surfaces so they are smooth and free from projections that could puncture flashing. Where flashing is within mortar joint, place through-wall flashing on sloping bed of mortar and cover with mortar. Before covering with mortar, seal penetrations in flashing with adhesive, sealant, or tape as recommended by flashing manufacturer.

a. Install metal drip edge beneath flashing at exterior face of wall. Adhere flashing to top of metal.
b. Lap ends of flashing a minimum of 6 inches. Seal flashing lap with mastic or adhesive compatible with flashing material if flashing is not self-adhering.

2. Cavity Walls:

a. Install concealed through-wall flexible flashing 1/2 inch back from exterior face of outer wythe of masonry, over metal drip edge, through outer wythe, and turn up a minimum of 8 inches.

1) Where interior face of masonry wall is exposed to building interior and is not scheduled to be concealed, extend flexible flashing through inner wythe to within 1/2 inch of the interior face of the wall.
2) Where interior face of inner wythe is not exposed to building interior and is scheduled to be concealed, extend flexible flashing completely through inner wythe and turn flashing up approximately 2 inches.
3) For support of pea gravel place through-wall flashing on sloping bed of mortar conforming to the curve of the flashing.

3. Masonry-veneer Walls:

a. Install concealed flexible flashing 1/2 inch back from exterior face of veneer, over metal drip edge, through veneer, across air space behind veneer, and up face of sheathing at least 8 inches, with upper edge tucked under building paper or building wrap lapping at least 4 inches.

4. Below wall openings in masonry, extend flexible flashing under sills 1/2 inch back from exterior face of masonry, over metal drip edge, and turn up flashing as specified for type of wall construction.
5. At lintels install metal drip edge beneath flashing at exterior face of wall in continuous bed of adhesive applied directly to steel lintels. Turn up flashing over lintel and as specified for type of wall construction.

a. Lay masonry unit directly on flashing over steel lintels.

6. Install flashing and metal drip edge continuous around corners and jogs in walls.
7. At heads and sills, extend flashing 6 inches at ends and turn up not less than 2 inches to form end dams.
8. Seal end dams to end of masonry unit.
9. Install end dams wherever flashing meets non-masonry wall components. Seal end dams to non-masonry wall components.
10. Seal underside of metal drip edge with elastomeric sealant complying with requirements in Division 07 Section Joint Sealants for application indicated.

C. Weeps:

1. Install weep holes in head joints in exterior wythes of first course of masonry immediately above embedded flashing and as follows:

a. Use specified weep products to form weep holes.
b. Use wicking material to form weep holes above flashing under brick sills. Turn wicking down at lip of sill to be as inconspicuous as possible.
c. Space weep holes 16 inches o.c.
d. Trim wicking material flush with outside face of wall after mortar has set.

D. Cavity Drainage:

1. Place pea gravel in cavities as soon as practical to a height equal to height of first course above top of flashing, but not less than 2 inches, to maintain drainage.

3.13 REINFORCED UNIT MASONRY INSTALLATION

A. Basic Requirement:

1. Reinforce concrete masonry unit cores with reinforcement bars and grout.

B. Temporary Formwork and Shores:

1. Construct formwork and shores as needed to support reinforced masonry elements during construction.
2. Construct formwork to provide shape, line, and dimensions of completed masonry as indicated. Make forms sufficiently tight to prevent leakage of mortar and grout. Brace, tie, and support forms to maintain position and shape during construction and curing of reinforced masonry.
3. Do not remove forms and shores until reinforced masonry members have hardened sufficiently to carry their own weight and other temporary loads that may be placed on them during construction.

C. Placing Reinforcement:

1. Comply with requirements in ACI 530.1/ASCE 6/TMS 602.
2. Lap and tie reinforcement to bars extending from concrete foundation.
3. Installation of reinforcement bars: Where bars are shown in close proximity, provide a clear distance between bars of not less than the nominal bar diameter or 1 inch (whichever is greater). Provide lapped splices wire tied together. Lap ends of Grade 60 bars as follows:

a. No. 3 bar: 18 inches.
b. No. 4 bar: 24 inches.
c. No. 5 bar: 30 inches.
d. No. 6 bar: 36 inches.
e. No. 7 bar: 42 inches.
f. No. 8 bar: 48 inches.

D. Keying:

1. To form key for subsequent lift, terminate grout lift 1-1/2 inches below top course.

E. Grouting:

1. Do not place grout until entire height of masonry to be grouted has attained enough strength to resist grout pressure.
2. Comply with requirements in ACI 530.1/ASCE 6/TMS 602 for cleanouts and for grout placement, including minimum grout space and maximum pour height.
3. Limit height of vertical grout pours to not more than 60 inches.
4. Consolidate pours by mechanical vibration and reconsolidate by mechanical vibration after initial water loss and settlement has occurred.

3.14 BOND BEAMS

A. Use specially formed U-shaped bond beam units. Place horizontal reinforcement in bond beams; lap at corners and intersections. Fill bond beam course with grout or concrete as indicated.

3.15 FIELD QUALITY CONTROL

A. Testing and Inspections:

1. The Contractor shall employ a qualified testing laboratory to perform tests.
2. The Contractor shall employ a structural masonry special inspector to perform inspections.

a. Inspections:

1) The inspection program by the Special Inspector shall comply with Table 1704.5.1 of the 2009 International Building Code.

b. Sampling and Testing Mortar, Grout, and CMU:

1) Mortar and grout samples shall be secured from field mixed materials. Do not use retempered mortar.
2) Concrete Masonry Unit Testing: Units shall be tested prior to construction and test unit during construction for each 5,000 sq. ft. of wall. The testing shall be per ASTM C140 and show compliance with IBC Table 2105.2.2.1.2.
3) Compressive Strength Tests: ASTM C780 for mortar and ASTM C1019 for group; one set (four molds) for each material the first day it is used and averaging every third day that the material is used thereafter, but not less than one set for each 5,000 sq. ft. of wall for each material; one specimen for each material tested at seven days, two specimens tested at 28 days, and one specimen retained in reserve for later testing if required.

a) When acceptable to the Contracting Officer, strength level of mortar and grout will be considered satisfactory if average of sets of three consecutive strength test results equal or exceed specified compressive strength, and no individual strength test result falls below specified compressive strength by more than 300 psi.

4) Test results will be reported in writing on same day that tests are made. Reports of compressive strength tests will contain the project identification name and number, date of material placement, name of testing service, location of material in structure, design compressive strength at 28 days, material mix proportions and materials; compressive breaking strength for both seven-day and 28-day tests.

5) If testing service reports and inspections indicated specified material strengths and other characteristics have not been attained in the structure, the testing service will make additional tests of in-place mortar or grout, as directed by the Contracting Officer. Contractor shall pay for such tests conducted, and any other additional testing as may be required, when unacceptable material is verified.

3. Complete cost of retesting and/or reinspection shall be the Contractor's responsibility.

3.16 REPAIRING, POINTING, AND CLEANING

A. General:

1. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Install new units to match adjoining units; install in fresh mortar, pointed to eliminate evidence of replacement.

B. Pointing:

1. During the tooling of joints, enlarge voids and holes, except weep holes, and completely fill with mortar. Point up joints, including corners, openings, and adjacent construction, to provide a neat, uniform appearance. Prepare joints for sealant application, where indicated.

C. In-Progress Cleaning:

1. Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.

D. Final Cleaning:

1. After mortar is thoroughly set and cured, clean exposed masonry as follows:

a. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
b. Clean concrete masonry by cleaning method indicated in NCMA TEK 8-2A applicable to type of stain on exposed surfaces.
c. Clean brick by bucket and brush hand-cleaning method described in BIA Technical Note No. 20 Revised, using cleaners appropriate for conditions requiring cleaning. Apply cleaners in compliance with directions of cleaner manufacturer.

END OF SECTION

SECTION 05 12 00

STRUCTURAL STEEL FRAMING

(Edited from DeCA June 2011 Design Criteria)

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Structural steel.
2. Grout.

B. Related Sections:

1. Division 01 Section Sustainable Design Reporting for recycled content of steel products.

1.2 PERFORMANCE REQUIREMENTS

A. Structural Performance:

1. Engineer structural steel connections required by the Contract Documents to be selected or completed by the fabricator to withstand design loadings indicated.
2. Engineering Responsibility: Engage a fabricator who utilizes a qualified professional engineer to prepare calculations, Shop Drawings, and other structural data for structural steel connections.

1.3 SUBMITTALS

A. Product Data:

1. For each type of product specified.

B. Shop Drawings:

1. Detailing fabrication of structural steel components.

a. Include details of cuts, connections, splices, camber, holes, and other pertinent data.
b. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld.
c. Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify high-strength bolted slip-critical, direct-tension, or tensioned shear/bearing connections.
d. Include Shop Drawings signed and sealed by a qualified professional engineer responsible for their preparation when connections are required to be designed by the fabricator.
e. Identify members and connections of the seismic-load-resisting system.

f. Identify locations and dimensions of protected zones.
g. Identify demand critical welds.

C. Welding Certificates.

D. Mill Test Reports:

1. Structural steel including chemical and physical properties.
2. Bolts, nuts, and washers including mechanical properties and chemical analysis.
3. Direct-tension indications.
4. Shop primers.
5. Non-shrink grout.

E. Special Inspection reports on shop and field bolted connections, and welded connections.

F. Submittal List:

Reference	Submittal Item	Quantity	Action
1.3A	Product Data	X	R
1.3B	Shop Drawings	X	R
1.3C	Welding Certificates	X	R
1.3D	Mill Test Reports	X	R
1.3E	Special Inspection Reports	X	R

X Submit quantity specified in Division 01 Section Administrative Requirements.
R Review each submittal, mark to indicate action taken, and return.
I Submittal is for information or record purposes only. No action will be taken.

1.4 QUALITY ASSURANCE

A. Installer Qualifications:

1. Engage an experienced Installer who has completed structural steel work similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.

B. Fabricator Qualifications:

1. Engage a qualified fabricator that participates in the AISC Quality Certification Program and is designated an AISC-Certified Plant, Category STD.

C. Comply with applicable provisions of the following specifications and documents:

1. AISC360"Specification for Structural Steel Buildings"
2. AISC 341s1 Seismic Provisions for Structural Steel Buildings."
3. AISC 303 "Code of Standard Practice for Steel Buildings and Bridges."
4. AISC's "Specification for Allowable Stress Design of Single-Angle Members."
5. "AISC's "Seismic Provisions for Structural Steel Buildings."
6. ASTM A 6 "Specification for General Requirements for Rolled Steel Plates, Shapes, Sheet Piling, and Bars for Structural Use."
7. Research Council on Structural Connections' (RCSC) "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."
8. AISC's "Specification for the Design of Steel Hollow Structural Sections."

D. Professional Engineer Qualifications:

1. A professional engineer who is legally authorized to practice in the jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for projects with structural steel framing that are similar to that indicated for this Project in material, design, and extent.

E. Welding: Qualifications:

1. Qualify procedures and personnel according to AWS D1.1 "Structural Welding Code-Steel."

F. Special Inspector Qualifications:

1. Special Inspections for bolted and welded connections and steel details shall be performed under the direct supervision of a Professional Engineer registered in the State in which the project is located. The personnel performing the inspections shall be ICC-certified Structural Steel and Welding Special Inspection or an equivalent certification program.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Delivery:

1. Deliver structural steel to Project site in such quantities and at such times to ensure continuity of installation.

B. Storage and Handling:

1. Store materials to permit easy access for inspection and identification. Keep steel members off ground by using pallets, platforms, or other supports. Protect steel members and packaged materials from erosion and deterioration.
2. Store fasteners in a protected place. Clean and relubricate bolts and nuts that become dry or rusty before use. Comply with manufacturers' written recommendations for cleaning and lubricating ASM F 1852 fasteners and for retesting fasteners after lubrication.
3. Do not store materials on structure in a manner that might cause distortion or damage to members or supporting structures. Repair or replace damaged materials or structures as directed.

1.6 SEQUENCING

A. Supply anchorage items to be embedded in or attached to other construction without delaying the Work. Provide setting diagrams, templates, instructions, and directions, as required, for installation.

PART 2 - PRODUCTS

2.1 STRUCTURAL-STEEL MATERIALS

A. W-Shapes: ASTM A 992.

B. Channels, Angles-Shapes: ASTM A 36.

C. Plate and Bar: ASTM A 36.

D. Cold-Formed Hollow Structural Sections: ASTM A 500, Grade B, structural tubing.

E. Hot-Formed Structural Steel Tubing: ASTM A 501.

F. Steel Pipe: ASTM A 53, Type E or S, Grade B.

1. Finish: Black.

G. Welding Electrodes:

1. Comply with AWS requirements.

2.2 BOLTS, CONNECTORS, AND ANCHORS

A. Unheaded Anchor Rods: ASTM F1554, Grade 36.

1. Nuts: ASTM A563, hex carbon steel.
2. Washers: ASTM F 436, Type 1, hardened carbon steel.

B. Headed Anchor Rods: ASTM F 1554, Grade 36, straight.

1. Nuts: ASTM A563, hex carbon steel.
2. Washers: ASTM F 436, Type 1, hardened carbon steel.

C. Threaded Rods: ASTM A 36.

1. Nuts: ASTM A563, hex carbon steel.
2. Washers: ASTM F 436, Type 1, hardened carbon steel.

D. Non-High-Strength Bolts, Anchor Bolts, Nuts, and Washers: ASTM A 307, Grade A.

1. Carbon-steel, hex-head bolts; carbon-steel nuts; and flat, unhardened steel washers.
2. Finish: Plain, uncoated.

E. High-Strength Bolts, Nuts, and Washers: ASTM A 325, Type 1.

1. Heavy hex steel structural bolts, heavy hex carbon-steel nuts, ASTM A 563, Grade C, and hardened carbon-steel washers, ASTM F 436 Type 1.
2. Direct-Tension Indicators: ASTM F 959, Type 325 compressible-washer type with plain finish.
3. Finish: Plain, uncoated.

4. Tension-Control, High Strength Bolt-Nut-Washer Assemblies: ASTM 1852, Type 1, Heavy Hex head assemblies consisting of steel structural bolts with splined ends, heavy-hex carbon-steel nuts, and hardened carbon-steel washers.

F. Shear Connectors: ASTM A 108, Grades 1015 through 1020.

1. Headed-stud type, cold-finished carbon steel; AWS D1.1, Type B.

2.3 PRIMER

A. Comply with MPI#79.

1. Lead- and chromate-free, rust inhibiting primer compatible with field applied topcoat indicated.
2. Where field applied topcoat is not indicated provide fabricator's standard lead- and chromate-free, rust inhibiting primer.
3. Do not use asphaltic primers or primers containing red oxide.
4. Color: Gray.

2.4 GROUT

A. General:

1. Nonmetallic, Shrinkage-Resistant Grout: Premixed, nonmetallic, noncorrosive, nonstaining grout containing selected silica sands, portland cement, shrinkage compensating agents, plasticizing and water-reducing agents, complying with ASTM C 1107, of consistency suitable for application, and a 30-minute working time.

2.5 FABRICATION

A. General:

1. Fabricate and assemble structural steel in shop to greatest extent possible. Fabricate structural steel according to AISC specifications referenced in this Section and in Shop Drawings.

a. Camber structural steel members where indicated.
b. Identify high-strength structural steel according to ASTM A 6 and maintain markings until steel has been erected.
c. Mark and match-mark materials for field assembly.
d. Fabricate for delivery a sequence that will expedite erection and minimize field handling of structural steel.
e. Complete structural steel assemblies, including welding of units, before starting shop-priming operations.
f. Comply with fabrication tolerance limits of AISC's "Code of Standard Practice for Steel Buildings and Bridges" for structural steel.

B. Thermal Cutting:

1. Perform thermal cutting by machine to greatest extent possible.
2. Plane thermally cut edges to be welded.

C. Finishing:

1. Accurately mill ends of columns and other members transmitting loads in bearing.

D. Holes:

1. Provide holes required for securing other work to structural steel framing and for passage of other work through steel framing members, as shown on Shop Drawings.
2. Cut, drill, or punch holes perpendicular to metal surfaces. Do not flame-cut holes or enlarge holes by burning. Drill holes in bearing plates.
3. Weld threaded nuts to framing and other specialty items as indicated to receive other work.

2.6 SHOP CONNECTIONS

A. General:

1. Shop install and tighten non-high-strength bolts, except where high-strength bolts are indicated.
2. Shop install and tighten high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

   a. Bolts: ASTM A 325 high-strength bolts, unless otherwise indicated.
   b. Connection Type: Slip-critical, direct-tension, or tensioned shear/bearing connections as indicated.

B. Weld Connections:

1. Comply with AWS D1.1 for procedures, appearance and quality of welds, and methods used in correcting welding work.
2. Assemble and weld built-up sections by methods that will maintain true alignment of axes without warp.
3. Verify that weld sizes, fabrication sequence, and equipment used for architecturally exposed structural steel will limit distortions to allowable tolerances. Prevent surface bleeding of back-side welding on exposed steel surfaces. Grind smooth exposed fillet welds 1/2 inch and larger. Grind flush butt welds. Dress exposed welds.

C. Beam Connections:

1. Unless otherwise indicated, beam connections shall develop one-half of the maximum shear capacity of the beam.

2.7 SHOP PRIMING

A. Shop prime steel surfaces, except the following:

1. Surfaces embedded in concrete or mortar. Extend priming of partially embedded members to a depth of 2 inches.
2. Surfaces to be field welded.
3. Surfaces to be high-strength bolted with slip-critical connections.
4. Galvanized surfaces.

B. Surface Preparation:

1. Clean surfaces to be painted. Remove loose rust and mill scale and spatter, slag, or flux deposits. Prepare surfaces according to SSPC-PS Guide 7.00, "Painting System Guide 7.00: Guide for Selecting One-Coat Shop Painting Systems."

C. Primer Application:

1. Apply 1-coat primer in accordance with SSPC-PS Guide 7.00, "Painting System Guide 7.00: Guide for Selecting One-Coat Shop Painting Systems," to provide a dry film thickness of not less than 1.5 mils.

D. Painting:

1. Indicate protected zone by applying contrasting color on all surfaces of protected zone excluding surfaces to be field welded. Stencil "Protected Zone - No cutting, welding, attachments or modifications permitted" within the zone.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Before erection proceeds, and with the steel erector present, verify elevations of concrete and masonry bearing surfaces and locations of anchorages for compliance with requirements. Do not proceed with erection until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Provide temporary shores, guys, braces, and other supports during erection to keep structural steel secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports when permanent structural steel, connections, and bracing are in place, unless otherwise indicated.

3.3 ERECTION

A. General:

1. Set structural steel accurately in locations and to elevations indicated and according to AISC specifications referenced in this Section.

B. Base and Bearing Plates:

1. Clean concrete and masonry bearing surfaces of bond-reducing materials and roughen surfaces prior to setting base and bearing plates. Clean bottom surface of base and bearing plates.

a. Set base and bearing plates for structural members on wedges, shims, or setting nuts as required.

b. Tighten anchor bolts after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of base or bearing plate prior to packing with grout.
c. Pack grout solidly between bearing surfaces and plates so no voids remain. Finish exposed surfaces, protect installed materials, and allow to cure.

1) Comply with manufacturer's instructions for proprietary grout materials.

C. Erection Tolerances:

1. Maintain erection tolerances of structural steel within AISC's "Code of Standard Practice for Steel Buildings and Bridges."

D. Alignment:

1. Align and adjust various members forming part of complete frame or structure before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that will be in permanent contact. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.
2. Level and plumb individual members of structure.
3. Establish required leveling and plumbing measurements on mean operating temperature of structure. Make allowances for difference between temperature at time of erection and mean temperature at which structure will be when completed and in service.

E. Modifications:

1. Splice members only where indicated.
2. Do not use thermal cutting during erection.
3. Do not enlarge holes in members by burning or by using drift pins. Ream holes that must be enlarged to admit bolts.

3.4 FIELD CONNECTIONS

A. General:

1. Install and tighten non-high-strength bolts, except where high-strength bolts are indicated.
2. Install and tighten high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

a. Bolts: ASTM A 325 high-strength bolts, unless otherwise indicated.
b. Connection Type: Slip-critical, direct-tension, or tensioned shear/bearing connections as indicated.

B. Weld Connections:

1. Comply with AWS D1.1 for procedures, appearance and quality of welds, and methods used in correcting welding work.
2. Comply with AISC specifications referenced in this Section for bearing, adequacy of temporary connections, alignment, and removal of paint on surfaces adjacent to field welds.
3. Assemble and weld built-up sections by methods that will maintain true alignment of axes without warp.

4. Verify that weld sizes, fabrication sequence, and equipment used for architecturally exposed structural steel will limit distortions to allowable tolerances. Prevent surface bleeding of back-side welding on exposed steel surfaces. Grind smooth exposed fillet welds 1/2 inch and larger. Grind flush butt welds. Dress exposed welds.
5. Remove backing bars or runoff tabs where indicated, back gouge, and grind steel smooth.
6. Welds designated as demand critical shall be made with a filler metal capable of providing a minimum Charpy V-Notch (CVN) toughness of 20 ft-lb at -20 deg F as determined by AWS classification test or manufacturer certification and 40 ft-lb at 70 deg F when the steel frame is normally enclosed and maintained above 49 deg F.

3.5 QUALITY CONTROL

A. Quality Control Compliance:

1. Field quality control shall be in accordance with the Quality Control Plan.

B. Testing and Inspection:

1. Engage a special Inspector to perform field inspections and tests and to prepare test reports.
2. Testing agency will conduct and interpret tests and state in each report whether tested Work complies with or deviates from requirements.
3. Correct deficiencies in or remove and replace structural steel that inspections and test reports indicate do not comply with specified requirements.
4. Additional testing, at Contractor's expense, will be performed to determine compliance of corrected Work with specified requirements.
5. Field-bolted connections will be tested and inspected according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

    a. Direct-tension indicator gaps will be verified to comply with ASTM F 959, Table 2.

6. In addition to visual inspection, field-welded connections will be inspected and tested according to AWS D1.1 and the inspection procedures listed below, at Special Inspector’s option.

    a. Liquid Penetrant Inspection: ASTM E 165.
    b. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration will not be accepted.
    c. Radiographic Inspection: ASTM E 94 and ASTM E 142; minimum quality level "2-2T."
    d. Ultrasonic Inspection: ASTM E 164.

7. In addition to visual inspection, shear connector stud welds will be tested and inspected according to requirements in AWS D1.1 for stud welding and as follows:

    a. Bend tests will be performed if visual inspections reveal either a less-than-continuous 360-degree flash or welding repairs to any shear connector.
    b. Tests will be conducted on additional shear connectors if weld fracture occurs on shear connectors already tested, according to requirements in AWS D1.1.

3.6 CLEANING

A. Touchup Painting:

1. Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint. Apply paint to exposed areas using same material as used for shop painting.
2. Apply by brush or spray to provide a minimum dry film thickness of 1.5 mils.

END OF SECTION

SECTION 05 30 00

STEEL DECKING

(Edited from DeCA June 2011 Design Criteria)

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Roof deck.

B. Related Sections:

1. Division 01 Section Sustainable Design Reporting for recycled content of steel products.

1.2 SUBMITTALS

A. Product Data:

1. For each type of deck, accessory, and product indicated.

B. Shop Drawings:

1. Show layout and types of deck panels, anchorage details, reinforcing channels, pans, deck openings, special jointing, accessories, and attachments to other construction.

C. Field quality-control test and inspection reports.

D. Welding certificates.

E. Submittal List:

Reference	Submittal Item	Quantity	Action
1.2A	Product Data	X	R
1.2B	Shop Drawings	X	R
1.2C	Field Quality-Control Test and Inspection Report	X	R
1.2D	Welding Certificate	X	R

X Submit quantity specified in Division 01 Section Administrative Requirements.
R Review each submittal, mark to indicate action taken, and return.
I Submittal is for information or record purposes only. No action will be taken.

1.3 QUALITY ASSURANCE

A. Installer Qualifications:

1. An experienced installer who has completed steel deck similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.

B. Special Inspector qualifications.

C. Special inspections for welding shall be performed under the direct supervision of a Professional Engineer registered in the State in which the project is located. The personnel performing the inspections shall be ICC-certified Structural Steel and Welding Special Inspector or an equivalent certification program.

D. Welding:

1. Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code-Steel," and AWS D1.3, "Structural Welding Code-Sheet Steel."

E. AISI Specifications:

1. Calculate structural characteristics of steel deck according to AISI's "Specification for the Design of Cold-Formed Steel Structural Members."

1.4 DELIVERY, STORAGE, AND HANDLING

A. Protect steel deck from corrosion, deformation, and other damage during delivery, storage, and handling. Stack steel deck on platforms or pallets and slope to provide drainage. Protect with a waterproof covering and ventilate to avoid condensation.

PART 2 - PRODUCTS

2.1 ROOF DECK

A. Steel Roof Deck:

1. Fabricate panels, without top-flange stiffening grooves, to comply with "SDI Specifications and Commentary for Steel Roof Deck," in SDI Publication No31, and the following:

a. Hot-Dipped Galvanized and Pretreated Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS), Grade 33, G60 zinc coating; cleaned, and pretreated for field painting.
b. Deck Profile: Type B.
c. Profile Depth: 1-1/2 inches.
d. Design Uncoated-Steel Thickness: 0.0474 inch (18 gage) except where 0.0358 inch (20 gage) is indicated.
e. Side Laps: Overlapped or interlocking seam at Contractor’s option.
f. Span Condition: Triple span or more.

2.2 ACCESSORIES

A. General:

1. Provide manufacturer's standard accessory materials for deck that comply with requirements indicated.
2. Mechanical Fasteners: Corrosion-resistant, low-velocity, power-actuated or pneumatically driven carbon-steel fasteners; or self-drilling, self-threading screws.
3. Side-Lap Fasteners: Corrosion-resistant, hexagonal washer head; self-drilling, carbon-steel screws, No. 10 minimum diameter.
4. Miscellaneous Sheet Metal Deck Accessories: Steel sheet, minimum yield strength of 33,000 psi, not less than 0.0359-inch design uncoated thickness, of same material and finish as deck; of profile indicated or required for application.
5. Steel Sheet Accessories: Steel sheet, of same material, finish, and thickness as deck, unless otherwise indicated.
6. Pour Stops and Girder Fillers: Steel sheet, minimum yield strength of 33,000 psi, of same material and finish as deck, and of thickness and profile recommended by SDI Publication No. 30 for overhang and slab depth.
7. Column Closures, End Closures, Z-Closures, and Cover Plates: Steel sheet, of same material, finish, and thickness as deck, unless otherwise indicated.
8. Weld Washers: Uncoated steel sheet, shaped to fit deck rib, 0.0598 inch thick, with factory-punched hole of 5/8-inch minimum diameter.
9. Roof Sump Receiver (Flat Sump Plate): Single-piece steel sheet, 0.0747 inch thick, of same material and finish as deck. For drains, cut holes in the field. Exclude roof sump receiver if specified with drains under work of Division 22.
10. Galvanizing Repair Paint: ASTM A 780.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine supporting frame and field conditions for compliance with requirements for installation tolerances and other conditions affecting performance.

3.2 INSTALLATION

A. General:

1. Install deck panels and accessories according to applicable specifications and commentary in SDI Publication No. 31 manufacturer's written instructions, and requirements in this Section.
2. Install temporary shoring before placing deck panels, if required to meet deflection limitations.
3. Locate decking bundles to prevent overloading of supporting members.
4. Place deck panels on supporting frame and adjust to final position with ends accurately aligned and bearing on supporting frame before being permanently fastened. Do not stretch or contract side-lap interlocks.
5. Place deck panels flat and square and fasten to supporting frame without warp or deflection.
6. Cut and neatly fit deck panels and accessories around openings and other work projecting through or adjacent to decking.

7. Provide additional reinforcement and closure pieces at openings as required for strength, continuity of decking, and support of other work.
8. Comply with AWS requirements and procedures for manual shielded metal arc welding, appearance and quality of welds, and methods used for correcting welding work.

B. Roof Deck Installation:

1. Fasten roof deck panels to steel supporting members by arc spot (puddle) welds of the surface diameter indicated or arc seam welds with an equal perimeter, but not less than 1-1/2 inches long, and as follows:

   a. Weld Diameter: 5/8 inch, nominal.
   b. Weld Spacing: As indicated on Drawings.

2. Side-Lap and Perimeter Edge Fastening: Fasten side laps and perimeter edges of panels between supports, at intervals not exceeding the lesser of 1/2 of the span or 36 inches, and as follows:

   a. Mechanically button punch side laps as indicated on Drawings.
   b. Perimeter edge fastening as indicated on Drawings.

3. End Bearing: Install deck ends over supporting frame with a minimum end bearing of 1-1/2 inches, with end joints as follows:

   a. End Joints: Lapped 2 inches minimum.

4. Roof Plates: Install over openings provided in roof decking and weld flanges to top of deck. Space welds not more than 12 inches apart with at least 1 weld at each corner.
5. Miscellaneous Roof Deck Accessories: Install ridge and valley plates, finish strips, cover plates, end closures, and reinforcing channels according to deck manufacturer's written instructions. Weld to substrate to provide a complete deck installation.

C. Floor Deck Installation:

1. Fasten floor deck panels to steel supporting members by arc spot (puddle) welds of the surface diameter indicated and as follows:

   a. Weld Diameter: 5/8 inch, nominal.
   b. Weld Spacing: As indicated on Drawings.

2. Side-Lap and Perimeter Edge Fastening: Fasten side laps and perimeter edges of panels between supports, and as follows:

   a. Overlap sides and weld as indicated on Drawings.
   b. Perimeter edge fastening as indicated on Drawings.

3. End Bearing: Install deck ends over supporting frame with a minimum end bearing of 1-1/2 inches, with end joints as follows:

   a. End Joints: Lapped. Two inches minimum.

4. Shear Connectors: Weld shear connectors through deck to supporting frame according to AWS D1.1 and manufacturer's written instructions. Butt end joints of deck panels; do not overlap. Remove and discard arc shields after welding shear connectors.

5. Pour Stops and Girder Fillers: Weld steel sheet pour stops and girder fillers to supporting structure according to SDI recommendations, unless otherwise indicated.
6. Floor Deck Closures: Weld steel sheet column closures, cell closures, and Z-closures to deck, according to SDI recommendations, to provide tight-fitting closures at open ends of ribs and sides of decking. Weld cover plates at changes in direction of floor deck panels, unless otherwise indicated.
7. Install piercing hanger tabs not more than 14 inches apart in both directions, within 9 inches of walls at ends, and not more than 12 inches from walls at sides, unless otherwise indicated.

3.3 FIELD QUALITY CONTROL

A. General:

1. Field quality control shall be in accordance with the Quality Control Plan.
2. Contractor shall engage a Special Inspector to inspect field welds and all deck connections.
3. Field welds shall be subject to inspection.

   a. In addition to visual inspection, shear connector stud welds shall be tested and inspected according to requirements in AWS D1.1 for stud welding and as follows:

      1) Bend tests shall be performed if visual inspections reveal either a less-than-continuous 360-degree flash or welding repairs to any shear connector.
      2) Tests shall be conducted on additional shear connectors if weld fracture occurs on shear connectors already tested, according to requirements in AWS D1.1.

4. Special Inspector shall report test results promptly and in writing to Contractor and Contracting Officer.
5. Remove and replace work that does not comply with specified requirements.
6. Additional testing and inspecting, at Contractor's expense, shall be performed to determine compliance of corrected work with specified requirements.

3.4 REPAIRS AND PROTECTION

A. Galvanizing Repairs:

1. Prepare and repair damaged galvanized coatings on both surfaces of deck with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.

B. Protection:

1. Provide final protection and maintain conditions to ensure that steel deck is without damage or deterioration at time of final acceptance.

END OF SECTION

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SECTION 05 50 13

METAL FABRICATIONS

(Edited from DeCA June 2011 Design Criteria)

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Steel framing and supports for mechanical and electrical equipment.
2. Steel framing and supports for applications where framing and supports are not specified in other Sections.
3. Shelf angles.
4. Loose bearing and leveling plates.
5. Steel weld plates and angles for casting into concrete not specified in other Sections.
6. Structural-steel door frames for traffic doors and overhead doors.
7. Miscellaneous steel trim including wall mounted steel angle corner guards and loading-dock edge angles.
8. Metal vertical ladders.
9. Metal ships' ladders.
10. Metal bollards (bumper posts).
11. Bumper post sleeves.
12. Metal column covers.
13. Safety chains.
14. Stainless steel wall panels.

B. Products furnished, but not installed, under this Section include the following:

1. Loose steel lintels.
2. Anchor bolts and wedge-type inserts indicated to be cast into concrete or built into unit masonry.

C. Related Sections:

1. Division 01 Section Sustainable Design Requirements for recycled content of steel products.
2. Division 10 Section Storage Racks for floor mounted corner guards.
3. Division 10 Section Wall and Equipment Protection for stock-manufactured wall and equipment guards.
4. Division 11 Section Loading Dock Equipment for pit edge angles.

1.2 PERFORMANCE REQUIREMENTS

A. Thermal Movements:

1. Provide exterior metal fabrications that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, failure of connections, and

other detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

a. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

B. Delegated Design:

1. Design supplementary supports for ladders including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

C. Structural Performance of Ladders:

1. Provide ladders (including ships' ladders, if any) capable of withstanding the effects of loads and stresses within limits and under conditions specified in ANSI A14.3.

1.3 SUBMITTALS

A. Shop Drawings:

1. Show fabrication and installation details for metal fabrications.

a. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items.
b. Provide templates for anchors and bolts specified for installation under other Sections.

B. Samples:

1. Stainless steel quilted wall panel 24 by 24 inches.

C. Welding Certificates.

D. Special Inspection reports on shop and field bolted connections, and welded connections.

E. Product Data:

1. Bumper post sleeves.
2. Ladder rung non-slip material.

F. Delegated-Design Submittal:

1. For installed products indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

G. Qualification Data and Certificate.

H. Submittal List:

Reference	Submittal Item	Quantity	Action
1.3A	Shop Drawings	X	R
1.3B	Samples	X	R
1.3C	Welding Certificates	X	R

1.3D	Special Inspection Reports	X	R
1.3E	Product Data	X	R
1.3F	Delegated-Design Submittal	X	R
1.3G	Qualification Data	X	I

X Submit quantity specified in Division 01 Section Administrative Requirements.
R Review each submittal, mark to indicate action taken, and return.
I Submittal is for information or record purposes only. No action will be taken.

1.4 QUALITY ASSURANCE

A. Welding:

1. Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code--Steel."

B. Special Inspector Qualifications:

1. Special Inspections for bolted and welded connections and steel details shall be performed under the direct supervision of a Professional Engineer registered in the State in which the project is located. The personnel performing the inspections shall be ICC-certified Structural Steel and Welding Special Inspection or an equivalent certification program.

1.5 PROJECT CONDITIONS

A. Field Measurements:

1. Verify actual locations of walls and other construction contiguous with metal fabrications by field measurements before fabrication and indicate measurements on Shop Drawings.

1.6 COORDINATION

A. Coordinate installation of anchorages for metal fabrications. Furnish setting Drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

PART 2 - PRODUCTS

2.1 METALS, GENERAL

A. Metal Surfaces:

1. Provide materials with smooth, flat surfaces, unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.

2.2 FERROUS METALS

A. Recycled Content of Steel Products: Provide products with average recycled content of steel products so postconsumer recycled content plus one-half of preconsumer recycled content is not less than 25 percent. Steel Plates, Shapes, and Bars ASTM A 36/A 36M.

B. Steel Pipe ASTM A 53/A 53M.

1. Standard weight (Schedule 40), unless another weight is indicated or required by structural loads.

C. Stainless-Steel Sheet, Strip, and Plate: ASTM A 240/A 240M or ASTM A 666.

2.3 FASTENERS

A. General:

1. Unless otherwise indicated, provide Type 304 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B 633, Class Fe/Zn 5, at exterior walls. Provide stainless-steel fasteners for fastening aluminum. Select fasteners for type, grade, and class required.

a. Provide stainless-steel fasteners for fastening stainless steel.

2.4 MISCELLANEOUS MATERIALS

A. Welding Rods and Bare Electrodes:

1. Select according to AWS specifications for metal alloy welded.

B. Shop Primers:

1. Provide primers that comply with Division 09 painting Sections.

C. Universal Shop Primer:

1. Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79 and compatible with topcoat.
2. Use primer with a VOC content of 3.5 lb/gal. or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
3. Use primer containing pigments that make it easily distinguishable from zinc-rich primer.

D. Zinc-Rich Primer:

1. Complying with SSPC-Paint 20 or SSPC-Paint 29 and compatible with topcoat.
2. Use primer with a VOC content of 3.5 lb/gal. or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

E. Galvanizing Repair Paint:

1. High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.

F. Bituminous Paint:

1. Cold-applied asphalt emulsion complying with ASTM D 1187.

G. Nonshrink, Nonmetallic Grout:

1. Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.

H. Concrete Materials and Properties:

1. Comply with requirements in Division 03 Section Cast-in-Place Concrete for normal-weight, air-entrained, ready-mix concrete with a minimum 28-day compressive strength of 3000 psi, unless otherwise indicated.

2.5 FABRICATION, GENERAL

A. Shop Assembly:

1. Preassemble items in the shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.
2. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch, unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
3. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
4. Form exposed work true to line and level with accurate angles and surfaces and straight edges.
5. Weld corners and seams continuously to comply with the following:

   a. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
   b. Obtain fusion without undercut or overlap.
   c. Remove welding flux immediately.
   d. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

6. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) screws or bolts, unless otherwise indicated. Locate joints where least conspicuous.
7. Fabricate seams and other connections that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.
8. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.
9. Provide for anchorage of type indicated; coordinate with supporting structure. Space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.

   a. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors, 1/8 by 1-1/2 inches, with a minimum 6-inch

embedment and 2-inch hook, not less than 8 inches from ends and corners of units and 24 inches o.c., unless otherwise indicated.

2.6 MISCELLANEOUS FRAMING AND SUPPORTS

A. General:

1. Provide steel framing and supports not specified in other Sections as needed to complete the Work.
2. Fabricate units from steel shapes, plates, and bars of welded construction, unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction retained by framing and supports. Cut, drill, and tap units to receive hardware, hangers, and similar items.
3. Furnish inserts if units are installed after concrete is placed.
4. Galvanize miscellaneous framing and supports where indicated.

2.7 LOOSE STEEL LINTELS

A. Fabrication:

1. Fabricate loose steel lintels from steel angles and shapes of size indicated for openings at locations indicated. Weld adjoining members together to form a single unit where indicated.
2. Size loose lintels to provide bearing length at each side of openings equal to 1/12 of clear span but not less than 8 inches, unless otherwise indicated.
3. Galvanize loose steel lintels located in exterior walls.

2.8 SHELF ANGLES

A. Fabrication:

1. Fabricate shelf angles from steel angles of sizes indicated and for attachment to concrete framing. Provide horizontally slotted holes to receive 3/4-inch bolts, spaced not more than 6 inches from ends and 24 inches o.c., unless otherwise indicated.
2. Provide mitered and welded units at corners.
3. Provide open joints in shelf angles at expansion and control joints. Make open joint approximately 2 inches larger than expansion or control joint.
4. Galvanize shelf angles located in exterior walls.

2.9 LOOSE BEARING AND LEVELING PLATES

A. Provide loose bearing and leveling plates for steel items bearing on masonry or concrete construction. Drill plates to receive anchor bolts and for grouting. Prime plates with zinc-rich primer.

2.10 STEEL WELD PLATES AND ANGLES

A. Provide steel weld plates and angles not specified in other Sections, for items supported from concrete construction as needed to complete the Work. Provide each unit with not less than two integrally welded steel strap anchors for embedding in concrete.

2.11 STRUCTURAL-STEEL DOOR FRAMES

A. Fabrication, General:

1. Fabricate structural-steel door frames from steel shapes, plates, and bars of size and to dimensions indicated, fully welded together unless otherwise indicated. Plug-weld built-up members and continuously weld exposed joints. Reinforce frames and drill and tap as necessary to accept finish hardware.
2. Provide with integrally welded steel strap anchors for securing door frames into adjoining concrete or masonry.
3. Unless otherwise indicated provide anchors 1/8 thick by 2 inches wide, with a minimum 6-inch embedment and 2-inch hook for securing door frames into adjoining concrete or masonry. Weld anchors to frame jambs no more than 12 inches from both bottom and head of frame, and space anchors not more than 30 inches apart.

B. Overhead Door Structural-Steel Door Frames:

1. Structural steel jambs and head of sizes and shapes as indicated; provide steel plates where indicated on overhead door Shop Drawings for support of tracks, counterbalance system, and operators.

C. Traffic Door Structural-Steel Door Frames:

1. Structural steel jambs and head of size and shape as indicated.
2. Extend bottom of frames to floor elevation indicated with steel angle clips welded to frames for anchoring frame to floor with expansion shields and bolts.

D. Finish:

1. Galvanize exterior steel frames.
2. Prime interior steel frames.

2.12 MISCELLANEOUS STEEL TRIM

A. General:

1. Unless otherwise indicated, fabricate units from steel shapes, plates, and bars of profiles shown with continuously welded joints and smooth exposed edges. Miter corners and use concealed field splices where possible.

B. Fabrication:

1. Provide cutouts, fittings, and anchorages as needed to coordinate assembly and installation with other work.
2. Provide with integrally welded steel strap anchors for embedding in concrete or masonry construction.
3. Unless otherwise indicated provide anchors 1/8 thick by 2 inches wide, with a minimum 6-inch embedment and 2-inch hook for securing steel trim into adjoining concrete or masonry. Weld anchors to steel trim no more than 12 inches from ends of opening, and space anchors not more than 16 inches apart.

C. Wall Mounted Steel Angle Corner Guards:

1. 4- by 4- by 1/4-inch steel angle, unless otherwise indicated.

D. Concrete Slab Edgings:

1. Unless otherwise indicated provide edgings of sizes as follows:

a. Loading Dock Edge Angles: 4- by 4- by 1/4-inch.

E. Finish:

1. Prime interior miscellaneous steel trim.
2. Galvanize exterior miscellaneous steel trim.

2.13 METAL VERTICAL LADDERS

A. General:

1. Comply with ANSI A14.3, unless otherwise indicated.
2. Space siderails 18 inches apart, unless otherwise indicated.
3. Support each ladder at top and bottom and not more than 60 inches o.c. with welded or bolted brackets, made from same metal as ladder.

B. Steel Ladders:

1. Siderails: Continuous, 3/8-by-2-1/2-inch steel flat bars, with eased edges, unless otherwise indicated.
2. Rungs: 3/4-inch- diameter steel bars, unless otherwise indicated.
3. Fit rungs in centerline of siderails; plug-weld and grind smooth on outer rail faces.
4. Provide nonslip surfaces on top of each rung, either by coating rung with aluminum-oxide granules set in epoxy-resin adhesive or by using a type of manufactured rung filled with aluminum-oxide grout.
5. Galvanize exterior ladders and interior ladders, where indicated, including brackets and fasteners.
6. Prime interior ladders, including brackets and fasteners.

C. Aluminum Ladders:

1. 6063-T5 or 6063-T6 extruded aluminum complying with ASTM B 221.
2. Ladder Side Rails: Continuous, tubular, assembled from two interlocking aluminum extrusions, NL-1 channel rail and NL-2 cover plate, 3 inches wide, 1/8 inch wall thickness. Construction shall be self-locking stainless steel fasteners, full penetration TIG welds and clean, smooth and burr-free surfaces.
3. Ladder Grab Bars: Deeply serrated, square, tubular rails.
4. Ladder Rungs: Not less than 1-1/4 inches square, serrated extruded tubular aluminum, and shall withstand a 1,500 lb load without deformation or failure.
5. Fit rungs in centerline of side rails and fasten with self tapping screws.
6. Mill finish.
7. Basis-of-Design Product: O'Keeffe's, Inc., Ladder Model 502. Phone (415) 822-4222 or www.okeeffes.com.

D. Above-Cooler-Access Aluminum Ladder and Platform:

1. 6063-T5 or 6063-T6 extruded aluminum complying with ASTM B 221.
2. Ladder Side rails: Continuous, tubular, assembled from two interlocking aluminum extrusions, NL-1 channel rail and NL-2 cover plate, 3 inches wide, 1/8 inch wall

thickness. Construction shall be self-locking stainless steel fasteners, full penetration TIG welds and clean, smooth and burr-free surfaces.

3. Ladder Rungs: Not less than 1-1/4 inches square, serrated extruded tubular aluminum, and shall withstand a 1,500 lb load without deformation or failure.
4. Fit rungs in centerline of side rails and fasten with self tapping screws.
5. Mill finish.
6. Landing Platform: Minimum 1-1/2-inch diameter serrated extruded tubular aluminum.
7. Landing Platform Guard Rails: 1.666-inch diameter Schedule 40 aluminum pipe.
8. Basis-of-Design Product: O'Keeffe's, Inc. Ladder Model 501 and LP Landing Platform. Phone (415) 822-4222 or www.okeeffes.com.

2.14 METAL SHIPS' LADDERS

1. Provide metal ships' ladders where indicated. Fabricate of open-type construction with channel or plate stringers, pipe and tube railings, and bar grating treads, unless otherwise indicated. Provide brackets and fittings for installation.
2. Fabricate ships' ladders, including treads and railings from steel.
3. Comply with applicable requirements in Division 05 Sections Metal Stairs and Pipe Railings.
4. Prime steel ships' ladders, including treads, railings, brackets, and fasteners.

2.15 METAL BOLLARDS (BUMPER POSTS)

A. Fabrication:

1. Fabricate metal bollards from Schedule 40 steel pipe.
2. Galvanized finish.

2.16 BUMPER POST SLEEVES

A. Plastic Bumper Post Sleeve:

1. Basis-of-Design Product: Ideal Shield, Standard Bumper Post Sleeve, 2525 Clark Street, Detroit, MI 48209-1355. Telephone: (877)323-0769.
2. Low-density polyethylene thermoplastic (LDPE) tubes having ultra-violet resistance and anti static properties, nominal thickness 0.250 inch. OSHA yellow color unless otherwise indicated.

    a. Size sleeve shield diameter for pipe diameters indicated on Drawings.
    b. Sleeve height as indicated on Drawings.
    c. Sleeve surface: Smooth with round top. No ribbed or two-piece systems acceptable.

2.17 METAL COLUMN COVERS

A. Stainless Steel: 20 gage, Type 304 stainless steel sheet metal with #4 finish.

1. Form column covers to tightly fit building columns.
2. Radius corners to match building columns.
3. Return vertical edges to form hook that will engage continuous mounting clips.

4. Return vertical edges on continuous mounting clips to form hook that will engage hooks on column covers.

2.18 SAFETY CHAINS

A. Chain:

1. Galvanized wrought iron, straight link style, 3/16-inch diameter, minimum 12 links per foot and with boat type snap hooks on each end.

B. Eye Bolts for Attachment of Chains:

1. Galvanized 3/8-inch diameter bolts with 3/4-inch eye, anchored to frame opening.

C. Installation:

1. Provide chains for each guarded opening.
2. Mount chains 3 feet-6 inches above finished floor.

2.19 STAINLESS STEEL WALL PANELS

A. 18 gage (0.0500 inch) thick, Type 304 stainless steel with #4 finish, 4-inch by 4-inch quilted pattern. Perimeter edges of panel shall be turned-in against wall with 15 degree break, to increase rigidity of panel and provide tight fit against wall. Secure to ceramic wall tile with construction adhesive.

2.20 FINISHES, GENERAL

A. Metal Finishes

1. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
2. Finish metal fabrications after assembly.

2.21 STEEL AND IRON FINISHES

A. Galvanizing:

1. Hot-dip galvanize items as indicated to comply with applicable standard listed below:
2. ASTM A 123/A 123M, for galvanizing steel and iron products.
3. ASTM A 153/A 153M, for galvanizing steel and iron hardware.

B. Preparation for Shop Priming:

1. Prepare uncoated ferrous-metal surfaces to comply with minimum requirements indicated below for SSPC surface preparation specifications and environmental exposure conditions of installed metal fabrications:
2. Interiors (SSPC Zone 1A): SSPC-SP 3, "Power Tool Cleaning."

C. Shop Priming:

1. Apply shop primer to uncoated surfaces of ferrous-metal fabrications, except those with galvanized finishes and those to be embedded in concrete, sprayed-on fireproofing, or masonry, unless otherwise indicated. Comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.
2. Stripe paint corners, crevices, bolts, welds, and sharp edges.

2.22 STAINLESS-STEEL FINISHES

A. General:

1. Provide stainless steel free from surface blemishes where exposed to view in the finished unit. Exposed-to-view surfaces exhibiting pitting, seam marks, roller marks, stains, discolorations, or other imperfections on finished units are not acceptable.
2. Remove tool and die marks and stretch lines or blend into finish.
3. Grind and polish surfaces to produce uniform, directionally textured, polished finish indicated, free of cross scratches. Run grain with long dimension of each piece.

B. Finish:

1. Bright, Directional Satin Finish: No. 4.
2. When polishing is completed, rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General:

1. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.
2. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.

B. Field Welding:

1. Comply with the following requirements:

a. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
b. Obtain fusion without undercut or overlap.
c. Remove welding flux immediately.
d. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

C. Fastening to In-Place Construction:

1. Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction. Provide threaded fasteners for use with concrete and masonry inserts, toggle bolts, through bolts, lag bolts, wood screws, and other connectors.

D. Built-In Construction:

1. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

3.2 INSTALLING MISCELLANEOUS FRAMING AND SUPPORTS

A. General:

1. Install framing and supports to comply with requirements of items being supported, including manufacturers' written instructions and requirements indicated on Shop Drawings.

3.3 INSTALLING BEARING AND LEVELING PLATES

A. Preparation:

1. Clean concrete and masonry bearing surfaces of bond-reducing materials, and roughen to improve bond to surfaces. Clean bottom surface of plates.

B. Setting:

1. Set bearing and leveling plates on wedges, shims, or leveling nuts. After bearing members have been positioned and plumbed, tighten anchor bolts. Do not remove wedges or shims but, if protruding, cut off flush with edge of bearing plate before packing with grout. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

3.4 INSTALLING CONCRETE SLAB EDGINGS

A. Install edgings flush with edge of concrete.

3.5 INSTALLING PIPE BOLLARDS (BUMPER POSTS)

A. Concrete Embedment:

1. Anchor bollards in place with concrete footings. Center bollards in holes and set bottom end of bollard 3 inches above bottom of excavation. Place concrete and vibrate or tamp for consolidation. Support and brace bollards in position until concrete has cured. Slope concrete up approximately 1/8 inch toward bollard.

B. Pipe Fill:

1. Fill bollards solidly with concrete, mounding top surface to shed water.

3.6 INSTALLING BUMPER POST SLEEVES

A. Location:

1. Install bumper post sleeves over interior pipe bollards (bumper posts) located in non-customer areas and where indicated on Drawings.
2. Secure sleeve to pipe with manufacturer's neoprene adhesive tape in accordance with manufacturer's installation guidelines. Do not use screws, glue, or clamps.

3.7 INSTALLING METAL COLUMN COVERS

A. General:

1. Install metal column covers around building columns.
2. Secure column covers to columns with full bed of construction adhesive.
3. Slide returned edges of continuous mounting clip over returned edges of column cover to form interlocked edges.

3.8 QUALITY CONTROL

A. Quality Control Compliance:

1. Field quality control shall be in accordance with the Quality Control Plan.

B. Testing and Inspection:

1. Engage a special Inspector to perform field inspections and tests and to prepare test reports.
2. Field and shop welds will be subject to testing and inspecting.
3. Testing agency will report test results promptly and in writing to Contractor and Contracting Officer.
4. Remove and replace work where test results indicate that it does not comply with specified requirements.
5. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.9 ADJUSTING AND CLEANING

A. Touchup Painting:

1. Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces. Apply by brush or spray to provide a minimum 2 mil dry film thickness.

B. Galvanized Surfaces:

1. Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

END OF SECTION

SECTION 06 10 00

ROUGH CARPENTRY

(Edited from DeCA June 2011 Design Criteria)

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Wood furring, grounds, nailers, and blocking.
2. Miscellaneous lumber.
3. Plywood backing panels.

1.2 DELIVERY, STORAGE, AND HANDLING

A. General:

1. Keep materials under cover and dry. Protect from weather and contact with damp or wet surfaces. Stack lumber, plywood, and other panels. Provide for air circulation within and around stacks and under temporary coverings.
2. For lumber and plywood pressure treated with waterborne chemicals, place spacers between each bundle to provide air circulation.

1.3 SUBMITTALS

A. Product Data:

1. For each type of process and factory-fabricated product.

a. Include data for wood-preservative and fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements.

B. Submittal List:

Reference	Submittal Item	Quantity	Action
1.3A	Product Data	X	R

X Submit quantity specified in Division 01 Section Administrative Requirements.
R Review each submittal, mark to indicate action taken, and return.
I Submittal is for information or record purposes only. No action will be taken.

PART 2 - PRODUCTS

2.1 LUMBER, GENERAL

A. Lumber Standards:

1. Comply with DOC PS 20, "American Softwood Lumber Standard," and with applicable grading rules of inspection agencies certified by American Lumber Standards Committee's (ALSC) Board of Review.

B. Sizes:

1. Where nominal sizes are indicated, provide actual sizes required by DOC PS 20 for moisture content specified. Where actual sizes are indicated, they are minimum dressed sizes for dry lumber.
2. Provide dressed lumber, S4S, unless otherwise indicated.
3. Provide dry lumber with 19 percent maximum moisture content at time of dressing for 2-inch nominal thickness or less, unless otherwise indicated.

C. Engineered Wood Products: Provide engineered wood products acceptable to authorities having jurisdiction and for which current model code research or evaluation reports exist that show compliance with building code in effect for Project.

1. Allowable Design Stresses: Provide engineered wood products with allowable design stresses, as published by manufacturer, that meet or exceed those indicated. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency.

2.2 WOOD-PRESERVATIVE-TREATED MATERIALS

A. General:

1. Where lumber or plywood is indicated as preservative treated or is specified to be treated, comply with applicable requirements of AWPA C2 (lumber) Use Category UC3b for exterior construction not in contact with the ground, and Use Category UC4a for items in contact with the ground and AWPA C9 (plywood). Mark each treated item with the Quality Mark Requirements of an inspection agency approved by ALSC's Board of Review.
2. Do not use chemicals containing chromium or arsenic.

B. Pressure Treatment:

1. Pressure treat aboveground items with waterborne preservatives to a minimum retention of 0.25 lb/cu. ft. After treatment, kiln-dry lumber and plywood to a maximum moisture content of 19 and 15 percent, respectively. Treat indicated items and the following:

a. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing.
b. Wood blocking, furring, stripping, and similar concealed members in contact with masonry or concrete.

C. Application: Treat items indicated on Drawings, and the following:

1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
2. Wood blocking, and similar concealed members in contact with masonry or concrete.
3. Wood framing and furring attached directly to the interior of below-grade exterior masonry or concrete walls.
4. Wood framing members that are less than 18 inches above the ground in crawl spaces or unexcavated areas.
5. Wood floor plates that are installed over concrete slabs-on-grade.

2.3 FIRE-RETARDANT-TREATED PLYWOOD

A. General:

1. Comply with performance requirements in AWPA C27 (plywood).

B. Fire-Retardant-Treated Lumber and Plywood by Pressure Process: Products with a flame spread index of 25 or less when tested according to ASTM E 84, and with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet beyond the centerline of the burners at any time during the test.

1. Use treatment that does not promote corrosion of metal fasteners.

a. Use treatment that does not promote corrosion of metal fasteners.

2. Identify fire-retardant-treated wood with appropriate classification marking of testing and inspecting agency acceptable to authorities having jurisdiction.
3. Application: Treat items indicated on Drawings, and the following:

a. Concealed blocking.
b. Plywood backing panels.

C. See Design Criteria and UFC for restrictions on fire treated plywood in roof systems

2.4 MISCELLANEOUS LUMBER

A. General:

1. Provide lumber for support or attachment of other construction, including rooftop equipment curbs and support bases, cant strips, bucks, nailers, blocking, furring, grounds, stripping, and similar members.
2. Fabricate miscellaneous lumber from dimension lumber of sizes indicated and into shapes shown.
3. Moisture Content: 19 percent maximum for lumber items are not specified to receive wood preservative treatment.
4. Grade: For dimension lumber sizes, provide No. 3 or Standard grade lumber per ALSC's NGRs of any species. For board-size lumber, provide No. 3 Common grade per NELMA, NLGA, or WWPA; No. 2 grade per SPIB; or Standard grade per NLGA, WCLIB or WWPA of any approved species.

2.5 WOOD-BASED STRUCTURAL-USE PANELS

A. Structural-Use Panel Standards:

1. Provide all-veneer, mat-formed, or composite panels complying with DOC PS 2, "Performance Standard for Wood-Based Structural-Use Panels," unless otherwise indicated. Provide plywood panels complying with DOC PS 1, "U.S. Product Standard for Construction and Industrial Plywood," where plywood is indicated.

B. Trademark:

1. Factory mark structural-use panels with APA trademark evidencing compliance with grade requirements.

C. Miscellaneous Concealed Plywood:

1. C-C Plugged Exterior, thickness as indicated but not less than 1/2 inch.

D. Miscellaneous Exposed Plywood:

1. A-D Interior, thickness as indicated but not less than 1/2 inch.

E. Plywood Backing Panels:

1. For mounting electrical or telephone equipment, provide fire-retardant-treated plywood panels with grade, C-D Plugged Exposure 1, in thickness indicated or, if not otherwise indicated, not less than 3/4-inch nominal thickness.

2.6 FASTENERS

A. General:

1. Provide fasteners of size and type indicated that comply with requirements specified in this Article for material and manufacture.

a. Where carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A 153 or of Type 304 or Type 316 stainless steel.

B. Nails, Wire, Brads, and Staples: FS FF-N-105. ASTM F 1667.

C. Power-Driven Fasteners: NES NER-272.

D. Wood Screws: ASME B18.6.1.

E. Lag Bolts: ASME B18.2.1.

F. Bolts: Steel bolts complying with ASTM A 307, Grade A; with ASTM A 563 hex nuts and, where indicated, flat washers.

G. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to 6 times the load imposed when installed in unit masonry assemblies and equal to 4 times the load imposed when installed in concrete as

determined by testing per ASTM E 488 conducted by a qualified independent testing and inspecting agency.

1. Material: Carbon-steel components, zinc plated to comply with ASTM B 633, Class Fe/Zn 5 for interior applications.
2. Material: Stainless steel with bolts and nuts complying with ASTM F 593 and ASTM F 594, Alloy Group 1 or 2 for exterior applications.

H. Screws for Fastening to Cold-Formed Metal Framing, Unless Otherwise Indicated: ASTM C 954.

1. Except with wafer heads and reamer wings.
2. Length as recommended by screw manufacturer for material being fastened.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General:

1. Discard units of material with defects that impair quality of carpentry and that are too small to use with minimum number of joints or optimum joint arrangement.
2. Set carpentry to required levels and lines, with members plumb, true to line, cut, and fitted.
3. Fit carpentry to other construction; scribe and cope as required for accurate fit. Correlate location of furring, nailers, blocking, grounds, and similar supports to allow attachment of other construction.
4. Where wood-preservative-treated lumber is installed adjacent to metal decking, install continuous flexible flashing separator between wood and metal decking.
5. Apply field treatment complying with AWPA M4 to cut surfaces of preservative-treated lumber and plywood.
6. Securely attach carpentry work as indicated and according to applicable codes and recognized standards.
7. Countersink nail heads on exposed carpentry work and fill holes with wood filler.
8. Use fasteners of appropriate type and length. Predrill members when necessary to avoid splitting wood.

3.2 WOOD GROUNDS, NAILERS, BLOCKING, AND SLEEPERS

A. General:

1. Install where shown and where required for screeding or attaching other work. Cut and shape to required size. Coordinate locations with other work involved.
2. Attach to substrates to support applied loading. Recess bolts and nuts flush with surfaces, unless otherwise indicated.
3. Anchor wood nailers for roofing system work as follows:

a. Wood nailer to concrete masonry units: Provide 1/2 inch diameter steel bolt by length required for 8-inch embedment into concrete filled core. Space anchors 4 feet 0 inches on center, staggered, except at corners space anchors 2 feet 0 inches on center from corner for a distance of 8 feet 0 inches.

b. Wood nailer to concrete masonry unit bond beam: Provide 1/2 inch diameter steel bolt with 2-inch hook with embedment length of 5 inches into concrete filled concrete masonry unit bond beam. Space anchors 4 feet 0 inches on center, staggered, except at corners space anchors 2 feet 0 inches on center from corner for a distance of 8 feet 0 inches.
c. Wood nailer to metal deck: Provide No. 10 cadmium plated sheet metal screws with 5/8 inch diameter galvanized washers. Install in two rows. Space 2 feet 0 inches on center in each row except at corners space screws 1 foot 0 inches on center from corner for a distance of 8 feet 0 inches. Stagger spacing between rows.
d. Wood member to wood nailer: Provide 10d threaded nail by length required for 1-1/2 inches penetration into nailer. Install in two rows. Space 2 feet 0 inches on center in each row except at corners space nails 1 foot 0 inches on center from corner for a distance of 8 feet 0 inches. Stagger spacing between rows.
e. Wood nailer to metal stud: Provide No. 10 cadmium plated sheet metal screws with 5/8 inch diameter galvanized washers. Anchor 2 feet 0 inches on center except at corners space screws 1 foot 0 inches on center from corner for a distance of 8 feet 0 inches.

3.3 WOOD FURRING

A. General:

1. Install plumb and level with closure strips at edges and openings. Shim with wood as required for tolerance of finish work.
2. Furring to Receive Plywood Paneling: Install 1-by-3-inch nominal- size furring at 24 inches o.c., horizontally and vertically. Select furring with no knots capable of producing bent-over nails and damage to paneling.

3.4 WOOD STRUCTURAL PANEL INSTALLATION

A. General:

1. Comply with applicable recommendations contained in APA Form No. E30K, "APA Design/Construction Guide: Residential & Commercial," for types of structural-use panels and applications indicated.

B. Fastening Methods:

1. Plywood Backing Panels: Screw to supports.

3.5 PROTECTION

A. Protect wood that has been treated with inorganic boron (SBX) from weather. If, despite protection, inorganic boron-treated wood becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

B. Protect rough carpentry from weather. Replace rough carpentry if, despite protection, rough carpentry becomes sufficiently wet that moisture content exceeds that specified, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

END OF SECTION

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SECTION 06 40 23

INTERIOR ARCHITECTURAL WOODWORK

(Edited from DeCA June 2011 Design Criteria)

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Plastic-laminate-faced cabinets.

   a. Kitchen Counter (less sink).
   b. Counter, Kitchen (less sink and disposal).

2. Plastic-laminate-faced countertops.
3. Hardware and accessory materials.
4. Utility shelving.

B. Related Sections:

1. Division 01 Section Sustainable Design Reporting for products containing urea-formaldehyde resin.
2. The following items of architectural woodwork are specified in Division 22 Section Plumbing, General Purpose.

   a. Sink for Kitchen Counter.
   b. Sink and disposal for Counter, Kitchen.

3. Division 6 Section "Rough Carpentry" for wood furring, blocking, shims, and hanging strips required for installing cabinets and concealed within other construction before cabinet installation.

1.2 DEFINITIONS

A. Interior architectural woodwork includes wood furring, blocking, shims, and hanging strips for installing woodwork items unless concealed within other construction prior to woodwork installation.

1.3 SUBMITTALS

A. Product Data:

1. For each type of product indicated, including cabinet hardware and accessories, and finishing materials and processes.

B. Shop Drawings:

1. Dimensioned plans, elevations, and large scale details showing location of each cabinet, attachment devices, and other components.

C. Samples For Verification:

1. Standing and running trim with transparent finish, 12 inches long, for each species and cut, finished on one side and one edge.
2. Plastic-laminate and solid-surfacing material color, pattern, and texture selected.

D. Submittal List:

Reference	Submittal Item	Quantity	Action
1.3A	Product Data	X	R
1.3B	Shop Drawings	X	R
1.3C	Samples for Verification	X	R

X Submit quantity specified in Division 01 Section Administrative Requirements.
R Review each submittal, mark to indicate action taken, and return.
I Submittal is for information or record purposes only. No action will be taken.

1.4 QUALITY ASSURANCE

A. Fabricator Qualifications:

1. Firm experienced in producing architectural woodwork that employs skilled workers who custom fabricate products similar to that indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units without delaying the Work.

B. Installer Qualifications:

1. Arrange for interior architectural woodwork installation by a firm that can demonstrate successful experience in installing architectural woodwork items similar in type and quality to those required for this Project.

C. Quality Standard:

1. Except as otherwise indicated, comply with the following standard:

a. “Architectural Woodwork Standards” for grades of interior architectural woodwork, construction, finishes, installation, and other requirements.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Protect woodwork during transit, delivery, storage, and handling to prevent damage, soilage, and deterioration. Do not deliver woodwork until painting and similar operations that could damage, soil, or deteriorate woodwork have been completed in installation areas. If woodwork must be stored in other than installation areas, store only in areas whose environmental conditions meet requirements specified in "Project Conditions."

1.6 PROJECT CONDITIONS

A. Environmental Limitations:

1. Do not deliver or install woodwork until building is enclosed, wet-work is completed, and HVAC system is operating and will maintain temperature and relative humidity at occupancy levels during the remainder of the construction period.

B. Field Measurements:

1. Where woodwork is indicated to be fitted to other construction, check actual dimensions of other construction by accurate field measurements before fabrication, and show recorded measurements on final shop drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work. Fabricate to allow trimming at site and coordinate construction to ensure that actual dimensions correspond to established dimensions.
2. Verify locations of concealed framing, blocking, reinforcements, and furring that support woodwork by accurate field measurements before being enclosed. Record measurements on final Shop Drawings.

1.7 COORDINATION

A. General:

1. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to ensure that interior architectural woodwork can be supported and installed as indicated.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Products: To establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of other manufacturers, a specific manufacturer's product is named and accompanied by the words "basis of design," including make or model number or other designation. Subject to compliance with requirements, provide either the named products or equal products.

2.2 MATERIALS

A. General:

1. Provide materials that comply with requirements of referenced quality standard for each type of woodwork and quality grade specified unless otherwise indicated and, where the following products are part of interior woodwork, with requirements of the referenced product standards that apply to product characteristics indicated:

a. Hardboard: AHA A135.4.
b. Medium-Density Fiberboard: ANSI A208.2, Grade 130, made with binder containing no urea formaldehyde.

c. Particleboard: ANSI A208.1, Grade M-2, made with binder containing no urea formaldehyde.
d. Softwood Plywood: DOC PS 1.
e. Veneer-Faced Panel Products (Hardwood Plywood): HPVA HP-1**,** made with adhesive containing no urea formaldehyde.

2. High-Pressure Decorative Laminate: NEMA LD 3, grades as indicated, or if not indicated, as required by woodwork quality standard.
3. Solid-Surfacing Material: Homogeneous solid sheets of filled plastic resin complying with ISSFA-2. Nd material and performance requirements in ANSI Z124.3, for Type 5 or Type 6, without a precoated finish.

a. Basis-of-Design Products: Corian; DuPont Polymers.

2.3 HARDWARE AND ACCESSORY MATERIALS

A. General:

1. Provide hardware and accessory materials associated with interior architectural woodwork.

B. Hardware Standard:

1. Comply with BHMA A156.9 for items indicated by reference to BHMA numbers or referenced to this standard.

C. Exposed Hardware Finishes:

1. For exposed hardware, provide finish that complies with BHMA A156.18 for BHMA code number indicated.

a. Satin Chromium Plated Steel, BHMA 652.

D. Concealed Hardware Finishes:

1. For concealed hardware provide manufacturer's standard finish that complies with product class requirements of BHMA A156.9.

E. Hardware:

1. Hinges: B01602, 95 degree opening.
2. Pulls: B02011, 5/16 inch diameter wire pull, 4-inch centers, 1-5/16-inch projection.
3. Shelf Supports: B04013.
4. Adjustable Shelf Standards: B04102, 1-1/4-inch wide by 1/2 inch, double slot.
5. Adjustable Knife Brackets: B04112, double knife bracket.
6. Drawer Slides: B05011.
7. Locks for Reveal Overlay On Face Frame Type Cabinet:

a. Basis-of-Design Products: Olympus Lock, Inc., Series 721.
b. Provide lock cylinder, keying, and finish as specified in Division 08 Section Door Hardware; interchangeable core, key projects and retracts dead bolt, key may be withdrawn in locked or unlocked position.
c. Key locks of cabinets in same room alike unless otherwise indicated.

2.4 INSTALLATION MATERIALS

A. Furring, Blocking, Shims, and Hanging Strips:

1. Softwood or hardwood lumber, kiln dried to less than 15 percent moisture content.

B. Screws:

1. Select material, type, size, and finish required for each use. Comply with ASME B18.6.1 for applicable requirements. For metal framing supports, provide screws as recommended by metal-framing manufacturer.

C. Nails:

1. Select material, type, size, and finish required for each use. Comply with FS FF-N-105 for applicable requirements.

D. Anchors:

1. Select material, type, size, and finish required for each substrate for secure anchorage. Provide nonferrous metal or hot-dip galvanized anchors and inserts on inside face of exterior walls and elsewhere as required for corrosion resistance. Provide toothed steel or lead expansion bolt devices for drilled-in-place anchors.

2.5 FABRICATION, GENERAL

A. Interior Woodwork Grade:

1. Provide interior woodwork complying with the referenced quality standard and of the following grade:

a. Grade: Premium.

B. Wood Moisture Content:

1. Comply with requirements of referenced quality standard for wood moisture content in relation to relative humidity conditions existing during time of fabrication and in installation areas.

C. Fabrication:

1. Fabricate woodwork to dimensions, profiles, and details indicated. Ease edges to radius indicated for the following:

a. Corners of cabinets and edges of solid-wood (lumber) members 3/4 inch thick or less: 1/16 inch.
b. Edges of rails and similar members more than 3/4 inch thick: 1/8 inch.

2. Complete fabrication, including assembly, finishing, and hardware application, before shipment to Project site to maximum extent possible. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.
3. Shop-cut openings, to maximum extent possible, to receive hardware, appliances, plumbing fixtures, electrical work, and similar items. Locate openings accurately and use

templates or roughing-in diagrams to produce accurately sized and shaped openings. Smooth edges of cutouts and, where located in countertops and similar exposures, seal edges with a water-resistant coating.

2.6 PLASTIC-LAMINATE-FACED ARCHITECTURAL CABINETS

A. Quality Standard:

1. Comply with requirements of referenced quality standard for plastic laminate-faced cabinets.

B. Grade:

1. Premium.

C. Type of Cabinet Construction:

1. Type B, Style 1 (Reveal overlay on face frame).
2. Reveal Dimension: 1/2 inch.

D. Laminate Cladding for Exposed Surfaces:

1. High-pressure decorative laminate complying with the following requirements:

a. Horizontal Surfaces Other Than Plastic-Laminate Countertops: HGS.
b. Postformed Surfaces: HGP.
c. Vertical Surfaces: VGS.
d. Edges: HGS.

E. Materials for Semiexposed Surfaces:

1. Surfaces Other Than Drawer Bodies: Thermoset decorative panels.

a. For semiexposed backs of panels with exposed plastic-laminate surfaces, provide surface of high-pressure decorative laminate, Grade VGS.
b. Edges of Thermoset Decorative Panel Shelves: PVC or polyester edge banding.

2. Drawer Sides and Backs: Thermoset decorative panels.
3. Drawer Bottoms: Thermoset decorative panels.

F. Concealed Backs of Panels with Exposed Plastic Laminate Surfaces:

1. High-pressure decorative laminate, NEMA LD3, Grade BKL.

G. Colors, Patterns, and Finishes:

1. Provide materials and products that result in colors and textures of exposed laminate surfaces complying with the following requirements:

a. Match color, pattern, and finish as indicated by laminate manufacturer's designations for these characteristics.

H. Drawer Construction

1. Fabricate with exposed fronts fastened to subfront with mounting screws from interior of body.

   a. Join subfronts, backs, and sides with glued rabbeted joints supplemented by mechanical fasteners or glued dovetail joints

2.7 PLASTIC-LAMINATE COUNTERTOPS

A. Quality Standard:

1. Comply with requirements or referenced standard for high-pressure decorative laminate countertops.
2. Grade: Premium.
3. High-Pressure Decorative Laminate Grade: HGS.
4. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces complying with the following requirements:

   a. Match color, pattern, and finish as indicated by manufacturer's designations for these characteristics.

5. Grain Direction: Parallel to cabinet fronts.
6. Edge Treatment: HGS.
7. Core Material: Industrial grade medium-density particleboard.
8. Core Material at Sinks and Sink Splashes: Veneer core plywood with Type II adhesive, industrial-grade particleboard or fiberboard with a 24-hour thickness swell factor of 5 percent or less and a 24-hour water-absorption factor of 10 percent or less for the entire countertop elevation and return elevation.

B. Fabrication

1. Assembly 2 (deck mount) back- an end-splash construction.

2.8 SHELVING

A. Utility Shelving:

1. Softwood Boards: Eastern white, Idaho white, lodgepole, ponderosa, radiata, or sugar pine; C Select (Choice), D Select (Quality), Finish or 1 Common (Colonial), Premium or 2 Common (Sterling); NeLMA, NLGA, or WWPA; kiln dried.

   a. 3/4 inch by 1-1/2-inch solid lumber dropped edge, glued and nailed to shelf.
   b. Shelf Width: As indicated.
   c. Finish: Opaque painted finish as specified in Division 09 Section Painting and Coating and color indicated on Drawings.

2. Adjustable Shelf Standards:

   a. Double slot, 1-1/4-inch wide by 1/2-inch high, 1-inch adjustment.
   b. Knape & Vogt Mfg. Co., No. 85.
   c. Maximum Standard Spacing: 48 inches on center.

d. Fasten standards to solid backing in wall with No. 10 screws, minimum, 12 inches on center.

3. Adjustable Double Knife Brackets:

a. Length: Maximum length consistent with width under shelf.
b. Knape & Vogt Mfg. Co., No. 185.

4. Shelf Rest:

a. Mount shelves to brackets with two shelf rests per bracket. Fasten with 2-No. 10 wood screws per shelf rest.
b. Knape & Vogt Mfg. Co., No. 106.

PART 3 - EXECUTION

3.1 PREPARATION

A. General:

1. Condition woodwork to average prevailing humidity conditions in installation areas before installing.
2. Before installing architectural woodwork, examine shop-fabricated work for completion and complete work as required, including back priming and removal of packing.

3.2 INSTALLATION

A. General:

1. Quality Standard: Install interior architectural woodwork to comply with referenced quality standard for the same grade specified in Part 2 of this Section for type of woodwork involved.
2. Install woodwork plumb, level, true, and straight with no distortions. Shim as required with concealed shims. Install to a tolerance of 1/8 inch in 96 inches for plumb and level (including tops).
3. Scribe and cut woodwork to fit adjoining work and refinish cut surfaces or repair damaged finish at cuts.
4. Anchor woodwork to anchors or blocking built in or directly attached to substrates.
5. Secure to grounds, stripping, and blocking with countersunk, concealed fasteners and blind nailing as required for complete installation. Use fine finishing nails or finishing screws for exposed nailing, countersunk and filled flush with woodwork and matching final finish.
6. Cabinets: Install without distortion so that doors and drawers fit openings properly and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete the installation of hardware and accessory items as indicated.

a. Install cabinets with no more than 1/8 inch in 96-inch sag, bow, or other variation from a straight line.
b. Fasten wall cabinets through back, near top and bottom, and at ends not more than 16 inches o.c. as follows:

1) No. 10 wafer-head screws sized for not less than 1-1/2-inch penetration into wood framing, blocking, or hanging strips.
2) No. 10 wafer-head sheet metal screws or toggle bolts through metal backing or metal framing behind wall finish.

c. Tops: Anchor securely to base units and other support systems as indicated. Calk space between backsplash and wall with clear single-component mildew-resistant acid-curing silicone sealant.

1) Install countertops with no more than 1/8 inch in 96-inch sag, bow, or other variation from a straight line.

3.3 ADJUSTING AND CLEANING

A. General:

1. Repair damaged and defective woodwork where possible to eliminate functional and visual defects; where not possible to repair, replace woodwork. Adjust joinery for uniform appearance.
2. Clean, lubricate, and adjust hardware.
3. Clean woodwork on exposed and semiexposed surfaces. Touch up shop-applied finishes to restore damaged or soiled areas.

3.4 PROTECTION

A. Provide final protection and maintain conditions in a manner acceptable to fabricator and Installer that ensures that woodwork is without damage or deterioration at the time of final acceptance.

END OF SECTION

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SECTION 06 83 16
PVC EXTERIOR WALL PANELING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Exterior-grade PVC Wall Panels and trim accessories

1.2 RELATED SECTIONS

A. Section 07 92 00 – Joint Sealants.

1.3 REFERENCES

A. ASTM E 84 – Standard Test Method for Surface Burning Characteristics of Building Materials.

1.4 SUBMITTALS

A. Product Data:

1. Manufacturer's data sheets on each product to be used, including:

a. Panel and Trim details.
b. Preparation instructions and recommendations.
c. Storage and handling requirements and recommendations.
d. Installation methods.

B. Samples:

1. Submit manufacturer's samples of wall panels, including tongue-and-groove edges and nailing fins.
2. Submit manufacturer's samples of each type of trim to be installed.

C. Certification: Manufacturer's certifications that materials comply with specified requirements and are suitable for intended application.

D. Maintenance Instructions: Submit manufacturer's maintenance and cleaning instructions.

E. Warranty: Submit manufacturer's standard warranty.

F. Submittal List:

Reference	Submittal Item	Quantity	Action
1.2.A	Product Data	X	R

1.2B	Samples	X	R
1.2C	Certification	X	R
1.2D	Maintenance Instructions	X	I
1.2E	Warranty	X	I

X Submit quantity specified in Division 01 Section Administrative Requirements.
R Review each submittal, mark to indicate action taken, and return.
I Submittal is for information or record purposes only. No action will be taken.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Delivery: Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying product name and manufacturer.

B. Storage:

1. Store materials in clean, dry area indoors in accordance with manufacturer's instructions.
2. Store wall panels flat.

C. Handling: Protect materials during handling and installation to prevent damage.

1.6 ENVIRONMENTAL REQUIREMENTS

A. A. Installing Wall Panels:

1. Cold Temperatures: When installing wall panels in temperatures below 40 degrees F, leave space between panels to allow for expansion in accordance with manufacturer's instructions.
2. Warm Temperatures: When installing wall panels in temperatures above 70 degrees F, warm panels to a minimum of 60 degrees F in accordance with manufacturer's instructions.

B. Cutting Wall Panels:

1. Cold Temperatures: Before field-cutting wall panels in temperatures below 40 degrees F, warm panels to a minimum of 50 degrees F overnight.

1.7 WARRANTY

A. Warranty Period for Wall Panels: 10 years.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Products: To establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of other manufacturers, a specific

manufacturer's product is named and accompanied by the words "basis-of-design," including make or model number or other designation. Subject to compliance with requirements, provide either the named products or equal products.

2.2 WALL PANELS

A. Basis-of-Design Product:

1. Model P-2400, as manufactured by Extrutech Plastics, Inc., 5902 West Custer Street, Manitowoc, Wisconsin 54220. Toll Free (888) 818-0118. Phone (920) 684-9650. Fax (920) 684-4344. Website www.epiplastics.com. E-mail extrutech@lakefield.net.

B. Wall Panel Materials: Model P-2400

1. Description: Tongue-and-groove, rib-reinforced wall panels with nailing fins.
2. Material: 100 percent virgin, exterior-grade PVC.
3. Outside Surface: Flat.
4. Width: 24 inches.
5. Thickness: 1/2 inch.
6. Weight: 0.69 pound per square foot.
7. Surface Burning Characteristics, ASTM E 84:
   a. Flame Spread Index: 10.
   b. Smoke Developed Index: 450.
8. Color: White, glossy finish.

C. Trim:

1. Material: 100 percent virgin, exterior-grade PVC.
2. Weight: 0.06 pound per linear foot.
3. Color: Same as wall panels.

D. Fire Classification:

1. NFPA Class A interior finish in accordance with ASTM E 84.
2. Flame spread: 0 to 25.
3. Smoke development: 0 to 450.

E. Accessories:

1. Construction Adhesive: PL400 or Liquid Nails, as recommended by wall panel manufacturer.

2. Fasteners:

   a. Fastening into Wood: Stainless steel, 1-1/4-inch, No. 8 truss-head sheet metal screws.
   b. Fastening into Masonry: Stainless steel, Buildex Tapcon 3/16-inch by 1-1/4-inch screws, with 1/4-inch stainless steel washers.
   c. Fastening into Metal: Stainless steel, 3/4-inch, No. 8 truss-head sheet metal or flat-head Tek screws.
   d. Staples: Do not use..
   e. Joint Sealants: As specified in Section 07 92 00.

f. Fastening into metal cooler wall panels: Aluminum, ¾ inch, No. 8 Truss-Head sheet metal or flat-head Tek screws.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas to receive wall panels.
B. Notify Architect of conditions that would adversely affect installation or subsequent use.
C. Do not begin preparation or installation until unacceptable conditions are corrected.

3.2 PREPARATION

1. Prepare wall panels for installation in accordance with manufacturer's instructions.
2. Ensure wall panels are dry and clean.

3.3 INSTALLATION

A. Install wall panels in accordance with manufacturer's instructions at locations indicated on the Drawings.

B. Install wall panels plumb, level, square, flat, and in proper alignment. Provide continuous sealant in bottom of panel groove prior to insertion of tongue of next panel to ensure completely watertight weal.

C. Install trim in accordance with manufacturer's instructions. Prior to installation of trim, provide continuous sealant along substrate side of trim. Provide continuous sealant in all trim channels prior to installation of panels to ensure complete watertight seal.

D. Anchor wall panels with construction adhesive and fasteners in accordance with manufacturer's instructions.

E. Fasteners:

1. Install fasteners 16 inches to 24 inches on center into nailing fins.
2. Keep top of screw head 1/16 inch above top of nailing fins, allowing panels to move
3. slightly.
4. Do not recess screw heads into nailing fins.
5. Ensure nailing fins lay flat against surface, not deformed around screw heads.
6. Ensure fasteners are not exposed.

F. Cutting Wall Panels:

1. Field-cut panels as necessary in accordance with manufacturer's instructions.
2. Ensure cuts are straight, square, and do not damage panels.

G. Apply joint sealants as specified in Section 07 92 00.

H. At locations of wall-mounted equipment and fixtures, pre-drill wall panels as required for inserting manufacturer's approved standoffs or mounting hardware. Provide continuous sealant at all openings.

3.4 ADJUSTING

A. Repair minor damages to finish in accordance with manufacturer's instructions and as approved by Architect.

B. Remove and replace damaged wall panels in accordance with manufacturer's instructions.

3.5 CLEANING

A. Clean wall panels promptly after installation in accordance with manufacturer's instructions.

B. Do not use harsh cleaning materials or methods that could damage finish.

3.6 PROTECTION

A. Protect installed wall panels from damage during construction.

END OF SECTION

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SECTION 07 40 00

METAL PANELS

(Edited from DeCA June 2011 Design Criteria)

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Factory-formed and field-assembled, concealed-fastener, metal wall panels.
2. Factory-formed and field-assembled, concealed-fastener, metal soffit panels.
3. Substrate boards.
4. Miscellaneous metal framing.

1.2 Related Sections:

A. Division 05 Section Steel Decking for steel roof deck supporting metal roof panels.

B. Division 05 Section Cold-Formed Metal Framing for cold-formed metal framing supporting metal panels.

C. Division 07 Section Sheet Metal Flashing and Trim for field-formed roof drainage systems, and other sheet metal work not part of metal roof panel assemblies.

1.3 PERFORMANCE REQUIREMENTS

A. General:

1. Provide metal roof panel assemblies that comply with performance requirements specified as determined by testing manufacturers' standard assemblies similar to those indicated for this Project, by a qualified testing and inspecting agency.

B. Seismic Performance:

1. Provide metal panel assemblies capable of resisting the effects of earthquake motions.
2. Refer to Division 01 Section Summary of Work for seismic-load design criteria.
3. Determine seismic loads using the appropriate exposure coefficient for the metal panel assemblies.

C. Thermal Movements:

1. Provide metal panel assemblies that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

a. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

1.4 SUBMITTALS

A. Product Data:

1. For each type of metal panel and accessory indicated.

B. Shop Drawings:

1. Show layouts of metal panels, including plans, elevations, sections, details, and attachments to other work.
2. Include details of edge conditions, joints, panel profiles, corners, anchorages, trim, flashings, closures, and accessories.

C. Samples:

1. For each exposed finish.

D. Submittal List:

Reference	Submittal Item	Quantity	Action
1.3A	Product Data	X	R
1.3B	Shop Drawings	X	R
1.3C	Samples	X	R

X Submit quantity specified in Division 01 Section Administrative Requirements.
R Review each submittal, mark to indicate action taken, and return.
I Submittal is for information or record purposes only. No action will be taken.

1.5 ADMINISTRATIVE REQUIREMENTS

A. Pre-installation Meeting: Conduct pre-installation meeting at site attended by Owner, Architect, manufacturer's representative, and other trade contractors.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Protect metal wall panel products during shipping, handling, and storage to prevent staining, denting, deterioration of components or other damage.

1. Deliver, unload, store, and erect metal wall panel products and accessory items without misshaping panels or exposing panels to surface damage from weather or construction operations.

1.7 WARRANTY

A. Special Panel Finish Warranty: On manufacturer’s standard form, in which manufacturer agrees to repair or replace metal wall panels that evidence deterioration of finish within the following periods from the date of substantial completion:

1. Warranty Period: 20 years.

1.8 QUALITY ASSURANCE

A. Installer Qualifications: An employer of workers trained and approved by manufacturer.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Products: To establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of other manufacturers, a specific manufacturer's product is named and accompanied by the words "basis of design," including make or model number or other designation. Subject to compliance with requirements, provide either the named products or equal products.

B. Basis of Design: **CENTRIA, IW Series Metal Wall Panels**; Model IW-15A; Provide basis of design product, or comparable product approved by Architect prior to bid.

1. CENTRIA Architectural Systems; Moon Township, PA 15108-2944. Tel: (800)759-7474. Tel: (412)299-8000. Fax: (412)299-8317. Email: info@CENTRIA.com. Web: www.CENTRIA.com.

2.2 PANEL MATERIALS

A. Aluminum Sheet: Coil-coated sheet, ASTM B 209, alloy as standard with manufacturer, with temper as required to suit forming operations and structural performance required.

1. Panel Thickness: .050 Aluminum
2. Surface: Smooth, flat finish.
3. Panel Depth: 1-1/2 inches.
4. Panel Width: 12 inches.
5. Fasteners: Concealed.
6. Exposed Finishes: Apply the following coil coating, as specified or indicated on Drawings.
   a. Fluoropolymer Two-Coat System: Manufacturer's standard two-coat, thermocured system consisting of specially formulated inhibitive primer and fluoropolymer color topcoat containing not less than 70 percent polyvinylidene fluoride resin by weight; complying with physical properties and coating performance requirements of AAMA 2604, except as modified below:
      1) Humidity Resistance: 2000 hours.
      2) Salt-Spray Resistance: 2000 hours.
7. Concealed Finish: Apply pretreatment and manufacturer's standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil.

2.3 MISCELLANEOUS MATERIALS

A. Fasteners for Metal Panels:

1. Self-tapping screws, bolts, nuts, self-locking rivets and bolts, end-welded studs, and other suitable fasteners designed to withstand design loads. Provide exposed fasteners with heads matching color of metal panels by means of plastic caps or factory-applied coating.

    a. Fasteners for Panels: Self-drilling or self-tapping 410 stainless or zinc-alloy steel hex washer head, with EPDM or PVC washer under heads of fasteners bearing on weather side of metal panels.
    b. Fasteners for Flashing and Trim: Blind fasteners or self-drilling screws with hex washer head.
    c. Blind Fasteners: High-strength aluminum or stainless-steel rivets.

2.4 METAL WALL PANELS

A. Concealed-Fastener, Metal Wall Panels:

1. General: Factory-formed, concealed fastener panels with interconnecting side joints, fastened to supports with concealed fasteners, with factory-applied sealant in side laps when required to meet performance requirements.

2. Horizontal Joints: Horizontal Joints with drip edge and sloped drain shelf to provide positive water shed away from Panel Joinery.

    a. Flush-joint profile with raised flat pan and three stiffener beads.
    b. Color: Match face brick veneer.
    c. Texture: Smooth.

3. Panel Coverage: 12 inches.
4. Panel Height: 1.5 inches.

B. Wall Panel Accessories:

1. Provide components required for a complete metal wall panel assembly including trim, fasciae, corner units, clips, flashings, sealants, gaskets, fillers, and similar items. Match material and finish of metal wall panels, unless otherwise indicated.
2. Closures: Provide closures at eaves, fabricated of same metal as metal wall panels.
3. Sealants: Type recommended by metal wall panel manufacturer for application, meeting requirements of Division 07 Section "Joint Sealants."
4. Flashing Tape: 4-inch wide self-adhering butyl flashing tape.
5. Fasteners: Self-tapping screws and other acceptable fasteners recommended by panel manufacturer. Where exposed fasteners cannot be avoided, supply corrosion-resistant fasteners with heads matching color of metal wall panels by means factory-applied coating.

2.5 METAL SOFFIT PANELS

A. Concealed-Fastener, Metal Soffit Panels:

1. Factory-formed, designed to be field assembled by lapping and interconnecting side edges of adjacent panels and mechanically attaching through panel to supports using concealed fasteners and factory-applied sealant in side laps. Include accessories required for weathertight installation.

B. V-Groove-Profile Metal Soffit Panels:

1. Perforated panels formed with vertical panel edges and flat pan between panel edges; with V-groove joint between panels.
2. Basis-of-Design Product: Peterson Aluminum Corporation, "PAC-850."
3. Material: Aluminum sheet, 0.032 inch thick.

    a. Half vent panels.
    b. Exterior Finish: Fluoropolymer.
    c. Color: As indicated on Drawing.
    d. Texture: Smooth.

4. Panel Coverage: 12 inches.
5. Panel Height: 1/2 inch.

2.6 FABRICATION

A. Fabrication and Finishing:

1. Fabricate and finish metal panels and accessories at the factory to greatest extent possible, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.
2. Provide panel profile, including major ribs and intermediate stiffening ribs, if any, for full length of panel.
3. Where indicated, fabricate metal panel joints with factory-installed captive gaskets or separator strips that provide a tight seal and prevent metal-to-metal contact, in a manner that will minimize noise from movements within panel assembly.
4. Sheet Metal Accessories: Fabricate flashing and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to the design, dimensions, metal, and other characteristics of item indicated.
5. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

PART 3 - EXECUTION

3.1 EXAMINATION

A. General:

1. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, metal roof panel supports, and other conditions affecting performance of the Work.
2. Examine roughing-in for components and systems penetrating metal roof panels to verify actual locations of penetrations relative to seam locations of metal roof panels before metal roof panel installation.
3. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. General:

1. Clean roof deck of substances harmful to substrate boards, including removing projections capable of interfering with substrate board attachment.
2. Substrate Board: Install substrate boards over roof deck on entire roof surface. Attach with substrate-board fasteners.

    a. Install substrate board with long joints in continuous straight lines, perpendicular to roof slopes with end joints staggered between rows. Tightly butt substrate boards together.

3. Miscellaneous Framing: Install eave angles, furring, and other miscellaneous panel support members and anchorage according to manufacturer's written instructions.

    a. Soffit Framing: Wire tie or clip furring channels to supports, as required to comply with requirements for assemblies indicated.

3.3 METAL PANEL INSTALLATION

A. Metal Wall Panels:

1. Fasten metal wall panels to supports with fasteners at each lapped joint at location and spacing recommended by manufacturer.
2. Provide sealant tape at lapped joints of metal wall panels and between panels and protruding equipment, vents, and accessories.
3. Apply a continuous ribbon of sealant tape to weather-side surface of fastenings on end laps, and on side laps of nesting-type panels; on side laps of panels; and elsewhere as needed to make panels weatherproof to driving rains. Install metal wall panels in orientation, sizes, and locations indicated on Drawings.
4. Install panels perpendicular to girts and subgirts, unless otherwise indicated. Anchor metal wall panels and other components of the Work securely in place, with provisions for thermal and structural movement.

    a. Field cutting of metal wall panels by torch is not permitted.
    b. Rigidly fasten base end of metal wall panels and allow eave end free movement due to thermal expansion and contraction. Predrill panels.
    c. Install screw fasteners in predrilled holes.
    d. Locate panel splices over, but not attached to, structural supports. Stagger panel splices and end laps to avoid a four-panel lap splice condition.

5. Apply elastomeric sealant continuously between metal base channel (sill angle) and concrete, and elsewhere as indicated or, if not indicated, as necessary for waterproofing.
6. Provide weatherproof escutcheons for pipe and conduit penetrating exterior walls.

B. Metal Soffit Panels:

1. Provide metal soffit panels full width of soffits. Install panels perpendicular to support framing.
2. Flash and seal panels with weather closures where metal soffit panels meet walls and at perimeter of all openings.

C. Fasteners:

1. Use stainless-steel fasteners for surfaces exposed to the exterior and galvanized steel fasteners for surfaces exposed to the interior.

D. Metal Protection:

1. Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with bituminous coating, by applying rubberized-asphalt underlayment to each contact surface, or by other permanent separation as recommended by metal roof panel manufacturer.

E. Joint Sealers:

1. Install gaskets, joint fillers, and sealants where indicated and where required for weatherproof performance of metal roof panel assemblies.
2. Prepare joints and apply sealants to comply with requirements in Division 07 Section Joint Sealants.

3.4 ACCESSORY INSTALLATION

A. Install accessories with positive anchorage to building and weathertight mounting and provide for thermal expansion. Coordinate installation with flashings and other components.

B. Install components required for a complete metal panel assembly including trim, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items.

C. Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.

3.5 CLEANING AND PROTECTION

A. Remove temporary protective coverings and strippable films, if any, as metal panels are installed, unless otherwise indicated in manufacturer's written installation instructions. On completion of metal panel installation, clean finished surfaces as recommended by metal panel manufacturer. Maintain in a clean condition during construction. After metal wall panel installation, clear weep holes and drainage channels of obstructions, dirt, and sealant.

END OF SECTION

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SECTION 07 41 13

METAL ROOF PANELS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Structural roofing system of preformed steel panels which is a hydrostatic roof system.

B. Fastening system.

C. Factory finishing.

D. Accessories and miscellaneous components.

1. 2 RELATED REQUIREMENTS

B. Section 07 60 00 - Sheet Metal Flashing And Trim: Gutters, snow guard color insert strips.

C. Section 07 72 00 (07720) - Roof Specialties: Snow Guards.

D. Section 07 92 00 - Joint Sealers: Field-installed sealants.

1. 3 REFERENCE STANDARDS

A. ASCE 7 - Minimum Design Loads for Buildings and Other Structures; 2005.

B. ASTM A 653/A 653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2007.

C. ASTM D 1970 – Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection; 2001.

D. ASTM E 1592 - Standard Test Method for Structural Performance of Sheet Metal Roof and Siding Systems by Uniform Static Air Pressure Difference; 2005.

E. ASTM E 1646 - Standard Test Method for Water Penetration of Exterior Metal Roof Panel Systems by Uniform Static Air Pressure Difference; 1995 (Reapproved 2003).

F. FM DS 1-28 - Wind Design; 2007.

G. FM DS 1-29 - Roof Deck Securement and above Deck Roof Components; 2007.

H. MBMA (RSDM) Metal Roofing Systems Design Manual; 2000.

I. NRCA ML104 - The NRCA Roofing and Waterproofing Manual; Fifth Edition, with interim updates.

J. SMACNA (ASMM) - Architectural Sheet Metal Manual; 2003.

K. UL 580 - Standard for Tests for Uplift Resistance of Roof Assemblies; 2006.

1. 4 SYSTEM DESCRIPTION

A. Performance Requirements: Provide factory formed, prefinished, mechanically field-seamed, concealed clip, vertical rib leg SSR roof system that has been pretested and certified by manufacturer to comply with specified requirements under installed conditions.

1. Provide UL 90 rated roofing system that has been tested in accordance with UL 580 test procedure for wind-uplift resistance Class 90 loading and have been uplifted performance tested in accordance to ASTM E- 1592. Provide corner and perimeter fastener enhancement as required.
2. Resistance to water penetration: There was no leakage through panel joints when tested in accordance with ASTM E 1646 at static pressure differential of 20.0 psf.

1.5 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Manufacturer's data sheets on each product to be used, including:
   1. Storage and handling requirements and recommendations.
   2. Installation methods.
   3. Specimen warranty.

C. Shop Drawings: Include layouts of roof panels, details of edge and penetration conditions, spacing and type of connections, flashings, and special conditions.
   1. Show work to be field-fabricated or field-assembled.
   2. Include structural analysis signed and sealed by qualified structural engineer, indicating conformance of roofing system to specified loading conditions.

D. Selection Samples: For each roofing system specified, submit color chips representing manufacturer's range of available colors.

E. Verification Samples: Submit samples of minimum size 12 inches square, representing actual roofing metal, thickness, profile, color, and texture.
   1. Include typical panel joint in sample.
   2. Include typical fastening detail.

F. Test Reports: Indicate compliance of preformed metal roofing system to specified requirements.

G. Warranty: Submit specified manufacturer's warranty and ensure that forms have been completed in Owner's name and are registered with manufacturer.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in the manufacture of roofing systems similar to those required for this project, with not less than 5 years of documented experience.

B. Panel installer shall have a minimum of 5 years experience in the installation of concealed clip standing seam metal roofing and show evidence of successful completion of at least 5 projects of similar size, scope, and complexity.

C. Perform work in accordance with SMACNA Architectural Sheet Metal Manual, NRCA and MBMA requirements along with standard details, as well as the roofing manufacturer's written instructions.

D. Installer Qualifications: Company trained and authorized by roofing system manufacturer.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store roofing panels on project site as recommended by manufacturer to minimize damage to panels prior to installation.

1.8 WARRANTY

A. See Section 01 77 00 - Closeout Submittals, for additional warranty requirements.

B. Finish Warranty: Provide manufacturer’s special warranty covering failure of factory-applied exterior finish on metal roof panels and agreeing to repair or replace panels that show evidence of finish degradation, including significant fading, chalking, cracking, or peeling within specified warranty period of 20 year period from date of Substantial Completion.

C. Waterproofing Warranty: Manufacturer agrees to repair or stop any roof leaks attributable to defects in the metal roofing assembly which includes roof panels, fasteners, connectors, roof securement components and assemblies and roof flashings, penetration flashings, mastic, closures, and sealants as provided by the manufacturer. The manufacturer's limit of liability under this Option shall be NO DOLLAR LIMIT. Warranty period shall extend for a period of 20 years from the date of Substantial Completion, the first 2 years of which are warranted by the Contractor.

D. Special Warranty: Provide 5-year extended labor warranty on any soffit that becomes loose or damaged

by wind uplift.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Basis of Design Products: To establish standards of manufacturer, operation, performance and appearance, drawings and specifications are based on products of the manufacturer (s) listed herein. Provided compliance with requirements, products of other manufacturers may also be acceptable..

B. Basis of Design: Model Double-Lok, 12” Panels, as manufactured by MBCI www.mbci.com.

C. Substitutions: See Section 01 30 00 - Administrative Requirements.

2.2 STRUCTURAL ROOF PANELS

A. Engineering: Provide panel assemblies designed to safely support design loads at support spacing indicated, with deflection not to exceed 1/180 of the span when tested in accordance with ASTM E 1592.
   1. Loads: As indicated on structural drawings.

B. Performance Requirements: Provide complete roofing assemblies, including roof panels, clips, fasteners, connectors, and miscellaneous accessories, tested for conformance to the following minimum standards:
   1. Overall: Complete weather-tight system tested and approved in accordance with ASTM E 1592.
   2. Wind Uplift: Class 90 wind uplift resistance of UL 580.
   3. Thermal Movement: Design system to accommodate without deformation anticipated thermal movement over ambient temperature range of 100 degrees F.

C. Metal Roofing: Factory-formed panels with factory-applied finish.
   1. Steel Panels:
      a. Zinc-coated SS (structural steel) sheet conforming to ASTM A 653/A 653M; minimum G60 galvanizing.
      b. Steel Thickness: Minimum 20 gage, (uncoated 0.024 inch).
   2. Profile: Standing seam, with minimum 2.0 inch seam height; concealed fastener system for field seaming with special tool.
   3. Texture: Striations for added stiffness.
   4. Length: Full length of roof slope, without lapped horizontal joints.
   5. Width: Panel coverage width shall be 12 inches.

2.3 PANEL FINISH

A. Fluoropolymer Coating System: Manufacturer’s standard multi-coat thermocured coating system, including minimum 70 percent fluoropolymer color topcoat with minimum total dry film thickness of 0.9 mil; color to be dark bronze.

2.4 ACCESSORIES AND MISCELLANEOUS ITEMS

A. Miscellaneous Sheet Metal Items: Provide flashings, gutters, downspouts, trim, moldings, closure strips, preformed crickets, caps, and equipment curbs of the same material, thickness, and finish as used for the roofing panels. Items completely concealed after installation may optionally be made of stainless steel.

B. Rib and Ridge Closures: Provide prefabricated, close-fitting components of steel with corrosion resistant finish, closed-cell synthetic rubber, neoprene, or PVC, or combination steel and closed-cell foam.

C. Sealants: As specified in Section 07 92 00.
   1. Exposed sealant must cure to rubber-like consistency.
   2. Concealed sealant must be non-hardening type.
   3. Seam sealant must be factory-applied, non-skinning, non-drying type.

D. Gutters and Downspouts: Provide smooth sheet metal matching finish of roof panels. See gutters and downspouts in Section 07 60 00.

E. Snow Guard Color Insert Strips: Provide 2 inches wide smooth sheet metal matching finish of roof

panels. See snow guards in Section 07 72 00.

2.5 FABRICATION

A. Panels: Fabricate panels and accessory items at factory, using manufacturer's standard processes as required to achieve specified appearance and performance requirements.

B. Joints: Factory-install captive gaskets, sealants, or separator strips at panel joints to provide weather-tight seals, eliminate metal-to-metal contact, and minimize noise from panel movements.

PART 3 EXECUTION

3.1 EXAMINATION

A. Do not begin installation of preformed metal roof panels until substrates have been properly prepared.

B. If substrate preparation is the responsibility of another installer, notify Architect Engineer of unsatisfactory preparation before proceeding.

3.2 PREPARATION

A. Coordinate roofing work with provisions for roof drainage, flashing, trim, penetrations, and other adjoining work to assure that the completed roof will be free of leaks.

B. Separate dissimilar metals by applying a bituminous coating, self-adhering rubberized asphalt sheet, or other permanent method approved by roof panel manufacturer.

C. Where metal will be in contact with wood or other absorbent material subject to wetting, seal joints with sealing compound and apply one coat of heavy-bodied bituminous paint.

3.3 INSTALLATION

A. Overall: Install roofing system in accordance with approved shop drawings and panel manufacturer's instructions and recommendations, as applicable to specific project conditions. Anchor all components of roofing system securely in place while allowing for thermal and structural movement.
   1. Install roofing system with concealed clips and fasteners, except as otherwise recommended by manufacturer for specific circumstances.
   2. Minimize field cutting of panels. Where field cutting is absolutely required, use methods that will not distort panel profiles. Use of torches for field cutting is absolutely prohibited.

B. Accessories: Install all components required for a complete roofing assembly, including flashings, gutters, downspouts, trim, moldings, closure strips, preformed crickets, caps, equipment curbs, rib closures, ridge closures, and similar roof accessory items.

C. Roof Panels: Install panels in strict accordance with manufacturer's instructions, minimizing transverse joints except at junction with penetrations.
   1. Form weather-tight standing seams incorporating concealed clips, using an automatic mechanical seaming device approved by the panel manufacturer.
   2. Coordinate concealed clip locations with deck sheathing and insulation fasteners.
   3. Provide 1/8 inch minimum air space between roof panel pan and substrate.

3.4 CLEANING

A. Clean exposed sheet metal work at completion of installation. Remove grease and oil films, excess joint sealer, handling marks, and debris from installation, leaving the work clean and unmarked, free from dents, creases, waves, scratch marks, or other damage to the finish.

3.5 PROTECTION

A. Do not permit storage of materials or roof traffic on installed roof panels. Provide temporary walkways or planks as necessary to avoid damage to completed work. Protect roofing until completion of project.

B. Touch-up, repair, or replace damaged roof panels or accessories before date of Substantial Completion.

END OF SECTION

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SECTION 07 53 23

EPDM MEMBRANE ROOFING AND INSULATION

PART 1 - GENERAL

1.1 SUMMARY

1.1.1. Section Includes

a. Adhered membrane roofing system.

b. Roof insulation.

1.1.2. Related Sections

1.1.3. Division 7 Section " Sheet Metal Flashing and Trim " for sheet metal flashing and trim integral with membrane roofing.

1.2 DEFINITIONS

1.2.1. Roofing Terminology

a. Refer to ASTM D 1079 and glossary of NRCA's "The NRCA Roofing and Waterproofing Manual" for definition of terms related to roofing work in this Section.

1.3 PERFORMANCE REQUIREMENTS

1.3.1. General

a. Provide installed fully adhered EPDM roofing membrane and base flashings that remain watertight; do not permit the passage of water; and resist specified uplift pressures, thermally induced movement, and exposure to weather without failure.

1.3.2. Material Compatibility

a. Provide roofing materials that are compatible with one another under conditions of service and application required, as demonstrated by roofing membrane manufacturer based on testing and field experience.

1.3.3. Roofing System Design

a. Provide a membrane roofing system that is identical to systems that have been successfully tested by a qualified testing and inspecting agency to resist uplift pressure calculated according to Factory Mutual, ASCE 7, and ICC IBC Building Code, current edition.

b. Wind Load:

(1) Provide roofing assemblies, including anchorage, capable of withstanding wind pressures acting inward and outward normal to the plane of the roof.

(2) Refer to Division 1 Section "Description of Work" for wind loading design criteria.
(3) Determine design loads using the appropriate coefficients for the roof configurations indicated.
(4) System attachment shall include perimeter and corner enhancements.

1.4 SUBMITTALS

1.4.1. Product Data

a. For each type of product indicated.

1.4.2. Shop Drawings

a. For roofing system. Include plans, elevations, sections, details, and attachments to other Work.

b. Base flashings and membrane terminations.

c. Tapered insulation, including slopes.

d. Insulation fastening patterns.

1.4.3. Installer Certificates

a. Signed by roofing system manufacturer certifying that Installer is approved, authorized, or licensed by manufacturer to install roofing system.

1.4.4. Manufacturer Certificates

a. Signed by roofing manufacturer certifying that roofing system complies with requirements specified in "Performance Requirements" Article.

b. Submit evidence of meeting performance requirements. Include the following roofing system design considerations:

(1) Corner Uplift Pressure.
(2) Perimeter Uplift Pressure.
(3) Field-of-Roof Uplift Pressure.

1.4.5. Product Test Reports

a. Based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified testing agency, for components of roofing system.

1.4.6. Maintenance Data

a. For roofing system to include in maintenance manuals.

1.4.7. Warranties

a. Special warranties specified in this Section.

1.4.8. Inspection Report

a. Copy of roofing system manufacturer's inspection report of completed roofing installation.

1.4.9. Sustainable Design Data for all products see paragraph 1.4 this Section and Section 01115 Sustainable Design Requirements.

1.4.10. Submittal List

Reference	Submittal Item	Quantity	Action
1.5.1	Product Data	X	R
1.5.2	Shop Drawings	X	R
1.5.3	Installer Certificates	X	I
1.5.4	Manufacturer Certificates	X	I
1.5.5	Product Test Reports	X	I
1.5.6	Maintenance Data	X	I
1.5.7	Warranties	X	I
1.5.8	Inspection Report	X	I

X Submit quantity specified in Division 1 Section “Administrative Requirements.”
R Review each submittal, mark to indicate action taken, and return.
I Submittal is for information or record purposes only. No action will be taken.

1.5 ENVIRONMENTAL CONSIDERATIONS

1.5.1. This project is designed and constructed with practices and procedures to meet the project's environmental considerations and goals. These considerations and goals are to establish a facility which is environmentally responsible, profitable, and a healthy place to live and work. The Contractor shall ensure that the requirements related to these considerations and goals, as defined in the Contract Documents, are implemented to the fullest extent.

1.6 QUALITY ASSURANCE

1.6.1. Installer Qualifications

a. A qualified firm that is approved, authorized, or licensed by roofing system manufacturer to install manufacturer's product and that is eligible to receive manufacturer's warranty.

1.6.2. Manufacturer Qualifications

a. A qualified manufacturer that has UL listing approval for membrane roofing system identical to that used for this Project.

1.6.3. Source Limitations

a. Obtain components for membrane roofing system from same manufacturer as roofing membrane.

1.6.4. Fire-Test-Response Characteristics

a. Provide membrane roofing materials with the fire-test-response characteristics indicated as determined by testing identical products per test method below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Materials shall be identified with appropriate markings of applicable testing and inspecting agency.

(1) Exterior Fire-Test Exposure: Class A; ASTM E 108, for application and roof slopes indicated.

1.6.5. Preliminary Roofing Conference

a. Before starting reroof construction, conduct conference at Project site. Comply with requirements for preinstallation conferences in Division 1 Section "Coordination." Review methods and procedures related to roof deck construction and roofing system including, but not limited to, the following:

(1) Meet with Contracting Officer; testing and inspecting agency representative; roofing Installer; roofing system manufacturer's representative; and installers whose work interfaces with or affects roofing, including installers of roof accessories and roof-mounted equipment.
(2) Review methods and procedures related to roofing installation, including manufacturer's written instructions.
(3) Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
(4) Examine deck substrate conditions and finishes for compliance with requirements, including flatness and fastening.
(5) Review structural loading limitations of roof deck during and after roofing.
(6) Review base flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that will affect roofing system.
(7) Review governing regulations and requirements for insurance and certificates.
(8) Review temporary protection requirements for roofing system during and after installation.
(9) Review roof observation and repair procedures after roofing installation.

1.6.6. Preinstallation Conference

a. Conduct conference at Project site. Comply with requirements in Division 1 Section "Coordination." Review methods and procedures related to roofing system including, but not limited to, the following:

(1) Meet with Contracting Officer; testing and inspecting agency representative; roofing Installer; roofing system manufacturer's representative; and installers whose work interfaces with or affects roofing, including installers of roof accessories and roof-mounted equipment.
(2) Review methods and procedures related to roofing installation, including manufacturer's written instructions.
(3) Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
(4) Examine deck substrate conditions and finishes for compliance with requirements, including flatness and fastening.
(5) Review structural loading limitations of roof deck during and after roofing.
(6) Review base flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that will affect roofing system.
(7) Review governing regulations and requirements for insurance and certificates.
(8) Review temporary protection requirements for roofing system during and after installation.
(9) Review roof observation and repair procedures after roofing installation.

1.7 DELIVERY, STORAGE, AND HANDLING

1.7.1. Delivery

a. Deliver roofing materials to Project site in original containers with seals unbroken and labeled with manufacturer's name, product brand name and type, date of manufacture, and directions for storing and mixing with other components.

1.7.2. Storage and Handling

a. Store liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by roofing system manufacturer. Protect stored liquid material from direct sunlight.

b. Discard and legally dispose of liquid material that cannot be applied within its stated shelf life.

c. Protect roof insulation materials from physical damage and from deterioration by sunlight, moisture, soiling, and other sources. Store in a dry location. Comply with insulation manufacturer's written instructions for handling, storing, and protecting during installation.

d. Handle and store roofing materials and place equipment in a manner to avoid permanent deflection of deck.

1.8 PROJECT CONDITIONS

1.8.1. Weather Limitations

a. Proceed with installation only when existing and forecasted weather conditions permit roofing system to be installed according to manufacturer's written instructions and warranty requirements.

1.9 WARRANTY

1.9.1. Special Warranty

a. Manufacturer's standard total system form, without monetary limitation, in which manufacturer agrees to repair or replace components of roofing system that fail in materials or workmanship within specified warranty period. Failure includes roof leaks.

(1) Special warranty includes roofing membrane, base flashings, perimeter metal, roofing accessories, roof insulation, fasteners, walkway products, and other components of membrane roofing system.
(2) Warranty Period: 20-year (from date of final acceptance) manufacturer's standard warranty of labor and materials for water-tightness of the roofing system.
(3) Warranty shall include roofing damage resulting from wind speeds up to 90 mph (3-second gust speed at 33 feet above ground for exposure category indicated).
(4) The maximum amount of the system warranty shall not be prorated over the life of the warranty.

b. Upon completion of construction, ownership of the building will be transferred to the Installation upon which the facility is located, via DD Form 1354 “Transfer and Acceptance of Military Real Property”. Warranty shall be issued to the Installation as identified in Division 1 “Phase Turnover and Contract Closeout.”

c. Contractor is to provide one 10" x 12" sign made of aluminum for each distinct roof area, with a dark background and contrasting lettering. Use paint suitable for aluminum. The signs are to read "Do not make alterations or repairs to this roof without written approval from the Owner. This roof is under Contractor's warranty until (insert month and year 2 years after substantial completion date) and roofing manufacturer's warranty until (insert month and year of expiration of roofing manufacturer's warranty)." Locate signs as directed by the Owner.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

Basis-of-Design Products: To establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of other manufacturers, a specific manufacturer's product is named and accompanied by the words "basis of design," including make or model number or other designation. Subject to compliance with requirements, provide either the named products or equal products.

2.2 ETHYLENE-PROPYLENE-DIENE-MONOMER (EPDM) ROOFING MEMBRANE

2.2.1. Membrane Materials

a. ASTM D 4637, Type I, nonreinforced uniform, flexible sheet made from EPDM, and as follows:

(1) Thickness: 60 mils, nominal.
(2) Exposed Face Color: White.

b. Basis-of-Design Product Manufacturer:

(1) Carlisle Syntec, Carlisle Design “A - Sure-White," Fully-Adhered Roofing System, “Golden Seal” Total System Roofing Warranty (No Dollar Limit).

c. Initial Solar Reflectance: Not less than 0.65 when tested in accordance with ASTM E903 - Standard Test Method for Solar Absorptance, Reflectance, and Transmission of Materials Using Integrating Spheres.

d. Maintenance of Solar Reflectance: Not less than 0.50 three years after installation under normal conditions.

e. Emissivity: Not less than 0.9 when tested in accordance with ASTM E408 Standard Test Methods for Total Normal Emittance of Surfaces Using Inspection-Meter Techniques.

2.3 AUXILIARY MATERIALS

2.3.1. General

a. Auxiliary materials recommended by roofing system manufacturer for intended use and compatible with membrane roofing.

b. Liquid-type auxiliary materials shall meet VOC limits of authorities having jurisdiction.

2.3.2. Sheet Flashing

a. 60-mil- thick EPDM, partially cured or cured, according to application.

2.3.3. Bonding Adhesive

a. Manufacturer's standard bonding adhesive: low VOC bonding adhesive

b. Insulation and Membrane Adhesive: Cold applied adhesive as recommended by membrane manufacturer.

2.3.4. Seaming Material

a. Manufacturer's standard synthetic-rubber polymer primer and 3-inch- wide minimum, butyl splice tape with release film.

2.3.5. Lap Sealant

a. Manufacturer's standard single-component sealant.

2.3.6. Water Cutoff Mastic

a. Manufacturer's standard butyl mastic sealant.

2.3.7. Metal Termination Bars

a. Manufacturer's standard predrilled stainless-steel or aluminum bars, approximately 1 by 1/8 inch thick; with anchors.

2.3.8. Fasteners

a. Factory-coated steel fasteners and metal or plastic plates meeting corrosion-resistance provisions in FMG 4470, designed for fastening membrane to substrate, and acceptable to membrane roofing system manufacturer.

2.3.9. Miscellaneous Accessories

a. Provide pourable sealers, preformed cone and vent sheet flashings, preformed inside and outside corner sheet flashings, reinforced EPDM securement strips, T-joint covers, in-seam sealants, termination reglets, cover strips, and other accessories.

b. Pre-Molded Pipe Flashing.

2.4 ROOF INSULATION

2.4.1. General

a. Provide preformed roof insulation boards that comply with requirements and referenced standards, selected from manufacturer's standard sizes and of thicknesses indicated.

2.4.2. Polyisocyanurate Board Insulation

a. ASTM C 1289, Type II, Class 1, Grade 2 or 3, felt or glass-fiber mat facer on both major surfaces.

b. Thickness: One layer of 2 inches; R-value (LTTR) of 12.1 per 2" thickness and one layer of 1-1/2 inch. R-value (LTTR) of 9 per 1.5" thickness. Total R-value to be a minimum of R-21.

2.4.3. Tapered Insulation

a. Provide preformed saddles, crickets, tapered edge strips, and other insulation shapes where indicated for sloping to drain. Fabricate to slopes indicated.

b. ASTM C 1289, Type II, Class 1, Grade 2 or 3, felt or glass-fiber mat facer on both major surfaces.

2.4.4. Miscellaneous Insulation Shapes

a. Provide preformed saddles, crickets, tapered edge strips, and other insulation shapes where indicated for sloping to drain. Fabricate to slopes indicated.

2.5 INSULATION ACCESSORIES

2.5.1. General

a. Furnish roof insulation accessories recommended by insulation manufacturer for intended use and compatible with membrane roofing.

2.5.2. Fasteners

a. Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Approvals 4470, designed for fastening roof insulation to substrate, and acceptable to roofing system manufacturer.

2.5.3. Cover Board

a. Fiberglass-Mat Faced Gypsum Roof Board:

(1) Basis of Design: Georgia-Pacific Gypsum LLC; Dens Deck Roof Board (for use as cover board over insulation). As approved by the roofing membrane manufacturer.

(2) Thickness: 1/2 inch thick, minimum.

2.5.4. Cold Fluid-Applied Adhesive

a. Insulation manufacturer's recommended adhesive formulated to attach roof insulation to another insulation layer and cover board to insulation as approved in writing by membrane roofing system manufacturer.

2.6 WALKWAYS

2.6.1. Flexible Walkways

a. Factory-formed, nonporous, heavy-duty, solid-rubber, slip-resisting, surface-textured walkway pads, approximately 3/16 inch thick, and acceptable to membrane roofing system manufacturer.

b. Size: 24 by 36 inches unless otherwise indicated.

c. Colors and Textures: White, or as selected by Contracting Officer from manufacturer's full range.

PART 3 - EXECUTION

3.1 General

a. Building space directly under roof area covered will be utilized by on-going operations. Do not interrupt Government operations unless prior written approval is received from the Government.

b. Roof replacement as shown in the drawings including removal of existing roof system, insulation and flashing systems and replacement with new thermal insulation system for positive drainage and new roofing and flashing system as specified herein. Provide for extension of existing curbs as required by roof manufacturer for warranty purposes.

c. Install a watertight, membrane roofing and base flashing system with compatible components that will not permit the passage of water and will withstand wind loads, thermally induced movement, and exposure to weather without failure.

d. Contractor shall have SOLE responsibility for accuracy of all measurements, estimates of material quantities and sizes, and site conditions that will affect work.

e. Proceed with tear off and new roofing work only when existing and forecasted weather conditions permit roofing to be installed according to manufacturer's written instructions and warranty requirements.

f. Remove any work exposed to rain or other weather detrimental to the materials.

g. Sequence installation of roofing system with related units of work to ensure that roof assemblies, including roof accessories, flashing, trim, and joint sealers, are protected against damage from effects of weather. Sequence installation of roofing system to eliminate traffic over new roofed areas to the greatest extent possible.

h. When wheeled or other traffic over the existing roof or partially or fully completed roofing is unavoidable, use adequate plank or plywood protection for the roofing. Mechanical application devices

shall be mounted on pneumatic-tired wheels, and shall be designed and maintained to operate without damaging the insulation or the roofing membrane.

i. Protect building surfaces at set-up areas with tarpaulins. Secure tarpaulins in place to prevent movement. Provide dumpster for refuse in connection with the tear-off Work and remove from premises when full and empty at approved dumping or refuse area. Deliver empty dumpster to site for further use. Upon job completion, dumpster shall be removed from premises. Spilled or scattered debris shall be cleaned-up immediately. Remove material to be disposed from roof as it accumulates.

j. At end of each work day, removal areas shall be sealed with a temporary roof system and water cut-offs along edges to prevent water entry.

k. Schedule removal and replacement of roofing to occur concurrently and under suitable weather conditions, as established by roofing materials manufacturer, to accomplish installation of new roof system and to limit exposure of the building. Remove no more roofing than can be covered with a temporary roof system and sealed off completely in one work period.

l. The entire roofing system, including top finish membrane, shall be finished in one operation up to the line of termination at end of day's work unless otherwise permitted in writing by the roofing system manufacturer. Application of roofing shall immediately follow application of insulation as a continuous operation. Phased construction will not be permitted. Roofing membrane shall be installed according to membrane manufacturer's requirements and specifications

3.2 EXAMINATION

a. Examine substrates, areas, and conditions, with Installer present, for compliance with the following requirements and other conditions affecting performance of roofing system:

b. Verify that roof openings and penetrations are in place and set and braced and that roof drains are securely clamped in place.

c. Verify that wood blocking, curbs, and nailers are securely anchored to roof deck at penetrations and terminations and that nailers match thicknesses of insulation.

d. Verify that surface plane flatness and fastening of steel roof deck

e. Proceed with installation only after unsatisfactory conditions have been corrected.

3.3 PREPARATION

3.3.1. General

a. Clean substrate of dust, debris, moisture, and other substances detrimental to roofing installation according to roofing system manufacturer's written instructions. Remove sharp projections.

b. Prevent materials from entering and clogging roof drains and conductors and from spilling or migrating onto surfaces of other construction. Remove roof-drain plugs when no work is taking place or when rain is forecast.

c. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing system at the end of the workday or when rain is forecast. Remove and discard temporary seals before beginning work on adjoining roofing.

3.4 INSULATION INSTALLATION

3.4.1. General

a. Coordinate installing membrane roofing system components so insulation is not exposed to precipitation or left exposed at the end of the workday.

b. Comply with membrane roofing system manufacturer's written instructions for installing roof insulation.

c. Install tapered insulation under area of roofing to conform to slopes indicated or if not indicated, to provide positive sloping to drains.

d. Install insulation so that all roof surfaces slope to drains, whether or not slope is explicitly indicated.

e. Install insulation so completed surface is flush with surface of contiguous wood nailers; adjust thickness of nailers to maintain surfaces flush.

f. Install in two or more layers with joints of each succeeding layer staggered from joints of previous layer a minimum of 6 inches in each direction.

(1) Where installing composite and noncomposite insulation in two or more layers, install noncomposite board insulation for bottom layer and intermediate layers, if applicable, and install composite board insulation for top layer.

g. Provide insulation materials complying with a total minimum Long Term Thermac Resistance (LTTR) R-value of 21 minimum, per CAN/ULC test method.

h. Trim surface of insulation where necessary at roof drains so completed surface is flush and does not restrict flow of water.

i. Install insulation with long joints of insulation in a continuous straight line with end joints staggered between rows, abutting edges and ends between boards. Fill gaps exceeding 1/4 inch with insulation.

j. Cut and fit insulation within 1/4 inch of nailers, projections, and penetrations.

3.4.2. Insulation Attachment

a. Install insulation to deck in accordance to uplift and warranty requirements using mechanical fasteners specifically designed and sized for fastening specified board-type roof insulation to deck type. Insulation attachment is to be approved in writing by the membrane roofing system manufacturer.

b. Insulation layers are to have joints staggered from joints of each preceding layer. When using multiple layers of insulation, joints of each succeeding layer shall be parallel and offset in both directions with respect to layer below. Neatly and tightly fit insulation to all penetrations, projections, nailers, with gaps not greater than 1/4 inch. Fill gaps greater than 1/4 inch with acceptable insulation. Do not leave the roofing membrane unsupported over space greater than 1/4 inch.

c. On metal deck, place boards perpendicular to flutes with insulation board edges bearing on deck flutes in accordance with roofing manufacturer's recommendations. Do not apply more insulation than can be covered with membrane in same day.

3.4.3. Cover Boards

a. Install cover boards in adhesive over insulation with long joints in continuous straight lines with end joints staggered between rows. Offset joints of insulation below a minimum of 6 inches in each direction. Loosely butt cover boards together and fasten to roof deck.

b. Resist uplift pressure at corners, perimeter, and field of roof.

c. Install in accordance to the roofing manufacturer's and warranty requirements.

3.5 ADHERED ROOFING MEMBRANE INSTALLATION

3.5.1. General

a. Install roofing membrane over area to receive roofing according to membrane roofing system manufacturer's written instructions. Unroll roofing membrane and allow to relax before installing.

b. Start installation of roofing membrane in presence of membrane roofing system manufacturer's technical personnel.

c. Accurately align roofing membrane and maintain uniform side and end laps of minimum dimensions required by manufacturer. Stagger end laps.

d. Bonding Adhesive: Apply bonding adhesive to substrate and underside of roofing membrane at rate required by manufacturer and allow to partially dry before installing roofing membrane. Do not apply bonding adhesive to splice area of roofing membrane.

e. Mechanically or adhesively fasten roofing membrane securely at terminations, penetrations, and perimeter of roofing, as recommended by roofing membrane manufacturer.

f. Apply roofing membrane with side laps shingled with slope of roof deck where possible.

g. Tape Seam Installation: Clean and prime both faces of splice areas, apply splice tape, and firmly roll side and end laps of overlapping roofing membranes according to manufacturer's written instructions to ensure a watertight seam installation. Apply lap sealant and seal exposed edges of roofing membrane terminations.

h. Repair tears, voids, and lapped seams in roofing that does not meet requirements.

i. Spread sealant or mastic bed over deck drain flange at deck drains and securely seal roofing membrane in place with clamping ring.

3.6 BASE FLASHING INSTALLATION

3.6.1. General

a. Install sheet flashings and preformed flashing accessories and adhere to substrates according to membrane roofing system manufacturer's written instructions.

b. Apply bonding adhesive to substrate and underside of sheet flashing at required rate and allow to partially dry. Do not apply bonding adhesive to seam area of flashing.

c. Flash penetrations and field-formed inside and outside corners with cured or uncured sheet flashing.

d. Clean splice areas, apply splicing cement, and firmly roll side and end laps of overlapping sheets to ensure a watertight seam installation. Apply lap sealant and seal exposed edges of sheet flashing terminations.

e. Terminate and seal top of sheet flashings and mechanically anchor to substrate through termination bars.

3.7 WALKWAY INSTALLATION

Flexible Walkways: Install walkway products in locations indicated, from roof access indicated to and around roof-mounted mechanical equipment. Adhere walkway products to substrate with compatible adhesive according to roofing system manufacturer's written instructions. Space walkway products to permit drainage.

3.8 FIELD QUALITY CONTROL

3.8.1. Final Roof Inspection

a. Arrange for roofing system manufacturer's technical personnel to inspect roofing installation at beginning, 1/4 points of installation, and at completion and submit report to Contracting Officer.

(1) Notify Contracting Officer 48 hours in advance of date and time of inspection.

b. Repair or remove and replace components of membrane roofing system where test results or inspections indicate that they do not comply with specified requirements.

c. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.9 PROTECTING AND CLEANING

3.9.1. Protection

a. Protect membrane roofing system from damage and wear during remainder of construction period. When remaining construction will not affect or endanger roofing, inspect roofing for deterioration and damage, describing its nature and extent in a written report, with copies to Contracting Officer.

3.9.2. Correction

a. Correct deficiencies in or remove membrane roofing system that does not comply with requirements, repair substrates and repair or reinstall membrane roofing system to a condition free of damage and deterioration at time of final acceptance and according to warranty requirements.

3.9.3. Cleaning

a. Clean overspray and spillage from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION

SECTION 07 62 00

SHEET METAL FLASHING AND TRIM

PART 1 - GENERAL

1.1 SUMMARY

1.1.1. Section Includes

a. Formed low-slope roof flashing and trim.
b. Precast concrete splash blocks
c. Metal downspout boots (shoes).
d. Prefabricated prefinished metal scuppers.

1.1.2. Related Sections

a. Division 6 Section "Miscellaneous Carpentry" for wood nailers, curbs, and blocking.
b. Division 7 Section "Manufactured Roof Specialties" for manufactured roof specialties not part of sheet metal flashing and trim.

1.2 PERFORMANCE REQUIREMENTS

1.2.1. General

a. Install factory fabricated sheet metal flashing, scuppers, and trim to withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failing, rattling, leaking, and fastener disengagement.

b. The roof perimeter fascia systems shall be certified through third party verification by the manufacturer/supplier to meet performance design criteria according to the most recent edition of ANSI/SPRI ES-1: Wind Design Standard for Edge Systems Used with Low Slope Roofing Systems and Factory Mutual 1-49 Perimeter Flashing requirements.

1.2.2. Thermal Movements

a. Provide sheet metal flashing, scuppers, and trim that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, hole elongation, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Provide clips that resist rotation and avoid shear stress as a result of sheet metal and trim thermal movements. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

(1) Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

1.2.3. Water Infiltration

a. Provide sheet metal flashing, scuppers, and trim that do not allow water infiltration to building interior.

1.3 SUBMITTALS

1.3.1. Shop Drawings

a. Show layouts of sheet metal flashing, scuppers, and trim, including plans and elevations. Distinguish between shop- and field-assembled work. Include the following:

(1) Identify material, thickness, weight, and finish for each item and location in Project.
(2) Details for forming sheet metal flashing, scuppers, and trim, including profiles, shapes, seams, and dimensions.
(3) Details for fastening, joining, supporting, and anchoring sheet metal flashing and trim, including fasteners, clips, cleats, and attachments to adjoining work.
(4) Details of expansion-joint covers, including showing direction of expansion and contraction.

1.3.2. Samples for Verification

a. For each type of exposed finish required, prepared on Samples of size indicated below:

(1) Sheet Metal Flashing: 12 inches long. Include fasteners, cleats, closures, and other attachments.
(2) Trim: 12 inches long. Include fasteners and other exposed accessories.

1.3.3. Submittal List

Reference	Submittal Item	Quantity	Action
1.3.1	Shop Drawings	X	R
1.3.2	Samples for Verification	X	R

X Submit quantity specified in Division 1 Section “Administrative Requirements.”
R Review each submittal, mark to indicate action taken, and return.

1.4 QUALITY ASSURANCE

Sheet Metal Flashing, Scuppers, and Trim Standard: Comply with SMACNA's "Architectural Sheet Metal Manual." Conform to dimensions and profiles shown unless more stringent requirements are indicated.

1.5 DELIVERY, STORAGE, AND HANDLING

1.5.1. Delivery

a. Deliver sheet metal flashing materials and fabrications undamaged. Protect sheet metal flashing and trim materials and fabrications during transportation and handling.

1.5.2. Storage

a. Unload, store, and install sheet metal flashing materials and fabrications in a manner to prevent bending, warping, twisting, and surface damage.

1.5.3. Handling

a. Stack materials on platforms or pallets, covered with suitable weathertight and ventilated covering. Do not store sheet metal flashing and trim materials in contact with other materials that might cause staining, denting, or other surface damage.

1.6 COORDINATION

Coordinate installation of sheet metal flashing, scuppers, and trim with interfacing and adjoining construction to provide a leakproof, secure, and noncorrosive installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

Basis-of-Design Products: Subject to compliance with requirements, provide either the named products or equal products. Refer to Division 1 Section “Reference Standards and Definitions.”

2.2 SHEET METALS

2.2.1. Aluminum Sheet: ASTM B 209 (ASTM B 209M), alloy as standard with manufacturer for finish required, with temper as required to suit forming operations and performance required.

2.2.2. Exposed Finishes

a. High-Performance Organic Finish: Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

(1) Fluoropolymer 2-Coat System: Manufacturer's standard 2-coat, thermocured system consisting of specially formulated inhibitive primer and fluoropolymer color topcoat containing not less than 70 percent polyvinylidene fluoride resin by weight; complying with physical properties and coating performance requirements of AAMA 2604, except as modified below:

(a) Humidity Resistance: 2000 hours.
(b) Salt-Spray Resistance: 2000 hours.

(2) Color: As selected by Contracting Officer from manufacturer's full range.

2.3 MISCELLANEOUS MATERIALS

2.3.1. General

a. Provide materials and types of fasteners, solder, welding rods, protective coatings, separators, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation.

2.3.2. Fasteners

a. Wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads.
b. Exposed Fasteners: Heads matching color of sheet metal by means of plastic caps or factory-applied coating.
c. Fasteners for Flashing and Trim: Blind fasteners or self-drilling screws, gasketed, with hex washer head.
d. Blind Fasteners: High-strength aluminum or stainless-steel rivets.
e. Spikes and Ferrules: Same material as gutter; with spike with ferrule matching internal gutter width.

2.3.3. Elastomeric Sealant

a. ASTM C 920, elastomeric silicone polymer sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.

2.3.4. Epoxy Seam Sealer

a. Two-part, noncorrosive, aluminum seam-cementing compound, recommended by aluminum manufacturer for exterior nonmoving joints, including riveted joints.

2.4 FABRICATION, GENERAL

a. Custom fabricate sheet metal flashing, scuppers, and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of item indicated. Obtain field measurements for accurate fit before shop fabrication.
b. Fabricate sheet metal flashing, scuppers, and trim in thickness or weight needed to comply with performance requirements, but not less than that specified for each application and metal.
c. Fabricate sheet metal flashing, scuppers, and trim without excessive oil canning, buckling, and tool marks and true to line and levels indicated, with exposed edges folded back to form hems.

(1) Seams for Other Than Aluminum: Fabricate nonmoving seams in accessories with flat-lock seams. Tin edges to be seamed, form seams, and solder.

d. Sealed Joints: Form nonexpansion but movable joints in metal to accommodate elastomeric sealant to comply with SMACNA recommendations.
e. Expansion Provisions: Where lapped or bayonet-type expansion provisions in the Work cannot be used, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with elastomeric sealant concealed within joints.
f. Conceal fasteners and expansion provisions where possible on exposed-to-view sheet metal flashing and trim, unless otherwise indicated.
g. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal.

(1) Thickness: As recommended by SMACNA's "Architectural Sheet Metal Manual" for application but not less than thickness of metal being secured.

2.5 ROOF DRAINAGE SHEET METAL FABRICATIONS

2.5.1. Hanging Gutters

a. Fabricate to cross section indicated, complete with end pieces, outlet tubes, and other accessories as required. Fabricate in minimum 96-inch- long sections. Furnish flat-stock gutter spacers and gutter brackets fabricated from same metal as gutters, of size recommended by SMACNA but not less than twice the gutter thickness. Fabricate expansion joints, expansion-joint covers, and gutter accessories from same metal as gutters.
b. Expansion Joints: Butt type.
c. Gutters with Girth up to 15 Inches: Fabricate from the following material:

(1) Aluminum: 0.032 inch (0.81 mm) thick.

d. Gutters with Girth 16 to 20 Inches: Fabricate from the following material:

(1) Aluminum: 0.040 inch (1.02 mm) thick.

2.5.2. Downspouts

a. Fabricate rectangular, open-type (min. 1") for ice control, downspouts complete with mitered elbows. Furnish with metal hangers, from same material as downspouts, and anchors.
b. Fabricate downspouts from the following materials:

(1) Aluminum: 0.040 (1.02 mm) inch thick.

2.6 LOW-SLOPE ROOF SHEET METAL FABRICATIONS

2.6.1. Counterflashing

a. Aluminum: 0.032 inch (0.81 mm) thick.

2.7 FINISHES

2.7.1. General

a. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
b. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
c. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.8 PRECAST CONCRETE SPLASH BLOCKS

Precast concrete type, of size and profile indicated on drawings; if not indicated, provide minimum 12-inch wide by 18-inch long with center depression.

2.9 METAL DOWNSPOUT BOOTS (SHOES)

a. Provide downspout boots made from cast gray iron in heights indicated with inlets of size and shape to suit downspouts.
b. Mark A: Vertical, to discharge into pipe, 48 inches long.

(1) Basis-of-Design Products

(a) Barry Pattern & Foundry Company, Inc., Catalog Number B25A. (800) 524-1809.
(b) McKinley Iron Works, Inc., Type DS4. (800) 433-2303.

c. Mark B: At 35 degrees from horizontal, to discharge onto pavement, 48 inches long.

(1) Basis-of-Design Product

(a) Barry Pattern & Foundry Company, Inc., Catalog Number B25D. (800) 524-1809.
(b) McKinley Iron Works, Inc., Type DS8. (800) 433-2303.

PART 3 - EXECUTION

3.1 EXAMINATION

3.1.1. General

a. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions and other conditions affecting performance of work.
b. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.
c. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

a. Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement. Use fasteners, solder, welding rods, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.
b. Torch cutting of sheet metal flashing and trim is not permitted.
c. Do not use graphite pencils to mark aluminum surfaces
d. Metal Protection

(1) Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with bituminous coating or by other permanent separation as recommended by fabricator or manufacturers of dissimilar metals.

(a) Underlayment: Where installing metal flashing directly on cementitious or wood substrates, install a course of felt underlayment and cover with a slip sheet or install a course of polyethylene underlayment.
(b) Bed flanges in thick coat of asphalt roofing cement where required for waterproof performance.
(c) Coat back side of uncoated aluminum sheet metal flashing and trim with bituminous coating where flashing and trim will contact wood, ferrous metal, or cementitious construction.

e. Install exposed sheet metal flashing and trim without excessive oil canning, buckling, and tool marks.
f. Install sheet metal flashing and trim true to line and levels indicated. Provide uniform, neat seams with minimum exposure of solder, welds, and elastomeric sealant.
g. Install sheet metal flashing and trim to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.

(1) Space cleats not more than 12 inches apart. Anchor each cleat with two fasteners. Bend tabs over fasteners.

h. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet with no joints allowed within 24 inches of corner or intersection. Where lapped or bayonet-type expansion provisions cannot be used or would not be sufficiently watertight, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with elastomeric sealant concealed within joints.
i. Fasteners: Use fasteners of sizes that will penetrate substrate not less than 1-1/4 inches for nails and not less than 3/4 inch for wood screws.

j. Seal joints with elastomeric sealant as required for watertight construction.

(1) Where sealant-filled joints are used, embed hooked flanges of joint members not less than 1 inch into sealant. Form joints to completely conceal sealant. When ambient temperature at time of installation is moderate, between 40 and 70 deg F, set joint members for 50 percent movement either way. Adjust

setting proportionately for installation at higher ambient temperatures. Do not install sealant-type joints at temperatures below 40 deg F.

(2) Prepare joints and apply sealants to comply with requirements in Division 7 Section "Joint Sealants."

k. Soldered Joints: Clean surfaces to be soldered, removing oils and foreign matter. Pretin edges of sheets to be soldered to a width of 1-1/2 inches except where pretinned surface would show in finished Work.

(1) Do not use open-flame torches for soldering. Heat surfaces to receive solder and flow solder into joints. Fill joints completely. Completely remove flux and spatter from exposed surfaces.

3.3 ROOF DRAINAGE SYSTEM INSTALLATION

3.3.1. General

a. Install sheet metal roof drainage items to produce complete roof drainage system according to SMACNA recommendations and as indicated. Coordinate installation of roof perimeter flashing with installation of roof drainage system.

3.3.2. Hanging Gutters

a. Join sections with riveted and soldered joints or with lapped joints sealed with elastomeric sealant. Provide for thermal expansion. Attach gutters at eave or fascia to firmly anchored straps spaced not more than 36 inches apart. Provide end closures and seal watertight with sealant. Slope to downspouts.

(1) Fasten gutter spacers to front and back of gutter.
(2) Loosely lock straps to front gutter bead and anchor to roof deck.
(3) Anchor and loosely lock back edge of gutter to continuous cleat.
(4) Install gutter with expansion joints at locations indicated but not exceeding 50 feet apart. Install expansion joint caps.

3.3.3. Downspouts

a. Join sections with 1-1/2-inch telescoping joints. Provide fasteners designed to hold downspouts securely 1 inch away from walls; locate fasteners at top and bottom and at approximately 60 inches o.c. in between.

(1) Provide elbows at base of downspout to direct water away from building and, where indicated, onto splash blocks.
(2) Connect downspouts to underground drainage system where indicated.

3.3.4. Expansion-Joint Covers

a. Install expansion-joint covers at locations and of configuration indicated. Lap joints a minimum of 4 inches in direction of water flow.

3.3.5. Precast Concrete Splash blocks

a. Install where downspouts discharge on low-sloped roofs. Set in elastomeric sealant compatible with roofing membrane. Provide roofing protection pad as required by roofing membrane manufacturer.

3.4 ROOF FLASHING INSTALLATION

3.4.1. General

a. Install sheet metal roof flashing and trim to comply with performance requirements and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, set units true to line, and level as indicated. Install work with laps, joints, and seams that will be permanently watertight.

3.4.2. Counterflashing

a. Coordinate installation of counterflashing with installation of base flashing. Insert counterflashing in reglets or receivers and fit tightly to base flashing. Extend counterflashing 4 inches over base flashing. Lap counterflashing joints a minimum of 4 inches and bed with elastomeric sealant.

3.4.3. Roof-Penetration Flashing

a. Coordinate installation of roof-penetration flashing with installation of roofing and other items penetrating roof. Install flashing as the roofing manufacturer’s details.

3.5 CLEANING AND PROTECTION

3.5.1. Cleaning

a. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.
b. Clean and neutralize flux materials. Clean off excess solder and sealants.
c. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed. On completion of installation, clean finished surfaces, including removing unused fasteners, metal filings, pop rivet stems, and pieces of flashing. Maintain in a clean condition during construction.

3.5.2. Protection and Repair

a. Replace sheet metal flashing and trim that have been damaged or that have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION

SECTION 07 71 00

ROOF SPECIALTIES

(Edited from DeCA June 2011 Design Criteria)

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Copings.
2. Roof-edge flashings.

B. Related Sections:

1. Division 06 Section Rough Carpentry for wood nailers, curbs, and blocking.
2. Division 07 Section Sheet Metal Flashing and Trim for site-fabricated sheet metal flashing and trim and for roof-edge drainage-system components.
3. Division 07 Section Ethylene-Propylene-Diene-Monomer Roofing for metal edging specified as part of roofing system special warranty.

1.2 PERFORMANCE REQUIREMENTS

A. General Performance:

1. Roof specialties shall withstand exposure to weather and resist thermally induced movement without failure, rattling, leaking, or fastener disengagement due to defective manufacture, fabrication, installation, or other defects in construction.
2. ANSI/SPRI Wind Design Standard: Manufacture and install copings and roof-edge flashings tested according to ANSI/SPRI ES-1 and capable of resisting the following design pressures:

   a. Refer to Division 01 Section Summary of Work for wind loading design criteria.

3. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes to prevent buckling, opening of joints, hole elongation, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Provide clips that resist rotation and avoid shear stress as a result of thermal movements. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

   a. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

1.3 SUBMITTALS

A. Product Data:

1. For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Shop Drawings:

1. For roof specialties. Include plans, elevations, expansion-joint locations, keyed details, and attachments to other work. Distinguish between plant- and field-assembled work. Include the following:

a. Details for expansion and contraction; locations of expansion joints, including direction of expansion and contraction.
b. Pattern of seams and layout of fasteners, cleats, clips, and other attachments.
c. Details of termination points and assemblies, including fixed points.
d. Details of special conditions.

C. Samples for Verification:

1. For copings and roof-edge flashings made from 12-inch lengths of full-size components including fasteners, cover joints, accessories, and attachments.

D. Product Test Reports:

1. Based on evaluation of comprehensive tests performed by a qualified testing agency, for copings and roof-edge flashings indicating performance requirements.

E. Warranty: Sample of special warranty.

F. Submittal List:

Reference	Submittal Item	Quantity	Action
1.3A	Product Data	X	R
1.3B	Shop Drawings	X	R
1.3C	Samples for Verification	X	R
1.3D	Product Test Reports	X	I
1.3E	Warranties	X	I

X Submit quantity specified in Division 01 Section Administrative Requirements.
R Review each submittal, mark to indicate action taken, and return.
I Submittal is for information or record purposes only. No action will be taken.

1.4 QUALITY ASSURANCE

A. Mockups:

1. Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.

a. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups.
b. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Storage:

1. Do not store roof specialties in contact with other materials that might cause staining, denting, or other surface damage. Store roof specialties away from uncured concrete and masonry.

B. Protection:

1. Protect strippable protective covering on roof specialties from exposure to sunlight and high humidity, except to extent necessary for the period of roof specialties installation.

1.6 WARRANTY

A. Special Warranty on Painted Finishes:

1. Manufacturer's standard form in which manufacturer agrees to repair finish or replace roof specialties that show evidence of deterioration of factory-applied finishes within specified warranty period.

a. Fluoropolymer Finish: Deterioration includes, but is not limited to, the following:

1) Color fading more than 5 Hunter units when tested according to ASTM D 2244.
2) Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
3) Cracking, checking, peeling, or failure of paint to adhere to bare metal.

2. Finish Warranty Period: 20 years from date of Substantial Completion.

1.7 COORDINATION

A. Coordinate installation of roofing specialties with interfacing and adjoining construction to provide a leakproof, secure, and noncorrosive installation.

PART 2 - PRODUCTS

2.1 EXPOSED METALS

A. Aluminum Sheet:

1. ASTM B 209, alloy as standard with manufacturer for finish required, with temper to suit forming operations and performance required.

a. Surface: Smooth, flat finish.
b. Exposed Coil-Coated Finishes: Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

1) Two-Coat Fluoropolymer: AAMA 620. System consisting of primer and fluoropolymer color topcoat containing not less than 70 percent PVDF resin by weight.
2) Concealed Surface: Pretreat with manufacturer's standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil.

2.2 CONCEALED METALS

A. Aluminum Extrusions:

1. ASTM B 221, alloy and temper recommended by manufacturer for type of use and structural performance indicated, mill finished.

B. Zinc-Coated (Galvanized) Steel Sheet:

1. ASTM A 653/A 653M, G90 coating designation.

2.3 UNDERLAYMENT MATERIALS

A. Provide underlayment in accordance with roofing-specialty manufacture’s recommendations.

2.4 MISCELLANEOUS MATERIALS

A. General:

1. Provide materials and types of fasteners, protective coatings, sealants, and other miscellaneous items required by manufacturer for a complete installation.
2. Fasteners: Manufacturer's recommended fasteners, suitable for application and designed to meet performance requirements. Furnish the following unless otherwise indicated:

a. Fasteners: Series 300 stainless steel screws electrolytically compatible with materials fastened.

3. Elastomeric Sealant: ASTM C 920, elastomeric polymer sealant of type, grade, class, and use classifications required by roofing-specialty manufacturer for each application.
4. Bituminous Coating: Cold-applied asphalt emulsion complying with ASTM D 1187.

B. Asphalt Roofing Cement: ASTM D 4586, asbestos free, of consistency required for application.

2.5 COPINGS

A. Copings:

1. Manufactured coping system consisting of formed-metal coping cap in section lengths not exceeding 12 feet, concealed anchorage; corner units, end cap units, and concealed splice plates with same finish as coping caps.

a. Basis-of-Design Product: Subject to compliance with requirements, provide product by Carlisle SynTec Inc.

1) SecurEdge 200 Coping (Tapered).

b. Coping-Cap Material: Formed aluminum, thickness as required to meet performance requirements.

1) Finish: Two-coat fluoropolymer.
2) Color: As indicated on Drawings.

c. Corners: Factory mitered and continuously welded or mechanically clinched and sealed watertight.
d. Special Fabrications: Radiussed sections with sloped coping cap.
e. Coping-Cap Attachment Method: Snap-on.
f. Snap-on-Coping Anchor Plates: Concealed, galvanized-steel sheet, 12 inches wide, with integral cleats.

2.6 ROOF-EDGE FLASHINGS

A. Roof-Edge Fascia:

1. Manufactured, two-piece, roof-edge fascia consisting of snap-on metal fascia cover in section lengths not exceeding 12 feet and a continuous extruded-aluminum anchor bar with integral drip-edge cleat to engage fascia cover. Provide matching corner units.

a. Basis-of-Design Product: Subject to compliance with requirements, provide product by Carlisle SynTec Inc.
b. SecurEdge 2000 Fascia.
c. SecurEdge 3000 Fascia.
d. Fascia Cover: Formed aluminum, thickness as required to meet performance requirements.

1) Finish: Two-coat fluoropolymer.
2) Color: As indicated on Drawings.

e. Corners: Factory mitered and continuously welded or mechanically clinched and sealed watertight.
f. Splice Plates: Injection molded EPDM splices to allow thermal expansion of extruded aluminum anchor bar.
g. Special Fabrications: Radiussed sections.

2.7 GENERAL FINISH REQUIREMENTS

A. General:

1. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
2. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
3. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

A. General:

1. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions, and other conditions affecting performance of the Work.
2. Examine walls, roof edges, and parapets for suitable conditions for roof specialties.
3. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.
4. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

A. General:

1. Install roof specialties according to manufacturer's written instructions. Anchor roof specialties securely in place, with provisions for thermal and structural movement. Use fasteners, solder, protective coatings, separators, sealants, and other miscellaneous items as required to complete roof-specialty systems.

a. Install roof specialties level, plumb, true to line and elevation; with limited oil-canning and without warping, jogs in alignment, buckling, or tool marks.
b. Provide uniform, neat seams with minimum exposure of solder and sealant.
c. Install roof specialties to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before manufacture.
d. Torch cutting of roof specialties is not permitted.
e. Do not use graphite pencils to mark metal surfaces.

B. Metal Protection:

1. Protect metals against galvanic action by separating dissimilar metals from contact with each other or with corrosive substrates by painting contact surfaces with bituminous coating or by other permanent separation as recommended by manufacturer.

a. Coat concealed side of uncoated aluminum roof specialties with bituminous coating where in contact with wood, ferrous metal, or cementitious construction.
b. Underlayment: Where installing metal flashing directly on cementitious or wood substrates, install a course of underlayment and cover with a slip sheet.
c. Bed flanges in thick coat of water cut-off mastic where required by manufacturers of roof specialties for waterproof performance.

C. Expansion Provisions:

1. Allow for thermal expansion of exposed roof specialties.

a. Space movement joints at a maximum of 12 feet with no joints within 18 inches of corners or intersections unless otherwise shown on Drawings.
b. When ambient temperature at time of installation is between 40 and 70 deg F, set joint members for 50 percent movement each way. Adjust setting proportionately for installation at higher ambient temperatures.

D. Fastener Sizes:

1. Use fasteners of sizes that will penetrate substrate not less than recommended by fastener manufacturer to achieve maximum pull-out resistance.

E. Joint Seal:

1. Seal joints with elastomeric sealant as required by roofing-specialty manufacturer.
2. Seal joints as required for watertight construction. Place sealant to be completely concealed in joint. Do not install sealants at temperatures below 40 deg F.

3.3 COPING INSTALLATION

A. General:

1. Install cleats, anchor plates, and other anchoring and attachment accessories and devices with concealed fasteners.
2. Anchor copings to meet performance requirements.

a. Interlock face and back leg drip edges of snap-on coping cap into cleated anchor plates anchored to substrate at manufacturer's required spacing that meets performance requirements.

3.4 ROOF-EDGE FLASHING INSTALLATION

A. General:

1. Install cleats, cants, and other anchoring and attachment accessories and devices with concealed fasteners.
2. Anchor roof edgings with manufacturer's required devices, fasteners, and fastener spacing to meet performance requirements.

3.5 CLEANING AND PROTECTION

A. General:

1. Clean off excess sealants.
2. Remove temporary protective coverings and strippable films as roof specialties are installed. On completion of installation, clean finished surfaces including removing unused fasteners, metal filings, and pieces of flashing. Maintain roof specialties in a clean condition during construction.
3. Replace roof specialties that have been damaged or that cannot be successfully repaired by finish touchup or similar minor repair procedures.

END OF SECTION

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SECTION 07 72 33

ROOF HATCHES

(Edited from DeCA June 2011 Design Criteria)

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Roof hatches.

1.2 SUBMITTALS

A. Product Data:

1. For each type of roof accessory indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Submittal List:

Reference	Submittal Item	Quantity	Action
1.2A	Product Data	X	R

X Submit quantity specified in Division 01 Section Administrative Requirements.
R Review each submittal, mark to indicate action taken, and return.
I Submittal is for information or record purposes only. No action will be taken.

1.3 QUALITY ASSURANCE

A. NRCA's "Roofing and Waterproofing Manual" details for installing units.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Pack, handle, and ship roof hatches properly labeled in heavy-duty packaging to prevent damage.

1.5 COORDINATION

A. Coordinate layout and installation of roof hatches with roofing membrane and base flashing and interfacing and adjoining construction to provide a leakproof, weathertight, secure, and noncorrosive installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Products: To establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of other manufacturers, a specific manufacturer's product is named and accompanied by the words "basis of design," including make or model number or other designation. Subject to compliance with requirements, provide either the named products or equal products.

2.2 METAL MATERIALS

A. Galvanized Steel Sheet: ASTM A 653/A 653M, G90 coated.

2.3 MISCELLANEOUS MATERIALS

A. Cellulosic-Fiber Board Insulation:

1. ASTM C 208, Type II, Grade 1, 1 inch thick.

B. Glass-Fiber Board Insulation:

1. ASTM C 726, 1 inch thick.

C. Polyisocyanurate Board Insulation:

1. ASTM C 1289, 1 inch thick.

2.4 ROOF HATCHES

A. Roof Hatches:

1. Fabricate roof hatches with insulated double-wall lids and insulated double-wall curb frame with integral deck mounting flange and lid frame counterflashing. Fabricate with welded or mechanically fastened and sealed corner joints. Provide continuous weathertight perimeter gasketing and equip with corrosion-resistant or hot-dip galvanized hardware.

a. Basis-of-Design Products: Bilco Company (The), Type NB for ship stair access.

2. Loads: Fabricate roof hatches to withstand 40-lbf/sq. ft. external and 20-lbf/sq. ft. internal loads.
3. Type and Size: Single-leaf lid, 30 by 54 inches.
4. Curb and Lid Material: Galvanized steel sheet, 0.079 inch thick.

a. Shop Finish: Mill phosphatized and prime painted.
b. Field Painted Finish: Refer to the following for finishing requirements:

1) Division 09 Section Painting and Coating.
2) Color: Dark Bronze.

5. Insulation: Cellulosic-fiber, glass-fiber, or polyisocyanurate board.
6. Interior Lid Liner: Manufacturer's standard metal liner of same material and finish as outer metal lid.
7. Exterior Curb Liner: Manufacturer's standard metal liner of same material and finish as metal curb.
8. Lid Liner: Manufacturer's standard metal liner of same material and finish as metal curb.
9. Fabricate units to minimum height of 12 inches, unless otherwise indicated.
10. Sloping Roofs: Where slope or roof deck exceeds 1:48, fabricate hatch curbs with height tapered to match slope to level tops of units.
11. Hardware: Galvanized steel spring latch with turn handles, butt- or pintle-type hinge system, and padlock hasps inside and outside.

B. Safety Railing System:

1. Manufacturer's standard complete system including rails, clamps, fasteners, safety barrier at railing opening, and all accessories required for a complete installation.

   a. Basis-of-Design Products: Bilco Company (The), Bil-Guard - Model RL-S.

2. Hatch rail system shall satisfy the requirements of OSHA 29 CFR 1910.23 and shall meet OSHA strength requirements with a factor of safety of two, and the following:

   a. Uniform load of 50 lbf/ ft. applied in any direction.
   b. Concentrated load of 200 lbf applied in any direction.
   c. Uniform and concentrated loads need not be assumed to act concurrently.

3. Height: 42 inches, minimum, above finished roof deck.
4. Posts and Rails: Round pultruded reinforced fire retardant yellow fiberglass treated with a UV inhibitor.

   a. UV and corrosion resistant construction with a twenty-five year warranty.
   b. High visibility safety yellow color shall be molded in.

5. Self-Latching Gate: Fabricated of same materials and rail spacing as safety railing system. Provide manufacturer's standard hinges and self-latching mechanism.
6. Pipe Ends and Tops: Covered or plugged with weather-resistant material.
7. Provide weep holes or another means to drain entrapped water in hollow sections of handrail and railing members that are exposed to exterior or to moisture from condensation or other sources.
8. Fabricate joints that will be exposed to weather in a watertight manner.
9. Close exposed ends of handrail and railing members with prefabricated end fittings.
10. Hardware:

    a. Mounting brackets: 1/4 inch thick hot dip galvanized steel.
    b. Hinges and post guides: 6063T5 aluminum.
    c. Fasteners: Type 316 stainless steel.

PART 3 - EXECUTION

3.1 EXAMINATION

A. General:

1. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions, and other conditions affecting performance of work.
2. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored and is ready to receive roof accessories.
3. Verify dimensions of roof openings for roof hatches.
4. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General:

1. Install roof accessories according to manufacturer's written instructions. Anchor roof accessories securely in place and capable of resisting forces specified. Use fasteners, separators, sealants, and other miscellaneous items as required for completing roof accessory installation. Install roof accessories to resist exposure to weather without failing, rattling, leaking, and fastener disengagement.
2. Install roof accessories to fit substrates and to result in surface drainage and watertight performance.
3. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with bituminous coating or by other permanent separation as recommended by manufacturer.

    a. Coat concealed side of roof hatches with bituminous coating where in contact with wood, ferrous metal, or cementitious construction.
    b. Underlayment: Where installing exposed-to-view components of roof hatches directly on cementitious or wood substrates, install a course of felt underlayment and cover with a slip sheet, or install a course of polyethylene underlayment.
    c. Bed flanges in thick coat of asphalt roofing cement where required by roof accessory manufacturers for waterproof performance.

4. Install roof accessories level, plumb, true to line and elevation, and without warping, jogs in alignment, excessive oil canning, buckling, or tool marks.
5. Roof Hatch Installation: Check roof hatch for proper operation. Adjust operating mechanism as required. Clean and lubricate joints and hardware.
6. Safety Railing System Installation: Attach hatch rail system to the cap flashing of roof hatch; do not penetrate any roofing material.
7. Seal joints with elastomeric sealant as required by manufacturer of roof hatches.

3.3 TOUCH UP

A. Factory-Primed Surfaces:

1. Touch up factory-primed surfaces with compatible primer ready for field painting in accordance with Division 09 painting Sections.

B. Galvanized Surfaces:

1. Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

3.4 CLEANING

A. Clean exposed surfaces according to manufacturer's written instructions.

END OF SECTION

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SECTION 07 92 00

JOINT SEALANTS

(Edited from DeCA June 2011 Design Criteria)

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Joint sealants for the following applications, including those specified by reference to this Section:

a. Exterior Joints in Vertical Surfaces and Nontraffic Horizontal Surfaces:

1) Control Joints in Cast-In-Place Concrete: Elastomeric joint sealant ES-S3 or ES-S4, match concrete color.
2) Expansion Joints in Cast-In-Place Concrete: Elastomeric joint sealant ES-S3, match concrete color.
3) Joints Between Precast Concrete Units: Elastomeric joint sealant ES-S3, match precast concrete color.
4) Control Joints in Unit Masonry: Elastomeric joint sealant ES-S3 or ES-S4, match mortar color.
5) Expansion Joints in Unit Masonry: Elastomeric joint sealant ES-S3, match mortar color.
6) Perimeter Joints Between Precast Concrete Units and Metal Frames Of Doors and Windows: Elastomeric joint sealant ES-S1, match precast concrete color.
7) Perimeter Joints Between Unit Masonry and Metal Frames of Doors and Windows: Elastomeric joint sealant ES-S4, match mortar color.

b. Interior Joints in Vertical Surfaces and Nontraffic Horizontal Surfaces:

1) Joints Between Precast Concrete Units: Elastomeric joint sealant ES-S3, match precast concrete color.
2) Control Joints in Unit Masonry: Elastomeric joint sealant ES-S3 or ES-S4, match mortar color.
3) Expansion Joints in Unit Masonry: Elastomeric joint sealant ES-S3, match mortar color.
4) Perimeter Joints Between Precast Concrete Units and Metal Frames of Doors and Windows: Elastomeric joint sealant ES-S1, match precast concrete color.
5) Perimeter Joints Between Unit Masonry and Metal Frames of Doors and Windows: Elastomeric joint sealant ES-S4, match mortar color.
6) Control Joints in Ceramic Tile: Elastomeric joint sealant ES-S5, match grout color.
7) Sealing Around Toilet Fixtures: Elastomeric joint sealant ES-S5, match toilet fixture color.
8) Fiberglass Reinforced Panel Joints, General Areas: Elastomeric joint sealant ES-S1, where sealant is exposed match panel color.

9) Fiberglass Reinforced Panel Joints, Food Processing Areas: Elastomeric joint sealant ES-S5, where sealant is exposed match panel color.
10) Joints in Field-Painted Vertical and Overhead Surfaces in Gypsum Board: Latex joint sealant. Match color of paint topcoat.
11) Joints Between Concrete Curbs and Cold Storage Room Panels: Elastomeric joint sealant ES-S2 or ES-U1, match concrete curb color.
12) Joints Between Stainless Steel Plumbing Fixtures and Adjoining Floors and Counters: Elastomeric joint sealant ES-S5, transparent (clear).

c. Interior Joints in Horizontal Traffic Surfaces:

1) Control Joints in Ceramic Tile Flooring: Elastomeric joint sealant ES-S3, match grout color.

d. Interior perimeter joints between food equipment cases and Between Surfaces Indicated and Food Equipment Cases: Foam compression seals.
e. Joint-sealant applications not indicated will be selected by the Contracting Officer from elastomeric products indicated in Part 2.

B. Related Sections:

1. Division 03 Section Cast-In-Place Concrete for filling joints in interior floor slabs.
2. Division 04 Section Unit Masonry for masonry control and expansion joint fillers and gaskets.
3. Division 07 Section Exterior Insulation and Finish Systems (EIFS) for sealing joints in EIFS with elastomeric joint sealants.
4. Division 08 Section Glazing for glazing sealants.
5. Division 09 Section Gypsum Board for sealing perimeter joints of gypsum board partitions to reduce sound transmission.
6. Division 32 Section Concrete Paving Joint Sealants for sealing joints in exterior pavements, walkways, and curbing.

1.2 PRECONSTRUCTION TESTING

A. Preconstruction Compatibility and Adhesion Testing:

1. Submit to joint-sealant manufacturers, for testing indicated below, samples of materials that will contact or affect joint sealants.

a. Use ASTM C 1087 to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.
b. Submit not fewer than eight pieces of each type of material, including joint substrates, shims, joint-sealant backings, secondary seals, and miscellaneous materials.
c. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.
d. For materials failing tests, obtain joint-sealant manufacturer's written instructions for corrective measures including use of specially formulated primers.

B. Testing will not be required if joint-sealant manufacturers submit joint preparation data that are based on previous testing of current sealant products for adhesion to, and compatibility with, joint substrates and other materials matching those submitted.

C. Preconstruction Field-Adhesion Testing:

1. Before installing elastomeric sealants, field test their adhesion to Project joint substrates as follows:

a. Locate test joints where indicated on Project or, if not indicated, as directed by Contracting Officer.
b. Conduct field tests for each application indicated below:

1) Each kind of elastomeric sealant and joint substrate indicated.

c. Notify Contracting Officer seven days in advance of dates and times when test joints will be erected.
d. Arrange for tests to take place with joint-sealant manufacturer's technical representative present.

1) Test Method: Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1 in ASTM C 1193.
2) For joints with dissimilar substrates, verify adhesion to each substrate separately; extend cut along one side, verifying adhesion to opposite side. Repeat procedure for opposite side.

e. Report whether sealant failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each kind of product and joint substrate. For sealants that fail adhesively, retest until satisfactory adhesion is obtained.
f. Evaluation of Preconstruction Field-Adhesion-Test Results: Sealants not evidencing adhesive failure from testing, in absence of other indications of noncompliance with requirements, will be considered satisfactory. Do not use sealants that fail to adhere to joint substrates during testing.

1.3 SUBMITTALS

A. Product Data:

1. For each joint-sealant product indicated.

B. Samples for Verification:

1. For each kind and color of joint sealant required, provide Samples with joint sealants in 1/2-inch- wide joints formed between two 6-inch- long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.

C. Preconstruction Compatibility and Adhesion Test Reports:

1. From sealant manufacturer, indicating the following:

a. Materials forming joint substrates and joint-sealant backings have been tested for compatibility and adhesion with joint sealants.
b. Interpretation of test results and written recommendations for primers and substrate preparation needed for adhesion.

D. Product Test Reports:

1. Based on evaluation of comprehensive tests performed by a qualified testing agency, indicating that sealants comply with requirements.

E. Preconstruction Field-Adhesion Test Reports:

1. Indicate which sealants and joint preparation methods resulted in optimum adhesion to joint substrates based on testing specified in "Preconstruction Testing" Article.

F. Sealant, Waterproofing, and Restoration Institute (SWRI) Validation Certificate:

1. For each sealant specified to be validated by SWRI's Sealant Validation Program. www.SWRIONLINE.org

G. Submittal List:

Reference	Submittal Item	Quantity	Action
1.3A	Product Data	X	R
1.3B	Samples for Verification	X	R
1.3C	Preconstruction Compatibility and Adhesion Test Reports	X	I
1.3D	Product Test Reports	X	I
1.3E	Preconstruction Field-Adhesion Test Reports	X	I
1.3F	SWRI Validation Certificate	X	I

X Submit quantity specified in Division 01 Section Administrative Requirements.
R Review each submittal, mark to indicate action taken, and return.
I Submittal is for information or record purposes only. No action will be taken.

1.4 QUALITY ASSURANCE

A. Source Limitations:

1. Obtain each kind of joint sealant through one source from a single manufacturer.

B. Product Testing:

1. Test joint sealants using a qualified testing agency.

a. Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated.
b. Test elastomeric joint sealants according to SWRI's Sealant Validation Program for compliance with requirements specified by reference to ASTM C 920, for adhesion and cohesion under cyclic movement, adhesion-in-peel, and indentation hardness.

1.5 PROJECT CONDITIONS

A. General:

1. Do not proceed with installation of joint sealants under the following conditions:

a. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer.
b. When joint substrates are wet.
c. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
d. Where Contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Products: To establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of other manufacturers, a specific manufacturer's product is named and accompanied by the words "basis of design," including make or model number or other designation. Subject to compliance with requirements, provide either the named products or equal products.

2.2 MATERIALS, GENERAL

A. Compatibility:

1. Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by sealant manufacturer, based on testing and field experience.

B. VOC Content of Interior Sealants:

1. Provide sealants and sealant primers for use inside the weatherproofing system that comply with the following limits for VOC content when calculated according to 40 CFR 59, Part 59, Subpart D (EPA Method 24):

a. Architectural Sealants: 250 g/L.
b. Sealant Primers for Nonporous Substrates: 250 g/L.
c. Sealant Primers for Porous Substrates: 775 g/L

2.3 ELASTOMERIC JOINT SEALANTS

A. Elastomeric Sealants:

1. Comply with ASTM C 920 and other requirements indicated for each liquid-applied chemically curing sealant specified, including those referencing ASTM C 920 classifications for type, grade, class, and uses related to exposure and joint substrates.

B. Stain-Test-Response Characteristics:

1. Where elastomeric sealants are specified to be nonstaining to porous substrates, provide products that have undergone testing according to ASTM C 1248 and have not stained porous joint substrates indicated for Project.

C. Suitability for Contact with Food:

1. Where elastomeric sealants are indicated for joints that will come in repeated contact with food, provide products that comply with 21 CFR 177.2600.

D. **ES-S1** Single-Component Nonsag Neutral-Curing Surface Modified Silicone Sealant (Low dirt pick-up):

1. Basis-of-Design Product: Dow Corning Corporation; 756 SMS.
2. Type and Grade: S (single component) and NS (nonsag).
3. Class: 50.
4. Use Related to Exposure: NT (nontraffic).

E. **ES-S2** Single-Component Pourable Neutral-Curing Silicone Sealant:

1. Basis-of-Design Product: Dow Corning Corporation; 890-SL.
2. Type and Grade: S (single component) and P (pourable).
3. Class: 100/50.
4. Use Related to Exposure: T (traffic).

F. **ES-S3** Single-Component Neutral-Curing Silicone Sealant:

1. Basis-of-Design Product: Dow Corning Corporation; 790.
2. Type and Grade: S (single component) and NS (nonsag).
3. Class: 100/50.
4. Use Related to Exposure: T (traffic).
5. Stain-Test-Response Characteristics: Nonstaining to porous substrates.

G. **ES-S4** Single-Component Neutral-Curing Silicone Sealant:

1. Basis-of-Design Product: Dow Corning Corporation; 795.
2. Type and Grade: S (single component) and NS (nonsag).
3. Class: 50.
4. Use Related to Exposure: NT (nontraffic).
5. Stain-Test-Response Characteristics: Nonstaining to porous substrates.

H. **ES-S5** Single-Component Mildew-Resistant Acid-Curing Silicone Sealant:

1. Basis-of-Design Product: Dow Corning Corporation; 786 Mildew Resistant.
2. Type and Grade: S (single component) and NS (nonsag).
3. Class: 25.
4. Use Related to Exposure: NT (nontraffic).

I. **ES-U1** Single-Component, Self-Leveling, Urethane Joint Sealant:

1. Basis-of-Design Product: Tremco Incorporated; Vulkem 45.
2. Type and Grade: S (single component) and P (pourable).
3. Class: 25.
4. Use Related to Exposure: T (traffic).

2.4 LATEX JOINT SEALANTS

A. Acrylic Latex Or Siliconized Acrylic Latex Sealant:

1. Comply with ASTM C 834, Type OP, Grade NF.

B. Basis-of-Design Products:

1. Bostik Findley; Chem-Calk 600.
2. Pecora Corporation; AC-20+.
3. Schnee-Morehead, Inc.; SM 8200.
4. BASF Building Systems; Sonolac.
5. Tremco; Tremflex 834.

2.5 JOINT-SEALANT BACKING

A. General:

1. Provide sealant backings of material that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.

B. Cylindrical Sealant Backings:

1. ASTM C 1330, Type C (closed-cell material with a surface skin), O (open-cell material), B (bicellular material with a surface skin), or any of the preceding types, as approved in writing by joint-sealant manufacturer for joint application indicated, and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance:

C. Bond-Breaker Tape:

1. Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint. Provide self-adhesive tape where applicable.

2.6 FOAM COMPRESSION SEALS

A. Manufacturer's standard preformed continuous foam compression seals to fill voids between refrigerated display cases and adjacent wall surfaces.

B. Basis-of-design product: Armacell LLC, AP/Armaflex, 48-inch wide by 18-foot long by 2-inch thick rolls.

1. Meets requirements for resistance to mold growth (UL181), fungi (ASTM G 21 / C 1338), and bacteria (ASTM G 22).
2. Properties: Permanently elastic, mildew resistant, nonmigratory, nonstaining, and compatible with joint substrates and other joint sealants.
3. Flame spread and smoke developed index: 25/50, ASTM E 84.
4. Density: 3.0 to 6.0 lb/cu. ft.

2.7 MISCELLANEOUS MATERIALS

A. Primer:

1. Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.

B. Cleaners for Nonporous Surfaces:

1. Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.

C. Masking Tape:

1. Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint-sealant performance. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Cleaning of Joints:

1. Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:

a. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.

b. Clean porous joint substrate surfaces by brushing, grinding, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air. Porous joint substrates include the following:

1) Concrete.
2) Masonry.
3) Unglazed surfaces of ceramic tile.

c. Remove laitance and form-release agents from concrete.

d. Clean nonporous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants. Nonporous joint substrates include the following:

1) Metal.
2) Glass.
3) Porcelain enamel.
4) Glazed surfaces of ceramic tile.

2. Joint Priming: Prime joint substrates, where recommended in writing by joint-sealant manufacturer - or as indicated by preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.
3. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.3 INSTALLATION OF JOINT SEALANTS

A. General:

1. Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.

B. Sealant Installation Standard:

1. Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.

C. Sealant Backings:

1. Install sealant backings of kind indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.

a. Do not leave gaps between ends of sealant backings.
b. Do not stretch, twist, puncture, or tear sealant backings.
c. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.

D. Bond-Breakers:

1. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.

E. Sealant Installation:

1. Install sealants using proven techniques that comply with the following and at the same time backings are installed:

a. Place sealants so they directly contact and fully wet joint substrates.
b. Completely fill recesses in each joint configuration.

c. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.

F. Tooling of Nonsag Sealants:

1. Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified in subparagraphs below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.

a. Remove excess sealant from surfaces adjacent to joints.
b. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
c. Provide concave joint configuration per Figure 8A in ASTM C 1193, unless otherwise indicated.
d. Provide flush joint configuration where indicated per Figure 8B in ASTM C 1193.
e. Provide recessed joint configuration of recess depth and at locations indicated per Figure 8C in ASTM C 1193.

1) Use masking tape to protect surfaces adjacent to recessed tooled joints.

G. Foam Compression Seals:

1. Neatly cut 48-inch wide rolls of foam compression seal material into strips of appropriate width to insure force fit between refrigerated display cases and adjacent wall surfaces.
2. Secure foam compression seals in place with adhesive sealant as indicated on drawings.

3.4 CLEANING

A. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

3.5 PROTECTION

A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

END OF SECTION

SECTION 08 08 00

COMMISSIONING OF OPENINGS

(Edited from DeCA June 2011 Design Criteria)

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Division 08 responsibilities in the commissioning process.
2. Commissioning of Overhead Coiling Doors.
3. Commissioning of Automatic Entrance Doors.
4. Commissioning of Automatic Entrance Doors.
5. Commissioning of Door Hardware.

B. Related Sections:

1. Division 01 Section General Commissioning Requirements.

1.2 DEFINITIONS

A. CA: Commissioning Agent.

B. CO: Contracting Officer.

C. GC: Contractor; General Contractor, not a Subcontractor.

D. O&M: Operations and Maintenance.

E. QC: Contractor's Quality Control Manager.

F. TI: Technical Inspector.

1.3 DESCRIPTION

A. This Section describes commissioning requirements applicable to commissioned items and systems specified in Division 08 that contain any moving parts to ensure that all systems are operating in a manner consistent with the Contract Documents.

B. Conform to commissioning requirements and the commissioning plan issued by the CA.

1.4 RESPONSIBILITIES

A. Construction and Acceptance Phases:

1. Include the cost of commissioning in the contract price.

2. In each purchase order or subcontract written, include requirements for submittal data, O&M data and training.
3. Conduct a commissioning scoping meeting and other meetings necessary to facilitate the Commissioning process.
4. Provide requested documentation to the TI developed for functional testing procedures.
5. Provide functional performance test procedures. Subs shall review test procedures to ensure feasibility, safety and equipment protection and provide necessary written alarm limits to be used during the tests.
6. Develop a full start-up and initial checkout plan using manufacturer's start-up procedures and the prefunctional checklists for all commissioned equipment. Submit to QC for review prior to startup. TI will verify plan for compliance. Refer to Division 01 Section General Commissioning Requirements for further details related to start-up.
7. During the startup and initial checkout process, execute the prefunctional checklists for all commissioned equipment.
8. Perform and clearly document all completed startup and system operational checkout procedures, providing a copy to the QC and TI.
9. Correct system deficiencies before functional testing.
10. Provide skilled technicians to execute starting of equipment and to execute the functional performance tests. Ensure that they are available and present during the agreed upon schedules and for sufficient duration to complete the necessary tests, adjustments and problem-solving.
11. Provide all test equipment necessary to fulfill specified testing requirements.
12. Assist the CA and TI in interpreting the monitoring data, as necessary.
13. Correct deficiencies (differences between specified and observed performance) as interpreted by the TI, CA and A/E and retest the equipment.
14. Prepare O&M manuals according to the Contract Documents, including clarifying and updating the original sequences of operation to as-built conditions.
15. During construction, maintain as-built red-line drawings for all Drawings and final CAD as-builts for contractor-generated coordination drawings. Update after completion of commissioning (excluding deferred testing).
16. Coordinate with equipment manufacturers to determine specific requirements to maintain the validity of the warranty.

B. Operation Manuals shall include:

1. Schedules.
2. Instructions for operation of each piece of equipment for emergencies.
3. Seasonal adjustment.
4. Instructions for energy savings operations and descriptions of the energy savings strategies in the facility (from O&M Manuals).

C. Warranty Period:

1. Execute seasonal or deferred functional performance testing, witnessed by the GCR, according to the Specifications.
2. Correct deficiencies and make necessary adjustments to O&M manuals and As-Built Drawings for applicable issues identified in any seasonal testing.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 STARTUP

A. Contractors shall follow the start-up and initial checkout procedures listed in the Responsibilities list in this Section and in Division 01 Section General Commissioning Requirements. Division 08 has start-up responsibility and is required to complete systems and sub-systems so they are fully functional, meeting the design objectives of the Contract Documents. The commissioning procedures and functional testing do not relieve or lessen this responsibility or shift that responsibility partially to the commissioning agent, technical inspector, or Government.

B. Functional testing will generally begin upon completion of a system. Functional testing may proceed prior to the completion of systems or sub-systems at the discretion of the CO. Beginning system testing before full completion does not relieve the Contractor from fully completing the system, including all prefunctional checklists.

3.2 OPERATION AND MAINTENANCE (O&M) MANUALS

A. The following O&M manual requirements are in addition to O&M manual documentation requirements elsewhere in these Specifications.

B. Division 08 shall compile and prepare documentation for all commissioned systems covered in Division 08 and deliver this documentation to the GC for inclusion in the O&M manuals prior to the training of Government personnel.

3.3 TRAINING OF GOVERNMENT PERSONNEL

A. The GC shall be responsible for training coordination and scheduling to ensure that training is completed.

B. The QC shall be responsible for reviewing the content and adequacy of the training of Government personnel for commissioned equipment or systems. TI will verify compliance.

C. The Division 08 Contractor shall have the following training responsibilities for the commissioned systems:

1. Provide the TI with a training plan four weeks before the planned training.
2. Provide designated Government personnel with comprehensive orientation and training in the understanding of the systems and the operation and maintenance of each piece of commissioned equipment.
3. Training shall start with classroom sessions followed by hands-on training on each piece of equipment.
4. During any demonstration, should the system fail to perform in accordance with the requirements of the O&M manual or sequence of operations, the system will be repaired or adjusted as necessary and the demonstration repeated.
5. The appropriate trade or manufacturer's representative shall provide the instructions on each major piece of equipment. This person may be the start-up technician for the piece of equipment, the installing contractor or manufacturer's representative. Practical operating expertise as well as in-depth knowledge of all modes of operation of the

specific piece of equipment are required. More than one party may be required to execute the training.

6. The training sessions shall follow the outline in the Table of Contents of the operation and maintenance manual and illustrate whenever possible the use of the O&M manuals for reference.
7. Training shall include:

    a. Use of the printed installation, operation and maintenance instruction material included in the O&M manuals.
    b. A review of the written O&M instructions emphasizing safe and proper operating requirements, preventative maintenance, special tools needed and spare parts inventory suggestions. The training shall include start-up, operation in all modes possible, shut-down, seasonal changeover and any emergency procedures.
    c. Discussion of relevant health and safety issues and concerns.
    d. Discussion of warranties and guarantees.
    e. Common troubleshooting problems and solutions.
    f. Explanation of information included in the O&M manuals.
    g. Discussion of any peculiarities of equipment installation or operation.
    h. Classroom sessions shall include the use of overhead projections, slides, video/audio-taped material as might be appropriate.

8. Hands-on training shall include start-up, operation in all modes possible, including manual, shut-down and any emergency procedures and preventative maintenance for all pieces of equipment.
9. Training shall occur after functional testing is complete, unless approved otherwise by the Contracting Officer.
10. Minimum Duration of Training. Contractor shall meet for 8 hours with facility staff after completion of the work and instruct them as indicated above.

END OF SECTION

SECTION 08 11 13

HOLLOW METAL DOORS AND FRAMES

(Edited from DeCA June 2011 Design Criteria)

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Standard hollow-metal steel doors.
2. Standard hollow-metal steel frames.

1.2 DEFINITIONS

1. Minimum Thickness: Minimum thickness of base metal without coatings.
2. Standard Hollow Metal Work: Hollow metal work fabricated according to ANSI/SDI A250.8, SDI-100 “Recommended Specifications for Standard Steel Doors and Frames” as Published by the Steel Door Institute.

1.3 SUBMITTALS

A. Product Data:

1. Include construction details, material descriptions, core descriptions, label compliance, fire-resistance rating, and finishes for each type of steel door and frame specified.

B. Shop Drawings:

1. In addition to requirements below, provide a schedule of standard steel doors and frames using same reference numbers for details and openings as those on Drawings:
2. Elevations of each door design.
3. Details of doors, including vertical and horizontal edge details.
4. Frame details for each frame type, including dimensioned profiles.
5. Details and locations of reinforcement and preparations for hardware.
6. Details of each different wall opening condition.
7. Details of anchorages, accessories, joints, and connections.
8. Details of glazing frames and stops showing glazing.
9. Details of conduit and preparations for electrified door hardware and controls.

C. Coordination Drawings:

1. Drawings of each opening, including door and frame, drawn to scale and coordinating door hardware. Show elevations of each door design type, showing dimensions, locations of door hardware, and preparations for power, signal, and electrified control systems.

D. Submittal List:

Reference	Submittal Item	Quantity	Action
1.3A	Product Data	X	R
1.3B	Shop Drawings	X	R
1.3C	Coordination Drawings	X	R

X Submit quantity specified in Division 01 Section Administrative Requirements.
R Review each submittal, mark to indicate action taken, and return.
I Submittal is for information or record purposes only. No action will be taken.

1.4 QUALITY ASSURANCE

A. Installer Qualifications:

1. An employer of workers trained and approved by manufacturer.

B. Source Limitations:

1. Obtain standard steel doors and frames through one source from a single manufacturer.

C. Fire-Rated Door Assemblies:

1. Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at as close to neutral pressure as possible according to NFPA 252 or UL 10C.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Delivery:

1. Deliver doors and frames palletized, wrapped, or crated to provide protection during transit and Project-site storage. Do not use nonvented plastic.
2. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.

B. Storage:

1. Store doors and frames under cover at Project site. Place units in a vertical position with heads up, spaced by blocking, on minimum 4-inch- high wood blocking. Avoid using nonvented plastic or canvas shelters that could create a humidity chamber.

a. If wrappers on doors become wet, remove cartons immediately. Provide minimum 1/4-inch space between each stacked door to permit air circulation.

1.6 PROJECT CONDITIONS

A. Field Measurements: Verify openings by field measurements before fabrication and indicate measurements on Shop Drawings.

1.7 COORDINATION

A. Coordinate installation of anchorages for standard steel frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in masonry. Deliver such items to Project site in time for installation.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Cold-Rolled Steel Sheet:

1. ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.

B. Metallic-Coated Steel Sheet:

1. ASTM A 653/A 653M, Commercial Steel (CS), Type B; with minimum A40 zinc-iron-alloy (galvannealed) coating designation.

C. Frame Anchors:

1. Interior Frame Anchors: ASTM A 591/A 591M, Commercial Steel (CS), 40Z coating designation; mill phosphatized.

a. Exterior Frame Anchors: Steel sheet complying with ASTM A 1008/A 1008M or ASTM A 1011/A 1011M. After fabricating, hot-dip galvanize units to be built into exterior walls according to ASTM A 153/A 153M, Class B.

D. Inserts, Bolts, and Fasteners:

1. Provide items to be built into exterior walls, hot-dip galvanized according to ASTM A 153/A 153M.

E. Powder-Actuated Fasteners in Concrete:

1. Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching standard steel door frames of type indicated.

F. Grout:

1. Comply with ASTM C 476, with a slump of 4 inches for standard steel door frames built into concrete or masonry, as measured according to ASTM C 143/C 143M.

G. Mineral-Fiber Insulation:

1. ASTM C 665, Type I (blankets without membrane facing); consisting of fibers manufactured from slag or rock wool with 6- to 12-lb/cu. ft. density; with maximum flame-spread and smoke-developed indexes of 25 and 50 respectively; passing ASTM E 136 for combustion characteristics.

H. Glazing:

1. Comply with requirements in Division 08 Section Glazing.

I. Bituminous Coating:

1. Cold-applied asphalt mastic, SSPC-Paint 12, compounded for 15-mil dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

2.2 STANDARD STEEL DOORS

A. General:

1. Provide doors of design indicated, not less than thickness indicated; fabricated with smooth surfaces, without visible joints or seams on exposed faces unless otherwise indicated. Comply with ANSI/SDI A250.8.
2. Design: Flush panel.
3. Core Construction: Manufacturer's standard core indicated that produces doors complying with ANSI/SDI A250.8.

   a. Thermal-Rated (Insulated) Doors: Where indicated, provide doors fabricated with rigid polyurethane core with thermal-resistance value (R-value) of not less than 12.3deg F x h x sq. ft./Btu) when tested according to ASTM C 1363.
   b. Fire Door Core: As required to provide fire-protection ratings indicated.
   c. Interior Security Door Core: Vertical steel stiffeners with mineral fiber fill.

4. Vertical Edges for Single-Acting Doors: Edge profile in accordance with manufacturer’s standard for the Model specified.

   a. Beveled Edge: 1/8 inch in 2 inches.

5. Top and Bottom Edges: Closed with flush or inverted 0.042-inch- thick end closures or channels of same material as face sheets.
6. Tolerances: Comply with SDI 117, "Manufacturing Tolerances for Standard Steel Doors and Frames."

B. Exterior Doors:

1. Face sheets fabricated from metallic-coated steel sheet. Provide doors complying with requirements indicated below by referencing ANSI/SDI A250.8 for level and model and ANSI/SDI A250.4 for physical-endurance level:

   a. Level 3 and Physical Performance Level A (Extra Heavy Duty), Model 2 (Seamless) MSG No. 16 gage, (0.053-inch-thick) steel faces.

C. Interior Doors:

1. Face sheets fabricated from cold-rolled steel sheet. Provide doors complying with requirements indicated below by referencing ANSI/SDI A250.8for level and model and ANSI/SDI A250.4 for physical-endurance level:

a. Unless Otherwise Indicated: Level 3 and Physical Performance Level A (Extra Heavy Duty), Model 1 (Full Flush), MSG No. 16, (0.053-inch-thick), uncoated steel faces.
b. Security Doors Level 4 and Physical Performance Level A (Maximum Duty), Model 1 (Full Flush), MSG No. 14, (0.067-inch-thick) uncoated steel faces.

2. Metallic-coated steel sheet where indicated.
3. Metallic-coated steel sheet where interior steel doors are located in cold storage rooms.

D. Hardware Reinforcement:

1. Fabricate according to ANSI/SDI A250.6 with reinforcement plates from same material as door face sheets

E. Concealed Stiffeners and Hardware Reinforcement:

1. Fabricate concealed stiffeners and hardware reinforcement from either cold- or hot-rolled steel sheet.

2.3 STANDARD STEEL FRAMES

A. General:

1. Comply with ANSI/SDI A250.8 and with details indicated for type and profile.
2. Fabricate frames with mitered or coped corners. Fabricate frames as full profile welded frames.
3. Fabricate from metallic-coated steel sheet.

B. Exterior Frames:

1. Frames of MSG No. 14, (0.067-inch-thick) uncoated steel sheet.
2. Fabricated from metallic-coated steel sheet.

C. Interior Frames:

1. Frames of MSG No.16, (0.053-inch-thick) uncoated steel sheet, unless otherwise indicated.
2. Security Frames: Frames of MSG No. 14, (0.067-inch-thick) uncoated steel sheet.
3. Frames for Borrowed Lights: Same as adjacent door frame.
4. Metallic-coated steel sheet where indicated.
5. Metallic-coated steel sheet where interior steel frames are located in cold storage rooms.

D. Hardware Reinforcement:

1. Fabricate according to ANSI/SDI A250.6 with reinforcement plates from same material as frames and to comply with the following:

a. Impact Type Traffic Door Frames: As indicated.

E. Jamb Anchors:

1. Masonry Type: Adjustable strap-and-stirrup or T-shaped anchors to suit frame size, not less than 0.042 inch thick, with corrugated or perforated straps not less than 2 inches wide by 10 inches long. Do not use wire anchors.

2. Stud-Wall Type: Designed to engage stud, welded to back of frames; not less than 0.042 inch thick.
3. Postinstalled Expansion Type for In-Place Masonry: Minimum 3/8-inch- diameter bolts with expansion shields or inserts. Provide pipe spacer from frame to wall, with throat reinforcement plate, welded to frame at each anchor location.

F. Floor Anchors:

1. Formed from same material as frames, not less than 0.042 inch thick, and as follows:

a. Monolithic Concrete Slabs: Clip-type anchors, with two holes to receive fasteners.
b. Separate Topping Concrete Slabs: Adjustable-type anchors with extension clips, allowing not less than 2-inch height adjustment. Terminate bottom of frames at finish floor surface.

G. Hardware Reinforcement:

1. Fabricate according to ANSI/SDI A250.6 with reinforcement plates from same material as frames.

H. Ceiling Struts:

1. Minimum 1/4-inch-thick by 1-inch wide steel.

I. Grout Guards:

1. Formed from same material as frames, not less than 0.016-inch thick.

J. Mullions and Transom Bars: Join to adjacent members by welding or rigid mechanical anchors.

2.4 STOPS AND MOLDINGS

A. Moldings for Glazed Lites in Doors:

1. Minimum 0.032 inch thick, fabricated from same material as door face sheet in which they are installed.

B. Fixed Frame Moldings:

1. Formed integral with standard steel frames, minimum 5/8 inch high, unless otherwise indicated.

C. Loose Stops for Glazed Lites in Frames:

1. Minimum 0.032 inch thick, fabricated from same material as frames in which they are installed.

2.5 LOUVERS

A. Interior Doors:

1. Provide louvers where indicated, that comply with SDI 111C, with blades or baffles formed of 0.020-inch- thick, cold-rolled steel sheet set into 0.032-inch-thick steel frame.

a. Sightproof Louver: Stationary louvers constructed with inverted V-shaped or Y-shaped blades.

2.6 FABRICATION

A. General:

1. Fabricate standard steel doors and frames to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for thickness of metal. Where practical, fit and assemble units in manufacturer's plant. To ensure proper assembly at Project site, clearly identify work that cannot be permanently factory assembled before shipment.

B. Tolerances:

1. Fabricate hollow metal work to tolerances indicated in SDI 117.

C. Standard Steel Doors:

1. Exterior Doors: Provide weep-hole openings in bottom of exterior doors to permit moisture to escape. Seal joints in top edges of doors against water penetration.
2. Glazed Lites: Factory cut openings in doors.
3. Astragals: Provide overlapping astragal on one leaf of pairs of doors as specified in Division 08 Section Door Hardware where required by NFPA 80 for fire-performance rating or where indicated. Extend minimum ¾ inch beyond edge of door on which astragal is mounted.

D. Standard Steel Frames:

1. Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames. This does not permit knockdown frames or slip-on drywall frames to be substituted for full profile welded frames.
2. Full Profile Welded Frames: Weld flush face joints continuously; grind, fill, dress, and make smooth, flush, and invisible.
3. Sidelight and Transom Bar Frames: Provide closed tubular members with no visible face seams or joints; fabricated from same material as door frame. Fasten members at crossings and to jambs by butt welding.
4. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners, unless otherwise indicated.
5. Grout Guards: Weld guards to frame at back of hardware mortises in frames to be grouted.
6. Floor Anchors: Weld anchors to bottom of jambs and mullions with at least four spot welds per anchor.
7. Jamb Anchors: Provide number and spacing of anchors as follows:

a. Masonry Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:

1) Two anchors per jamb up to 60 inches in height.
2) Three anchors per jamb from 60 to 90 inches in height.
3) Four anchors per jamb from 90 to 120 inches in height.
4) Four anchors per jamb plus 1 additional anchor per jamb for each 24 inches or fraction thereof more than 120 inches in height.

b. Stud-Wall Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:

1) Three anchors per jamb up to 60 inches in height.
2) Four anchors per jamb from 60 to 90 inches in height.
3) Five anchors per jamb from 90 to 96 inches in height.
4) Five anchors per jamb plus 1 additional anchor per jamb for each 24 inches or fraction thereof more than 96 inches in height.
5) Two anchors per head for frames more than 42 inches wide and mounted in metal-stud partitions.

c. Postinstalled Expansion Type: Locate anchors not more than 6 inches from top and bottom of frame. Space anchors not more than 26 inches o.c.

8. Door Silencers: Except on weather-stripped doors, drill stops to receive door silencers as follows. Keep holes clear during construction.

a. Single-Door Frames: Drill stop in strike jamb to receive three door silencers.
b. Double-Door Frames: Drill stop in head jamb to receive two door silencers.

E. Hardware Preparation:

1. Factory prepare standard steel doors and frames to receive templated mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping, according to the Door Hardware Schedule and templates furnished as specified in Division 08 Section Door Hardware.
2. Reinforce doors and frames to receive nontemplated mortised and surface-mounted door hardware.
3. Comply with applicable requirements in ANSI/SDI A250.6 and ANSI/DHI A115 Series specifications for door and frame preparation for hardware. Locate hardware as indicated on Shop Drawings or, if not indicated, according to ANSI/SDI A250.8.

F. Stops and Moldings:

1. Provide stops and moldings around glazed lites where indicated. Form corners of stops and moldings with butted or mitered hairline joints.
2. Single Glazed Lites: Provide fixed stops and moldings welded on secure side of door or frame.
3. Multiple Glazed Lites: Provide fixed and removable stops and moldings such that each glazed lite is capable of being removed independently.
4. Provide fixed frame moldings on outside of exterior and on secure side of interior doors and frames.
5. Provide loose stops and moldings on inside of doors and frames.
6. Coordinate rabbet width between fixed and removable stops with type of glazing and type of installation indicated.

2.7 STEEL FINISHES

A. Factory Priming for Field-Painted Finish:

1. Apply shop primer specified below immediately after surface preparation and pretreatment.

a. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with ANSI/SDI A250.10 acceptance criteria; recommended by primer manufacturer for substrate; compatible with substrate and field-applied finish paint system indicated; and providing a sound foundation for field-applied topcoats despite prolonged exposure.

PART 3 - EXECUTION

3.1 EXAMINATION

1. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of standard steel doors and frames.
2. Examine roughing-in for embedded and built-in anchors to verify actual locations of standard steel frame connections before frame installation.
3. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Remove Spreaders:

1. Remove welded-in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.

B. Adjust and Brace:

1. Prior to installation and with installation spreaders in place, adjust and securely brace standard steel door frames for squareness, alignment, twist, and plumb:

C. Drill and Tap:

1. Drill and tap doors and frames to receive nontemplated mortised and surface-mounted door hardware.

3.3 INSTALLATION

A. General:

1. Provide doors and frames of sizes, thicknesses, and designs indicated. Install standard steel doors and frames plumb, rigid, properly aligned, and securely fastened in place; comply with Drawings and manufacturer's written instructions.

B. Standard Steel Frames:

1. Install standard steel frames for doors, sidelights, transoms, borrowed lights, and other openings, of size and profile indicated. Comply with ANSI/SDI A250.11.
2. Set frames accurately in position; plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces, leaving surfaces smooth and undamaged.

    a. Where frames are fabricated in sections due to shipping or handling limitations, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces.
    b. At fire-protection-rated openings, install frames according to NFPA 80.
    c. Install frames with removable glazing stops located on secure side of opening.
    d. Install door silencers in frames before grouting.
    e. Remove temporary braces necessary for installation only after frames have been properly set and secured.
    f. Check plumb, squareness, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.
    g. Field Apply bituminous coating to backs of frames that are filled with containing antifreezing agents.

3. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor and secure with postinstalled expansion anchors.

    a. Floor anchors may be set with powder-actuated fasteners instead of postinstalled expansion anchors if so indicated and approved on Shop Drawings.

4. Metal-Stud Partitions: Solidly pack mineral-fiber insulation behind frames.
5. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with grout.
6. In-Place Masonry Construction: Secure frames in place with postinstalled expansion anchors. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.
7. In-Place Gypsum Board Partitions: Secure frames in place with postinstalled expansion anchors through floor anchors at each jamb. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.
8. Ceiling Struts: Extend struts vertically from top of frame at each jamb to supporting construction above, unless frame is anchored to masonry or to other structural support at each jamb. Bend top of struts to provide flush contact for securing to supporting construction above. Provide adjustable wedged or bolted anchorage to frame jamb members.
9. Installation Tolerances: Adjust standard steel door frames for squareness, alignment, twist, and plumb to the following tolerances:

    a. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
    b. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.
    c. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
    d. Plumbness: Plus or minus 1/16 inch, measured at jambs at floor.

C. Standard Steel Doors:

1. Fit hollow-metal doors accurately in frames, within clearances specified below. Shim as necessary.
2. Non-Fire-Rated Standard Steel Doors:

   a. Jambs and Head: 1/8 inch plus or minus 1/16 inch.
   b. Between Edges of Pairs of Doors: 1/8 inch plus or minus 1/16 inch.
   c. Between Bottom of Door and Top of Threshold: Maximum 3/8 inch.
   d. Between Bottom of Door and Top of Finish Floor (No Threshold): Maximum 3/4 inch.

3. Fire-Rated Doors: Install doors with clearances according to NFPA 80.

D. Glazing:

1. Comply with installation requirements in Division 08 Section Glazing and with standard steel door and frame manufacturer's written instructions.
2. Secure stops with countersunk flat- or oval-head machine screws spaced uniformly not more than 9 inches o.c., and not more than 2 inches o.c. from each corner.

3.4 ADJUSTING AND CLEANING

A. Final Adjustments:

1. Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including standard steel doors or frames that are warped, bowed, or otherwise unacceptable.

B. Clean:

1. Remove grout and other bonding material off standard steel doors and frames immediately after installation.

C. Prime-Coat Touchup:

1. Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying primer.

D. Metallic-Coated Surfaces:

1. Clean abraded areas and repair with galvanizing repair paint according to manufacturer's written instructions.

END OF SECTION

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SECTION 08 31 13

ACCESS DOORS AND FRAMES

(Edited from DeCA June 2011 Design Criteria)

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Wall access doors.
2. Ceiling access doors.

1.2 SUBMITTALS

A. Product Data:

1. For each type of access door assembly specified, including details of construction relative to materials, individual components, profiles, and finishes.

B. Submittal List:

Reference	Submittal Item	Quantity	Action
1.2A	Product Data	X	R

X Submit quantity specified in Division 01 Section Administrative Requirements.
R Review each submittal, mark to indicate action taken, and return.
I Submittal is for information or record purposes only. No action will be taken.

1.3 QUALITY ASSURANCE

A. Single-Source Responsibility:

1. Obtain access doors for entire Project from one source and by a single manufacturer.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Steel Sheet:

1. Uncoated or electrolytic zinc coated, ASTM A 879/A 879M, with cold-rolled steel sheet substrate complying with ASTM A 1008/A 1008M, Commercial Steel, exposed.

2.2 ACCESS DOORS

A. Flush Access Doors and Frames with Exposed Trim:

1. Fabricated from steel sheet.
2. Door: Minimum 0.060-inch- thick sheet metal, set flush with exposed face flange of frame.

   a. Finish: Factory Prime.

3. Frame: Minimum 0.060-inch- thick sheet metal with 1-inch- wide, surface-mounted trim.
4. Hinges: Concealed spring pin or continuous type.
5. Latch: Screwdriver- operated cam latch unless otherwise indicated.

   a. Where indicated provide self-latching bolt operated by an integral knurled knob turn.

2.3 FABRICATION

A. General:

1. Manufacture each access door assembly as an integral unit ready for installation.

B. Steel Access Doors and Frames:

1. Continuous welded construction. Grind welds smooth and flush with adjacent surfaces. Furnish attachment devices and fasteners of type required to secure access panels to types of supports indicated.

C. Locking Devices:

1. Furnish number required to hold door in flush, smooth plane when closed.

PART 3 - EXECUTION

3.1 PREPARATION

A. Coordination:

1. Advise Installers of other work about specific requirements relating to access door installation, including sizes of openings to receive access door and frame, as well as locations of supports, inserts, and anchoring devices. Furnish inserts and anchoring devices for access doors that must be built into other construction. Coordinate delivery with other work to avoid delay.

3.2 INSTALLATION

A. General:

1. Comply with manufacturer's instructions for installing access doors.

2. Set frames accurately in position and attach securely to supports with plane of face panels aligned with adjacent finished surfaces.
3. Install concealed-frame access doors flush with adjacent finish surfaces.

3.3 ADJUST AND CLEAN

A. Adjust hardware and panels after installation for proper operation. Remove and replace panels or frames that are warped, bowed, or otherwise damaged.

END OF SECTION

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SECTION 08 33 23

OVERHEAD COILING DOORS

(Edited from DeCA June 2011 Design Criteria)

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Type OCD 2: Manual operated insulated exterior coiling service doors.

1.2 DEFINITIONS

A. Operation Cycle: One complete cycle of a door begins with the door in the closed position. The door is then moved to the open position and back to the closed position.

1.3 PERFORMANCE REQUIREMENTS

A. General Performance:

1. Exterior overhead coiling doors shall meet performance requirements specified without failure due to defective manufacture, fabrication, installation, or other defects in construction and without requiring temporary installation of reinforcing components.
2. Delegated Design overhead coiling doors, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

B. Structural Performance:

1. Provide overhead coiling doors capable of withstanding the effects of gravity loads, wind loads and the following loads and stresses without evidencing permanent deformation of door components according to SEI/ASCE 7:

a. Wind Load:
1) Provide exterior overhead coiling door assemblies, including anchorage, capable of withstanding wind pressures acting inward and outward normal to the plane of the wall.
2) Refer to Division 01 Section Summary of Work for wind loading design criteria.
3) Determine design loads using the appropriate coefficients for the exterior overhead coiling door assembly configurations indicated.

b. Seismic Loads:

1) Provide overhead coiling doors assemblies capable of resisting the effects of earthquake motions determined according to SEI/ASCE 7.
2) Refer to Division 01 Section Summary of Work for seismic-load design criteria.

3) Determine seismic loads using the appropriate exposure coefficient for the overhead coiling door assemblies.

C. Operation-Cycle Requirements:

1. Design overhead coiling exterior service and ventilation door components and operator to operate for not less than 100,000 cycles.
2. Provide interior service door components and operators capable of operating for not less than 20,000 cycles.

1.4 SUBMITTALS

A. Product Data:

1. For each type and size of overhead coiling door and accessory. Include details of construction relative to materials, dimensions of individual components, profiles, and finishes. Provide roughing-in diagrams, operating instructions, and maintenance information. Include the following:

a. Setting drawings, templates, and installation instructions for built-in or embedded anchor devices.
b. Summary of forces and loads on walls and jambs.

B. Delegated-Design Submittal:

1. For overhead coiling doors indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

a. Detail fabrication and assembly of seismic restraints.
b. Summary of forces and loads on walls and jambs.

C. Submittal List:

Reference	Submittal Item	Quantity	Action
1.4A	Product Data	X	R
1.4B	Delegated-Design Submittal	X	I

X Submit quantity specified in Division 01 Section Administrative Requirements.
R Review each submittal, mark to indicate action taken, and return.
I Submittal is for information or record purposes only. No action will be taken.

1.5 QUALITY ASSURANCE

A. Installer Qualifications:

1. Engage an experienced installer who is an authorized representative of the overhead coiling door manufacturer for both installation and maintenance of units required for this Project.

B. Source Limitations:

1. Obtain overhead coiling doors through one source from a single manufacturer.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Products, General:

1. To establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of other manufacturers, a specific manufacturer's product is named and accompanied by the words "basis of design," including make or model number or other designation. Subject to compliance with requirements, provide either the named products or equal products.
2. Basis-of-Design Products: Overhead Door Corporation.

a. Coiling Service Doors:

1) Exterior: 625 Series Stormtite Insulated Service Doors.
2) Interior: 610 Series (Non-Insulated) Service Doors.

b. Ventilation Doors: 610 Series Ventilated Service Doors.
c. Counter Doors: 652 Series Counter Doors.

2.2 COILING DOORS DOOR CURTAIN MATERIALS AND CONSTRUCTION

A. Door Curtain:

1. Fabricate overhead coiling-door curtain of interlocking slats, designed to meet performance requirements indicated, in a continuous length for width of door without splices. Unless otherwise indicated, provide slats of material thickness recommended by door manufacturer for performance, size, and type of door indicated, and as follows:

a. Exterior Service Door Steel Door Curtain Exterior (Front) Slats: Structural-quality, cold-rolled galvanized steel sheets complying with ASTM A 653/A 653M, with G90 zinc coating. Provide manufacturer's standard flat-profile slats. 0.033 inch (20 gage) minimum base-metal (uncoated) thickness.
b. Interior Service Door Steel Door Curtain Slats: Structural-quality, cold-rolled galvanized steel sheets complying with ASTM A 653/A 653M. Provide manufacturer's standard flat-profile slats. 0.027 inch (22 gage) minimum base-metal (uncoated) thickness.
c. Counter Door Aluminum Door Curtain Slats. ASTM B 209 or ASTM B 221, alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated. Provide manufacturer's standard flat-profile slats.
d. Insulation for Exterior Doors: Fill slat with manufacturer's standard CFC-free foamed-in-place polyurethane thermal insulation complying with maximum flame-spread and smoke-developed indices of 75 and 450, respectively, according to ASTM E 84. Enclose insulation completely within metal slat faces. R-value of 6.7 minimum.
e. Inside (Back) Curtain Slat Face for Insulated Door: Galvanized steel sheet not less than 0.021 inch (24 gage) minimum base-metal (uncoated) thickness. Fabricate inside and exterior slat faces interlocked with each other.

B. Service Door Endlocks:

1. Malleable-iron castings galvanized after fabrication, secured to curtain slats with galvanized rivets, or high-strength nylon. Provide locks on not less than alternate curtain slats for curtain alignment and resistance against lateral movement.

C. Counter Door Endlocks:

1. Manufacturer's standard locks on not less than alternate curtain slats for curtain alignment and resistance against lateral movement.

D. Exterior Service Door Windlocks:

1. Malleable-iron castings secured to curtain slats with galvanized rivets or high-strength nylon, as required to comply with wind load.

E. Service Door Bottom Bar:

1. Consisting of 2 angles, each not less than 1-1/2 by 1-1/2 by 1/8 inch thick, either galvanized or stainless-steel or aluminum extrusions to suit type of curtain slats.

F. Astragal for Interior Doors: Equip each door bottom bar with a replaceable, adjustable, continuous, compressible gasket of flexible vinyl, rubber, or neoprene as a cushion bumper.

G. Counter Door Bottom Bar:

1. Manufacturer's standard continuous channel or tubular shape, either stainless-steel or aluminum extrusions to suit type of curtain slats.

H. Service Door Curtain Jamb Guides:

1. Fabricate curtain jamb guides of steel angles, or channels and angles, with sufficient depth and strength to retain curtain, to allow curtain to operate smoothly, and to withstand loading. Build up units with not less than 3/16-inch- thick, galvanized steel sections complying with ASTM A 36, and ASTM A 123. Slot bolt holes for guide adjustment. Provide removable stops on guides to prevent overtravel of curtain and a continuous bar for holding windlocks.

I. Counter Door Curtain Jamb Guides:

1. Fabricate curtain jamb guides of angles, or channels and angles of material and finish to match curtain slats, with sufficient depth and strength to retain curtain, to allow curtain to operate smoothly, and to withstand loading. Provide continuous integral wear strips to prevent metal-to-metal contact and minimize noise of travel and removable stops on guides to prevent overtravel of curtain.

2.3 VENTILATION DOORS

A. Door Curtains:

1. Fabricate overhead ventilation coiling-door curtain of interlocking metal slats in a continuous length for width of door without splices. Unless otherwise indicated, provide slats of thickness and mechanical properties recommended by door manufacturer for performance, size, and type of door indicated, and as follows:

a. Perforated Aluminum Door Curtain Slats: ASTM B 209 sheet or ASTM B 221 extrusions, alloy and temper standard with manufacturer for type of use and finish indicated; thickness of 0.050 inch and as required to meet requirements.

B. Endlocks:

1. Malleable-iron castings galvanized after fabrication, secured to curtain slats with galvanized rivets, or high-strength nylon. Provide locks on not less than alternate curtain slats for curtain alignment and resistance against lateral movement.

C. Bottom Bar:

1. Consisting of two angles, each not less than 1-1/2 by 1-1/2 by 1/8 inch thick; fabricated from aluminum extrusions to match curtain slats and finish.

D. Astragal:

1. Equip each door bottom bar with a replaceable, adjustable, continuous, compressible gasket of flexible vinyl, rubber, or neoprene as a cushion bumper.

E. Curtain Jamb Guides:

1. Fabricate curtain jamb guides of steel angles, or channels and angles, with sufficient depth and strength to retain curtain and to allow curtain to operate smoothly. Build up units with not less than 3/16-inch- thick, galvanized steel sections complying with ASTM A 36, and ASTM A 123. Slot bolt holes for guide adjustment. Provide removable stops on guides to prevent overtravel of curtain.

F. Mounting Hardware and Accessories:

1. Provide a separate duel track mounted behind the exterior coiling service door to allow independent door operation.
2. Separate hood from that of service door.
3. Fabricate and install ventilation door separate from service door so that each door may be removed and serviced independent of the other.

2.4 HOODS AND ACCESSORIES

A. Hood:

1. Form to entirely enclose coiled curtain and operating mechanism at opening head and act as weatherseal. Contour to suit end brackets to which hood is attached. Roll and reinforce top and bottom edges for stiffness. Provide closed ends for surface-mounted hoods and fascia for any portion of between-jamb mounting projecting beyond wall face. Provide intermediate support brackets as required to prevent sag.
2. Service and Ventilation Doors: Fabricate steel hoods of not less than 0.021 inch (24 gage) base-metal (uncoated) thickness, hot-dip galvanized steel sheet with G90 zinc coating, complying with ASTM A 653/A 653M.
3. Counter Doors: Fabricate aluminum hoods, complying with ASTM B 209, alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated, and not less than 0.032 inch thick, for aluminum doors.
4. Service and Ventilation Door Shape: Round.
5. Counter Door Shape: Square.

B. Weatherseals:

1. Provide replaceable, adjustable, continuous, compressible weather-stripping gaskets fitted to bottom and at top of exterior doors. At door head, use 1/8-inch- thick, replaceable, continuous sheet secured to inside of curtain coil hood.
2. In addition, provide replaceable, adjustable, continuous, flexible, 1/8-inch- thick seals of flexible vinyl, rubber, or neoprene at door jambs for a weathertight installation.

C. Vision-Panel Glazing:

1. Manufacturer's standard clear glazing, fabricated from transparent acrylic sheet; set in glazing channel secured to curtain slats.

D. Push/Pull Handles for Non-Insulated Service Doors and Ventilation Doors:

1. Provide galvanized steel lifting handles on each side of door. Provide pull-down straps for doors more than 84 inches high.

E. Slide Bolt for Service and Ventilation Doors:

1. Fabricate with side locking bolts to engage through slots in tracks for locking by padlock, located on both left and right jamb sides, operable from coil side.

F. Slide Bolt for Counter Door:

1. Fabricate locking device assembly with lock, spring-loaded dead bolt, operating handle, cam plate, and adjustable locking bar to engage through slots in tracks.
2. Locking Bars: Full-disc Cremone type, both jamb sides, operable from inside only.
3. Lock cylinder is specified in Division 08 Section Door Hardware.

2.5 COUNTERBALANCING MECHANISM

A. General:

1. Counterbalance doors by means of adjustable-tension steel helical torsion spring, mounted around a steel shaft and contained in a spring barrel connected to door curtain with required barrel rings. Use grease-sealed bearings or self-lubricating graphite bearings for rotating members.

B. Counterbalance Barrel:

1. Fabricate spring barrel of hot-formed, structural-quality, welded or seamless carbon-steel pipe, of sufficient diameter and wall thickness to support rolled-up curtain without distortion of slats and to limit barrel deflection to not more than 0.03 in./ft. of span under full load.

C. Spring Balance:

1. Provide spring balance of one or more oil-tempered, heat-treated steel helical torsion springs. Size springs to counterbalance weight of curtain, with uniform adjustment accessible from outside barrel. Provide cast-steel barrel plugs to secure ends of springs to barrel and shaft.

D. Torsion Rod Fabrication:

1. Fabricate torsion rod for counterbalance shaft of cold-rolled steel, sized to hold fixed spring ends and carry torsional load.

E. Brackets:

1. Provide mounting brackets of manufacturer's standard design, either cast-iron or cold-rolled steel plate with bell-mouth guide groove for curtain. Support and attach guides to opening jambs with continuous angle welded to tracks and attached to wall.

2.6 MANUAL DOOR OPERATORS

A. Chain-Hoist Operator for Insulated Service Doors:

1. Provide manual chain-hoist operator consisting of endless steel hand chain, chain pocket wheel and guard, and gear-reduction unit with a maximum 35-lbf force for door operation. Provide alloy steel hand chain with chain holder secured to operator guide.

B. Push-up Operation for Non-Insulated Service Doors, Ventilation Doors, and Counter Doors:

1. Design counterbalance mechanism so required lift or pull for door operation does not exceed 25 lbf.

2.7 FINISHES, GENERAL

A. General:

1. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Appearance of Finished Work:

1. Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.8 ALUMINUM FINISHES

A. Finish Designation:

1. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.

B. Class II, Clear Anodic Finish:

1. AA-M12C22A31 (Mechanical Finish: Nonspecular as fabricated; Chemical Finish: Etched, medium matte; Anodic Coating: Architectural Class II, clear coating 0.010 mm or thicker) complying with AAMA 611.

2.9 STEEL AND GALVANIZED STEEL FINISHES

A. General:

1. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Contractor’s Option:

1. At Contractor’s option provide factory primer for field finish specified in Division 09 Section Painting and Coating, baked finish, or powder-coat finish.

a. Factory Primer for Field Finish: Manufacturer's standard primer, compatible with field-applied finish according to coating manufacturer's written instructions for cleaning, pretreatment, application, and minimum dry film thickness.
b. Baked Finish: Baked finish consisting of primer and topcoat according to coating manufacturer's written instructions for cleaning, pretreatment, application, thermosetting, and minimum dry film thickness.
c. Powder-Coat Finish: Powder-coat finish consisting of primer and topcoat according to coating manufacturer's written instructions for cleaning, pretreatment, application, thermosetting, and minimum dry film thickness.

C. Color:

1. Custom color topcoats as indicated.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General:

1. Install door and operating equipment complete with necessary hardware, jamb and head mold strips, anchors, inserts, hangers, and equipment supports according to Shop Drawings, manufacturer's written instructions, and as specified.
2. Do not install overhead coiling door components with through-bolts to wall.

3.2 ADJUSTING

A. Lubricate and Adjust:

1. Lubricate bearings and sliding parts; adjust doors to operate easily, free from warp, twist, or distortion and fitting weathertight for entire perimeter.
2. Adjust seals to provide weathertight fit around entire perimeter.

3.3 DEMONSTRATION

A. Startup Services:

1. Engage a factory-authorized service representative to train Government's maintenance personnel to adjust, operate, and maintain doors.

END OF SECTION

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SECTION 08 38 00

TRAFFIC DOORS

(Edited from DeCA June 2011 Design Criteria)

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Double action, self-closing, lightweight, impact resistant doors of the following types:

a. Type F single and Type FF, pair of doors, non-sealed.

2. Flexible vertical strip barrier doors.

a. Plastic strip curtains.

1.2 SUBMITTALS

A. Product Data:

1. Manufacturer's product description, installation and maintenance instructions for each type and size of traffic door.

B. Submittal List:

Reference	Submittal Item	Quantity	Action
1.2A	Product Data	X	R

X Submit quantity specified in Division 01 Section Administrative Requirements.
R Review each submittal, mark to indicate action taken, and return.
I Submittal is for information or record purposes only. No action will be taken.

1.3 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Protect doors during transit, storage and handling to prevent damage, soiling and deterioration. Store products in manufacturers unopened packages until ready for installation. Do not lay flat.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Products: To establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of other manufacturers, a specific

manufacturer's product is named and accompanied by the words "basis of design," including make or model number or other designation. Subject to compliance with requirements, provide either the named products or equal products.

2.2 DOOR TYPES AND ACCESSORIES

A. Traffic Doors Type: F and FF.

1. Basis-of-Design Product: Eliason Easy Swing Door Division, Model HCP-10.
2. Door Body: Fire retardant exterior surface of 0.125 thick high impact thermoplastic material, bonded to a high strength polymer cell core with a high strength structural PVC frame; 1-1/2 inch total door thickness.
3. Standard design clearances.
4. Windows: Clear acrylic; double glazed; set in black rubber molding; 14 inches by 16 inchesunless otherwise indicated.
5. Spring Bumpers: Flexible, impact resistant thermoplastic material; 18 inches high; in manufacturer’s standard black finish front and back.
6. Jamb Guards: Welded assembly of 1/4 inch stainless steel; 18 inches high by 5 inches deep. Provide with floor and wall anchors. Secure bottom pin assembly to top of jamb guard.
7. Color: Black.
8. Provide manufacturer's standard brackets on doors for application of padlocks.

B. Traffic Doors Type: G and GG.

1. Basis-of-Design Product: Eliason Easy Swing Door Division; Model HCG-10.
2. Door body: Fire retardant exterior surface of 0.125 thick high impact thermoplastic material, bonded to a high strength urethane foam core with a high strength structural PVC frame; 1-1/2 inch total door thickness.
3. Standard design clearances.
4. Windows: Clear acrylic; double glazed; set in black rubber molding; 14 inches by 16 inches unless otherwise indicated.
5. Provide the following as indicated on Drawings:

    a. Spring Bumpers: Flexible, impact resistant thermoplastic material; 18 incheshigh; in manufacturer’s standard black finish front and back.
    b. Scuff Pates: 0.090 inch thick thermoplastic, 48 inches high; in manufacturer's standard black finish.

6. Jamb Guards: Welded assembly of 1/4 inch stainless steel; 18 inches high by 5 inches deep. Provide with floor and wall anchors. Secure bottom pin assembly to top of jamb guard.
7. Color: Black.
8. Provide manufacturer's standard brackets on doors for application of padlocks.
9. Full perimeter gasket seal, adjustable at bottom.

2.3 TRANSPARENT-STRIP DOOR CURTAINS

A. General:

1. Door curtains consisting of overlapping strips to form a sealed door curtain. Provide strips of length required to suit opening height and with sufficient number in unit to close opening width with 4 to 6 inches overlap on each jamb.

2. Basis-of-Design Product: American Floor Products Company, Inc., Vista-Curtain Flexible, Transparent Strip Doors (VC-5050), Style PF-808.

B. Strip Material: Curved, clear, transparent, extruded PVC. Fabricate strips for manufacturer's standard method of attachment to overhead mounting system indicated.

1. Low-Temperature Grade: USDA accepted, designed to withstand temperature range of minus 30 to plus 150 deg F.

C. Strip Size and Overlap:

1. Strip width and thickness: Minimum 8 inches wide and 0.08 inch thick.
2. Strip overlap: Overlap strips 2/3 width of strips.

PART 3 - EXECUTION

3.1 INSPECTION

A. Verify openings are prepared with headers level, jambs plumb, floor level, without projections, and are correctly dimensioned to receive traffic doors. Begin installation of doors only when conditions are satisfactory.

3.2 INSTALLATION

A. General:

1. Install doors, complete with accessories and hardware, in strict accordance with shop drawings and manufacturer's installation instructions.

B. Transparent-Strip Door Mounting:

1. Mount strip doors so operation of doors or other apparatus in same opening are not obstructed.

a. Wall Surface Mounting: Consisting of a steel plate bolted to side of interior face of wall above door opening; equip plate with permanently attached, threaded, mounting pins and steel-angle or -plate retaining strip attached to plate with wing nuts.
b. Wall Surface Mounting: Consisting of a rigid, vinyl wall-mounting unit bolted to interior face of wall above opening; equip unit with a similarly formed, rigid, vinyl retainer attached to unit with wing nuts.
c. At Contractor’s option, mount strip doors using either of the above systems.

3.3 ADJUST AND CLEAN

A. General:

1. Follow traffic door manufacturer’s instructions as required to:

a. Clean and lubricate operating parts.
b. Adjust to open and close smoothly and freely without binding.

c. Check seals for proper fit.

B. Repair and Clean:

1. Repair damage to doors to match manufacturer's original finish; if unable to repair damage, replace doors.
2. Clean surfaces soiled by work as recommended by manufacturer.
3. Leave work area clean and free of debris.

END OF SECTION

SECTION 08 71 00

DOOR HARDWARE

(Edited from DeCA June 2011 Design Criteria)

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Commercial door hardware for the following:

a. Swinging doors.
b. Sliding doors.
c. Other doors to the extent indicated.

2. Cylinders for doors specified in other Sections.
3. Electrified door hardware.

B. Related Sections:

1. Division 08 Section Commissioning of Openings for commissioning requirements.
2. Division 08 Section Overhead Coiling Doors for door hardware provided as part of overhead door assemblies.
3. Division 08 Section Aluminum-Framed Entrances and Storefronts for **installation of** entrance door hardware, except cylinders.
4. Division 08 Section Key Storage Equipment for key management system.
5. Division 28 Section Intrusion Detection for detection devices installed at door openings and provided as part of an intrusion-detection system.

1.2 SUBMITTALS

A. Product Data:

1. Manufacturer's technical product data for each item of door hardware, installation instructions, maintenance of operating parts and finish, and other information necessary to show compliance with requirements.

B. Product Certificates: For locksets, signed by product manufacturer.

1. Certify that locksets approved for use complies with "Buy American Act."

C. Hardware Schedule:

1. Door Hardware Sets: Prepared by or under the supervision of Architectural Hardware Consultant. Coordinated with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.
2. Hardware Schedule Content: Based on hardware indicated, organize schedule into "hardware sets" indicating complete designations of every item required for each door or

opening. Use same door and hardware set designations as in the Contract Documents. Include the following information:

a. Type, style, function, size, and finish of each hardware item.
b. Name and manufacturer of each item.
c. Fastenings and other pertinent information.
d. Location of each hardware set cross referenced to indications on Drawings both on floor plans and in door and frame schedule.
e. Explanation of all abbreviations, symbols and codes contained in schedule.
f. Mounting locations for hardware.
g. Door and frame sizes and materials.
h. Door handing and key side.

3. Submittal Sequence: Submit final schedule at earliest possible date particularly where acceptance of hardware schedule must precede fabrication of other work that is critical in the Project construction schedule. Include with schedule the product data, samples, shop drawings of other work affected by door hardware, and other information essential to the coordinated review of schedule.

D. Keying Schedule:

1. Submit separate detailed schedule prepared by or under the supervision of Architectural Hardware Consultant (AHC) indicating clearly how the Contracting Officer's final instructions on keying of locks has been fulfilled.

E. AHC Report:

1. Upon completion of the installation, and as a condition of its acceptance, deliver a report signed by the AHC stating that his inspection was made, that all adjustments recommended by him have been completed, that all finish hardware furnished under this Section has been installed and is in optimum working condition, and that finish hardware conforms to commissioning requirements.

F. Product Test Reports:

1. Based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified testing agency, for **locks, latches, delayed-egress locks and closers** where indicated to comply with accessibility requirements.

G. Submittal List:

Reference	Submittal Item	Quantity	Action
1.2A	Product Data	X	R
1.2B	Product Certificates	X	I
1.2C	Hardware Schedule	X	R
1.2D	Keying Schedule	X	R
1.2E	AHC Report	X	I
1.2F	Product Test Reports	X	I

X Submit quantity specified in Division 01 Section Administrative Requirements.
R Review each submittal, mark to indicate action taken, and return.
I Submittal is for information or record purposes only. No action will be taken.

1.3 QUALITY ASSURANCE

A. Single Source Responsibility:

1. Obtain each type of hardware (latch and lock sets, hinges, closers, etc.) from a single manufacturer.

B. Lockset Manufacturer Qualifications:

1. A recognized architectural door hardware manufacturer that has a record of successful in-service performance for domestically manufacturing locksets similar in quantity, type, and quality to that indicated for this Project and that meets the requirements of the "Buy American Act."

C. Installer Qualifications:

1. An employer of workers trained and approved by lock manufacturer.
2. Installer's responsibilities include supplying and installing door hardware, and providing a qualified Architectural Hardware Consultant (AHC) available at reasonable times during the course of the Work to consult with Contracting Officer, Government's Designated Representative, and Contractor about door hardware and keying.
3. Installer shall have warehousing facilities in Project's vicinity.
4. Scheduling Responsibility: Preparation of door hardware and keying schedules.
5. Engineering Responsibility: Preparation of data for electrified door hardware, including Shop Drawings, based on testing and engineering analysis of manufacturer's standard units in assemblies similar to those indicated for this Project.
6. Meet with Contracting Officer to finalize keying requirements and to obtain final instructions in writing.

D. Architectural Hardware Consultant (AHC) Qualifications:

1. A person who is currently certified by DHI as an Architectural Hardware Consultant and who is experienced in providing consulting services for door hardware installations that are comparable in material, design, and extent to that indicated for this Project.

E. Electrified Door Hardware Consultant Qualifications:

1. A qualified Architectural Hardware Consultant who is experienced in providing consulting services for electrified door hardware installations. Architectural Hardware Consultant (AHC) who is also an Electrified Hardware Consultant (EHC) Fire-Rated Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to NFPA 252.

1.4 MAINTENANCE

A. Furnish a complete set of specialized tools and maintenance instructions as needed for Government’s continued adjustment, maintenance and removal and replacement of door hardware.

1.5 COORDINATION

A. Templates:

1. Distribute door hardware templates for doors, frames, and other work specified to be factory prepared for installing door hardware. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.

B. Electrical System Preinstallation Conference:

1. Coordinate layout and installation of electrified door hardware with connections to power supplies, fire alarm system and detection devices, access control system, security system, and building control system, as applicable to project.
2. Conduct conference at Project site to comply with requirements in Division 01 Section Administrative Requirements. Review methods and procedures related to electrified door hardware including, but not limited to, the following:

a. Inspect and discuss electrical roughing-in and other preparatory work performed by other trades.
b. Review sequence of operation for each type of electrified door hardware.
c. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
d. Review required testing, inspecting, and certifying procedures.

1.6 REGULATORY REQUIREMENTS

A. Accessibility Requirements:

1. Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's "Architectural Barriers Act (ABA) Accessibility Guidelines for Buildings and Facilities" and ICC/ANSI A117.1 as follows:

a. Provide operating devices that do not require tight grasping, pinching, or twisting of the wrist and that operate with a force of not more than 5 lbf.
b. Comply with the following maximum opening-force requirements:

1) Interior, Non-Fire-Rated Hinged Doors: 5 lbf applied perpendicular to door.
2) Fire Doors: Minimum opening force allowable by authorities having jurisdiction.

c. Bevel raised thresholds with a slope of not more than 1:2. Provide thresholds not more than 1/2 inch high.

1.7 DELIVERY, STORAGE, AND HANDLING

A. General:

1. Inventory door hardware on receipt and provide secure lock-up for door hardware delivered to Project site.

2. Tag each item or package separately with identification related to the final door hardware sets, and include basic installation instructions, templates, and necessary fasteners with each item or package.
3. Deliver keys and replacement cores to manufacturer of key control system for subsequent delivery to Contracting Officer.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Products: To establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of other manufacturers, a specific manufacturer's product is named and accompanied by the words "basis of design," including make or model number or other designation. Subject to compliance with requirements, provide either the named products or equal products.

2.2 MATERIALS AND FABRICATION

A. Manufacturer's Name Plate:

1. Do not use manufacturers' products that have manufacturer's name or trade name displayed in a visible location (omit removable nameplates) except in conjunction with required fire-rated labels and as otherwise acceptable to Contracting Officer.
2. Manufacturer's identification will be permitted on rim of lock cylinders only.

B. Base Metals:

1. Produce hardware units of basic metal and forming method indicated, using manufacturer's standard metal alloy, composition, temper and hardness, but in no case of lesser (commercially recognized) quality than specified for applicable hardware units by applicable ANSI/BHMA A156 series standards for each type of hardware item and with ANSI/BHMA A156.18 for finish designations indicated. Do not furnish "optional" materials or forming methods for those indicated, except as otherwise specified.

C. Fasteners:

1. Provide hardware manufactured to conform to published templates, generally prepared for machine screw installation. Do not provide hardware that has been prepared for self-tapping sheet metal screws, except as specifically indicated.
2. Furnish screws for installation with each hardware item. Provide Phillips flat-head screws except as otherwise indicated. Finish exposed (exposed under any condition) screws to match hardware finish, or, if exposed in surfaces of other work, to match finish of this other work as closely as possible including "prepared for paint" surfaces to receive painted finish.
3. Provide concealed fasteners for hardware units that are exposed when door is closed except to the extent no standard units of type specified are available with concealed fasteners. Do not use thru-bolts for installation where bolt head or nut on opposite face is exposed in other work unless their use is the only means of reinforcing the work adequately to fasten the hardware securely. Where thru-bolts are used as a means of reinforcing the work, provide sleeves for each thru-bolt or use sex screw fasteners.

2.3 HINGES

A. Templates:

1. Except for hinges to be installed entirely (both leaves) into wood doors and frames, provide only template-produced units.

B. Screws:

1. Furnish Phillips flat-head screws complying with the following requirements:

a. For metal doors and frames, install machine screws into drilled and tapped holes.
b. For wood doors, install wood screws.
c. Finish screw heads to match surface of hinges or pivots.

C. Hinge Pins:

1. Except as otherwise indicated, provide hinge pins as follows:

a. Doors with Locks: Nonremovable pins.
b. Out-Swing Exterior Doors: Nonremovable pins.
c. Out-Swing Corridor Doors with Locks: Nonremovable pins.
d. Interior Doors: Nonrising pins.
e. Tips: Flat button and matching plug, finished to match leaves.

D. Number of Hinges:

1. Provide number of hinges indicated but not less than 2 hinges per door leaf for doors 60 inches or less in height and one additional hinge for each 30 inches, or fraction thereof, of additional height.

E. Butts:

1. 5 knuckle, full mortise hinges with ball bearings conforming to ANSI/BHMA A156.1 and as follows:

a. Exterior Door Hinges: Stainless steel base metal, A5111, 4-1/2 by 4-1/2 by 0.180 inches, with 4 ball bearings.
b. Interior Door Hinges: Cold rolled steel base metal, A8112, 4-1/2 by 4-1/2 by 0.134 inches, with 2 ball bearings.
c. Provide doors greater than 3 feet in width with hinges 5 inches high.
d. Where required to clear trim or permit doors to swing 180 degrees, furnish hinges of sufficient throw.
e. Nylon and oil impregnated bearing hinges shall not be substituted for ball bearing hinges.
f. Ball bearing hinges which are not adequately greased shall be rejected.

2.4 LOCK CYLINDERS AND KEYING

A. General:

1. Provide cylinders for each hardware device requiring cylinder operation. Cylinders and the locks in which they are used shall be functionally compatible.

2. Coordinate preparation of doors receiving cylinders with door manufacturer to assure their compatibility.

B. Cylinders:

1. Equip locks with cylinders that comply with performance requirements for Grade 1 cylinders as listed in ANSI/BHMA A 156.5.

   a. Number of Pins: Seven.
   b. Mortise Type: Threaded cylinders with rings and straight- or clover-type cam.
   c. Rim Type: Cylinders with back plate, flat-type vertical or horizontal tailpiece, and raised trim ring.
   d. Bored-Lock Type: Cylinders with tailpieces to suit locks.

2. Equip locks with cylinders for interchangeable-core pin tumbler inserts, compatible with Installation's locking system. Provide temporary inserts for the construction period, and remove these when directed. Provide key control for removal and insertion of cores.
3. Furnish final cores (complete with materials to combinate) and keys for installation by Government. After final acceptance and keying, Government will return construction cores to Contractor.
4. Metals: Construct lock cylinder parts from brass or bronze, stainless steel or nickel silver.
5. Furnish replacement cores in the quantity of 10 percent of total locks with interchangeable core pin tumbler inserts.

C. Keys and Keying:

1. Installer shall meet with Contracting Officer at Project site to finalize keying requirements and obtain final instructions in writing.
2. Keying System: Factory registered, complying with guidelines in ANSI/BHMA A156.28, Appendix A. Except as otherwise indicated, provide new master key system for Project. Review the keying system with the Contracting Officer and provide the type required (master, grandmaster or great-grandmaster), either new or integrated with Government's existing system.
3. Comply with Contracting Officer's instructions for master keying and, except as otherwise indicated, provide individual change key for each lock that is not designated to be keyed alike with a group of related locks.

   a. Key Type: Verify with Installation if a special key section is required to match existing.

4. Permanently inscribe each key with number of lock that identifies cylinder manufacturer's key symbol, and notation "U.S. GOVERNMENT - DO NOT DUPLICATE."
5. Key Material: Provide keys of nickel silver only.
6. Key Quantity: Furnish 3 change keys for each lock, 5 master keys for each master system, and 5 grandmaster keys for each grandmaster system.
7. Furnish blank keys in the quantity of 10 percent of total locks.

D. Delivery:

1. Deliver keys and replacement cores to Contracting Officer.

2.5 BUILDING KEY BOX

A. General:

1. Provide surface mounted building key box to contain key for emergency access to building. Install in location indicated.

B. Basis-of-Design Products: The Knox Company, Model 3263.

1. Surface mount heavy duty KNOX-BOX with hinged door.
2. 1/2 inch solid steel plate door.
3. 1/4 inch steel case, outside dimensions 4 inches wide by 5 inches high by 3-1/4 inches deep.
4. Color of surfaces exposed to view: Aluminum.

2.6 LOCKS, LATCHES, AND BOLTS

A. General:

1. Keyed locks shall conform to general requirements and cylinder requirements specified under "LOCK CYLINDERS AND KEYING."

B. Tactile Warnings on Doors to Hazardous Areas:

1. Provide a textured surface on the door handle, knob, pull, and other operating hardware of doors that lead to areas that might prove dangerous to a blind person, i.e., doors to loading platforms, boiler rooms, mechanical equipment rooms, electrical equipment rooms, and janitor’s closets.

C. Strikes:

1. Provide manufacturer's standard wrought box strike for each latch and lock bolt, with curved lip extended to protect frame, finished to match hardware set, unless otherwise indicated.
2. Mortise-type locks and latches for doors 1-3/4 inches thick and over: Provide adjustable bevel fronts or otherwise conform to the shape of the door edge.
3. Provide mortise locks with armored fronts.
4. Provide flat lip strikes for locks with 3-piece, antifriction latchbolts as recommended by manufacturer.
5. Provide recess type top strikes for bolts locking into head frames, unless otherwise indicated.
6. Provide dust-proof strikes for foot bolts, except where special threshold construction provides nonrecessed strike for bolt.

D. Certified Locks & Latches:

1. Mortise type locks shall be listed under Category F in BHMA's "Certified Product Directory."

E. Mortise Type:

1. Stamped steel case with steel or brass parts; ANSI/BHMA A156.13;Series 1000. Provide mortise locks and latches with escutcheon, minimum 7 by 1-3/4 inches.

a. Lock Functions: Function numbers and descriptions indicated in door hardware sets comply with ANSI/BHMA A156.13.

2. Lever Handle: Cast lever handle and cast shank. Breakaway feature on lock functions (such as weakened spindle or shear key) to prevent irreparable damage to lock when force in excess of that specified in reference standard is applied to the lever handle. Lever handles shall return to within 1/2 inch of door face.
3. Type 1: Operational Grade 1.
4. Type 2: Security Grade 1; meet both operational and security criteria.
5. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Best Access Systems.
b. Corbin Russwin Architectural Hardware, Div. Black & Decker Corp.
c. Sargent Manufacturing Company.
d. Schlage Lock, Div. Ingersoll-Rand Door Hardware Group.
e. Yale Security, Inc.

F. Bored Type:

1. ANSI/BHMA A156.2, Grade 1; Series 4000.

a. Lock Functions: Function numbers and descriptions indicated in door hardware sets comply with ANSI/BHMA A156.2.

1) Compactor door: Dead locking latch bolt operated by trim on inside of building only. Non-removable blank trim or no trim (no cutout) outside.

2. Lock Trim:

a. Knobs: Machined from solid brass or bronze.
b. Escutcheons (Roses): Brass or bronze reinforced with steel liner.
c. Basis-of-lockset-design: Best Access Systems, 8K Series, 2-3/4 back set, round knob, standard strike plate.

3. Lock Throw: Minimum 1/2-inch latchbolt throw.

G. Latch Guard:

1. Provide stainless steel latchguards appropriate for the type of lock and strike used; concealed, through-bolt fasteners.

H. Electric Strikes:

1. Conform to ANSI/BHMA A156.31, US32D, Grade 1. Provide appropriate strike for use with type of lock specified, i.e., rim latch, mortise lock, deadlatch.
2. Intermittent action; fail secure; audible operations.
3. Provide appropriate rectifier, current limiter, and transformer.
4. Provide concealed conduit and wiring in door frame and building construction to remote electric power supply junction box and strike release switch junction box.

2.7 AUXILIARY LOCKS, LATCHES AND BOLTS

A. General:

1. Keyed auxiliary locks shall conform to general requirements and cylinder requirements specified under "LOCK CYLINDERS AND KEYING."
2. Keyed auxiliary locks shall conform to requirements for strikes and rabbeted doors specified under "LOCKS, LATCHES, AND BOLTS."
3. Locate centerline of deadlock and deadlatch strikes 48 inches above finished floor.

B. Deadlocks:

1. Bored auxiliary deadlock; Type 1, ANSI/BHMA A156.5, keyed both sides, E2141. Where indicated in Hardware Schedule provide sign "THIS DOOR TO REMAIN UNLOCKED WHEN THE BUILDING IS OCCUPIED" in line with lock. Letters shall be not less than 1 inch high in a contrasting background.
2. Bored auxiliary deadlock; Type 2, ANSI/BHMA A156.5, keyed inside, mounting plate on out side, E5161.
3. Mortise deadlock; ANSI/BHMA A156.5, dead bolt operated by key from inside only, 1-inch throw, E06082.

C. Deadlatches:

1. Two-Point Deadlatch with Paddle: Basis-of-Design Product Adams Rite 4781: Concealed vertical rod mechanism which latches to header and bolts to threshold; inside operation with 4781 push paddle (located 39 inches above finished floor at centerline) unblocks top bolt and withdraws bottom bolt; outside operation with key operation retracts bolts; provide dogging using hex screw in paddle escutcheon to hold paddle down; provide outside 8650 key cylinder escutcheon; match door finish.

D. Flush Bolts:

1. Manual flush bolt, ANSI/BHMA A156.16; L04081; provide extension at head and dustproof strike, L04011 or L04021 as applicable, at floor.

E. Padlocks:

1. Padlock; ASTM F 883, Grade 1, Type P01 (key operated), 6 pin deadlock, option E (corrosion resistant), 4-inch shackle, sash chain with clevis on each end of chain. Secure chain to padlock and frame. Option B (removable cylinder).

2.8 EXIT ALARMS

A. General:

1. Local sound alarm produced by a high decibel horn; armed and disarmed by control key; cylinders as specified under "LOCK CYLINDERS AND KEYING" automatic rearming after authorized use; sign stating "EMERGENCY EXIT/ALARM WILL SOUND"
2. Basis-of-Design Product: Detex Corporation, EAX 2500S surface mount on wall.

   a. 115V AC 50/60 Hz power to 24V Transformer, PP-5152-2; automatically switches to 9-volt alkaline battery back-up upon loss of power.
   b. Surface magnetic switch mounted overhead, MS-2049SC with all wiring concealed within rigid conduit.

c. Cylinder controlled alarm armed and disarmed by inside mortise cylinder key switch. Conform to general requirements and cylinder requirements specified for LOCK CYLINDERS AND KEYING.

2.9 EXIT DEVICES

A. General:

1. Conform to ANSI/BHMA A156.3, Grade 1.
2. Classified by UL as to Accident Hazard for panic protection and shall be listed in UL's Mechanical Equipment Directory.
3. Cylinder controlled locks: Conform to general requirements and cylinder requirements specified for LOCKS, LATCHES, AND BOLTS.
4. Mount exit device centerline of strike approximately 40 inches above finished floor.

B. Exit Device:

1. Type: 1, Rim Exit Device.
2. Function: 08, entrance by lever; key locks or unlocks lever.
3. Outside Trim: Escutcheon, breakaway lever, and double cylinder (inside key cylinder locks or unlocks outside lever, outside key cylinder only retracts latch bolt.
4. Design: Push pad, wide stile.
5. Basis-of-Design Product: Von Duprin Series 99.

C. Delayed-Egress Lock:

1. Exit Device: Depressing push pad for more than 2 seconds initiates irreversible alarm and 15-second delay for egress. Fire alarm voids 15-second delay. Comply with the following:

   a. Conform to ANSI/BHMA A156.24.
   b. Locked when energized, unlocked when de-energized.
   c. Connect to fire alarm system.
   d. Provide power supply hard wired to electrical service: activated during power failure.
   e. Provide electric power transfer unit to exit device lock.
   f. Self-contained local alarm in exit device.
   g. Alarm armed, disarmed, and reset by inside mortise cylinder key switch on exit device.
   h. Cylinders as specified under "LOCK CYLINDERS AND KEYING."
   i. Sign stating "PUSH UNTIL ALARM SOUNDS DOOR CAN BE OPENED IN 15 SECONDS" or similar language.
   j. Type: 1, Rim Exit Device.
   k. Function: 01, Exit only, no trim.
   l. Outside Trim: None.
   m. Design: Push pad, wide stile.

2. Basis-of-Design Product: Von Duprin Series CX99.

   a. Electric Power Transfer: EPT-10.
   b. Power Supply: PS873BK-FA.

2.10 PUSH/PULL UNITS

A. General:

1. Conform to ANSI/BHMA A156.6.
2. Concealed Fasteners: Provide manufacturer's special concealed fastener system for installation, through-bolted for matched pairs but not for single units.
3. Mount pushes and pulls on centerline of stiles unless otherwise indicated. Where length of push or pull is "by door width", length shall be centerline to centerline of stiles unless otherwise indicated or required to clear door jamb.

   a. Mount push/pull sets back to back with concealed threaded sleeves.
   b. Locate centerline of horizontal pushes 42 inches above finished floor.
   c. Locate center of top return of vertical pulls 42 inches above finished floor.

B. Material and Finish:

1. BHMA 630, satin stainless steel (US 32D).

C. Push and Pull Types:

1. Type 1: Push/Pull set; J304/J407; 1/8 inch by 4-inch by 16-inch push plate with beveled edges and 3/4 inch round bar by 8-inch center-to-center pull.
2. Type 2: Push/Pull set; push bar J501, 1 inch round bar by door width; pull J402, 90 degree offset, 1 inch round bar by 9 inches center-to-center.
3. Type 3: Pull; J402, 90 degree offset; 1 inch round bar by 9 inches center-to-center.
4. Type 4: Pull; J303 1/8-inch thick plate, with cylinder hole and pull.
5. Type 5: Pull; J501, 3/4 inch round bar by 24 inches center-to-center. Mount horizontally on center of pull side of door.

2.11 CLOSERS

A. General:

1. Conform to ANSI/BHMA A156.4, Grade 1.
2. Closers shall be the product of a single manufacturer.
3. Provide closers with adjustable back check, which becomes effective between 60 and 85 degrees of door opening.
4. Provide closers without hold-open feature.
5. Locate closers on pull side of door, except where door swings to exterior or into corridor and as indicated.

B. Size of Units:

1. Except as otherwise specifically indicated, comply with the manufacturer's recommendations for size of door control unit depending upon size of door, exposure to weather, and anticipated frequency of use.
2. Wind conditions and mechanical ventilation systems shall be taken into consideration, and closer size shall be increased accordingly.
3. If, after closers are installed, a larger size is required, provide the larger size.
4. Where parallel arms are indicated for closers, provide closer unit one size larger than recommended for use with standard arms.

C. Overhead Closers:

1. Warranty closers against mechanical defects for a period of 10 years.
2. Modern-Type-with-Cover Surface Closers: Rack-and-pinion hydraulic type; with high strength cast iron cylinders, one piece forged steel pistons, hardened, double heat-treated steel pinions, full-complement bearings, and adjustable sweep and latch speeds controlled by key-operated valves; with forged-steel main arm; enclosed in full plastic covers. Provide specified finish on all parts of closer, including arms, pivots, brackets and fasteners, exposed to view regardless of position of door.
3. Provide closers with fluid complying with ANSI/BHMA A156.4, including cold storage rooms.
4. Overhead closer types:

   a. C02011 surface mounted on pull side, regular arm with closing power adjustment at least 50 percent more than minimum tested value.
   b. C02021 surface mounted on push side, parallel arm with closing power adjustment at least 50 percent more than minimum tested value and spring stop function in soffit shoe set at approximately 90 degrees to 110 degrees.

2.12 DOOR TRIM UNITS

A. General:

1. Provide manufacturer's standard exposed fasteners for door trim units consisting of either machine screws or self-tapping screws.
2. Fabricate protection plates not more than 1- 1/2 inches less than door width on pull side and not more than 1/2 inch less than door width on pull side by height indicated.
3. Stainless steel, 0.050 inch thick (U.S. 18 gage).
4. Bevel plate top and 2 sides.
5. Provide kickplates on both sides of door leaf unless otherwise indicated.

B. Types:

1. Kickplate: 12 inches high unless otherwise indicated.

2.13 ASTRAGALS

A. Types:

1. Type 1: Steel, 2 inches wide by 1/8 inch thick minimum, prime coat. Provide overlapping astragal on one leaf of pairs of doors where required by NFPA 80 for fire-performance rating or where indicated. Extend minimum 3/4 inch beyond edge of door on which astragal is mounted. Paint finish to match doors. Provide with tamperproof fasteners. Basis-of-Design Products:

   a. Reese Enterprises, Inc., 183S.
   b. National Guard Products, Inc., 139SP.

2.14 DOOR STOPS

A. General:

1. Conform to ANSI/BHMA A156.8 for overhead stops and ANSI/BHMA A156.16 for floor and wall stops.
2. Provide stops at all doors except where closers with integral stops are indicated or no stops are indicated.
3. Provide wall stops except where floor stops are more appropriate or overhead stops are indicated.
4. Place door stops in such a position that they permit maximum door swing but do not present hazard or obstruction.
5. Provide floor stops with risers at carpeted floors, at undercut doors, and at thresholds, as required for at least 1/2 inch contact with door bottom.
6. Size overhead stops in accordance with manufacturer's printed instructions for each door opening.
7. Set overhead stops for 110 degree opening, unless limited by building construction or equipment.

B. Stop Types:

1. Wall bumper, concave, L02251.
2. Floor stop, dome, L02141 without threshold, L02161with threshold, or with risers.
3. Overhead surface mounted slide type: Type 2; hold open and release by push and pull of door unless control is set in inactive position; with stop and shock absorber; adjustable holding pressure.

2.15 JAMB, HEAD AND SILL SEALS

A. General:

1. Provide continuous jamb, head and sill seals on exterior doors and on interior doors where indicated or scheduled. Provide noncorrosive fasteners for exterior applications and elsewhere as indicated.
2. Provide only those units where resilient or flexible seal strip is easily replaceable and readily available from stocks maintained by manufacturer.

B. Weatherstripping:

1. ANSI/BHMA 156.22, R3B196; bumper-type resilient insert and metal retainer strips, surface applied to stop, screw fastened, slotted holes for adjustment.

   a. Metal and finish: Extruded aluminum with natural anodized finish, 0.062-inch minimum thickness of main walls and flanges.
   b. Bumper material: Solid neoprene conforming to ASTM D 2000 and AAMA 701/702.

      1) Flexible, hollow bulb or loop insert.

C. Door Bottom Protection:

1. ANSI/BHMA 156.22, R3D536; door bottom consisting of contact-type resilient insert and metal housing, applied to door face, screw fastened, slotted holes for adjustment, as follows:

a. Metal and finish: Extruded aluminum rain drip type sweep retainer with natural anodized finish, 0.062-inch minimum thickness of main walls and flanges.
b. Resilient seal strip: Flexible vinyl wiper or sweep seal strip.

2.16 THRESHOLDS

A. ANSI/BHMA A156.21. Mill Finish Aluminum.

1. Type 1: J32130, 5 inches wide.
2. Type 2: J36130, 5 inches wide with stop and gasket, 1/2 inch high to top of stop, beveled rise slope no greater than 1:2.

2.17 DOOR HEAD PROTECTION

A. Extruded aluminum drip, 0.59 inch minimum projection, 0.082 inch minimum thickness, applied to frame face, screw fastened.

2.18 DOOR SILENCERS (MUTES)

A. Conform to ANSI/BHMA A156.16. L03011 for metal frames. Provide 3 silencers at strike jamb of single doors and 2 silencers at tops of frames of double doors. Install silencers on all door frames except frames receiving weatherstripping or gaskets.

2.19 HARDWARE FINISHES

A. U.S. and BHMA Finishes:

1. US 26D, satin chromium except hardware exposed to the weather shall be US 32D, satin stainless steel.
2. Provide finishes that match those established by BHMA.
3. Provide quality of finish, including thickness of plating or coating (if any), composition, hardness, and other qualities complying with manufacturer's standards, but in no case less than specified by referenced standards for the applicable units of hardware.
4. The designations used in schedules and elsewhere to indicate hardware finishes are those listed in ANSI/BHMA A156.18, "Materials and Finishes," including coordination with the traditional U.S. finishes shown by certain manufacturers for their products.

2.20 FASTENERS

A. General:

1. Furnish door hardware with necessary screws, bolts and other fasteners of suitable size and type to anchor the hardware in position for long life under hard use.
2. Furnish fastenings where necessary with expansion shields, toggle bolts, sex bolts, and other approved anchors according to material which the hardware is to be applied and instructions of the hardware manufacturer.
3. Fasteners exposed to weather shall be stainless steel, and shall match the finish of the trim.
4. Design: All fastenings shall harmonize with hardware as to material and finish.

2.21 OTHER MATERIALS

A. All other materials, such as brackets, fasteners, back-up plates and other accessories not specifically described but required for a complete operable finish hardware installation, shall be as provided by the Contractor and subject to approval.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Mounting Heights:

1. Mount door hardware units at heights indicated in following applicable publications, unless otherwise specifically indicated or required to comply with governing regulations:

   a. Standard Steel Doors and Frames: ANSI/SDI A250.8. DHI's "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."
   b. Wood Doors: DHI WDHS.3, "Recommended Locations for Architectural Hardware for Wood Flush Doors."

B. General:

1. Install each hardware item in compliance with the manufacturer's instructions and recommendations. Where cutting and fitting is required to install hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation or application of surface protection with finishing work specified in the Division 09 Sections. Do not install surface-mounted items until finishes have been completed on the substrates involved.
2. Set units level, plumb, and true to line and location. Adjust and reinforce the attachment substrate as necessary for proper installation and operation.
3. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors in accordance with industry standards.
4. Install closers, overhead stops, and similar hardware subject to hard use with sex nut and bolt type fastening on wood doors unless doors have been fabricated with wood blocking, plywood or similar substrate to receive screw type fasteners for absolute holding power.
5. Cope metal thresholds neatly to opening frame profiles. Attach thresholds to substrate with No. 10 or larger flat head, countersunk, wood screws. Use lead shield for anchoring to concrete. Provide fasteners of bronze or stainless steel which will not corrode in contact with the threshold metal; match threshold finish.
6. Set thresholds in a bed of non-shrink, non-metallic, grout or mortar to completely support threshold from deflecting and bending; remove excess grout and mortar.
7. To prevent water infiltration into building at exterior doors, install elastomeric urethane sealant around exterior and interior perimeter of threshold including joint where ends of threshold abut door frame. Provide sealant that is compatible with substrates and is recommended by manufacturer for traffic use. Remove excess sealant.
8. Install jamb and head seals to provide a complete seal against air and moisture, when door is in closed position. Install seals so as not to interfere with latching function of door. Comply with manufacturer's instructions and recommendations to the extent installation requirements are not otherwise indicated.

3.2 ADJUSTING, CLEANING, AND DEMONSTRATING

A. Adjusting:

1. Adjust and check each operating item of hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate freely and smoothly or as intended for the application made.
2. Where door hardware is installed more than one month prior to acceptance or occupancy of a space or area, return to the installation during the week prior to acceptance or occupancy and make final check and adjustment of all hardware items in such space or area. Clean operating items as necessary to restore proper function and finish of hardware and doors. Adjust door control devices to compensate for final operation of heating and ventilating equipment.

B. Cleaning:

1. Clean adjacent surfaces soiled by hardware installation.

C. Demonstrating:

1. Instruct Government's personnel in the proper adjustment and maintenance of door hardware and hardware finishes. Refer to Division 01 Section Demonstration and Training.

3.3 HARDWARE SCHEDULE

A. General:

1. Provide finish hardware in sets according to the following schedule. Unless otherwise modified in the hardware sets, provide hardware as previously specified in this Section. Hardware indicated is for each door leaf in an opening except where a single item serves a pair of doors, and unless additional items are indicated.

Automatic Sliding Doors

HDW SET 1:

Cylinders, mortise type, thumbturn inside and keyed outside. Provide sign "THIS DOOR TO REMAIN UNLOCKED WHEN THE BUILDING IS OCCUPIED" in line with lock. Letters shall be not less than 1 inch high in a contrasting background.

Cashier's Office

HDW SET 2:

Butts
Storeroom Lock F07, Type 2
Closer C02011
Kickplate
Stop

Cash Counting Room from Customer Service

HDW SET 2A:

Butts
Storeroom Lock F07, Type 2
Closer C02021
Kickplate
Stop

Cash Counting Room
HDW SET 3:
Butts
Storeroom Lock F07, Type 2
Electric Strike (controlled from Cashier's Office)
Closer C02011
Kickplate
Stop

Private Offices (Customer Service Office/ Medical Food Inspection Office/Region Management Support, etc.)
HDW SET 4:
Butts
Entrance Lock F04, Type 2
Kickplate
Stop

Administrative Corridor
Omit sign if opening is not a required means of egress.
HDW SET 5:
Butts
Bored Auxiliary Deadlock Type 1 with Sign
Push/Pull Set Type 1
Closer C02011
Kickplate
Stop

Administrative Corridor
HDW SET 6:
Butts
Passage Set F01, Type 1
Closer C02011
Kickplate
Stop

Restroom/Breakroom/Training Room/Locker Room/Vendor Room
HDW SET 7:
Butts
Push/Pull Set Type 1
Closer C02011
Kickplate
Stop

Administrative Entry - Exterior
HDW SET 8:
Butts
Two-Point Deadlatch with Paddle
Pull Type 3
Closer C02021
Threshold Type 1

Administrative Entry Vestibule
HDW SET 9:
Butts
Push/Pull Set Type 2
Closer C02011
Stop

Janitor's Closet/Storage Rooms - Single Doors
HDW SET 10:
Butts
Storeroom Lock F07, Type 1
Closer C02011 (Omit closer where door is not visible from customer areas.)
Kickplate
Stop

Damaged Merchandise/Storage Rooms/Sensitive Storage - Pair of Doors
HDW SET 11:
Butts
Storeroom Lock F07, Type 1
Manual Flush Bolt, Head and Sill
Kickplate
Astragal Type 1
Overhead Stop

Roof Hatch, Exterior Chain Link Gates, and Overhead Door at Mechanical Mezzanine
HDW SET 12:
Padlock

Wire Mesh Enclosed Storage Areas
HDW SET 12A:
Cylinders, mortise type, lever inside and keyed outside

Utility Rooms
HDW SET 13:
Butts
Storeroom Lock F07, Type 1
Kickplate, 32 inches high
Stop

Electrical Utility Room containing equipment rated 1200 amperes or more and over 6 feet wide - Single Exterior Door
HDW SET 14
Butts
Exit Device
Overhead Stop
Kickplate, 32 inches high
Threshold Type 2
Door Bottom Protection
Weatherstripping
Head Drip

Receiving Overhead Door and Ventilation Door
HDW SET 15:
Padlock, one at each jamb

Personnel Door Entrance/Exit (Receiving and Staging Areas)
HDW SET 16:

Butts
Exit Device
Exit Alarm
Closer C02021
Kickplate
Threshold Type 2
Door Bottom Protection
Weatherstripping
Head Drip

Personnel Door Emergency Exit to Exterior
HDW SET 17:

Butts
Delayed-Egress Lock
Overhead Stop
Threshold Type 2
Door Bottom Protection
Weatherstripping
Head Drip

Bakery-Deli Dry Storage
HDW SET 18:

Butts
Entrance Lock F04, Type 1
Closer C02011
Kickplate
Stop

Door to Compactor (in-swinging)
HDW SET 19:

Butts
F111 Bored Lock. Locate centerline of lock 6 inches above bottom of door
Weatherstripping at Jambs, Head & Sill

Access Door Above Cold Storage Rooms
HDW SET 20:

Butts
Passage Set F01

Communications Room(CISIC)
HDW SET 21:

Butts
Storeroom Lock F07, Type 1
Closer C02011
Kickplate
Stop

Sub Hub Communication Room – Pair of Doors
HDW SET 22:

Butts
Storeroom Lock F07, Type 1
Manual Flush Bolt, Head and Sill
Kickplate
Astragal Type 1
Overhead Stop

Administration Overhead Counter Door

HDW SET 23:

Cylinder, mortise type, keyed inside

END OF SECTION

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SECTION 09 29 00

GYPSUM BOARD

(Edited from DeCA June 2011 Design Criteria)

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Non-loadbearing steel framing members for interior gypsum board assemblies.
2. Gypsum board assemblies attached to steel framing.
3. Sound attenuation blanket and acoustical sealant.

B. Related Sections:
1. Division 05 Section Cold-Formed Metal Framing for exterior and interior load-bearing and exterior non-load-bearing wall studs; floor joists; roof rafters and ceiling joists; and roof trusses.
2. Division 06 Section Sheathing for gypsum sheathing at exterior walls.

1.2 SUBMITTALS

A. Product Data: For each type of product.

B. Submittal List:

Reference	Submittal Item	Quantity	Action
1.2A	Product Data	X	R

X Submit quantity specified in Division 01 Section Administrative Requirements.
R Review each submittal, mark to indicate action taken, and return.
I Submittal is for information or record purposes only. No action will be taken.

1.3 DEFINITIONS

A. Gypsum Board Construction Terminology: Refer to ASTM C 11 and GA-505 for definitions of terms for gypsum board assemblies not defined in this Section or in other referenced standards.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in original packages, containers, or bundles bearing brand name and identification of manufacturer or supplier. Store materials inside under cover and keep them dry and protected against damage from weather, direct sunlight, surface contamination, corrosion, construction traffic, and other causes. Neatly stack gypsum panels flat to prevent sagging.

1.5 PROJECT CONDITIONS

A. Environmental Conditions, General:

1. Establish and maintain environmental conditions for applying and finishing gypsum board to comply with ASTM C 840 requirements or gypsum board manufacturer's recommendations, whichever are more stringent.

B. Room Temperatures:

1. For nonadhesive attachment of gypsum board to framing, maintain not less than 40º F. Do not exceed 95 deg F when using temporary heat sources.

C. Ventilation:

1. Ventilate building spaces as required to dry joint treatment materials. Avoid drafts during hot, dry weather to prevent finishing materials from drying too rapidly.

PART 2 - PRODUCTS

2.1 FRAMING SYSTEMS

A. Framing Members, General:

1. Comply with ASTM C 754 for conditions indicated.

a. Steel Sheet Components: Comply with ASTM C 645 requirements for metal unless otherwise indicated.
b. Protective Coating: Manufacturer's standard rust-inhibiting coating.

2.2 STEEL FRAMING COMPONENTS FOR SUSPENDED CEILINGS

A. General:

1. Provide components complying with ASTM C 754 for materials and sizes unless otherwise indicated.

B. Wire for Hangers and Ties:

1. ASTM A 641, Class 1 zinc coating, soft temper.

a. Wire Hangers: 0.16 inch in diameter.
b. Tie Wire: 0.062-inch-diameter wire, or double strand of 0.048-inch-diameter wire.

C. Channels:

1. Cold-rolled steel, 0.053 inch minimum thickness of base (uncoated) metal and 1/2 inch wide flanges, and as follows:

a. Carrying Channels: 1-1/2 inches deep.
b. Furring Channels: 3/4 inch deep.

D. Steel Rigid Furring Channels:

1. ASTM C 645, hat-shaped, depth of 7/8 inch, and minimum thickness of base (uncoated) metal of 0.018 inch.

E. Grid Suspension System for Interior Ceilings:

1. ASTM C 645, manufacturer's standard direct-hung grid suspension system composed of main beams and cross furring members that interlock.

2.3 STEEL FRAMING FOR WALLS AND PARTITIONS

A. General:

1. Provide steel framing members complying with the following requirements:

a. Component Sizes and Spacings: As indicated but not less than that required to comply with ASTM C 754.

B. Steel Studs and Runners:

1. ASTM C 645.

a. Minimum Base Metal Thickness: 0.033 inch (20 gage).
b. Depth: As indicated.

C. Slip-Type Head Joints (Deflection Track):

1. Where indicated, provide steel sheet top runner manufactured to prevent cracking of finishes applied to interior partition framing resulting from deflection of structure above; in thickness not less than indicated for studs and in width to accommodate depth of studs.

D. Fasteners for Metal Framing:

1. Provide fasteners of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel framing to substrates.

2.4 INTERIOR GYPSUM BOARD

A. General:

1. Complying with ASTM C 1396.
2. Provide gypsum board of types indicated in maximum lengths available to minimize end-to-end butt joints.

a. Thickness: Provide gypsum board in thicknesses indicated or, if not otherwise indicated, in either 1/2 inch or 5/8 inch thicknesses to comply with ASTM C 840 for application system and support spacing indicated.
b. Long Edges: Tapered unless otherwise indicated.

B. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.

C. Types:

1. Regular type.
2. Type X.
3. Ceiling Type: Manufactured to have more sag resistance than regular-type gypsum board
4. Moisture- and Mold-Resistant Type (Water-Resistant Gypsum Backing Board): With moisture- and mold-resistant core and surfaces.

   a. Core: Type X**.**
   b. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.

2.5 TRIM ACCESSORIES

A. Accessories for Interior Installation:

1. Corner beads, edge trim, and control joints complying with ASTM C 1047 and requirements indicated below:

   a. Material: Formed metal, or metal combined with paper, with metal complying with the following requirement:

      1) Sheet steel coated with zinc by hot-dip or electrolytic processes, or with aluminum or rolled zinc.

   b. Shapes indicated below by reference to Fig. 1 designations in ASTM C 1047.
   c. Cornerbead on outside corners, unless otherwise indicated.
   d. Bullnose bead with flanges formed to receive joint compound. Use rounded cornerbead for vertical corner joints.
   e. LC-bead with both face and back flanges; face flange formed to receive joint compound. Use LC-beads for edge trim unless otherwise indicated.
   f. L-bead with face flange only; face flange formed to receive joint compound. Use L-bead where indicated.
   g. U-bead with face and back flanges; face flange formed to be left without application of joint compound. Use U-bead where indicated.
   h. One-piece expansion (control) joint formed with V-shaped slot, with removable strip covering slot opening.

2.6 JOINT TREATMENT MATERIALS

A. General:

1. Provide joint treatment materials complying with ASTM C 475.

B. Joint Tape for Gypsum Board:

1. Paper reinforcing tape, unless otherwise indicated.

C. Setting-Type Joint Compounds for Gypsum Board:

1. Factory-packaged, job-mixed, chemical-hardening powder products formulated for uses indicated.

a. Where setting-type joint compounds are indicated as a taping compound only or for taping and filling only, use formulation that is compatible with other joint compounds applied over it.
b. For prefilling gypsum board joints, use formulation recommended by gypsum board manufacturer for this purpose.
c. For filling joints and treating fasteners of water-resistant gypsum backing board behind base for ceramic tile, use formulation recommended by the gypsum board manufacturer for this purpose.
d. For topping compound, use sandable formulation.

2.7 MISCELLANEOUS MATERIALS

A. General:

1. Provide auxiliary materials for gypsum board construction that comply with referenced standards and recommendations of gypsum board manufacturer.

B. Steel Drill Screws:

1. Complying with ASTM C 1002 for fastening gypsum board to steel members less than 0.033 inch (22 gage) thick.
2. Complying with ASTM C 954 for fastening gypsum board to steel members from 0.033 to 0.112 inch thick.

C. Isolation Strip at Exterior Walls: Provide one of the following:

1. Asphalt-Saturated Organic Felt: ASTM D 226, Type I (No. 15 asphalt felt), nonperforated.
2. Foam Gasket: Adhesive-backed, closed-cell vinyl foam strips that allow fastener penetration without foam displacement, 1/8 inch thick, in width to suit steel stud size.

D. Sound-Attenuation Blankets:

1. Unfaced mineral-fiber blanket insulation produced by combining mineral fibers of type described below with thermosetting resins to comply with ASTM C 665 for Type I (blankets without membrane facing); consisting of fibers; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively; passing ASTM E 136 for combustion characteristics.

a. Mineral-Fiber Type: Fibers manufactured from glass-fiber or slag-wool-fiber/rock-wool-fiber.

E. Acoustical Joint Sealant: Manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C 834. Product effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates to which gypsum board assemblies attach or abut, installed hollow metal frames, cast-in-anchors, and structural framing, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of assemblies specified in this Section. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Ceiling Anchorages: Coordinate installation of ceiling suspension systems with installation of overhead structural assemblies to ensure that inserts and other provisions for anchorages to building structure have been installed to receive ceiling hangers that will develop their full strength and at spacing required to support ceilings.

3.3 INSTALLING STEEL FRAMING, GENERAL

A. Steel Framing Installation Standard:

1. Install steel framing to comply with ASTM C 754 and with ASTM C 840 requirements that apply to framing installation.
2. Install supplementary framing, blocking, and bracing at terminations in gypsum board assemblies to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction. Comply with details indicated and with recommendations of gypsum board manufacturer or, if none available, with United States Gypsum Co.'s "Gypsum Construction Handbook."
3. Isolate steel framing from building structure at locations indicated to prevent transfer of loading imposed by structural movement. Comply with details shown on Drawings.

   a. Where building structure abuts ceiling perimeter or penetrates ceiling.
   b. Where partition framing and wall furring abut structure, except at floor.

      1) Install deflection track top runner to attain lateral support and avoid axial loading.

4. Do not bridge building control and expansion joints with steel framing or furring members. Independently frame both sides of joints with framing or furring members as indicated.

3.4 INSTALLING STEEL FRAMING FOR SUSPENDED AND FURRED CEILINGS

A. Suspend ceiling hangers from building structural members and as follows:

1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or ceiling suspension system. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
2. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with the location of hangers required to support standard suspension system members, install supplemental suspension members and hangers in

form of trapezes or equivalent devices. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards.

3. Secure wire hangers by looping and wire-tying, either directly to structures or to inserts, eyescrews, or other devices and fasteners that are secure and appropriate for substrate, and in a manner that will not cause them to deteriorate or otherwise fail.
4. Do not attach hangers to steel deck tabs.
5. Do not attach hangers to steel roof deck. Attach hangers to structural members.

    a. Do not connect or suspend steel framing from ducts, pipes, or conduit.

6. Sway-brace suspended steel framing with hangers used for support.
7. Install suspended steel framing components in sizes and at spacings indicated, but not less than that required by the referenced steel framing installation standard.

    a. Wire Hangers: 48 inches o.c.
    b. Carrying Channels (Main Runners): 48 inches o.c.
    c. Furring Channels (Furring Members): 16 inches o.c.

8. Installation Tolerances: Install steel framing components for suspended ceilings so that cross-furring or grid suspension members are level to within 1/8 inch in 12 feet as measured both lengthwise on each member and transversely between parallel members.
9. Wire-tie or clip furring members to main runners and to other structural supports as indicated.
10. Grid Suspension System: Attach perimeter wall track or angle where grid suspension system meets vertical surfaces. Mechanically join main beam and cross-furring members to each other and butt-cut to fit into wall track.

3.5 INSTALLING STEEL FRAMING FOR WALLS AND PARTITIONS

A. General:

1. Install runners (tracks) at floors, ceilings, and structural walls and columns where gypsum board stud assemblies abut other construction.

    a. Where studs are installed directly against exterior walls, install asphalt felt strips between studs and wall.

2. Extend partition framing full height to structural supports or substrates above suspended ceilings, except where otherwise indicated. Continue framing over frames for doors and openings and frame around ducts penetrating partitions above ceiling to provide support for gypsum board.
3. Install steel studs and furring in sizes and at spacings indicated.

    a. Single-Layer Construction: Space studs 16 inches o.c., unless otherwise indicated.

4. Install steel studs so flanges point in the same direction and leading edge or end of each gypsum board panel can be attached to open (unsupported) edges of stud flanges first.
5. Slip-Type Head Joints (Deflection Track): Where framing extends to overhead structural supports, install to produce joints at tops of framing systems that prevent axial loading of finished assemblies.
6. Frame door openings to comply with GA-219, and with applicable published recommendations of gypsum board manufacturer, unless otherwise indicated. Attach

vertical studs at jambs with screws either directly to frames or to jamb anchor clips on door frames; install runner track section (for cripple studs) at head and secure to jamb studs.

a. Install 2 studs at each jamb, unless otherwise indicated.

7. Frame openings other than door openings to comply with details indicated or, if none indicated, as required for door openings. Install framing below sills of openings to match framing required above door heads.

3.6 APPLYING AND FINISHING GYPSUM BOARD, GENERAL

A. Gypsum Board Application and Finishing Standards:

1. Install and finish gypsum panels to comply with ASTM C 840 and GA-216.
2. Install sound-attenuation blankets, where indicated, prior to installing gypsum panels unless blankets are readily installed after panels have been installed on one side.
3. Install ceiling board panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in the central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.
4. Install gypsum panels with face side out. Do not install imperfect, damaged, or damp panels. Butt panels together for a light contact at edges and ends with not more than 1/16 inch of open space between panels. Do not force into place.
5. Locate both edge or end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Avoid joints other than control joints at corners of framed openings where possible.
6. Attach gypsum panels to steel studs so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.
7. Attach gypsum panels to framing provided at openings and cutouts.
8. Spot grout hollow metal door frames for solid-core wood doors, hollow metal doors, and doors over 32 inches wide. Apply spot grout at each jamb anchor clip and immediately insert gypsum panels into frames.
9. Form control and expansion joints at locations indicated and as detailed, with space between edges of adjoining gypsum panels, as well as supporting framing behind gypsum panels.
10. Cover both faces of steel stud partition framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases that are braced internally.

    a. Except where concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. in area.
    b. Fit gypsum panels around ducts, pipes, and conduits.
    c. Where partitions intersect structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by structural members; allow 1/4- to 3/8-inch-wide joints to install sealant.

11. Isolate perimeter of nonload-bearing gypsum board partitions at structural abutments, except floors. Provide 1/4- to 1/2-inch-wide spaces at these locations and trim edges with U-bead edge trim where edges of gypsum panels are exposed.
12. Space fasteners in gypsum panels according to referenced gypsum board application and finishing standard and manufacturer's recommendations.
13. Space fasteners in panels that are tile substrates a maximum of 8 inches o.c.

3.7 GYPSUM BOARD APPLICATION METHODS

A. Single-Layer Application:

1. Install gypsum wallboard panels as follows:

a. On ceilings, apply gypsum panels prior to wall/partition board application to the greatest extent possible and at right angles to framing, unless otherwise indicated.
b. On partitions/walls, apply gypsum panels vertically (parallel to framing), unless otherwise indicated, and provide panel lengths that will minimize end joints.

B. Wall Tile Substrates:

1. For substrates indicated to receive thin-set ceramic tile and similar rigid applied wall finishes, comply with the following:

a. Install gypsum wallboard panels with tapered edges taped and finished to produce a flat surface except at locations indicated to receive water-resistant panels.

C. Single-Layer Fastening Methods:

1. Apply gypsum panels to supports as follows:

a. Fasten with screws.

3.8 INSTALLING TRIM ACCESSORIES

A. General:

1. For trim accessories with back flanges, fasten to framing with the same fasteners used to fasten gypsum board. Otherwise, fasten trim accessories according to accessory manufacturer's directions for type, length, and spacing of fasteners.
2. Install cornerbead at external corners.
3. Install edge trim where edge of gypsum panels would otherwise be exposed. Provide edge trim type with face flange formed to receive joint compound, except where other types are indicated.

a. Install LC-bead where gypsum panels are tightly abutted to other construction and back flange can be attached to framing or supporting substrate.
b. Install L-bead where edge trim can only be installed after gypsum panels are installed.
c. Install U-bead where indicated.

4. Install control joints according to ASTM C 840 and manufacturer's recommendations.

3.9 FINISHING GYPSUM BOARD ASSEMBLIES

A. General:

1. Treat gypsum board joints, interior angles, flanges of cornerbead, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration.

2. Prefill open joints, rounded or beveled edges, and damaged areas using setting-type joint compound.
3. Apply joint tape over gypsum board joints, except those with trim accessories having flanges not requiring tape.
4. Levels of Gypsum Board Finish: Provide the following levels of gypsum board finish per GA-214.

    a. Level 1 for ceiling plenum areas and concealed areas, unless a higher level of finish is required for fire-resistance-rated assemblies and sound-rated assemblies.

        1) At joints and angles, embed tape in joint compound. Finish panel surfaces free of excess joint compound, but tool marks and ridges are acceptable.

    b. Level 2 where panels form substrates for tile and where indicated.

        1) At joints and angles, embed tape in joint compound and apply one separate coat of joint compound over tape, fastener heads, and flanges of trim accessories. Joint compound applied on the face of the tape when the tape is embedded is considered a separate coat. Finish panel surfaces free of excess joint compound, but tool marks and ridges are acceptable.

    c. Level 4 for all gypsum board exposed surfaces, unless otherwise indicated.

        1) At joints and angles, embed tape in joint compound and apply three separate coats of joint compound over joints, angles, fastener heads, and flanges of trim accessories. Finish panel surfaces and joint compound smooth and free of tool marks and ridges.

5. Use the following joint compound combination as applicable to the finish levels specified:

    a. Embedding and First Coat: Setting-type joint compound.
    b. Fill (Second) Coat: Setting-type joint compound.
    c. Finish (Third) Coat: Sandable, setting-type joint compound.

6. For Level 4 gypsum board finish, embed tape in joint compound and apply first, fill (second), and finish (third) coats of joint compound over joints, angles, fastener heads, and accessories. Touch up and sand between coats and after last coat as needed to produce a surface free of visual defects and ready for decoration.
7. Where Level 2 gypsum board finish is indicated, embed tape in joint compound and apply first coat of joint compound.
8. Where Level 1 gypsum board finish is indicated, embed tape in joint compound.
9. Finish water-resistant gypsum backing board forming base for ceramic tile to comply with ASTM C 840 and gypsum board manufacturer's directions for treatment of joints behind tile.

3.10 INSTALLATION OF INSULATION IN CEILINGS FOR SOUND ATTENUATION

A. Install unfaced-fiber blanket insulation over suspended ceilings so that insulation extends over entire ceiling.

3.11 INSTALLATION CRITERIA FOR ACOUSTICAL SEALANT

A. Acoustical Assemblies: Seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C 919 and with manufacturer's written recommendations for locating edge trim and closing off sound-flanking paths around or through assemblies, including sealing partitions above acoustical ceilings.

3.12 CLEANING AND PROTECTION

A. Promptly remove any residual joint compound from adjacent surfaces. Provide final protection and maintain conditions, in a manner acceptable to Installer, that ensure gypsum board assemblies are without damage or deterioration at the time of final acceptance.

END OF SECTION

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SECTION 09 30 00

TILING

(Edited from DeCA June 2011 Design Criteria)

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Glazed wall tile.
2. Unpolished paver tile.
3. Quarry tile.
4. Stone thresholds installed as part of tile installations.
5. Metal edge strips.

B. Related Sections:

1. Division 01 Section Sustainable Design Reporting for adhesives and sealants.
2. Division 07 Section Joint Sealants for sealing of expansion, contraction, control, and isolation joints in tile surfaces.

1.2 DEFINITIONS

A. General: Definitions in the ANSI A108 series of tile installation standards and in ANSI A137.1 apply to Work of this Section unless otherwise specified.

B. ANSI A108 Series: ANSI A108.01, ANSI A108.02, ANSI A108.1A, ANSI A108.1B, ANSI A108.1C, ANSI A108.4, ANSI A108.5, ANSI A108.6, ANSI A108.8, ANSI A108.9, ANSI A108.10, ANSI A108.11, ANSI A108.12, ANSI A108.13, ANSI A108.14, ANSI A108.15, ANSI A108.16, and ANSI A108.17, which are contained in "American National Standard Specifications for Installation of Ceramic Tile."

C. Module Size: Actual tile size plus joint width indicated.

D. Face Size: Actual tile size, excluding spacer lugs.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Samples for Verification:

1. Assembled samples with grouted joints for each type and composition of tile and for each color and finish required, at least 12 inches square and mounted on rigid panel. Use grout of type and in color or colors approved for completed work.

C. Submittal List:

Reference	Submittal Item	Quantity	Action
1.4A	Product Data	X	R
1.4B	Samples for Verification	X	R

X Submit quantity specified in Division 01 Section Administrative Requirements.
R Review each submittal, mark to indicate action taken, and return.
I Submittal is for information or record purposes only. No action will be taken.

1.4 QUALITY ASSURANCE

A. Source Limitations for Tile: Obtain all tile of same type and color or finish from one source or producer.

1. Obtain tile from same production run and of consistent quality in appearance and physical properties for each contiguous area.

B. Source Limitations for Setting and Grouting Materials: Obtain ingredients of a uniform quality for each mortar, adhesive, and grout component from a single manufacturer and each aggregate from one source or producer.

C. Source Limitations for Other Products: Obtain each of the following products specified in this Section from a single manufacturer for each product:

1. Stone thresholds.
2. Joint sealants.
3. Cementitious backer units.
4. Metal edge strips.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use. Comply with requirement in ANSI A137.1 for labeling sealed tile packages.

B. Store tile and cementitious materials on elevated platforms, under cover, and in a dry location.

C. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.

D. Store liquid latexes and emulsion adhesives in unopened containers and protected from freezing.

E. Handle tile that has temporary protective coating on exposed surfaces to prevent coated surfaces from contacting backs or edges of other units. If coating does contact bonding surfaces of tile, remove coating from bonding surfaces before setting tile.

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Do not install tile until construction in spaces is complete and ambient temperature and humidity conditions are maintained at the levels indicated in referenced standards and manufacturer's written instructions.

1.7 EXTRA MATERIALS

A. Furnish extra materials that match and are from same production runs as products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Tile and Trim Units: Furnish quantity of full-size units equal to 2 percent of amount installed, for each type, composition, color, pattern, and size indicated. Extra stock shall be from the same production run as installed materials.
2. Grout: Furnish quantity of grout equal to 3 percent of amount installed for each type, composition, and color indicated.

PART 2 - PRODUCTS

2.1 PRODUCTS, GENERAL

A. ANSI Ceramic Tile Standard: Provide tile that complies with ANSI A137.1, "Specifications for Ceramic Tile," for types, compositions, and other characteristics indicated.

1. Provide tile complying with Standard grade requirements, unless otherwise indicated.
2. Provide Vitreous type tile complying with ASTM C373-88 for water absorption in Food Processing areas, whether new or to match or replace existing tiles.

B. ANSI Standards for Tile Installation Materials: Provide materials complying with ANSI A108.02, ANSI standards referenced in other Part 2 articles, ANSI standards referenced by TCA installation methods specified in tile installation schedules, and other requirements specified.

C. Factory Blending: For tile exhibiting color variations within ranges selected during Sample submittals, blend tile in factory and package so tile units taken from one package show same range in colors as those taken from other packages and match approved Samples.

D. Mounting: For factory-mounted tile, provide back- or edge-mounted tile assemblies as standard with manufacturer, unless otherwise indicated.

1. Where tile is indicated for installation in food processing areas, do not use back- or edge-mounted tile assemblies unless tile manufacturer specifies in writing that this type of mounting is suitable for installation indicated and has a record of successful in-service performance.

E. Factory-Applied Temporary Protective Coating: Where indicated under tile type, protect exposed surfaces of tile against adherence of mortar and grout by precoating with continuous film of petroleum paraffin wax, applied hot. Do not coat unexposed tile surfaces.

F. Colors, Textures, and Patterns: Where manufacturer's standard products are indicated for tile, grout, and other products requiring selection of colors, surface textures, patterns, and other appearance characteristics, provide specific products or materials complying with the following requirements:

1. As indicated by manufacturer's designations.

2.2 MANUFACTURERS

A. Basis-of-Design Products: To establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of other manufacturers, a specific manufacturer's product is named and accompanied by the words "basis of design", including make or model number or other designation. Subject to compliance with requirements, provide either the named products or equal products.

2.3 TILE PRODUCTS

A. Glazed Wall Tile for Thin-Set Mortar Installations:

1. Basis-of-Design Product: Daltile; Div. of Dal-Tile International Inc.; product as indicated by manufacturer's designations.
2. Module Size: 4-1/4 by 4-1/4 inches.
3. Thickness: 5/16 inch.
4. Face: Pattern of design indicated, with manufacturer's standard edges.
5. Finish: Semi-gloss glaze.
6. Mounting: Factory back-mounted unless otherwise indicated by reference to manufacturer’s product.
7. Glazed Wall Tile Trim Units for Thin-Set Mortar Installations: Coordinated with sizes and coursing of adjoining flat tile where applicable, and matching characteristics of adjoining flat tile. Provide shapes as follows, selected from manufacturer's standard shapes:

   a. External Corners: Surface bullnose, module size 4-1/4 by 4-1/4 inches No. S-4449.
   b. Internal Corners: Surface coved internal angle, module size 4-1/4 by 4-1/4 inches, No. A-3401.
   c. Base: Sanitary cove:

      1) Square top unless otherwise indicated, module size 4-1/4 by 4-1/4 inches, No. A-3401.
      2) Internal corners: Field-butted square corners except with coved base designed to fit with stretcher shapes, module size 4-1/4 by 4-1/4 inches, No. A-3401.
      3) External corners: Unless otherwise indicated, surface bullnose, square top, module size 4-1/4 by 4-1/4 inches, No. SCR-L-3401.

B. Wall Tile for Thin-Set Mortar Installations

a. Basis-of-Design Product: Crossville, Inc. Model Buenos Aires Mood, as indicated on Finish Schedule.
b. Module Size: 12 x 24.
c. Thickness: 10.5 mm.
d. Face: Pattern of design indicated, with manufacturer's standard edges.
e. Finish: Unpolished as indicated on Finish Schedule.
f. Mounting: Factory back-mounted unless otherwise indicated by reference to manufacturer’s product.
g. Color: VS152 UP, Pampa, as indicated on Finish Schedule.

C. Wall Tile for Thin-Set Mortar Installations

a. Basis-of-Design Product: Crossville, Inc. Model Buenos Aires Mood, as indicated on Finish Schedule.
b. Module Size: 4 x 24.
c. Thickness: 10.5 mm.
d. Face: Pattern of design indicated, with manufacturer's standard edges.
e. Finish: Polished as indicated on Finish Schedule.
f. Mounting: Factory back-mounted unless otherwise indicated by reference to manufacturer's product.
g. Color: VS152 PO, Pampa, as indicated on Finish Schedule.

D. CT-7 - Unpolished Floor Paver Tile for Thin-Set Mortar Installations

a. Basis-of-Design Product: Crossville, Inc.; Model Now, as indicated on Finish Schedule by manufacturer's designations.
b. Composition: Porcelain.
c. Facial Dimensions: 18 by 18 inches.
d. Thickness: 7/16 inch.
e. Face: Pattern of design indicated, with square or cushion edges.
f. Color: 4EF6, Rust.
g. For latex-portland cement-mortared and -grouted paver tile, precoat with temporary protective coating.
h. Unpolished Paver Tile Trim Units for Thin-Set Mortar Installations: Matching characteristics of adjoining flat tile and coordinated with sizes and coursing of adjoining flat tile where applicable. Provide shapes as follows, selected from manufacturer's standard shapes:
1) Base: Coved.
2) Bullnose top.
3) Internal corners.
4) External corners.

E. CT-8 - Unpolished Floor Paver Tile for Thin-Set Mortar Installations

a. Basis-of-Design Product: Crossville, Inc.; Model Now, as indicated on Finish Schedule by manufacturer's designations.
b. Composition: Porcelain.
c. Facial Dimensions: 6 by 12 inches.
d. Thickness: 7/16 inch.
e. Face: Pattern of design indicated, with square or cushion edges.
f. Color: 4EF6, Rust.
g. For latex-portland cement-mortared and -grouted paver tile, precoat with temporary protective coating.
h. Unpolished Paver Tile Trim Units for Thin-Set Mortar Installations: Matching characteristics of adjoining flat tile and coordinated with sizes and coursing of adjoining flat tile where applicable. Provide shapes as follows, selected from manufacturer's standard shapes:
1) Base: Coved.
2) Bullnose top.
3) Internal corners.
4) External corners

F. Quarry Tile
1. Basis of Design Product: Daltile; Div. Of Dal-Tile International Inc.; product as indicated by manufacturer's designation.
2. Description: Unglazed quarry tiles, naturally stained and slip-resistant.
3. Color and Finish: Match existing.
4. Tile Thickness: Match Existing.
5. Accessories: Cove trim; Cove inside corner; and Cove Corner to match existing.

2.4 THRESHOLDS

A. Fabricate to sizes and profiles indicated or required to provide transition between adjacent floor finishes.

1. Bevel edges at 1:2 slope, aligning lower edge of bevel with adjacent floor finish. Limit height of bevel to 1/2 inch or less, and finish bevel to match face of threshold.

B. Marble Thresholds: ASTM C 503 with a minimum abrasion resistance of 10 per ASTM C 1353 or ASTM C 241 and with honed finish.

1. Description: Uniform, fine- to medium-grained white stone with gray veining.

2.5 SETTING MATERIALS

A. Latex-Portland Cement Mortar (Thin Set). ANSI A118.4:

1. Provide prepackaged dry-mortar mix combined with acrylic resin or styrene-butadiene-rubber liquid-latex additive at Project site.
2. For wall applications, provide nonsagging mortar that complies with Paragraph F-4.6.1 in addition to the other requirements in ANSI A118.4.

2.6 GROUT MATERIALS

A. Polymer-Modified Tile Grout. ANSI A118.7.

1. Polymer Type: Acrylic resin or styrene-butadiene rubber in liquid-latex form for addition to prepackaged dry-grout mix.

a. Unsanded grout mixture for joints 1/8 inch and narrower. Color as indicated.
b. Sanded grout mixture for joints 1/8 inch and wider. Color as indicated.

B. Water-Cleanable Epoxy Grout: ANSI A118.3.

1. Provide product capable of withstanding continuous and intermittent exposure to temperatures of up to 140 deg F and 212 deg F, respectively, and certified by manufacturer for intended use.
2. Use at all food handling and food processing areas where quarry or paver tile is used.

2.7 ELASTOMERIC SEALANTS

A. General: Provide sealants, primers, backer rods, and other sealant accessories that comply with the following requirements and with the applicable requirements in Division 07 Section Joint Sealants.

1. Use sealants that have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
2. Use primers, backer rods, and sealant accessories recommended by sealant manufacturer.

B. Colors: Provide colors of exposed sealants to match colors of grout in tile adjoining sealed joints, unless otherwise indicated.

2.8 MISCELLANEOUS MATERIALS

A. Trowelable Underlayments and Patching Compounds: Latex-modified, portland cement-based formulation provided or approved by manufacturer of tile-setting materials for installations indicated.

B. Temporary Protective Coating: Either product indicated below that is formulated to protect exposed surfaces of tile against adherence of mortar and grout; compatible with tile, mortar, and grout products; and easily removable after grouting is completed without damaging grout or tile.

1. Petroleum paraffin wax, fully refined and odorless, containing at least 0.5 percent oil with a melting point of 120 to 140 deg F per ASTM D 87.
2. Grout release in form of manufacturer's standard proprietary liquid coating that is specially formulated and recommended for use as temporary protective coating for tile.

C. Tile Cleaner: A neutral cleaner capable of removing soil and residue without harming tile and grout surfaces, specifically approved for materials and installations indicated by tile and grout manufacturers.

D. Metal Edge Strips: Angle or L-shape, height to match tile and setting-bed thickness, metallic or combination of metal and PVC or neoprene base, designed specifically for flooring applications; stainless-steel, ASTM A 666, 300 Series exposed-edge material.

E. Grout Sealer: Manufacturer's standard silicone product for sealing grout joints and that does not change color or appearance of grout.

2.9 MIXING MORTARS AND GROUT

A. Mix mortars and grouts to comply with referenced standards and mortar and grout manufacturers' written instructions.

B. Add materials, water, and additives in accurate proportions

C. Obtain and use type of mixing equipment, mixer speeds, mixing containers, mixing time, and other procedures to produce mortars and grouts of uniform quality with optimum performance characteristics for installations indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions where tile will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of installed tile.

1. Verify that substrates for setting tile are firm, dry, clean, free of coatings that are incompatible with tile-setting materials including curing compounds and other substances that contain soap, wax, oil, or silicone; and comply with flatness tolerances required by ANSI A108.01 for installations.
2. Verify that concrete substrates for tile floors installed with adhesives or thin-set mortar comply with surface finish requirements in ANSI A108.01 for installations indicated.

a. Verify that surfaces that received a steel trowel finish have been mechanically scarified.
b. Verify that protrusions, bumps, and ridges have been removed by sanding or grinding.

3. Verify that installation of grounds, anchors, recessed frames, electrical and mechanical units of work, and similar items located in or behind tile has been completed before installing tile.
4. Verify that joints and cracks in tile substrates are coordinated with tile joint locations; if not coordinated, adjust joint locations in consultation with Contracting Officer.

B. Proceed with installation only after correcting unsatisfactory conditions.

3.2 PREPARATION

A. Fill cracks, holes, and depressions in concrete substrates for tile floors installed with adhesives or thin-set mortar with trowelable leveling and patching compound specifically recommended by tile-setting material manufacturer.

B. Blending: For tile exhibiting color variations within ranges selected during Sample submittals, verify that tile has been factory blended and packaged so tile units taken from one package show same range of colors as those taken from other packages and match approved Samples. If not factory blended, either return to manufacturer or blend tiles at Project site before installing.

C. Field-Applied Temporary Protective Coating: Where indicated under tile type or needed to prevent grout from staining or adhering to exposed tile surfaces, precoat them with continuous film of temporary protective coating, taking care not to coat unexposed tile surfaces.

3.3 TILE INSTALLATION

A. Comply with TCA's "Handbook for Ceramic Tile Installation" for TCA installation methods specified in tile installation schedules. Comply with parts of the ANSI A108 Series "Specifications for Installation of Ceramic Tile" that are referenced in TCA installation methods, specified in tile installation schedules, and apply to types of setting and grouting materials used.

1. For the following installations, follow procedures in the ANSI A108 Series of tile installation standards for providing 95 percent mortar coverage:

a. Tile floors in food processing areas.
b. Tile floors composed of tiles 8 by 8 inches or larger.
c. Tile floors composed of rib-backed tiles.

B. Extend tile work into recesses and under or behind equipment and fixtures to form complete covering without interruptions, unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.

C. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.

D. Jointing Pattern: Lay tile in grid pattern, unless otherwise indicated. Lay out tile work and center tile fields in both directions in each space or on each wall area. Adjust to minimize tile

cutting and the use of pieces that are less than half of a tile. Provide uniform joint widths, unless otherwise indicated.

1. For tile mounted in sheets, make joints between tile sheets same width as joints within tile sheets so joints between sheets are not apparent in finished work.
2. Where adjoining tiles on floor, base, walls, or trim are specified or indicated to be same size, align joints.
3. Where tiles are specified or indicated to be whole integer multiples of adjoining tiles on loor, base, walls, or trim, align joints unless otherwise indicated.

E. Joint Widths: Unless otherwise indicated, install tile with the following joint widths:

1. Paver Tile: 1/4 inch.
2. Glazed Wall Tile: 1/16 inch.

F. Expansion Joints: Provide expansion joints and other sealant-filled joints, including control, contraction, and isolation joints, where indicated. Form joints during installation of setting materials, mortar beds, and tile. Do not saw-cut joints after installing tiles.

1. Where joints occur in concrete substrates, locate joints in tile surfaces directly above them.
2. Prepare joints and apply sealants to comply with requirements in Division 07 Section "Joint Sealants."
3. Indicate expansion joints and other sealant filled joints at perimeter of floor tiles where abutting walls and columns, including control, contraction, and isolation joints, on Drawings.

G. Lay out tile wainscots to dimensions indicated or to next full tile beyond dimensions indicated.

H. Stone Thresholds: Install stone thresholds at locations indicated, in same type of setting bed as adjacent floor unless otherwise indicated.

1. Set thresholds in latex-portland cement mortar (thin set) for locations where mortar bed would otherwise be exposed above adjacent nontile floor finish.

I. Metal Edge Strips: Install at locations indicated.

J. Grout Sealer: Apply grout sealer to cementitious grout joints in tile floors according to grout-sealer manufacturer's written instructions. As soon as grout sealer has penetrated grout joints, remove excess sealer and sealer from tile faces by wiping with soft cloth.

K. Grouting Standards: Grout tile to comply with requirements of the following tile installation standards:

1. For ceramic tile grouts (latex-portland cement grouts), comply with ANSI A108.10.

3.4 CLEANING AND PROTECTING

A. Cleaning: On completion of placement and grouting, clean all ceramic tile surfaces so they are free of foreign matter.

1. Remove latex-portland cement grout residue from tile as soon as possible.
2. Clean grout smears and haze from tile according to tile and grout manufacturer's written instructions but no sooner than 10 days after installation. Use only cleaners

recommended by tile and grout manufacturers and only after determining that cleaners are safe to use by testing on samples of tile and other surfaces to be cleaned. Protect metal surfaces and plumbing fixtures from effects of cleaning. Flush surfaces with clean water before and after cleaning.

3. Remove temporary protective coating by method recommended by coating manufacturer and that is acceptable to tile and grout manufacturer. Trap and remove coating to prevent drain clogging.

B. Protect installed tile work with kraft paper or other heavy covering during construction period to prevent staining, damage, and wear. If recommended by tile manufacturer, apply coat of neutral protective cleaner to completed tile walls and floors.

C. Prohibit foot and wheel traffic from tiled floors for at least seven days after grouting is completed.

D. Before final inspection, remove protective coverings and rinse neutral protective cleaner from tile surfaces.

3.5 INTERIOR TILE INSTALLATION SCHEDULE

A. Interior Floor Tile Installations, Concrete Subfloor:

1. Tile Installation F113: Thin-set mortar; TCA F113 and ANSI A108.5.

a. Tile Type: Unpolished Paver Tile.
b. Thin-Set Mortar: Latex portland cement mortar.
c. Grout: Polymer-modified unsanded grout. Color as indicated.

B. Interior Wall Tile Installations, Wood or Metal Studs or Furring:

1. Tile Installation W243: Thin-set mortar on gypsum board; TCA W243 and ANSI A108.5.
2. Tile Type: Glazed wall tile.
3. Thin-Set Mortar: Latex- portland cement mortar.
4. Grout: Polymer-modified unsanded grout. Color as indicated.

END OF SECTION

SECTION 09 51 00

ACOUSTICAL CEILINGS

(Edited from DeCA June 2011 Design Criteria)

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Ceilings composed of acoustical panels and exposed suspension systems.

2. Clean room tiles and accessories.

1.2 PERFORMANCE REQUIREMENTSs

A. Seismic Performance:

1. Acoustical ceiling system shall withstand the effects of earthquake motions determined according to ASCE/SEI 7-05, Chapter 13 as referenced by the International Building Code (IBC), Chapter 16. Specific seismic requirements for suspended ceiling are indicated in ASCE section 13.5.6.

B. Delegated Design:

1. Engage a qualified professional engineer, as defined in Division 1 Section "Reference Standards and Definitions," to design and size acoustical panel ceiling system components, including comprehensive engineering analysis, in accordance with seismic performance requirements.

a. Refer to Division 1 Section "Description of Work" for seismic design load data.

1.3 SUBMITTALS

A. Product Data:

1. For each type of acoustical panel specified.

B. Delegated-Design Submittal:

1. For design of acoustical ceiling system withstanding the effects of earthquake motions.

C. Field quality-control reports.

D. Qualification Data:

1. For testing agency.

E. Product Test Reports:

1. For each acoustical panel ceiling, for tests performed by a qualified testing agency.

F. Evaluation Reports:

1. For each acoustical panel ceiling suspension system and anchor and fastener type, from ICC-ES.

G. Maintenance Data

1. For finishes to include in maintenance manuals.

H. Submittal List:

Reference	Submittal Item	Quantity	Action
1.2A	Product Data	X	R
1.2B	Delegated-Design Submittal	X	R
1.2C	Field Quality-Control Reports	X	I
1.2D	Qualification Data	X	I
1.2E	Product Test Reports	X	I
1.2F	Evaluation Reports	X	I
1.2G	Maintenance Data	X	I

X Submit quantity specified in Division 01 Section Administrative Requirements.
R Review each submittal, mark to indicate action taken, and return.
I Submittal is for information or record purposes only. No action will be taken.

1.4 QUALITY ASSURANCE

A. Installer Qualifications:

1. Engage an experienced Installer who has completed acoustical panel ceilings similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.

B. Single-Source Responsibility for Ceiling Units and Suspension System:

1. Obtain acoustical ceiling panel and suspension system from a single source with resources to provide products of consistent quality in appearance and physical properties without delaying the Work.

C. Fire-Test-Response Characteristics:

1. Provide acoustical panel ceilings that comply with the following requirements:

a. Surface-Burning Characteristics: Provide acoustical panels with the following surface-burning characteristics complying with ASTM E 1264 for Class A materials as determined by testing identical products per ASTM E 84:

1) Smoke-Developed Index: 50 or less for Class A ceiling.

D. Seismic Standard:

1. Provide acoustical panel ceilings designed and installed to withstand the effects of earthquake motions indicated in Division 01 Section Summary of Work, according to ASCE 7-05, "Minimum Design Loads for Buildings and Other Structures," Section 13, "Seismic Design Requirements for Nonstructural Components."

E. Testing Agency Qualification:

1. Qualified according to NVLAP for testing indicated.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver acoustical panels and suspension system components to Project site in original, unopened packages and store them in a fully enclosed space where they will be protected against damage from moisture, direct sunlight, surface contamination, and other causes. Before installing acoustical panels, permit them to reach room temperature and a stabilized moisture content. Handle acoustical panels carefully to avoid chipping edges or damaging units in any way.

1.6 PROJECT CONDITIONS

A. Space Enclosure and Environmental Limitations: Do not install acoustical panel ceilings until spaces are enclosed and weatherproof, wet-work in spaces is completed and dry, ambient temperature and humidity conditions are being maintained at the levels indicated for Project when occupied for its intended use, and work above ceilings is complete and accepted by Government.

1.7 COORDINATION

A. Coordinate layout and installation of acoustical panels and suspension system components with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system components (if any), and partition assemblies (if any).

1.8 EXTRA STOCK

A. General:

1. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

B. Acoustical Ceiling Panels:

1. Full-size panels equal to 1.0 percent of quantity installed.

C. Suspension System Components:

1. Quantity of each exposed component equal to 1.0 percent of quantity installed.

D. Seismic Clips:

1. Equal to 1.0 percent of amount installed.

1.9 WARRANTY

A. General Warranty:

1. The special warranties specified in this Article shall not deprive the Government of other rights the Government may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.

B. Special Acoustical Panel Ceiling System Warranty:

1. Submit a written warranty executed by acoustical panel ceiling system manufacturer to repair or replace acoustical panel ceiling system that falls within the warranty period. Failures include, but are not limited to:

a. Acoustical Panels: Sagging or warping.

1) Warranty Period: Ten years from date of Substantial Completion.

b. Grid System: Rusting and manufacturing defects.

1) Warranty Period: Ten years from date of Substantial Completion.

c. Mold, Mildew, and Bacteria Resistance.

1) Warranty Period: 30 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Products: To establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of other manufacturers, a specific manufacturer's product is named and accompanied by the words "basis of design," including make or model number or other designation. Subject to compliance with requirements, provide either the named products or equal products.

2.2 ACOUSTICAL PANELS, GENERAL

A. Acoustical Panel Standard:

1. Provide manufacturer's standard panels of configuration indicated that comply with ASTM E 1264 classifications as designated by types, patterns, acoustical ratings, and light reflectance, unless otherwise indicated.
2. Mounting Method for Measuring Noise Reduction Coefficient (NRC): ASTM C 423.

3. Test Method for Ceiling Attenuation Class (CAC): Where acoustical panel ceilings are specified to have a CAC, provide units identical to those tested per ASTM E 1414 by a qualified testing agency.

B. Acoustical Panel Colors and Patterns:

1. Match appearance characteristics indicated for each product type.

2.3 ACOUSTICAL PANELS

A. Acoustical Panel Characteristics:

1. Provide panels complying with ASTM E 1264 and Basis-Of-Design Product for characteristics described below:

a. Pattern: CE (perforated, small holes and lightly textured).
b. Type and Form: Type III, mineral base with washable painted finish; Form 2 units, water felted.
c. Colors: White.
d. NRC (Noise Reduction Coefficient): 0.55.
e. CAC (Ceiling Attenuation Class): 35.
f. LR (Light Reflectance): 0,85.
g. Edge/Joint Detail: Angled Tegular for interface with basis-of-design exposed tee grid system.
h. Thickness: 5/8 inch.
i. Modular Size: 24- by 24-inches.
j. Sag resistant.
k. Broad Spectrum Antimicrobial Fungicide and Bactericide Treatment: Provide acoustical panels treated, on surface and back of panels, with manufacturer's standard antimicrobial formulation that inhibits fungus, mold, mildew, and gram-positive and gram-negative bacteria and showing no mold, mildew, or bacterial growth when tested according to ASTM D 3273.

B. Basis-of-Design Product:

1. Armstrong World Industries, Inc.
2. Type: Fine fissured tegular.
3. Item Number: 1732.
4. Dimensional Stability: HumiGuard Plus. Resistance to high humidity conditions.
5. Mold and Mildew Resistance: Surface and back treated with BioBlock paint containing a special biocide that inhibits or retards growth of mold and mildew.

2.4 CLEAN ROOM PANELS

A. Provide panels complying with ASTM E1264 and Basis of Design Product for characteristics described below:

a. Pattern: VL Unperforated, Class 5.
b. Type and Form: Type III, mineral base with washable painted finish; water felted.
c. Colors: White.
d. CAC (Ceiling Attenuation Class): 40.
e. LR (Light Reflectance): 0,80.
f. Fire Rating: Fire Guard

g. Edge/Joint Detail: Angled Tegular for interface with basis-of-design exposed tee grid system.
h. Thickness: 5/8 inch.
i. Modular Size: 24- by 24-inches.
j. Sag resistant.
k. Suspension System: Prelude 15/16 inch square lay-in.

2. BioBlock Plus Antimicrobial Fungicide and Bactericide Treatment: Provide acoustical panels treated, on surface and back of panels, with manufacturer's standard antimicrobial formulation that inhibits fungus, mold, mildew, and gram-positive and gram-negative bacteria and showing no mold, mildew, or bacterial growth for 30 years.

2.5 METAL SUSPENSION SYSTEMS, GENERAL

A. Metal Suspension-System Standard:

1. Provide manufacturer's standard direct-hung metal suspension systems of types, structural classifications, and finishes indicated that comply with applicable requirements in ASTM C 635.
2. Recycled Content Criteria: 25 percent.

B. Attachment Devices:

1. Size for five times design load indicated in ASTM C 635, Table 1, Direct Hung unless otherwise indicated. Comply with seismic design requirements.

C. Wire Hangers, Braces, and Ties:

1. Provide wires complying with the following requirements

a. Zinc-Coated, Carbon-Steel Wire: ASTM A 641, Class 1 zinc coating, soft temper.
b. Size: Select wire diameter so its stress at three times hanger design load (ASTM C 635, Table 1, Direct-Hung), will be less than yield stress of wire, but provide not less than 0.106-inch diameter wire.

2.6 METAL SUSPENSION SYSTEM

A. Wide-Face Capped Double-Web Steel Suspension System:

1. Main and cross-runners roll-formed from commercial-quality hot dipped galvanized steel coating. Exposed surfaces chemically cleansed, capping prefinished galvanized steel in baked polyester. 15/16-inch wide metal caps on flanges; other characteristics as follows:

a. Structural Classification: Intermediate-Duty System.
b. Cross Tees: Light gauge steel with rotary stitching to improve column strength and staked-on end detail allowing easy cross tee removal and remounting.
c. End Condition of Cross-Runners: Override (stepped) or butt-edge type, as standard with manufacturer.
d. Cap Material and Finish: Steel sheet baked polyester painted to match color of panels supported.

B. Basis-of-Design Product:

1. Armstrong World Industries, Inc.: Prelude XL 15/16-inch Exposed Tee System.

2.7 METAL EDGE MOLDINGS AND TRIM

A. Roll-Formed, Sheet-Metal Edge Moldings and Trim: Type and profile indicated or, if not indicated, manufacturer's standard moldings for edges and penetrations that comply with seismic design requirements; formed from sheet metal of same material, finish, and color as that used for exposed flanges of suspension-system runners.

1. Provide manufacturer's standard edge moldings that fit acoustical panel edge details and suspension systems indicated and that match width and configuration of exposed runners unless otherwise indicated.
2. For lay-in panels with reveal edge details, provide stepped edge molding that forms reveal of same depth and width as that formed between edge of panel and flange at exposed suspension member.
3. For circular penetrations of ceiling, provide edge moldings fabricated to diameter required to fit penetration exactly.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and structural framing to which acoustical panel ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Measure each ceiling area and establish the layout of acoustical panels to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width panels at borders, and conform to the layout shown on reflected ceiling plans.

3.3 INSTALLATION

A. General:

1. Install acoustical panel ceilings to comply with publications referenced below and per manufacturer's written instructions.

a. Standard for Ceiling Suspension System Installations: Comply with ASTM C 636 and seismic design requirements indicated**,** according to CISCA's "Ceiling Systems Handbook."

2. Suspend ceiling hangers from building's structural members and as follows:

   a. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of the supporting structure or of the ceiling suspension system.
   b. Splay hangers only where required to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
   c. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with the location of hangers at spacings required to support standard suspension system members, install supplemental suspension members and hangers in the form of trapezes or equivalent devices. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards and publications.
   d. Secure wire hangers to ceiling suspension members and to supports above with a minimum of three tight turns. Connect hangers either directly to structures or to inserts, eye screws, or other devices that are secure, that are appropriate for substrate, and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
   e. When steel framing does not permit installation of hanger wires at spacing required, install carrying channels or other supplemental support for attachment of hanger wires.
   f. Do not attach hangers to steel deck tabs.
   g. Do not attach hangers to steel roof deck. Attach hangers to structural members.
   h. Space hangers not more than 48 inches o.c. along each member supported directly from hangers, unless otherwise shown; and provide hangers not more than 8 inches from ends of each member.

3. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical panels.

   a. Attach moldings to substrate with screws at intervals not over 16 inches o.c. and not more than 3 inches from ends, leveling with ceiling suspension system to a tolerance of 1/8 inch in 12 feet. Miter corners accurately and connect securely.

4. Install suspension system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.
5. Install acoustical panels with undamaged edges and fitted accurately into suspension system runners and edge moldings. Scribe and cut panels at borders and penetrations to provide neat, precise fit.

   a. For reveal-edged panels on suspension system runners, install panels with bottom of reveal in firm contact with top surface of runner flanges.
   b. Paint the cut panel edges remaining exposed after installation; match color of exposed panel surfaces using coating recommended for this purpose by acoustical panel manufacturer.

3.4 FIELD QUALITY CONTROL

A. Statement of Special Inspections:

1. Perform periodic special inspections of the seismic-force-resisting systems during the anchorage and the installation of suspended ceiling grids.

B. Special Inspections:

1. Engage a qualified special inspector to perform the following special inspections:

a. Seismic design compliance. Perform special inspection of acoustical panel ceiling grids in accordance with requirements of ASCE 7-05, Appendix 11A “Quality Assurance Provisions,” 11A.1.3.9 subparagraph 2, as applicable to Project.

C. Defective Work:

1. Acoustical panel ceiling hangers, anchors, and fasteners will be considered defective if they do not pass inspections.

D. Prepare Inspection Reports:

1. Provide special inspection reports directly to the Government.

3.5 CLEANING

A. Clean exposed surfaces of acoustical panel ceilings, including trim, edge moldings, and suspension system members. Comply with manufacturer's instructions for cleaning and touchup of minor finish damage. Remove and replace ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION

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SECTION 09 65 19

RESILIENT TILE FLOORING

(Edited from DeCA June 2011 Design Criteria)

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Vinyl enhanced tile (VET).
2. Resilient wall base and accessories.
3. Metal accessories.

B. Related Sections:

1. Division 03 Section “Cast-In-Place Concrete” and Cast-In-Place Concrete Design Criteria for slab finishes in spaces to receive resilient floor tile and for vapor retarder and granular base below slabs-on–grade.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Samples for Verification:

1. Full-size units of each color and pattern of resilient floor tile required.
2. Resilient Wall Base and Accessories: Manufacturer's standard-size Samples, but not less than 12 inches long, of each resilient product color and pattern required.

C. Maintenance Data: For each type of floor tile to include in maintenance manuals.

D. Moisture/Bond Tests: Submit moisture/bond tests prior to installation of resilient tile.

E. Submittal List:

Reference	Submittal Item	Quantity	Action
1.2A	Product Data	X	R
1.2B	Samples for Verification	X	R
1.2C	Maintenance Data	X	I
1.2D	Moisture/Bond Tests	X	I

X Submit quantity specified in Division 01 Section Administrative Requirements.
R Review each submittal, mark to indicate action taken, and return.
I Submittal is for information or record purposes only. No action will be taken.

1.3 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who employs workers for this Project who are competent in techniques required by manufacturer for floor tile installation indicate.

B. Fire-Test-Response Characteristics: As determined by testing identical products according ASTM E 648 or NFPA 253 by a qualified testing agency.
   1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Store resilient products and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F or more than 90 deg F. Store tiles on flat surfaces.

1.5 PROJECT CONDITIONS

A. Maintain temperatures within range recommended by manufacturer, but not less than 70 deg F or more than 95 deg F, in spaces to receive floor tile during the following time periods:

   1. 48 hours before installation.
   2. During installation.
   3. 48 hours after installation.

B. Until Substantial Completion, maintain ambient temperatures within range recommended manufacturer, but not less than 55 deg F or more than 95 deg F.

C. Close spaces to traffic during floor covering installation.

D. Close spaces to traffic for 48 hours after floor covering installation.

E. Install resilient products after other finishing operations, including painting, have been completed.

1.6 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents. Furnish extra materials from the same production run as installed materials.

   1. Furnish not less than one percent of each type, color, pattern, class, wearing surface, and size of resilient tile flooring, accessory, and wall base installed.

PART 2 - PRODUCTS

2.1 VINYL ENHANCED FLOOR TILE (VET)

A. Basis-of-Design Products: To establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of other manufacturers, a specific

manufacturer's product is named and accompanied by the words "basis of design," including make or model number or other designation. Subject to compliance with requirements, provide either the named products or equal products.

B. Basis-of-Design Product:

1. Azrock VET Vinyl Enhanced Tile System by Tarket, Inc.

C. Tile Standard: ASTM F 1066, Class 2, through-pattern tile.

D. Wearing Surface: As indicated.

E. Adhesive: Perform a moisture test and select appropriate adhesive according to results from the following and manufacturer’s recommendations:

1. Spray Smart 120-8 Gold 7/11 System (up to 7 lbs. Of moisture and 11 pH).

2. Spray Smart 121-8 Platinum 10/12 System (up to 10 lbs. Of moisture and 12 pH).

F. Size: 12 by 12 inches.

G. Colors and Patterns: As indicated by manufacturer's designations and Drawing notes.

2.2 RESILIENT WALL BASE (RB) Coordinate below with Drawings and Interior Finishes Legend.

A. Basis-of-Design Products: To establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of other manufacturers, a specific manufacturer's product is named and accompanied by the words "basis of design," including make or model number or other designation. Subject to compliance with requirements, provide either the named products or equal products.

B. Basis-of-Design Product:

1. Johnsonite.

C. Resilient Base Standard: ASTM F 1861.

1. Material Requirement: Type TP (rubber, thermoplastic).
2. Manufacturing Method: Group I (solid, homogeneous) or Group II (layered).
3. Style:

a. Cove (base with toe) at resilient tile flooring and as indicated.
b. Straight (flat or toeless) at carpet and as indicated.

D. Minimum Thickness: 0.125 inch.

E. Height: 4 inches

G. Lengths: Coils in manufacturer's standard length.

H. Outside Corners: Preformed.

I. Inside Corners: Preformed.

J. Finish: Smooth.

K. Colors and Patterns: As indicated by manufacturer's designations and Drawing notes.

2.3 RESILIENT MOLDING ACCESSORY

A. Vinyl Flooring Molding Accessory:

1. Description: Reducer strip for resilient flooring.
2. Material: Vinyl.
3. Profile and Dimensions: Tapered or bullnose edge, thickness matching flooring, and width not less than one inch.
4. Color: to coordinate with flooring.
5. Accessibility for the disabled:
   a. Provide edge, transition, and other flooring accessory materials that comply with accessibility requirements and Authorities Having Jurisdiction.

B. Metal Molding Accessory:

1. Description: Transition edge strip for resilient flooring.
2. Material: Stainless steel.
3. Profile and Dimensions: 2 inches wide by 1/4 inch thick; tapered edges of thickness matching flooring.
4. Use metal accessory at all areas where resilient flooring terminates at corridors leading to Staging and Receiving Areas.

2.4 RESILIENT STAIR NOSING

A. Resilient Stair Nosing Standard: FS RR-T-650.

1. Material Requirement:

   a. Rubber: Composition A.
   b. Vinyl: Composition B.

2. Surface Design: Class 1, Smooth (flat).

B. Nosing Style: Square, adjustable to cover angles between 60 and 90 degrees.

C. Nosing Height: 1-1/2 inches.

E. Thickness: 1/4 inch and tapered to back edge.

F. Size: Lengths and depths to fit each stair tread in one piece one or, for treads exceeding maximum lengths manufactured, in equal-length units.

G. Colors and Patterns: As indicated by manufacturer's designations and Drawing notes.

2.5 INSTALLATION MATERIALS

A. Basis-of-Design Products: Provide either the named products or products provided or approved by resilient tile flooring manufacturer for applications indicated.

B. Concrete Sealer:

1. Material recommended by resilient tile flooring manufacturer where required to ensure adhesion of resilient tile to concrete substrates, as determined from preconstruction resilient-tile-concrete-substrate tests and field tests.

C. Concrete Primer:

1. Basis-of-Design Product: Ardex Engineered Cements. Ardex P-51 Primer.

D. Trowelable Leveling and Patching Compounds:

1. For repairing substrates and ramping:

a. Basis-of-Design Product: Ardex Engineered Cements. Ardex SD-P InstantPatch.

2. For flash patching and skim coating:

a. Basis-of-Design Product: Ardex Engineered Cements. Ardex SD-F Feather Finish.

3. Do not use gypsum-based formulations.

E. Adhesives (Cements):

1. Basis-of-Design Product: The W.W. Henry Company, Henry 530 TilePro High-Performance "Fast Tack" Adhesive.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

B. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of floor tile.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Prepare substrates according to manufacturer's written recommendations to ensure adhesion of resilient products.

B. Slab must be level and smooth before installing flooring material.

C. Concrete Substrates: Prepare according to ASTM F 710.

1. Review prospective floor covering manufacturer’s recommendations for slab preparation. Identify requirements of levelness, texture, water vapor transmission

limits and similar criteria and compare against the found condition of the subject slab.

2. Remove dust, solvent, paint, wax, oil, grease, residual adhesive, adhesive removers, curing, sealing, hardening, or parting compounds, alkaline salts, excessive carbonation or laitence, mold mildew, and other foreign materials that might prevent adhesive bond.
3. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.
4. 48 hours, minimum, before testing substrate for moisture, bead-blast surfaces with an apparatus that abrades the concrete surface, contains the dispensed beads within the apparatus, and re-circulates the beads by vacuum pickup. Acid etching, mechanical sanding, or mechanical scarification will not be accepted.

    a. Bead-blast concrete surfaces where existing resilient flooring has been removed.
    b. Bead-blast concrete surfaces where new resilient flooring is required.

5. Moisture Testing: Perform tests recommended by manufacturer and as follows. Proceed with installation only after substrates pass testing.

    a. Perform anhydrous calcium chloride test, ASTM F 1869, or other test methods acceptable to the resilient flooring manufacturer. Proceed with installation of resilient flooring only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. in 24 hours.
    b. Prepare 3 test sites for the first 1,000 sq. ft. and include 1 more test for each additional 1,000 sq. ft. area.
    c. Proceed with installation only after substrates pass testing.

6. Alkalinity and Adhesion Testing: Perform tests recommended by manufacturer only after shot-blasting of surfaces has been completed. Proceed with installation only after substrates pass testing.

D. Concrete Sealing:

1. Seal concrete substrates, where recommended in writing by resilient tile flooring manufacturer, based on preconstruction resilient-tile-concrete-substrate tests or prior experience. Apply sealer to comply with resilient tile manufacturer's written instructions.

    a. Contract completion time will not be extended due to time interval between sealer application and flooring installation.

E. Leveling and Patching:

1. Use trowelable leveling and patching compound to fill cracks, holes, and depressions in substrates.

    a. Fill and smooth surface cracks, grooves, depressions, control joints and other non-moving joints, and other irregularities with latex patching or underlayment compound recommended by the resilient flooring manufacturer.

F. Material Preconditioning:

1. Move resilient products and installation materials into spaces where they will be installed at least 48 hours in advance of installation.

2. Do not install resilient products until they are same temperature as space where they are to be installed.

G. Substrate Preparation:

1. Sweep and vacuum clean substrates to be covered by resilient products immediately before installation. After cleaning, examine substrates for moisture, alkaline salts, carbonation, and dust. Proceed with installation only after unsatisfactory conditions have been corrected.

3.3 RESILIENT FLOOR TILE INSTALLATION

A. Comply with manufacturer's written instructions for installing floor tile.

B. Lay out tiles from center marks established with principle walls, discounting minor offsets, so tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths that equal less than one-half tile at perimeter.

1. Lay tiles square with room axis.

C. Match tiles for color and pattern by selecting tiles from cartons in the same sequence as manufactured and packaged, if so numbered. Discard broken, cracked, chipped, or deformed tiles.

1. Lay tiles with grain running in one direction, in pattern of colors and sizes indicated, and with joints in straight line.

D. Scribe, cut, and fit tiles to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, edgings, door frames, thresholds, and nosings.

1. Where a visible gap occurs between joints of vertical surfaces and edge of resilient flooring, install clear elastomeric joint sealant ES-3 as specified in Division 07 Section Joint Sealants to form a waterproof seal.

E. Extend tiles into toe spaces, door reveals, closets, and similar openings, except in Sales Areas and other customer areas; Extend flooring completely under checkstands, shelving, and movable display fixtures.

1. Install stair nosing where tile terminates at trench edge under display cases.

F. Extend tile behind kick plates of permanent (i.e. fixed & non-movable) refrigerated display cases utilizing remote refrigeration systems. It is not necessary to extend tile completely beneath these cases. Install continuous bead of silicone sealant along exposed edge of tile beneath fixtures to minimize potential of adhesive failure due to water seeping beneath resilient floor tile. Refrigeration cases utilizing self-contained refrigeration are considered moveable and shall have resilient floor tile installed completely underneath them.

G. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on floor tiles as marked on substrates. Use chalk or other nonpermanent, nonstaining marking device.

H. Install tiles on covers for telephone and electrical ducts and similar items in finished floor areas. Maintain overall continuity of color and pattern with pieces of tile installed on covers. Tightly adhere tile edges to substrates that abut covers and to cover perimeters.

I. Adhere tiles to flooring substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.

J. Hand roll tiles immediately after installation according to tile manufacturer's written instructions, except if rolling is not required for products specified.

3.4 RESILIENT WALL BASE INSTALLATION

A. Comply with manufacturer's written instructions for installing resilient base.

B. Apply resilient base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.

C. Install resilient base in lengths as long as practicable without gaps at seams and with tops of adjacent pieces aligned.

D. Tightly adhere resilient base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.

E. Do not stretch resilient base during installation.

F. On masonry surfaces or other similar irregular substrates, fill voids along top edge of resilient base with manufacturer's recommended adhesive filler material.

G. Preformed Corners: Install preformed corners before installing straight pieces.

3.5 RESILIENT ACCESSORY INSTALLATION

A. Comply with manufacturer's written instructions for installing resilient accessories.

B. Resilient Stair Accessories:

1. Use stair-tread-nose filler to fill nosing substrates that do not conform to tread contours.
2. Tightly adhere to substrates throughout length of each piece.

C. Resilient Molding Accessories: Butt to adjacent materials and tightly adhere to substrates throughout length of each piece. Install reducer strips at edges of carpet, resilient floor covering that would otherwise be exposed.

D. Install expansion joint insert strip in isolation joints around columns in slabs on grade to allow movement of tile below cap and keep tile from cracking; miter corners.

3.6 METAL ACCESSORY INSTALLATION

A. Install transition edge strips at edges of flooring as indicated. Anchor edge strips with No. 10 or larger flat head, countersunk, machine screws (MS) at spacings not to exceed 12 inches. Use lead shield for anchoring to concrete.

3.7 CLEANING AND PROTECTION

A. Comply with manufacturer's written instructions for cleaning and protection of resilient products.

B. Perform the following operations immediately after completing resilient product installation:

1. Remove adhesive and other blemishes from exposed surfaces.
2. Sweep and vacuum surfaces thoroughly.
3. Damp-mop surfaces to remove marks and soil.

a. Do not wash surfaces until after time period recommended by manufacturer.

C. Protect resilient products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period. Use protection methods recommended in writing by manufacturer.

D. Floor Polish: Remove soil, visible adhesive, and surface blemishes from resilient stair treads before applying liquid floor polish.

1. Apply two coat(s) of liquid floor polish.
2. Use commercially available product acceptable to manufacturer.

E. Cover products installed on horizontal surfaces with undyed, untreated building paper until final acceptance. Coordinate with manufacturers' written recommendations for products used.

F. F. Do not move heavy and sharp objects directly over surfaces. Place hardboard or plywood panels over flooring and under objects while they are being moved. Slide or roll objects over panels without moving panels.

1. When required by flooring manufacturer, allow a minimum of 72 hours after resilient tile installation before moving and installing equipment on flooring.

END OF SECTION

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SECTION 09 67 23

RESINOUS FLOORING

(Edited from DeCA June 2011 Design Criteria)

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. RES-1 - Chemical and thermal-shock resistant urethane mortar flooring.

B. Related Sections:

1. Division 03 Section Cast-In-Place Concrete and Cast-In-Place Concrete Design Criteria for concrete substrates to receive resinous flooring.
2. Division 07 Section Joint Sealants for sealants installed at joints in resinous flooring systems.

1.2 UNIT PRICE FOR OSMOTIC RESISTANT GROUT

A. Unit Price: Provide a unit price per square foot, with initial bid, for osmotic resistant grout application in the event concrete floor slab moisture tests indicate the need for same.

B. Procedures:

1. Unit price includes all necessary material, plus cost for delivery, installation, insurance, applicable taxes, overhead, and profit.
2. Government reserves the right to reject Contractor's measurement of work-in-place that involves use of established unit prices and to have this work measured, at Government's expense, by an independent surveyor acceptable to Contractor.

1.3 SUBMITTALS

A. Product Data: For each type of product specified. Include manufacturer's technical data, installation instructions, and recommendations for each resinous flooring component required.

B. Samples for Verification: Of each resinous flooring system required, 6 inches square, applied by Installer for this Project to a rigid backing, in color, texture, and finish indicated. Where finishes involve normal color and texture variations, include Sample sets showing the full range of variations expected.

C. Submittal List:

Reference	Submittal Item	Quantity	Action
1.3A	Product Data	X	R
1.3B	Samples for Verification	X	R

X Submit quantity specified in Division 01 Section Administrative Requirements.
R Review each submittal, mark to indicate action taken, and return.
I Submittal is for information or record purposes only. No action will be taken.

D. Material Certificates: For each resinous flooring component, from manufacturer.

E. Maintenance Data: For resinous flooring to include in maintenance manuals.

1.4 QUALITY ASSURANCE

A. Installer Qualifications:

1. Engage an experienced installer (applicator) who has specialized in installing resinous flooring similar in material, design, and extent to that indicated for this Project and who is acceptable to resinous flooring manufacturer. Contractor shall have completed at least five projects of similar size and complexity.
2. Engage an installer who employs only persons trained and approved by resinous flooring manufacturer for installing resinous flooring systems specified.

B. Source Limitations: Obtain primary resinous flooring materials, including primers, resins, hardening agents, and sealing or finish coats, through one source from a single manufacturer. Provide secondary materials including patching and fill material, joint sealant, and repair materials from manufacturer of primary materials.

C. Pre-Installation Conference: Conduct conference at Project site. Comply with requirements in Division 01 Section Administrative Requirements.

1. Review methods and procedures related to resinous flooring including, but not limited to, the following:

a. Meet with Contracting Officer’s representative; testing and inspecting agency representative; resinous flooring Installer; resinous flooring system manufacturer's representative; and installers whose work interfaces with or affects resinous flooring, including installers of cold storage rooms regarding effect of temperature change to resinous flooring system upon activation of refrigeration system.
b. Inspect and discuss condition of substrate and other preparatory work performed by other trades.
c. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.

D. Fire-Test-Response Characteristics: As determined by testing identical products according to ASTM E 648 or NFPA 253 by a qualified testing agency.

1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Delivery: Deliver materials in original packages and containers, with seals unbroken, bearing manufacturer's labels indicating brand name and directions for storage and mixing with other components.

B. Storage: Store materials to comply with manufacturer's written instructions to prevent deterioration from moisture, heat, cold, direct sunlight, or other detrimental effects.

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Comply with resinous flooring manufacturer's written instructions for substrate temperature, ambient temperature, moisture, ventilation, and other conditions affecting resinous flooring installation.

B. Lighting: Provide permanent lighting or, if permanent lighting is not in place, simulate permanent lighting conditions during resinous flooring installation.

1. Provide side lighting focused horizontally across work area during installation to aid installers in eliminating trowel marks.

C. Traffic Limitations: Close spaces to traffic during resinous flooring application and for not less than 24 hours after application, unless manufacturer recommends a longer period.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Products: To establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of other manufacturers, a specific manufacturer's product is named and accompanied by the words "basis of design," including make or model number or other designation. Subject to compliance with requirements, provide either the named products or equal products.

2.2 MATERIALS

A. VOC Content of Resinous Flooring: Provide resinous flooring systems, for use inside the weatherproofing system, that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):

1. Resinous Flooring: 100 g/L.

2.3 INDUSTRIAL RESINOUS FLOORING

A. Resinous Flooring: RES-1 - Chemical and Thermal-Shock Resistant Urethane Mortar Resinous Flooring consisting of a high performance, four-component polyurethane mortar system including urethane-urea binder, pigments, powders and quartz aggregates; sealant and seal coats. Comply with requirements indicated in the Resinous Flooring Schedule located at end of this Section.

1. Basis-of-Design Products: Provide the following Stonhard, Inc. component products:

a. Stonproof CT5 crack and joint isolation membrane.
b. Stonclad UT four-component, troweled urethane mortar.
c. Stonclad UT seal coat two-component.

d. Stonflex MP7 two-component, self-leveling, polyurethane sealant.
e. Stonfil OP2 osmotic resistant grout.

2. Color: Brick Red.
3. Overall System Thickness: 1/4 inch.
4. Wearing Surface: Light Texture finish.
5. Base: Integral cove base as indicated.
6. Federal Agency Approvals: USDA or FDA approved for food-processing environments.
7. System Physical Properties: Provide resinous flooring system with the following minimum physical property requirements when tested according to test methods indicated:

   a. Compressive Strength: 7,700 psi after 7 days per ASTM C 579.
   b. Tensile Strength: 1,000 psi per ASTM C 307.
   c. Flexural Strength: 2,400 psi per ASTM C 580.
   d. Flexural Modulus of Elasticity: 2.6 x 106 psi per ASTM C 580.
   e. Water Absorption: 0.056 percent per ASTM C 413.
   f. Coefficient of Thermal Expansion, Linear: 1.1 x 10-5 in/in• C per ASTM C 531.
   g. Impact Resistance: 160 in/lbs per ASTM D-4226.
   h. Abrasion Resistance: 0.05 gm. maximum weight loss per ASTM D 4060, CS-17 Wheel.
   i. Flammability: Self-extinguishing per ASTM D 635. Extent of burning 0.31 inches maximum.
   j. Hardness: 80-84, Shore D per ASTM D 2240.
   k. Bond Strength: Greater than 400 psi, 100 percent concrete failure per ASTM D-4541.
   l. Heat Resistance Limitation: 200 deg F for continuous exposure, 250 deg F for intermediate spills.

8. Cure Rate allow (at 77 deg F): 6 hours for foot traffic, 24 hours for normal operations.
9. System Chemical Resistance: As indicated by system designation and components indicated above.

2.4 ACCESSORIES

A. Crack and Joint Isolation Membrane: Manufacturer's recommended flexible resin formulation for crack isolation to help prevent substrate cracks from reflecting through RES-2 trowel-applied epoxy mortar flooring system.

B. Osmotic Resistant Grout: A three-component, polymer modified, cementitious osmotic pressure resistant grout at a minimum 1/8-inch thickness. Comply with requirements indicated in the Resinous Flooring Schedule.

C. Patching and Fill Material: Resinous product manufactured by resinous flooring manufacturer and recommended by manufacturer for application indicated.

D. Joint Sealant: Type manufactured by resinous flooring manufacturer for type of service and joint condition indicated. Match resinous flooring color.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of resinous flooring. Do not proceed with installation until unsatisfactory conditions, including levelness tolerances, have been corrected.

3.2 PREPARATION

A. General: Prepare and clean substrate according to resinous flooring manufacturer's written instructions for substrate indicated. Provide clean, dry, and neutral Ph substrate for resinous flooring application.

1. At the juncture of resinous flooring with other floor finishes, saw cut and chase concrete as indicated on drawings for a flush transition of flooring surfaces.

B. Concrete Substrates: Provide sound concrete surfaces free of laitance, glaze, efflorescence, curing compounds, form-release agents, dust, dirt, grease, oil, and other contaminates incompatible with resinous flooring.

1. Roughen concrete substrates as follows:

a. Comply with ASTM C 811 requirements, unless manufacturer's written instructions are more stringent.
b. Shot-blast surfaces with an apparatus that abrades the concrete surface, contains the dispensed shot within the apparatus, and recirculates the shot by vacuum pickup.

2. Repair damaged and deteriorated concrete according to resinous flooring manufacturer's written recommendations.
3. Verify that concrete substrates are dry and moisture-vapor emissions are within acceptable levels according to manufacturer's written instructions. .

a. Perform anhydrous calcium chloride test, ASTM F 1869, in all areas of installations. Proceed with resinous flooring application only after substrates do not exceed a maximum moisture-vapor-emission rate of 7 lbs of water/1000 sq. ft. of slab in 24 hours.
b. Prepare 3 test sites for the first 1,000 sq. ft. and include 1 more test for each additional 1,000 sq. ft. area.

4. Verify that concrete substrates have neutral Ph and that resinous flooring will adhere to them. Perform tests recommended by manufacturer. Proceed with application only after substrates pass testing.

a. Resinous Materials: Mix components and prepare materials according to resinous flooring manufacturer's written instructions.
b. Patching and Filling: Use patching and fill material to fill holes and depressions in substrates according to manufacturer's written instructions.
c. Joints and Cracks: Treat nonmoving joints and other nonmoving substrate cracks to prevent cracks from reflecting through resinous flooring according to manufacturer’s written instructions.

5. Where RES-1 flooring is installed, saw cut resinous flooring where substrate joints occur and apply joint sealant according to manufacturer's written recommendations.
6. Where RES-2 flooring is installed apply crack and joint membrane at substrate joints to bridge non-moving joints with resinous flooring. At substrate isolation joints subject to movement, saw cut resinous flooring and apply joint sealant according to manufacturer's written recommendations.

3.3 APPLICATION

A. General: Apply components of resinous flooring system according to manufacturer's written instructions to produce a uniform, monolithic wearing surface of thickness indicated.

1. Coordinate application of components to provide optimum adhesion of resinous flooring system to substrate and optimum intercoat adhesion.
2. Cure resinous flooring components according to manufacturer's written instructions. Prevent contamination during application and curing processes. Close application area for a minimum of 24 hours
3. Except where materials are indicated by product manufacturer as self-priming, apply primer over prepared substrate at manufacturer's recommended spreading rate.
4. Apply troweled or screeded body coat(s) in thickness indicated for flooring system. Hand or power trowel to obtain uniform finish. When cured, sand to remove trowel marks and roughness.
5. Apply topcoat(s) in number of coats indicated for flooring system and at spreading rates recommended by manufacturer.
6. Coating/Texture: Remove surface imperfections by lightly abrading and vacuuming the floor surface. Mix coating according to manufacturer’s recommended procedures. Squeegee apply and backroll coating with strict adherence to manufacturer’s installation procedures and coverage rates. Allow coating to cure and apply a second layer of coating according to manufacturer’s recommended procedures.
7. Integral Cove Base: Apply cove base mix to vertical curb surfaces before applying flooring. Apply according to manufacturer's written instructions and details including those for taping, mixing, priming, troweling, sanding, and topcoating of cove base. Round internal and external corners.

   a. Integral Cove Base: 4 inches high.

8. For both RES-1 and RES-2 locations: Apply osmotic resistant grout over areas indicated to receive resinous flooring, bridging all joints except isolation joints. At substrate isolation joints, saw cut resinous flooring and apply joint sealant to comply with manufacturer's written recommendations.

3.4 PROTECTION AND CLEANING

A. Protection: Protect resinous flooring from damage and wear during the remainder of construction period. Use protective methods and materials, including temporary covering, recommended in writing by resinous flooring manufacturer.

B. Cleaning: Clean resinous flooring not more than 4 days before dates scheduled for inspections intended to establish date of final acceptance in each Project area. Use cleaning materials and procedures recommended in writing by resinous flooring manufacturer.

END OF SECTION

SECTION 09 72 00

WALL COVERINGS

(Edited from DeCA June 2011 Design Criteria)

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Vinyl wall covering.

1.2 SUBMITTALS

A. Product Data:

1. For each type of product indicated. Include data on physical characteristics, durability, fade resistance, and flame-resistance characteristics.

B. Shop Drawings:

1. Show location and extent of each wall-covering type. Indicate pattern placement, seams and termination points.

C. Samples:

1. For each type of wall covering and for each color, texture, and pattern required.
2. Sample from same print run or dye lot to be used for the Work, with specified treatments applied. Show complete pattern repeat. Mark top and face of fabric.

D. Submittal List:

Reference	Submittal Item	Quantity	Action
1.2A	Product Data	X	R
1.2B	Shop Drawings	X	R
1.2C	Samples	X	R

X Submit quantity specified in Division 01 Section Administrative Requirements.
R Review each submittal, mark to indicate action taken, and return.
I Submittal is for information or record purposes only. No action will be taken.

1.3 QUALITY ASSURANCE

A. Fire-Test-Response Characteristics:

1. Provide wall coverings and adhesives with the following fire-test-response characteristics as determined by testing identical products applied with identical adhesives to substrates

per test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.

a. Surface-Burning Characteristics: As follows, per ASTM E 84:

1) Flame-Spread Index: 25 or less.
2) Smoke-Developed Index: 450 or less.

1.4 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install wall coverings until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work above ceilings is complete, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

B. Lighting: Do not install wall covering until a permanent level of lighting is provided on the surfaces to receive wall covering.

C. Ventilation: Provide continuous ventilation during installation and for not less than the time recommended by wall-covering manufacturer for full drying or curing.

1.5 EXTRA MATERIALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Wall-Covering Materials: For each type, full-size units equal to 5 percent of amount installed.

PART 2 - PRODUCTS

2.1 WALL-COVERING PRODUCTS

A. General:

1. Provide rolls of each type of wall covering from the same run number or dye lot.

B. Vinyl Wall Covering:

1. Vinyl Wall-Covering Standards: Provide mildew-resistant products complying with the following:

a. FS CCC-W-408 D and CFFA-W-101-D for Type II, Medium-Duty products.
b. ASTM F 793 for strippable wall coverings that qualify as Category V, Type II Commercial Serviceability products.

2. Total Weight Excluding Coatings: 13 oz./sq.yd. minimum.
3. Width: 54 inches.
4. Backing Fiber Content: Polyester cellulose.
5. Backing Material: Osnaburg, drill, or nonwoven.
6. Repeat: Random.

7. Stain-Resistant Coating: DuPont; Tedlar/Teflon.
8. Colors, Textures, and Patterns: As indicated.

2.2 ACCESSORIES

A. Adhesive.

B. Mildew-resistant, nonstaining, strippable adhesive, for use with specific wall covering and substrate application, as recommended in writing by wall-covering manufacturer and with a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

C. Primer/Sealer:

1. Mildew-resistant primer/sealer recommended in writing by wall-covering manufacturer for intended substrate.

D. Seam Tape:

1. As recommended in writing by wall-covering manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for levelness, wall plumbness, maximum moisture content, and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Comply with manufacturer's written instructions for surface preparation.

B. Clean substrates of substances that could impair bond of wall covering, including dirt, oil, grease, mold, mildew, and incompatible primers.

C. Prepare substrates to achieve a smooth, dry, clean, structurally sound surface free of flaking, unsound coatings, cracks, and defects.

1. Moisture Content: Maximum of 5 percent on new plaster, concrete, and concrete masonry units when tested with an electronic moisture meter.
2. Plaster: Allow new plaster to cure. Neutralize areas of high alkalinity. Prime with primer as recommended in writing by primer/sealer manufacturer and wall-covering manufacturer.
3. Metals: If not factory primed, clean and apply metal as recommended in writing by primer/sealer manufacturer and wall-covering manufacturer.
4. Gypsum Board: Prime with primer as recommended in writing by primer/sealer manufacturer and wall-covering manufacturer.
5. Painted Surfaces: Treat areas susceptible to pigment bleeding.

D. Check painted surfaces for pigment bleeding. Sand gloss, semigloss, and eggshell finish with fine sandpaper.

E. Remove hardware and hardware accessories, electrical plates and covers, light fixture trims, and similar items.

F. Acclimatize wall-covering materials by removing them from packaging in the installation areas not less than 24 hours before installation.

3.3 INSTALLATION

A. General: Comply with wall-covering manufacturers' written installation instructions applicable to products and applications indicated except where more stringent requirements apply.

B. Cut wall-covering strips in roll number sequence. Change roll numbers at partition breaks and corners.

C. Install strips in same order as cut from roll.

D. Install reversing every other strip.

E. Install wall covering with no gaps or overlaps, no lifted or curling edges, and no visible shrinkage.

F. Match pattern 72 inches above the finish floor.

G. Install seams vertical and plumb at least 6 inches from outside corners and 6 inches from inside corners unless a change of pattern or color exists at corner. No horizontal seams are permitted.

H. Fully bond wall covering to substrate. Remove air bubbles, wrinkles, blisters, and other defects.

I. Trim edges and seams for color uniformity, pattern match, and tight closure. Butt seams without any overlay or spacing between strips.

END OF SECTION

SECTION 09 90 00

PAINTING AND COATING

(Edited from DeCA June 2011 Design Criteria)

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Surface preparation and the application of paint systems on the following substrates:

a. Exterior Painting:

1) Plaster substrates.
2) Steel substrates.
3) Galvanized-metal substrates.

b. Interior Painting:

1) Concrete masonry units (CMU).
2) Steel, including exposed structure where indicated.
3) Galvanized metal, including exposed structure where indicated, including roof deck.
4) Wood indicated to receive opaque finish.
5) Wood indicated to receive stain finish.
6) Gypsum board.
7) Concrete (traffic surfaces).

2. Customer Area Exposed Structure: Where areas above the Sales Area are not otherwise concealed by ceilings, soffits, or the like, apply dry-fall paint finishes indicated in the "Room Finish and Color Schedule."

B. Related Sections:

1. Division 01 Section Sustainable Design Reporting for field applications of paints that are inside the weatherproofing system.
2. Division 05 Sections for shop priming of metal substrates with primers specified in this Section.
3. Division 08 Section Flush Wood Doors for stains and transparent finishes applied to interior wood doors.
4. Division 08 Sections for factory priming hollow metal windows and doors with primers specified in this Section.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Samples: For each finish and for each color and texture required.

C. Product List: For each product indicated, include the following:

1. Printout of current "MPI Approved Products List" for each product category specified in Part 2, with the proposed product highlighted.

D. Submittal List:

Reference	Submittal Item	Quantity	Action
1.2A	Product Data	X	R
1.2C	Samples	X	R
1.2D	Product List	X	I

X Submit quantity specified in Division 1 Section Administrative Requirements.
R Review each submittal, mark to indicate action taken, and return.
I Submittal is for information or record purposes only. No action will be taken.

1.3 QUALITY ASSURANCE

A. MPI Standards:

1. Products: Complying with MPI standards indicated and listed in "MPI Approved Products List."
2. Preparation and Workmanship: Comply with requirements in "MPI Architectural Painting Specification Manual" for products and paint systems indicated.

1.4 MAINTENANCE MATERIAL SUBMITTALS

A. A. Furnish extra materials**,** from the same product run**,** that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Paint: 5 percent, but not less than 1 gal. of each material and color applied.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F.

1. Maintain containers in clean condition, free of foreign materials and residue.
2. Remove rags and waste from storage areas daily.

1.6 FIELD CONDITIONS

A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F.

B. Do not apply paints in snow, rain, fog, or mist; when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.

PART 2 - PRODUCTS

2.1 MANUFACTURERS:

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Behr Process Corporation.
2. Benjamin Moore & Co.
3. Benjamin Moore & Co. (Canada).
4. Bennette Paint Manufacturing Company, Inc.
5. Betonel Ltd.
6. BLP Mobile Paint Manufacturing.
7. California Paints.
8. Cloverdale Paint.
9. Color Wheel Paints & Coatings.
10. Columbia Paint & Coatings.
11. Conco Paints.
12. Coronado Paint.
13. Davis Paint Company.
14. Diamond Vogel Paints.
15. Dunn-Edwards Corporation.
16. Durant Performance Coatings.
17. Duron, Inc.
18. Envirocoatings Canada Inc.
19. Euclid Chemical Company.
20. Farrell-Calhoun.
21. Frazee Paint.
22. General Paint.
23. Hallman Lindsay Paints.
24. Hirshfield's, Inc.
25. ICI Paints.
26. ICI Paints (Canada).
27. Insl-x.
28. Kelly-Moore Paints.
29. Kwal Paint.
30. M.A.B. Paints.
31. McCormick Paints.
32. Microblend Technologies Inc.
33. Miller Paint.
34. Mills Paint.
35. PARA Paints.
36. Parex LaHabra Inc.
37. Parker Paint Mfg. Co. Inc.
38. PPG Architectural Finishes, Inc.
39. Pratt & Lambert.
40. Rodda Paint Co.
41. Scott Paint.
42. Sherwin-Williams Company (The).
43. Sico, Inc.
44. Southern Diversified Products, LLC.
45. Smith Paint Products.
46. Vista Paint.
47. Zinsser.

B. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to products listed in other Part 2 articles for the paint category indicated.

2.2 PAINT, GENERAL

A. MPI Standards: Provide products that comply with MPI standards indicated and that are listed in its "MPI Approved Products List."

B. Material Compatibility:

1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
2. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.

C. VOC Content: Products shall comply with VOC limits of authorities having jurisdiction and, for interior paints and coatings applied at Project site, the following VOC limits, exclusive of colorants added to a tint base, when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

1. Flat Paints and Coatings: 50 g/L.
2. Nonflat Paints and Coatings: 150 g/L.
3. Clear Wood Finishes, Varnishes: VOC not more than 350 g/L.
4. Stains: VOC not more than 250 g/L.
5. Dry-Fog Coatings: 400 g/L.
6. Primers, Sealers, and Undercoaters: 200 g/L.
7. Anticorrosive and Antirust Paints Applied to Ferrous Metals: 250 g/L.
8. Zinc-Rich Industrial Maintenance Primers: 340 g/L.
9. Pretreatment Wash Primers: 420 g/L.
10. Floor Coatings: 100 g/L.

D. Chemical Components of Field-Applied Interior Paints and Coatings: Provide products that comply with the following chemical restrictions; these requirements do not apply to primers or finishes that are applied in a fabrication or finishing shop:

1. Aromatic Compounds: Paints and coatings shall not contain more than 1.0 percent by weight of total aromatic compounds (hydrocarbon compounds containing one or more benzene rings).
2. Restricted Components: Paints and coatings shall not contain any of the following:

a. Acrolein.
b. Acrylonitrile.
c. Antimony.
d. Benzene.
e. Butyl benzyl phthalate.
f. Cadmium.
g. Di (2-ethylhexyl) phthalate.
h. Di-n-butyl phthalate.
i. Di-n-octyl phthalate.
j. 1,2-dichlorobenzene.
k. Diethyl phthalate.
l. Dimethyl phthalate.

m. Ethylbenzene.
n. Formaldehyde.
o. Hexavalent chromium.
p. Isophorone.
q. Lead.
r. Mercury.
s. Methyl ethyl ketone.
t. Methyl isobutyl ketone.
u. Methylene chloride.
v. Naphthalene.
w. Toluene (methylbenzene).
x. 1,1,1-trichloroethane.
y. Vinyl chloride.

E. Colors as indicated in "Room Finish and Color Schedule."

2.3 BLOCK FILLERS

A. Interior/Exterior Latex Block Filler: MPI #4.

B. Concrete Unit Masonry Block Filler Under Vapor Barrier Finish:

1. Duron, Block Kote Latex Block Filler, 08-126: Applied at a dry film thickness of not less than 10.2 mils.

2.4 EXTERIOR PAINT PRODUCTS

A. Exterior Metal Primers:

1. Quick-Drying Alkyd Metal Primer: MPI #76.
2. Cementitious Galvanized-Metal Primer: MPI #26.

B. Exterior Alkyd Paints:

1. Exterior Alkyd Gloss Enamel : MPI #9 (Gloss Level 6).

C. Exterior Quick-Drying Enamels:

1. Quick-Drying High Gloss Enamel : MPI #96 (Gloss Level 7).

D. Exterior Latex Paints:

1. Exterior Latex Flat: MPI #10 (Gloss Level 1).

2.5 INTERIOR PAINT PRODUCTS

A. Interior Metal Primers:

1. Quick-Drying Alkyd Metal Primer: MPI #76.
2. Interior Latex Primer/Sealer: MPI #50.
3. Rust-Inhibitive Primer Water Based: MPI #107.
4. Waterborne Galvanized-Metal Primer: MPI #134.

B. Interior Latex Primers/Sealers:

1. Alkali-Resistant Primer Water Based: MPI #3.

C. Interior Latex Vapor Barrier Primer/Sealer:

1. Benjamin Moore; Super Spec Latex Vapor Barrier Primer Sealer 260.

a. Film Thickness: Wet 3.6 mils, dry 1.0 mil.

D. Interior Wood Primers:

1. Interior Latex-Based Wood Primer: MPI #39.

E. Interior Latex Paints:

1. Institutional Low-Odor/VOC Latex Flat: MPI #143 (Gloss Level 1).
2. Institutional Low-Odor/VOC Latex Eggshell: MPI #145 (Gloss Level 3).
3. Institutional Low-Odor/VOC Latex Semi-Gloss: MPI #147 (Gloss Level 5).

F. Interior Dry Fog/Fall Coatings:

1. Dry Fall Waterborne for Galvanized Steel, Flat: MPI #133. (Gloss Level 1).

G. Interior Stains:

1. Interior Wood Stain Semitransparent: MPI #90.

H. Interior Polyurethane Finishes:

1. Varnish, Interior, Oil-Modified, Clear Polyurethane Satin: MPI #57, (Gloss Level 4).

I. Interior Traffic Paints:

1. Safety Yellow Cross-Hatch Traffic Paint Striping:

a. Sherwin-Williams Co. Setfast Fast Dry Acrylic Waterborne Traffic Marking Paint, 8.5 mils dft.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of work.

B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:

1. Wood: 15 percent.
2. Gypsum Board: 12 percent.
3. Concrete: 12 percent
4. Masonry (Clay and CMU): 12 percent.

5. Portland Cement Plaster: 12 percent.

C. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.

D. Primer is not required on shop-primed items that are compatible with system subsequent applied coats.

E. Provide barrier coats over incompatible primers or remove and reprime.

F. Portland Cement Plaster Substrates: Verify that plaster is fully cured.

G. Exterior Gypsum Board Substrates: Verify that finishing compound is sanded smooth.

H. Begin coating application only after unsatisfactory conditions have been corrected and surfaces are dry.

I. Beginning coating application constitutes Contractor's acceptance of substrates and conditions.

3.2 PREPARATION

A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates indicated.

B. Clean substrates of substances that could impair bond of paints, including dirt, oil, grease, and incompatible paints and encapsulants.

1. Remove incompatible primers and reprime substrate with compatible primers as required to produce paint systems indicated.

C. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.

D. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection.

E. Concrete Substrates: Remove release agents, curing compounds, efflorescence, and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer's written instructions.

F. Masonry Substrates: Remove efflorescence and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces or mortar joints exceeds that permitted in manufacturer's written instructions.

G. Steel Substrates: Remove rust, loose mill scale, and shop primer if any. Clean using methods recommended in writing by paint manufacturer but not less than the following:

1. SSPC-SP 2, "Hand Tool Cleaning."
2. SSPC-SP 3, "Power Tool Cleaning."
3. SSPC-SP 7/NACE No. 4, "Brush-off Blast Cleaning."
4. SSPC-SP 11, "Power Tool Cleaning to Bare Metal."

H. Shop-Primed Steel Substrates: Clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material as used for shop priming to comply with SSPC-PA 1 for touching up shop-primed surfaces.

I. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.

J. Interior Wood Substrates:

1. Scrape and clean knots. Before applying primer, apply coat of knot sealer recommended in writing by topcoat manufacturer for exterior use in paint system indicated.
2. Sand surfaces that will be exposed to view, and dust off.
3. Prime edges, ends, faces, undersides, and backsides of wood.
4. After priming, fill holes and imperfections in the finish surfaces with putty or plastic wood filler. Sand smooth when dried.

K. Cotton or Canvas Insulation Covering Substrates: Remove dust, dirt, and other foreign material that might impair bond of paints to substrates.

3.3 APPLICATION

A. Apply paints according to manufacturer's written instructions and recommendations in "MPI Manual."

1. Use applicators and techniques suited for paint and substrate indicated.
2. Paint surfaces behind movable items same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed items with prime coat only.
3. Paint both sides and edges of exterior doors and entire exposed surface of exterior door frames.
4. Paint entire exposed surface of window frames and sashes.
5. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
6. Primers specified in painting schedules may be omitted on items that are factory primed or factory finished if acceptable to topcoat manufacturers.
7. Paint front and backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.
8. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.

B. Tint undercoats same color as topcoat, but tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Provide sufficient difference in shade of undercoats to distinguish each separate coat.

C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.

D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

1. Minimum Coating Thickness: Apply paint materials no thinner than manufacturer's recommended spreading rate to achieve dry film thickness indicated. Provide total dry film thickness of the entire system as recommended by manufacturer, except as follows:

a. Exterior surfaces: Minimum of 5 mils.
b. Interior surfaces: Minimum of 3 mils.

E. Painting Mechanical and Electrical Work:

1. Paint items exposed in customer areas including, but not limited to, the following:

a. Mechanical Work:

1) Uninsulated metal piping.
2) Uninsulated plastic piping.
3) Pipe hangers and supports.
4) Tanks that do not have factory-applied final finishes.
5) Visible portions of internal surfaces of metal ducts, without liner, behind air inlets and outlets.
6) Duct, equipment, and pipe insulation having cotton or canvas insulation covering or other paintable jacket material.
7) Mechanical equipment that is indicated to have a factory-primed finish for field painting.

b. Electrical Work:

1) Switchgear.
2) Panelboards.
3) Conduit.
4) Cable trays.
5) Electrical equipment that is indicated to have a factory-primed finish for field painting.

3.4 CLEANING AND PROTECTION

A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.

B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.

D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.5 EXTERIOR PAINTING SCHEDULE

A. Steel Substrates:

1. Quick-Drying Enamel System: MPI EXT 5.1A.

a. Prime Coat: Quick-drying alkyd metal primer.
b. Intermediate Coat: Quick-drying alkyd matching topcoat.
c. Topcoat: Quick-drying alkyd, high gloss.

B. Galvanized-Metal Substrates:

1. Alkyd System: MPI EXT 5.3B

a. Prime Coat: Cementitious galvanized-metal primer.
b. Intermediate Coat: Exterior alkyd enamel matching topcoat.
c. Topcoat: Exterior alkyd enamel, gloss.

C. Plaster Substrates:

1. Latex Over Alkali-Resistant Primer System: MPI EXT 9.1J.

a. Prime Coat: Alkali-resistant primer, water based.
b. Intermediate Coat: Exterior latex matching topcoat.
c. Topcoat: Exterior latex, flat.

3.6 INTERIOR PAINTING SCHEDULE

A. CMU Substrates Except Where Vapor Barrier Finish Is Indicated:

1. Institutional Low-Odor/VOC Latex System: MPI INT 4.2E.

a. Prime Coat: Interior/exterior latex block filler.
b. Intermediate Coat: Institutional low-odor/VOC interior latex matching topcoat.
c. Topcoat: Institutional low-odor/VOC interior latex, semi-gloss.

B. CMU Substrates Where Vapor Barrier Finish Is Indicated:

1. Flat Latex Finish: Two finish coats over a block filler.

a. Block Filler: Concrete unit masonry block filler under vapor barrier finish.
b. Finish Coats: Latex Vapor Barrier Primer/Sealer.

C. Steel Substrates Unless Otherwise Indicated:

1. Institutional Low-Odor/VOC Latex System: MPI INT 5.1S.

a. Prime Coat: Rust-inhibitive primer, water based.
b. Intermediate Coat: Institutional low-odor/VOC interior latex matching topcoat.
c. Topcoat: Institutional low-odor/VOC interior latex, semi-gloss.

D. Galvanized-Metal Substrates Unless Otherwise Indicated:

1. Institutional Low-Odor/VOC Latex System: MPI INT 5.3N.

a. Prime Coat: Waterborne galvanized-metal primer.
b. Intermediate Coat: Institutional low-odor/VOC interior latex matching topcoat.
c. Topcoat: Institutional low-odor/VOC interior latex, semi-gloss.

E. Galvanized-Metal Substrates Receiving Dry-Fall System:

1. Water-Based Dry-Fall System: MPI INT 5.3H

a. Prime Coat: Waterborne dry fall for galvanized steel, flat.

b. Topcoat: Waterborne dry fall, for galvanized steel, flat..

F. Non-Galvanized Metal Substrates Receiving Dry-Fall System:

1. Water-Based Dry-Fall System: : MPI INT 5.1C

a. Prime Coat: Quick-drying alkyd metal primer.
b. Topcoat: Waterborne dry fall, flat.

G. Dressed Lumber Substrates Indicated To Receive Opaque Finish:

1. Including architectural woodwork.
2. Institutional Low-Odor/VOC Latex System: MPI INT 6.3V.

a. Prime Coat: Interior latex-based wood primer.
b. Intermediate Coat: Institutional low-odor/VOC interior latex matching topcoat.
c. Topcoat: Institutional low-odor/VOC interior latex, semi-gloss.

H. Wood Panel Substrates Indicated To Receive Opaque Finish:

1. Including painted plywood, medium-density fiberboard, and hardboard.
2. Institutional Low-Odor/VOC Latex System: MPI INT 6.4T.

a. Prime Coat: Interior latex-based wood primer.
b. Intermediate Coat: Institutional low-odor/VOC interior latex matching topcoat.
c. Topcoat: Institutional low-odor/VOC interior latex,semi-gloss.

I. Wood Indicated to Receive Transparent Finish Over Stain:

1. Polyurethane Varnish Over Stain System: MPI INT 6.3E.

a. Stain Coat: Interior wood stain semitransparent.
b. Three Finish Coats: Varnish, polyurethane, interior, oil-modified, clear satin.

J. Gypsum Board Substrates:

1. Institutional Low-Odor/VOC Latex System: MPI INT 9.2M.

a. Prime Coat: Interior latex primer/sealer, institutional low odor/VOC.
b. Intermediate Coat: Institutional low-odor/VOC interior latex matching topcoat.
c. Topcoat: Institutional low-odor/VOC interior latex:

1) Ceilings: Flat.
2) Walls and Soffits: Eggshell.

K. Concrete, Traffic Surfaces: Indicated To Receive Traffic Paint Striping:

1. One Coat Safety Yellow Cross-Hatch Traffic Paint Striping.

END OF SECTION

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SECTION 10 08 00

COMMISSIONING OF SPECIALTIES

(Edited from DeCA June 2011 Design Criteria)

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Division 10 responsibilities in the commissioning process.
2. Commissioning of pedestrian control equipment.

B. Related Sections:

1. Division 01 Section General Commissioning Requirements.

1.2 DEFINITIONS

A. CA: Commissioning Agent.

B. CO: Contracting Officer.

C. GC: Contractor; General Contractor, not a Subcontractor.

D. O&M: Operations and Maintenance.

E. QC: Contractor's Quality Control Manager.

F. TI: Technical Inspector.

1.3 DESCRIPTION

A. This Section describes commissioning requirements applicable to commissioned items and systems specified in Division 10 to ensure that all systems are operating in a manner consistent with the Contract Documents.

B. Conform to commissioning requirements and the commissioning plan.

1.4 RESPONSIBILITIES

A. Construction and Acceptance Phases:

1. Include the cost of commissioning in the contract price.
2. In each purchase order or subcontract written, include requirements for submittal data, O&M data and training.
3. Conduct a commissioning scoping meeting and other meetings necessary to facilitate the Commissioning process.

4. Provide requested documentation to the TI developed for functional testing procedures.
5. Provide functional performance test procedures. Subs shall review test procedures to ensure feasibility, safety and equipment protection and provide necessary written alarm limits to be used during the tests.
6. Develop a full start-up and initial checkout plan using manufacturer's start-up procedures and the prefunctional checklists for all commissioned equipment. Submit to QC for review prior to startup. TI will verify plan for compliance. Refer to Division 01 Section General Commissioning Requirements for further details related to start-up.
7. During the startup and initial checkout process, execute the prefunctional checklists for all commissioned equipment.
8. Perform and clearly document all completed startup and system operational checkout procedures, providing a copy to the QC and TI.
9. Correct system deficiencies before functional testing.
10. Provide skilled technicians to execute starting of equipment and to execute the functional performance tests. Ensure that they are available and present during the agreed upon schedules and for sufficient duration to complete the necessary tests, adjustments and problem-solving.
11. Provide all test equipment necessary to fulfill specified testing requirements.
12. Assist the CA and TI in interpreting the monitoring data, as necessary.
13. Correct deficiencies (differences between specified and observed performance) as interpreted by the TI, CA and A/E and retest the equipment.
14. Prepare O&M manuals according to the Contract Documents, including clarifying and updating the original sequences of operation to as-built conditions.
15. During construction, maintain as-built red-line drawings for all drawings and final CAD as-builts for Contractor-generated Coordination Drawings. Update after completion of commissioning (excluding deferred testing).
16. Coordinate with equipment manufacturers to determine specific requirements to maintain the validity of the warranty.

B. Operation Manuals shall include:

1. Schedules.
2. Instructions for operation of each piece of equipment for emergencies.
3. Seasonal adjustment.
4. Instructions for energy savings operations and descriptions of the energy savings strategies in the facility (from O&M Manuals).

C. Warranty Period:

1. Execute seasonal or deferred functional performance testing, witnessed by the GCR, according to the Specifications.
2. Correct deficiencies and make necessary adjustments to O&M manuals and as-built drawings for applicable issues identified in any seasonal testing.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 STARTUP

A. Contractors shall follow the start-up and initial checkout procedures listed in the Responsibilities list in this Section and in Division 01 Section General Commissioning Requirements. Division

10 has start-up responsibility and is required to complete systems and sub-systems so they are fully functional, meeting the design objectives of the Contract Documents. The commissioning procedures and functional testing do not relieve or lessen this responsibility or shift that responsibility partially to the Commissioning Agent, technical inspector, or Government.

B. Functional testing will generally begin upon completion of a system. Functional testing may proceed prior to the completion of systems or sub-systems at the discretion of the CO. Beginning system testing before full completion does not relieve the Contractor from fully completing the system, including all prefunctional checklists.

3.2 OPERATION AND MAINTENANCE (O&M) MANUALS

A. The following O&M manual requirements are in addition to O&M manual documentation requirements elsewhere in these specifications.

B. Division 10 shall compile and prepare documentation for all commissioned systems covered in Division 10 and deliver this documentation to the GC for inclusion in the O&M manuals prior to the training of Government personnel.

3.3 TRAINING OF GOVERNMENT PERSONNEL

A. The GC shall be responsible for training coordination and scheduling to ensure that training is completed.

B. The QC shall be responsible for reviewing the content and adequacy of the training of Government personnel for commissioned equipment or systems. TI will verify compliance.

C. The Division 10 Contractor shall have the following training responsibilities for the commissioned systems:

1. Provide the TI with a training plan four weeks before the planned training.
2. Provide designated Government personnel with comprehensive orientation and training in the understanding of the systems and the operation and maintenance of each piece of commissioned equipment.
3. Training shall start with classroom sessions followed by hands-on training on each piece of equipment.
4. During any demonstration, should the system fail to perform in accordance with the requirements of the O&M manual or sequence of operations, the system will be repaired or adjusted as necessary and the demonstration repeated.
5. The appropriate trade or manufacturer's representative shall provide the instructions on each major piece of equipment. This person may be the start-up technician for the piece of equipment, the installing contractor or manufacturer's representative. Practical operating expertise as well as in-depth knowledge of all modes of operation of the specific piece of equipment are required. More than one party may be required to execute the training.
6. The training sessions shall follow the outline in the Table of Contents of the operation and maintenance manual and illustrate whenever possible the use of the O&M manuals for reference.
7. Training shall include:

    a. Use of the printed installation, operation and maintenance instruction material included in the O&M manuals.

b. A review of the written O&M instructions emphasizing safe and proper operating requirements, preventative maintenance, special tools needed and spare parts inventory suggestions. The training shall include start-up, operation in all modes possible, shut-down, seasonal changeover and any emergency procedures.
c. Discussion of relevant health and safety issues and concerns.
d. Discussion of warranties and guarantees.
e. Common troubleshooting problems and solutions.
f. Explanation of information included in the O&M manuals.
g. Discussion of any peculiarities of equipment installation or operation.
h. Classroom sessions shall include the use of overhead projections, slides, video/audio-taped material as might be appropriate.

8. Hands-on training shall include start-up, operation in all modes possible, including manual, shut-down and any emergency procedures and preventative maintenance for all pieces of equipment.
9. Training shall occur after functional testing is complete, unless approved otherwise by the Contracting Officer.
10. Minimum Duration of Training. Contractor shall meet for 8 hours with facility staff after completion of the work and instruct them as indicated above.

END OF SECTION

SECTION 10 10 00

VISUAL DISPLAY SURFACES

(Edited from DeCA June 2011 Design Criteria)

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Markerboards.
2. Tackboards.

B. Related Sections:

1. Division 01 Section Sustainable Design Reporting for adhesive products.

1.2 SUBMITTALS

A. Product Data:

1. For each type of product indicated.

B. Samples:

1. For each type of visual display surface indicated.

C. Submittal List:

Reference	Submittal Item	Quantity	Action
1.2A	Product Data	X	R
1.2B	Samples	X	R

X Submit quantity specified in Division 01 Section Administrative Requirements.
R Review each submittal, mark to indicate action taken, and return.
I Submittal is for information or record purposes only. No action will be taken.

1.3 QUALITY ASSURANCE

A. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Flame-Spread Index: 25 or less.
2. Smoke-Developed Index: 450 or less.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Deliver factory-built visual display boards, including factory-applied trim where indicated, completely assembled in one piece without joints, where possible. If dimensions exceed maximum manufactured panel size, provide two or more pieces of equal length as acceptable to Architect. When overall dimensions require delivery in separate units, prefit components at the factory, disassemble for delivery, and make final joints at the site.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Products: To establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of other manufacturers, a specific manufacturer's product is named and accompanied by the words "basis of design," including make or model number or other designation. Subject to compliance with requirements, provide either the named products or equal products.

2.2 MATERIALS, GENERAL

A. Porcelain-Enamel Face Sheet:

1. Porcelain-enamel-clad, ASTM A 463/A 463M, Type 1, stretcher-leveled aluminized steel, with 0.0236-inch (24 gage) uncoated thickness; with porcelain-enamel coating fused to steel at approximately 1000 deg F.

B. Particleboard:

1. ANSI A208.1, Grade 1-M-1.

C. Cork Sheet:

1. MS MIL-C-15116-C, Type II with surface-burning characteristics indicated.

D. Polyester Fabric:

1. Nondirectional weave, 100 percent polyester; weighing not less than 15 oz./sq. yd.; with surface-burning characteristics indicated.

E. Extruded Aluminum:

1. ASTM B 221, Alloy 6063.

F. Laminating Adhesive:

1. Manufacturer's standard moisture-resistant thermoplastic type.

2.3 MARKERBOARD ASSEMBLIES

A. Porcelain-Enamel Markerboards:

1. Balanced, high-pressure, factory-laminated markerboard assembly of 3-ply construction consisting of backing sheet, core material, and 0.013 inch thick porcelain-enamel face sheet with low gloss finish.

a. Basis-of-Design Product: Claridge Products & Equipment, Inc.; LCS-II Markerboard.

1) Color: No. 75 Low Gloss White.

b. Core: 7/16 inch medium density fiberboard (MDF).

2.4 TACK ASSEMBLIES

A. Polyester-Fabric-Faced Tack Assembly:

1. 1/4-inch-thick, polyester-fabric-faced cork sheet factory laminated to 3/8-inch-thick particleboard backing.

a. Basis-of Design Product: Claridge Products & Equipment, Inc.; Designer Series fabric.

1) Color: No. 1692, Wheat.

2.5 MARKERBOARD AND TACKBOARD ACCESSORIES

A. Aluminum Frames and Trim:

1. Fabricated from not less than 0.062-inch- thick, extruded aluminum; of size and shape indicated.
2. Factory-Applied Trim:

a. Basis-of Design Product: Claridge Products & Equipment, Inc.; Series 5.

1) Perimeter trim: 5/8 inches wide.
2) Joint slip between markerboard and tack surfaces: 803-F, 1-inch wide.
3) Mounting: Steel mounting clips at top and angle clips at bottom.
4) Color: Satin anodized aluminum frame.

B. Markertray:

1. Manufacturer's standard, continuous, extruded aluminum, solid type with ribbed section and end closures. Match color of frame.

C. Markerboard Dry Erase Kit:

1. Basis-of Design Product: Claridge Products & Equipment, Inc.

a. Four fine point and eight broad-tipped LCS markers.
b. One 8 oz. Bottle LCS 683 Markerboard. Cleaner.

c. One Markerboard Eraser.

2.6 FABRICATION

A. General:

1. Fabricate visual display surfaces to sizes indicated on Drawings.

B. Porcelain-Enamel Visual Display Assemblies:

1. Laminate porcelain-enamel face sheet and backing sheet to core material under heat and pressure with manufacturer's standard flexible, waterproof adhesive.

C. Unitized Markerboard and Tack Surfaces:

1. Factory assemble markerboard and tack surfaces together as a single unit.
2. Coordinate unitized assembly with trim and accessories indicated.
3. Assemble and attach trim at manufacturer's factory before shipment. Join parts with a neat, precision fit.
4. Make joints only where total length exceeds maximum manufactured length. Fabricate with minimum number of joints.

D. Aluminum Anodic Finish:

1. Class II, clear anodic coating complying with AAMA 611, AA-M12C22A31, Class II, 0.010 mm or thicker.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General:

1. Install visual display surfaces in locations and at mounting heights indicated on Drawings. Keep perimeter lines straight, level, and plumb. Provide grounds, clips, backing materials, adhesives, brackets, anchors, trim, and accessories necessary for complete installation.

B. Visual Display Boards:

1. Attach concealed clips, hangers, and grounds to wall surfaces and to visual display boards with fasteners at not more than 16 inches o.c. Secure both top and bottom of boards to walls.

C. Field-Applied Aluminum Trim:

1. Attach trim over edges of visual display boards and conceal grounds and clips. Attach trim to boards with fasteners at not more than 24 inches o.c.

D. Clean and Protect:

1. Attach one cleaning label to visual display surface in each room. Cover and protect visual display surfaces after installation and cleaning.

END OF SECTION

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SECTION 10 14 00

SIGNAGE

(Edited from DeCA June 2011 Design Criteria)

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Construction sign.
2. Exterior illuminated building sign.
3. Commissary store hours sign.
4. Restroom door identification signage.
5. Interior door identification signage.
6. Customer service signage.
7. Surcharge plaque.

1.2 SYSTEM PERFORMANCE REQUIREMENTS

A. Wind Loading:

1. Design, fabricate, and install exterior freestanding-type signs capable of withstanding wind pressures acting inward and outward normal to the plane of the sign.
2. Refer to Division 01 Section Work Covered by Contract Documents for wind loading design criteria.
3. Determine design loads using the appropriate coefficients for the freestanding-type sign configurations indicated.

B. Seismic Performance:

1. Seismic Loads:

a. Provide signs capable of resisting the effects of earthquake motions.
b. Refer to Division 01 Section Work Covered by Contract Documents for seismic-load design criteria.

1.3 SUBMITTALS

A. Product Data:

1. For each type of sign specified, including details of construction relative to materials, dimensions of individual components, profiles, and finishes.

B. Shop Drawings:

1. Showing fabrication and erection of signs. Include plans, elevations, and large-scale sections of typical members and other components. Show anchors, grounds, layout, reinforcement, accessories, and installation details.
2. Provide message list for each sign required, including large-scale details of wording and lettering layout.
3. For signs supported by or anchored to permanent construction, provide setting Drawings, templates, and directions for installation of anchor bolts and other anchors to be installed as a unit of Work in other Sections.
4. Templates: Furnish full-size spacing templates for individually mounted dimensional letters and numbers.

C. Sign Message Verification:

1. Prior to sign fabrication, submit a list indicating the text required for each sign, including store hours where applicable, for verification by the Contracting Officer.

D. Submittal List:

Reference	Submittal Item	Quantity	Action
1.3A	Product Data	X	R
1.3B	Shop Drawings	X	R
1.3C	Sign Message Verification	X	R

X Submit quantity specified in Division 01 Section Administrative Requirements.
R Review each submittal, mark to indicate action taken, and return.
I Submittal is for information or record purposes only. No action will be taken.

1.4 QUALITY ASSURANCE

A. Sign Fabricator Qualifications:

1. Firm experienced in producing signs similar to those indicated for this Project, with a record of successful in-service performance, and sufficient production capacity to produce sign units required without causing delay in the Work.

B. UL and NEMA Compliance:

1. Provide lighting fixtures and electrical components for illuminated signs that are labeled and listed by UL and comply with applicable NEMA standards.

C. Regulatory Requirements:

1. Comply with applicable provisions in ABA Accessibility Guidelines and ICC/ANSI A117.1.

D. Single-Source Responsibility:

1. For each separate sign type required, obtain signs from one source of a single manufacturer.

1.5 PROJECT CONDITIONS

A. Field Measurements: Take field measurements prior to preparation of shop Drawings and fabrication to ensure proper fitting. Show recorded measurements on final shop Drawings. Coordinate fabrication schedule with construction progress to avoid delay.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Products: To establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of other manufacturers, a specific manufacturer's product is named and accompanied by the words "basis of design," including make or model number or other designation. Subject to compliance with requirements, provide either the named products or equal products.

2.2 MATERIALS

A. Plastic Laminate:

1. Provide high-pressure plastic laminate engraving stock with face and core plies in contrasting colors, in finishes and color combinations indicated or, if not indicated, as selected from the manufacturer's standards.

B. Aluminum Sheet:

1. Provide aluminum sheet of alloy and temper recommended by the sign manufacturer for the type of use and finish indicated, and with not less than the strength and durability properties specified in ASTM B 209 for 5005- H32.

C. Aluminum Extrusions:

1. Provide aluminum extrusions of alloy and temper recommended by the sign manufacturer for the type of use and finish indicated, and with not less than the strength and durability properties specified in ASTM B 221 for 6063-T5.

D. Vinyl Film:

1. Provide opaque vinyl film, 0.0035-inch minimum thickness, with pressure-sensitive adhesive backing, suitable for exterior as well as interior applications.

E. Fasteners:

1. Use concealed fasteners, unless otherwise indicated, fabricated from metals that are not corrosive to the sign material and mounting surface.
2. Exposed fasteners are permitted for construction sign and traffic signs.

F. Anchors and Inserts:

1. Use nonferrous metal or hot-dipped galvanized anchors and inserts for exterior installations and elsewhere as required for corrosion resistance. Use toothed steel or

lead expansion bolt devices for drilled-in-place anchors. Furnish inserts, as required, to be set into concrete or masonry work.

G. Colored Coatings for Acrylic Plastic Sheet:

1. Use colored coatings, including inks and paints for copy and background colors, that are recommended by acrylic manufacturers for optimum adherence to acrylic surface and are nonfading for the application intended.

H. Brackets:

1. Fabricate brackets and fittings for bracket-mounted signs from extruded aluminum to suit sign panel construction and mounting conditions indicated. Factory-paint brackets in a color matching the background color of the sign panel.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General:

1. Locate sign units and accessories where indicated, using mounting methods of the type described and in compliance with the manufacturer's instructions.
2. Install signs level, plumb, and at the height indicated, with sign surfaces free from distortion or other defects in appearance.

B. Construction Sign:

1. Immediately upon issuance of Notice to Proceed with construction, furnish, install, and maintain a Construction Sign capable of withstanding normal winds encountered in Project Area.
2. Locate sign where indicated, if not indicated locate as directed by Contracting Officer.
3. Sign shall remain the property of the Contractor, and upon completion of the Work shall be removed from Project site.

C. Restroom Door Identification Signage:

1. Install where indicated. Where not indicated, install on wall adjacent to latch side of door. Where there is no wall space to latch side of door, place signs on nearest adjacent wall or center on door. Locate signage so that a person may approach within 3 inches of signage without standing within swing of door.

   a. Install tactile signage and signs with international accessibility symbol 60 inches above finished floor to centerline of sign. Install other restroom signs 48 inches above finished floor to centerline of sign.

2. Employee Notice Sign: Install where indicated. Where not indicated, install on center of restroom side of door 60 inches above finished floor to centerline of sign.

D. Interior and Exterior Door Identification Signage:

1. Install where indicated. Where not indicated, install on wall adjacent to latch side of door. Where there is no wall space to latch side of door, including double leaf doors, place signs on nearest adjacent wall.
2. Locate signage so that a person may approach within 3 inches of signage without standing within swing of door.
3. Install interior and exterior door identification signage 60 inches above finished floor to centerline of sign.
4. Install receiving door identification signage centered above overhead door, at recessed docks, and adjacent to overhead door at grade level receiving doors.

E. Customer Service Signage:

1. Unless otherwise indicated mount customer service sign at height above finished floor to centerline of pushbutton as follows:

   a. 48 inches maximum for wheelchair unobstructed forward reach.
   b. 54 inches maximum for wheelchair unobstructed side reach.
   c. 46 inches maximum for wheelchair obstructed side reach.

2. Coordinate location of sign with pushbutton specified in Division 26.

F. Wall-Mounted Panel Signs:

1. Attach panel signs to wall surfaces using the methods indicated below:

   a. Vinyl-Tape Mounting: Use double-sided foam tape to mount signs to smooth, nonporous surfaces. Do not use this method for vinyl-covered or rough surfaces.
   b. Silicone-Adhesive Mounting: Use liquid silicone adhesive recommended by the sign manufacturer to attach sign units to irregular, porous, or vinyl-covered surfaces. Use double-sided vinyl tape where recommended by the sign manufacturer to hold the sign in place until the adhesive has fully cured.
   c. Shim Plate Mounting: Provide 1/8-inch- thick, concealed aluminum shim plates with predrilled and countersunk holes, at locations indicated, and where other mounting methods are not practicable. Attach plate with fasteners and anchors suitable for secure attachment to substrate. Attach panel signs to plate using method specified above.

3.2 CLEANING AND PROTECTION

A. After installation, clean soiled sign surfaces according to the manufacturer's instructions. Protect units from damage until final acceptance.

3.3 SIGN SCHEDULE

A. Construction Sign (Exterior):

1. Sign Panel Size: 64-inch wide by 48-inch tall.
2. Facing: Single sided.
3. Sign Panel Fabrication: 3/4-inch thick APA Medium Density Overlay (MDO), Veneer Grade A-A, Group 1 Exterior sign panel with preservative treated wood trim around sign panel. Comply with requirements in Division 06 Section Rough Carpentry.

4. Digital color print files shall be used for artwork. Artwork images shall be digitally printed on 3.4 mil minimum thickness gloss white vinyl and then applied over MDO panel. Artwork shall be laminated using 3.0 mil minimum thickness gloss shield. Edges and back of MDO shall be sealed.
5. Sign Supports: Preservative treated wood sign posts with cripple studs, embedded in concrete foundations.
6. Sign Finish: Exposed wood surfaces shall be painted with exterior-grade alkyd gloss enamel over exterior primer.
7. Sign Panel Content: Basic layout and artwork content to be included on sign panel shall be as indicated in artwork furnished by DeCA. Contractor shall add the following:

    a. Construction Cost.
    b. Completion Date.

8. Refer to construction sign details and artwork images attached at end of this Section.

B. Construction Sign (Interior):

1. Sign Panel Size: 32-inch wide by 24-inch tall.
2. Facing: Single sided.
3. Sign Panel Fabrication: 3/4-inch thick APA Medium Density Overlay (MDO), Veneer Grade A-A, Group 1 Exterior sign panel with preservative treated wood trim around sign panel. Comply with requirements in Division 06 Section Rough Carpentry.
4. Digital color print files shall be used for artwork. Artwork images shall be digitally printed on 3.4 mil minimum thickness gloss white vinyl and then applied over MDO panel. Artwork shall be laminated using 3.0 mil minimum thickness gloss shield. Edges and back of MDO shall be sealed.
5. Sign Mounting: Easel (capable of supporting sign weight and size). Also provide hangers on backside of sign to accommodate mounting on wall.
6. Sign Finish: Exposed wood surfaces shall be painted with exterior-grade alkyd gloss enamel over exterior primer.
7. Sign Panel Content: Basic layout and artwork content to be included on sign panel shall be as indicated in artwork furnished by DeCA. Contractor shall add the following:

    a. Construction Cost.
    b. Completion Date.

8. Refer to construction sign details and artwork images attached at end of this Section.

C. Exterior Illuminated Building Sign:

1. Custom fabricated as detailed on Drawings.
2. Cabinet:

    a. Designed to accommodate 3/16 inch panel thickness.
    b. Welded aluminum framework by AWS certified welders.
    c. Finish: Painted 3 coats AXCO polyurethane. Retainer to match cabinet.

3. Faces:

    a. G.E. Lexan, 0.15 inch thick, clear and white, with first and second surface 3M Brand Translucent film applications and custom logo of 3M Brand Translucent Scotch print Digital Graphic in high resolution.
    b. Colors shall match codes and descriptions for DeCA Commissary as indicated.

4. Electrical:

   a. Sign shall be powered by one dedicated 120V at 20 Amps circuit.
   b. Class 2 Compliant. Input Voltage: 24 Volt DC. 6300k White LED Illumination with life expectancy 60,000 hours or more. Operating Temperature: Minus 40 degrees to 60 degrees Celsius.
   c. US-LED, Tandem Series Sign Cabinet Model No. G1-14-24-4WUnderwriter's Laboratories listed.
   d. Provide photocell control or connect to existing exterior lighting control system.

5. Returns: Aluminum, with drain holes.
6. Back: 0.063 inch thick aluminum.
7. Basis-of-Design Product: I-5 Design & Manufacture (800) 459-2967 or www.i5design.com.

D. Commissary Store Hours Sign:

1. Extruded aluminum box frame.
2. 0.125 inch thick aluminum faces.
3. Removable aluminum face at top of sign for service and lamp access.
4. Fixed Signage: Individual jigged out letters with pushed through copy. Copy shall be 3/8 inch thick clear Plexiglas facing with white diffuser vinyl 2nd surface. Copy shall be back-lit.
5. Removable panel on backside for access to changeable signage.
6. Changeable Signage: Removable jigged out pushed through panels. Panels shall consist of 1/4 inch thick clear Plexiglas facing with back surface and edges painted (color as indicated) except copy, with 1/8 inch thick white Plexiglas back-up. Copy shall be back-lit.
7. Message:

   a. Single face.
   b. Size of uppercase letters: As indicated.

8. Letter Style: Helvetica medium.
9. Exterior Finish: As indicated on Drawings.
10. Electrical:

    a. Sign shall be powered by one dedicated 120V at 20 Amps circuit.
    b. Class 2 Compliant. Input Voltage: 24 Volt DC. 6300k White LED Illumination with life expectancy 60,000 hours or more. Operating Temperature: Minus 40 degrees to 60 degrees Celsius.
    c. US-LED, Tandem Series Sign Cabinet Model No. G1-14-24-4W
    d. Underwriter's Laboratories listed.
    e. Provide photocell control or connect to existing exterior lighting control system.

11. Internal post supports and bracing in accordance with system performance requirements.
12. Aluminum skirt to conceal post supports.
13. Basis-of-Design Product: I-5 Design & Manufacture (800) 459-2967 or www.i5design.com.

E. Restroom Door Identification Signs:

1. Provide restroom identification signs complying with UFAS and ADAAG.

2. Signage types:

    a. Men's restroom verbal and silhouette symbol identification sign with international accessibility symbol. Text in uppercase.
    b. Women's restroom verbal and silhouette symbol identification sign with international accessibility symbol. Text in uppercase.
    c. Family's restroom verbal and silhouette symbol identification sign with international accessibility symbol. Text in uppercase.
    d. "Employees Must Wash Hands Before Returning To Work" sign.

        1) Title text case: Lower case with first letter of each word in uppercase.

3. Size: Nominal 8 inch by 8 inch.
4. Panel:

    a. Size: Nominal 8-inch by 8-inch unless otherwise indicated.
    b. Phenolic resin bonded to Melamine; minimum 1/8-inch thick; 1/2-inch radius corners.
    c. Text, Braille, border and characters raised 1/32-inch with background blast etched and painted.

5. Colors:

    a. Sign background: Match Benjamin Moore AC-33 Mesa Verde Tan.
    b. Border, text, and characters: White.
    c. Braille: Match background.

6. Characters (letters and numbers) and Symbols:

    a. Typography: Helvetica medium.
    b. Character Height (measured using an upper case X): Approximately 3/4 inch.
    c. Male and female silhouette symbols (pictograms): Approximately 4 inches high with equivalent verbal description placed directly below pictogram.
    d. International accessibility symbol: Approximately 3 inches high.

7. Mounting: Vinyl-tape.
8. Basis-of-Design Product: I-5 Design & Manufacture (800) 459-2967 or www.i5design.com.

F. Interior Door Identification Signage:

1. Provide identification signs complying with UFAS and ADAAG.
2. Panel:

    a. Size: Nominal 8-inch by 8-inch unless otherwise indicated.
    b. Phenolic resin bonded to Melamine; minimum 1/8-inch thick; 1/2-inch radius corners.
    c. Text, Braille, border and characters raised 1/32-inch with background blast etched and painted.

3. Colors:

    a. Sign background: Match Benjamin Moore AC-33 Mesa Verde Tan.
    b. Border, text, and characters: White.

c. Braille: Match background.Text (letters and numbers):

1) Typography: Helvetica medium.
2) Text Height (measured using an upper case X):

d. Signs with Single Room Identification: Uppercase, approximately 3/4 inch.
e. Signs with Direction: Lowercase with an uppercase first letter of each word, approximately 5/8 inch.

4. Mounting: Vinyl-tape.
5. Basis-of-Design Product: I-5 Design & Manufacture (800) 459-2967 or www.i5design.com.

G. Customer Service Sign:

1. Provide signs complying with regulatory requirements for accessibility.
2. Panel:

a. Size: Nominal 8-inch by 8-inch unless otherwise indicated.
b. Phenolic resin bonded to Melamine; minimum 1/8-inch thick; 1/2-inch radius corners.
c. Text, Braille, border and characters raised 1/32-inch with background blast etched and painted.
d. Provide sign with hole for mounting with pushbutton device.

3. Colors:

a. Sign background: Match Benjamin Moore AC-33 Mesa Verde Tan.
b. Border, text, and characters: White.
c. Braille: Match background.

4. Characters (lettering):

a. Text: Ring For Customer Service.
b. Typography:

1) Helvetica medium.
2) Lowercase with an uppercase first letter of each word.

c. Character Height (measured using an upper case X): Approximately 3/4 inch.

5. Mounting: Vinyl-tape.
6. Basis-of-Design Product: I-5 Design & Manufacture (800) 459-2967 or www.i5design.com.
7. Traffic Door Identification Signage:
8. Unless otherwise indicated provide pressure sensitive lettering in accordance with the following:

a. Applied Copy: Die-cut characters from vinyl film with pressure-sensitive adhesive backing, pre-spaced and pre-aligned.
b. Letter Color: As indicated.
c. Letter Style: Helvetica Medium.

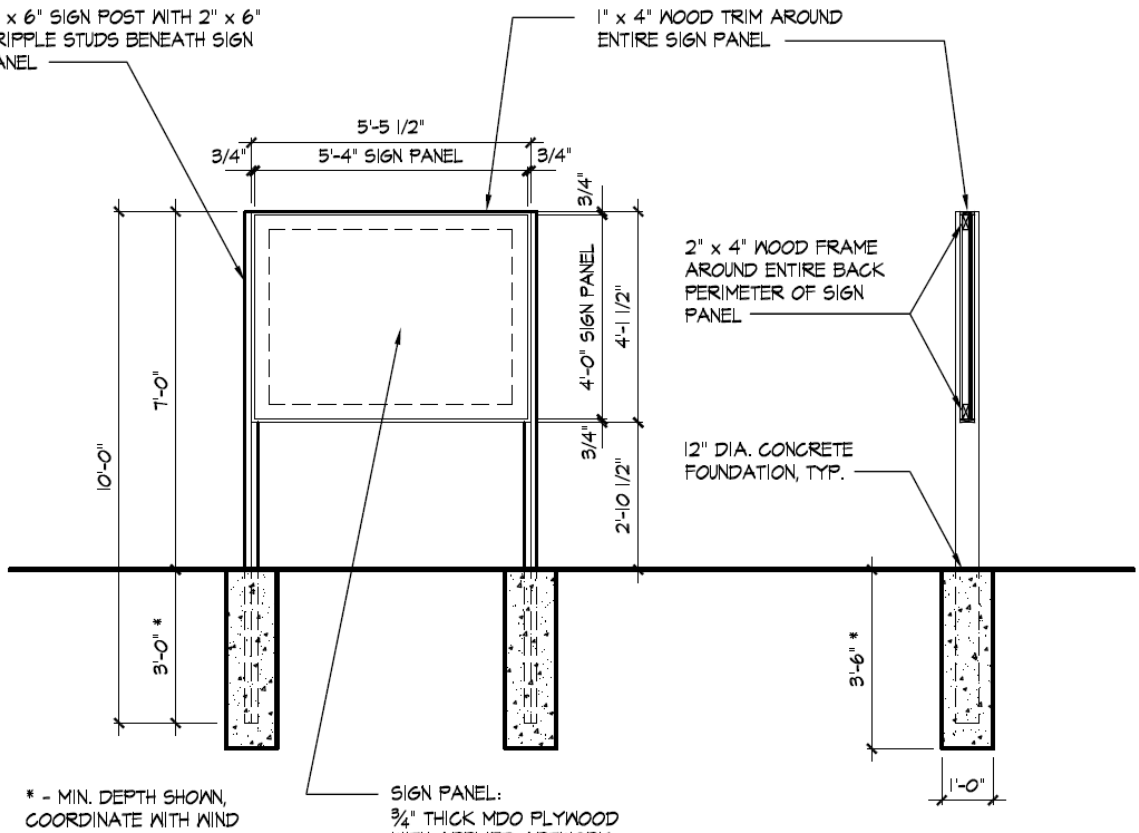
H. Surcharge Plaque:

1. The Government will furnish a cast bronze surcharge plaque for installation by the Contractor. Permanently mount the plaque in a prominent location at the front entrance. The Contracting Officer will determine the exact location.

END OF SECTION

EXAMPLE OF DECA FURNISHED ELECTRONIC ART WORK FOR NEW COMMISSARY PROJECT.

EXAMPLE OF DECA FURNISHED ELECTRONIC ART WORK FOR COMMISSARY UPGRADE PROJECT.



* - MIN. DEPTH SHOWN, COORDINATE WITH WIND SPEED REQUIREMENT AND FROST DEPTH.

SIGN PANEL:
¾" THICK MDO PLYWOOD WITH APPLIED ARTWORK PRINTED ON VINYL WITH LAMINATE FINISH.
(ELECTRONIC ARTWORK FURNISHED BY DeCA)

ALL WOOD SURFACES SHALL BE PAINTED - WHITE

CONSTRUCTION SIGN (INTERIOR) SHALL HAVE SAME SIGN PANEL CONSTRUCTION AND ARTWORK IMAGE, BUT SHALL BE PROVIDED WITH AN EASEL TO SUPPORT SIGN IN LIEU OF WOOD POSTS AND CONCRETE FOUNDATION

CONSTRUCTION SIGN (EXTERIOR)

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SECTION 10 15 00

INTERIOR DÉCOR SPECIALTIES

(Edited from DeCA June 2011 Design Criteria)

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Aisle directory signs.
2. Department decor elements.
3. Tagline lettering.
4. Banners.
5. Checkstand markers.
6. Department blade signs.
7. Frozen food identifier.
8. Frozen food valance.
9. Produce decor grid.
10. Soffit trim

B. Related Sections:

1. Division 06 Section Rough Carpentry for wood furring, blocking, shims, and hanging strips required for installation.
2. Division 06 Section Interior Architectural Woodwork for interior carpentry exposed to view that is not specified in this Section.

1.2 DEFINITIONS

A. ABA Accessibility Guidelines: U.S. Architectural & Transportation Barriers Compliance Board's "Architectural Barriers Act (ABA) Accessibility Guidelines."

1.3 SUBMITTALS

A. Product Data: For each type of interior decor specialty specified, including details of construction relative to materials, dimensions of individual components, profiles, and finishes.

B. Shop Drawings:

1. Show fabrication and erection of interior decor specialties. Include plans, elevations, and large-scale sections of typical members and other components. Show anchors, grounds, layout, reinforcement, accessories, and installation details.
2. Provide message list for each sign required, including large-scale details of wording and lettering layout.
3. Show details of anchors supporting banners.

C. Samples:

1. Provide digitally printed color sample, 2 inch by 2 inch minimum size for color matching with paint chip control samples. Submit paint chip color control samples with digitally printed color sample submittal.
2. Provide 2 foot by 2 foot banner sample.
3. Provide sample of anchors supporting banners.

1.4 QUALITY ASSURANCE

A. Interior Decor Specialty Fabricator Qualifications: Firm experienced in producing interior decor specialties similar to those indicated for this Project, with a record of successful in-service performance, and sufficient production capacity to produce interior decor specialty units required without causing delay in the Work.

B. Fire-Test-Response Characteristics: Provide materials with the fire-test-response characteristics indicated, as determined by testing identical products per test method indicated by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify materials with appropriate markings of applicable testing and inspecting agency.

1. Flame-Spread Index: 25 or less. According to ASTM E 84.
2. Smoke-Developed Index: 450 or less. According to ASTM E 84.

C. Regulatory Requirements: Comply with applicable provisions in ABA Accessibility Guidelines and ICC/ANSI A117.1.

D. Woodwork Quality Standard Compliance Certificates: WI Certified Compliance Program certificates.

1.5 PROJECT CONDITIONS

A. Field Measurements: Obtain field measurements prior to preparation of Shop Drawings and fabrication to ensure proper fitting. Show recorded measurements on final shop Drawings. Coordinate fabrication schedule with construction progress to avoid delay.

B. Environmental Limitations: Do not deliver or install directories until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work above ceilings is complete, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Products: To establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of other manufacturers, a specific manufacturer's product is named and accompanied by the words "basis of design," including make or model number or other designation. Subject to compliance with requirements, provide either the named products or equal products.

B. Basis of Design Interior Decor Specialties Fabricator: I-5 Design & Manufacture Inc, Contact: Joe Hier (800) 459-2967 x 105 or e-mail jhier@i5design.com.

2.2 MATERIALS

A. Foamed Core Board Type 1:

1. Extruded polystyrene foam board bonded on both sides with laminated facing materials. Lightweight structural panels of rigid polystyrene foam core faced on both sides with smooth, moisture resistant man-made wood fiber veneers. Foam and veneers are permanently bonded together in a sandwich construction. Face laminates specially developed to provide excellent surface for painting, silk screening, laminating, and photo mounting.
2. Fire-Test-Response Characteristics:

   a. Flame-spread index of not greater than 25 when tested according to ASTM E 84.
   b. Smoke-developed index of not greater than 450 when tested according to ASTM E 84.
   c. Rapid heat release rate of not greater than 150 kilowatts when tested according to UL 1975.

3. Basis-Of-Design Product: “Gatorfoam Graphic Arts Board,” International Paper Company, (800) 438-1701, www.gatorfoam.com.

B. Foamed Core Board Type 2: Rigid, foamed, closed-cell poly vinyl chloride (PVC) board bonded on both sides with laminated facing materials.

1. Fire-Test-Response Characteristics:

   a. Flame-spread index of not greater than 25 when tested according to ASTM E 84.
   b. Smoke-developed index of not greater than 450 when tested according to ASTM E 84.
   c. Rapid heat release rate of not greater than 150 kilowatts when tested according to UL 1975.

2. Basis-Of-Design Product: "Sintra," Alusuisse Composites, Inc., (800) 382-6445, http://www.graphicdisplayusa.com/sintra/substrate/.

C. Aluminum: Alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated, and with not less than the strength and durability properties of alloy and temper designated below for each aluminum form required.

1. Extruded Bar and Tube: ASTM B 221, alloy 6063-T5/T52.
2. Extruded Structural Pipe and Tube: ASTM B 429, alloy 6063-T6.
3. Drawn Seamless Tube: ASTM B 210, alloy 6063-T832.
4. Aluminum Sheet or Plate: Alloy and temper recommended by the aluminum producer and finisher for the type of use and finish indicated, and with at least the strength and durability properties specified in ASTM B 209 for 5005- H32 alloy.

D. Medium-Density Fiberboard (MDF - Medite 3D):

1. ANSI A208.2, Grade MD. , made with binder containing no urea formaldehyde.
2. Basis-Of-Design Product: "Medite 3D" Sierra Pine Composite Solutions, (800) 676-3339, www.sierrapine.com.

E. L.E.D. Lighting: L70 Rating of 60,000 up to 100,000 hours or more.

1. Class 2 Compliant. Input Voltage: 12 Volt DC.
2. Operating Temperature: minus 40 deg to 140 deg F.
3. Basis-Of-Design Product: "Right Light Series" US-LED, (866) 972-9191, www.usled.com.

F. Styrene: Polystyrene Resin.

1. Basis-Of-Design Product: "HIPS SP-2010 Styrene" Spartech, (888) 721-4242, www.spartech.com

2.3 FINISHES, GENERAL

A. Colors and Surface Textures: For exposed interior decor specialty material that requires selection of materials with integral or applied colors, surface textures or other characteristics related to appearance, provide color matches indicated.

B. Metal Finishes: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for finish designations and applications recommendations.

C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

D. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

2.4 ALUMINUM FINISHES

A. Mill brush finish for exposed components.

B. Mill finish for concealed components.

2.5 WOOD FINISHES

A. Hardwood Lumber Trim for Transparent Finish (Stain or Clear Finish):

1. Species and Grade: [**Western Hemlock**]; [**Clear**] [**A finish**] [**B finish**]; NHLA.
2. Maximum Moisture Content: [**13**] [**10**] [**9**] <**Insert value**> percent.
3. Finger Jointing: Not allowed.
4. Gluing for Width: Not allowed.
5. Veneered Material: Not allowed.
6. Face Surface: [**Surfaced (smooth)**].
7. Matching: Selected for compatible grain and color.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General:

1. Locate interior decor components where indicated, using mounting methods of the type described and in compliance with the manufacturer's instructions.
2. Install interior decor components level, plumb, and at the height indicated, with surfaces free from distortion or other defects in appearance.
3. Décor ceiling elements shall be supported from the structure.

B. Wall-Mounted Foamed Core Board Interior Decor Components: Attach foamed core board interior decor components to wall surfaces using the methods indicated below:

1. Silicone-Adhesive and 3M VHB Double-back Tape Mounting: Use liquid silicone adhesive recommended by the interior decor component manufacturer to attach interior decor components to wall surfaces. Use 3M VHB double-sided vinyl tape to hold the interior decor components in place until the adhesive has fully cured.

C. Wall-Mounted Metal-Framed Interior Decor Components: Attach metal-framed interior decor components to wall surfaces using concealed fasteners, unless otherwise indicated, fabricated from metals that are not corrosive to the interior decor specialty material and mounting surface. Fasteners size and attachment method shall be determined by manufacturer.

3.2 CLEANING AND PROTECTION

A. After installation, clean soiled interior decor specialty surfaces according to the manufacturer's instructions. Protect units from damage until final acceptance.

3.3 INTERIOR DECOR SPECIALTY SCHEDULE

A. Aisle Directory Signs: Custom fabricated of Foamed Core Board Type 2 and MDF (Medite 3D) as detailed on Drawings.

1. Colors: As indicated.
2. Numbers:

a. Thickness: As indicated.
b. Face style: As indicated.
c. Size: As indicated.

3. Mounting: As indicated.

B. Department Decor Elements: Custom fabricated of Foamed Core Board Type 2, Aluminum, MDF (Medite 3D) and LED Lighting as detailed on Drawings.

1. Colors: As indicated.
2. Letters: As indicated.

a. Thickness: As indicated.
b. Face style: As indicated.

c. Size: As indicated.
d. Profiles: As indicated.

3. Mounting: As indicated.
4. Valance:

a. Thickness: As indicated.
b. Face style: As indicated.
c. Size: As indicated.
d. Mounting: As indicated.

5. Painted Wall Graphic:

a. Size: As indicated.
b. Color: As indicated.

C. Tagline Lettering: MDF (Medite 3D) as detailed on Drawings:

1. Colors: As indicated.
2. Profiles: As indicated.
3. Size: As indicated.
4. Mounting: Silicone adhesive and 3M VHB.

D. Banners: Custom fabricated of styrene, MDF (Medite 3D) and aluminum as detailed on Drawings. Electronic artwork provided by Government.

1. Finish: As indicated.
2. Color: As indicated.
3. Size: As Indicated.
4. Mounting: As indicated.

E. Checkstand Markers: As Indicated.

F. Department Blade Signs: Custom fabricated of MDF (Medite 3D) and aluminum as indicated and detailed on Drawings.

1. Colors: As indicated.
2. Profiles: As indicated.
3. Size: As indicated.
4. Mounting: As Indicated.

G. Frozen Food Identifiers: Custom fabricated of MDF (Medite 3D) and aluminum as indicated and detailed on Drawings.

1. Colors: As indicated.
2. Profiles: As indicated.
3. Size: As indicated.
4. Mounting: As Indicated.

H. Frozen Food Valance: Custom fabricated of aluminum as indicated and detailed on Drawings.

1. Colors: As indicated.
2. Profiles: As indicated.
3. Size: As indicated.
4. Mounting: As Indicated.

I. Produce Decor Grid: Custom fabricated of Hemlock wood and aluminum as detailed on Drawings.

1. Framing:

a. Aluminum extrusions and aluminum tubing. As indicated.
b. Finish and Color: As indicated.

2. Brackets, Flanges and Anchors: As Indicated.
3. Framing Fabrication: As Indicated.

J. Soffit Trim.

1. Foamed Core Board Type 1 with painted edges.
2. Colors: As indicated.
3. Profiles: As indicated.
4. Size: As indicated.
5. Mounting: Silicone adhesive.

END OF SECTION

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SECTION 10 21 13

TOILET COMPARTMENTS

(Edited from DeCA June 2011 Design Criteria)

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Stainless-steel toilet compartments configured as toilet enclosures and urinal screens.

B. Related Sections:

1. Division 01 Section Sustainable Design Reporting for recycled contents.
2. Division 05 Section Metal Fabrications for supports that attach floor-and-ceiling-anchored compartments to overhead structural system.
3. Division 06 Section Miscellaneous Rough Carpentry for blocking and overhead support of post-to-ceiling screens.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

1. Show locations of cutouts for compartment-mounted toilet accessories.
2. Show locations of reinforcements for compartment-mounted grab bars.

C. Submittal List:

Reference	Submittal Item	Quantity	Action
1.2A	Product Data	X	R
1.2B	Shop Drawings	X	R

X Submit quantity specified in Division 01 Section Administrative Requirements.
R Review each submittal, mark to indicate action taken, and return.
I Submittal is for information or record purposes only. No action will be taken.

1.3 QUALITY ASSURANCE

A. Reference Standards: Comply with requirements in GSA's CID-A-A-60003, "Partitions, Toilets, Complete."

B. Regulatory Requirements: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's "Architectural Barriers Act (ABA) Accessibility Guidelines for Buildings and Facilities" and ICC/ANSI A117.1 for toilet compartments designated as accessible.

1.4 PROJECT CONDITIONS

A. Field Measurements: Verify actual locations of walls, columns, ceilings, and other construction contiguous with toilet compartments by field measurements before fabrication and indicate measurements on Shop Drawings.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Steel Sheet: Commercial steel sheet for exposed applications; mill phosphatized and selected for smoothness.

B. Stainless-Steel Sheet: ASTM A 666, Type 304, stretcher-leveled standard of flatness.

C. Stainless-Steel Castings: ASTM A 743/A 743M.

2.2 MANUFACTURERS

A. Basis-of-Design Products: To establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of other manufacturers, a specific manufacturer's product is named and accompanied by the words "basis of design," including make or model number or other designation. Subject to compliance with requirements, provide either the named products or equal products.

2.3 STAINLESS STEEL UNITS

A. Subject to compliance with requirements, provide products by one of the following Manufacturers:

1. Accurate Partitions Corporation.
2. Global Steel Products Corp.
3. Metpar Corp.

B. Toilet Enclosure Style: Floor anchored overhead braced: Manufacturer's standard thickness, but not less than 0.0375 inch.

C. Urinal Screen Style: Integral-Flange, Wall-Hung: Manufacturer's standard thickness, but not less than 0.0312 inch.

D. Door, Panel, and Pilaster Construction: Seamless, metal facing sheets pressure laminated to core material; with continuous, interlocking molding strip or lapped-and-formed edge closures; corners secured by welding or clips and exposed welds ground smooth Exposed surfaces shall be free of pitting, seam marks, roller marks, stains, discolorations, telegraphing of core material, or other imperfections.

1. Core Material: Manufacturer's standard sound-deadening honeycomb of resin-impregnated kraft paper in thickness required to provide finished thickness of 1 inch for doors and panels and 1-1/4 inches for pilasters.

2. Grab-Bar Reinforcement: Provide concealed internal reinforcement for grab bars mounted on units.
3. Tapping Reinforcement: Provide concealed reinforcement for tapping (threading) at locations where machine screws are used for attaching items to units.

E. Urinal-Screen Construction:

1. Integral-Flange, Wall-Hung Urinal Screen: Similar to panel construction, with integral full-height flanges for wall attachment, and maximum 1-1/4 inches thick.

F. Facing Sheets and Closures: Fabricated from ASTM A 666, Type 304, stainless-steel sheet, leveled to stretcher-leveled flatness. Stainless-steel sheet of nominal thicknesses as follows:

1. Pilasters, Braced at Both Ends: Manufacturer's standard thickness, but not less than 0.038 inch.
2. Panels: Manufacturer's standard thickness, but not less than 0.031 inch.
3. Doors: Manufacturer's standard thickness, but not less than 0.031 inch.
4. Integral-Flange, Wall-Hung Urinal Screens: Manufacturer's standard thickness, but not less than 0.031 inch.

G. Pilaster Shoes and Sleeves (Caps): ASTM A 666, Type 302 or 304. Stainless-steel sheet, not less than 0.031-inch nominal thickness and 3 inches high, finished to match hardware.

H. Brackets (Fittings): Stirrup Type: Ear or U-brackets, stainless steel.

I. Stainless Steel Finish: Manufacturer’s standard textured finish on exposed faces. Protect exposed surfaces from damage by application of strippable, temporary protective covering before shipment.

2.4 ACCESSORIES

A. Hardware and Accessories: Manufacturer's standard design, heavy-duty operating hardware and accessories.

1. Material: Stainless steel.
2. Hinges: Manufacturer's standard self-closing type that can be adjusted to hold doors open at any angle up to 90 degrees.
3. Latch and Keeper: Manufacturer's standard surface-mounted latch unit designed for emergency access and with combination rubber-faced door strike and keeper. Provide units that comply with accessibility requirements of authorities having jurisdiction at compartments indicated to be accessible to people with disabilities.
4. Coat Hook: Manufacturer's standard combination hook and rubber-tipped bumper, sized to prevent door from hitting compartment-mounted accessories.
5. Door Bumper: Manufacturer's standard rubber-tipped bumper at out-swinging doors.
6. Door Pull: Manufacturer's standard unit at out-swinging doors that complies with accessibility requirements of authorities having jurisdiction. Provide units on both sides of doors at compartments indicated to be accessible to people with disabilities.

B. Overhead Bracing: Manufacturer's standard continuous stainless steel supports, leveling mechanism, and anchors at pilasters to suit floor conditions. Provide shoes at pilasters to conceal supports and leveling mechanism.

C. Anchorages and Fasteners: Manufacturer's standard exposed fasteners of stainless steel finished to match hardware, with theft-resistant-type heads. Provide sex-type bolts for through-

bolt applications. For concealed anchors, use hot-dip galvanized or other rust-resistant, protective-coated steel.

2.5 FABRICATION

A. Overhead-Braced Units: Provide manufacturer's standard corrosion-resistant supports, leveling mechanism, fasteners, and anchors at pilasters to suit floor conditions. Make provisions for setting and securing continuous head rail at top of each pilaster. Provide shoes at pilasters to conceal supports and leveling mechanism.

B. Door Size and Swings: Unless otherwise indicated, provide 24 inch wide in-swinging doors for standard toilet compartments and 36 inch wide out-swinging doors with a minimum 32 inch wide clear opening for compartments indicated to be accessible to people with disabilities.

C. Urinal-Screen Posts: Provide manufacturer's standard stainless steel anchoring assemblies with leveling adjustment at tops and bottoms of posts. Provide shoes and sleeves (caps) at posts to conceal anchorage.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Comply with manufacturer's written installation instructions. Install units rigid, straight, level, and plumb. Secure units in position with manufacturer's recommended anchoring devices.

1. Maximum Clearances:

a. Pilasters and Panels: 1/2 inch.
b. Panels and Walls: 1 inch.

2. Stirrup Brackets: Secure panels to walls and to pilasters with not less than two brackets attached near top and bottom of panel.

a. Locate wall brackets so holes for wall anchors occur in masonry or tile joints.
b. Align brackets at pilasters with brackets at walls.

B. Overhead-Braced Units: Secure pilasters to floor and level, plumb, and tighten. Secure continuous head rail to each pilaster with not less than two fasteners. Hang doors to align tops of doors with tops of panels and adjust so tops of doors are parallel with overhead brace when doors are in closed position.

C. Urinal Screens: Attach with anchoring devices to suit supporting structure. Set units level and plumb, rigid, and secured to resist lateral impact.

D. Floor Seal: Seal tight at all floor connections with single or multi-component silicone sealant appropriate for application.

3.2 ADJUSTING

A. Hardware Adjustment: Adjust and lubricate hardware according to manufacturer's written instructions for proper operation. Set hinges on in-swinging doors to hold doors open approximately 30 degrees from closed position when unlatched. Set hinges on out-swinging doors to return doors to fully closed position.

END OF SECTION

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SECTION 10 26 00

WALL AND EQUIPMENT PROTECTION

(Edited from DeCA June 2011 Design Criteria)

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Stock-Manufactured Wall and Equipment Guards:

a. Protection posts.
b. Cart rails.
c. Cart bumpers.
d. Case corner guards.
e. Stainless steel bumper rail system.
f. Wood bumper rail.
g. Impact resistant wall covering.

B. Related Sections:

1. Division 01 Section Sustainable Design Requirements for adhesives.
2. Division 05 Section Metal Fabrications for custom-fabricated metal bollards (bumper posts) and steel angle corner guards.
3. Division 10 Section Storage Racks for floor mounted corner guards specified with storage racks.

1.2 SUBMITTALS

A. Product Data: Product Data: Include construction details, material descriptions, impact strength**,** dimensions of individual components and profiles, and finishes for each type of product indicated.

B. Submittal List:

Reference	Submittal Item	Quantity	Action
1.2A	Product Data	X	R

X Submit quantity specified in Division 01 Section Administrative Requirements.
R Review each submittal, mark to indicate action taken, and return.
I Submittal is for information or record purposes only. No action will be taken.

1.3 QUALITY ASSURANCE

A. Source Limitations: Obtain each type of wall and equipment guard unit through one source from a single manufacturer.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Store impact-resistant wall protection units in original undamaged packages and containers inside well-ventilated area protected from weather, moisture, soiling, extreme temperatures, and humidity.

B. Maintain room temperature within storage area at not less than 70 deg F during the period plastic materials are stored.

1. Keep plastic sheet material out of direct sunlight.
2. Store plastic wall protection components for a minimum of 72 hours, or until plastic material attains a minimum room temperature of 70 deg F.

1.5 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install wall and equipment guards until building is enclosed and weatherproof, wet work is complete and dry, and HVAC system is operating and maintaining temperature at 70 deg F for not less than 72 hours before beginning installation and for the remainder of the construction period.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Products: To establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of other manufacturers, a specific manufacturer's product is named and accompanied by the words "basis of design," including make or model number or other designation. Subject to compliance with requirements, provide either the named products or equal products.

2.2 MATERIALS

A. Metal Surfaces: Provide materials with smooth, flat surfaces, unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.

B. PVC Plastic: ASTM D 1784, Class 1, textured, chemical- and stain-resistant, high-impact-resistant PVC or acrylic-modified vinyl plastic with integral color throughout; sheet material, thickness as indicated.

1. Impact Resistance: Minimum 18.0 ft-lbf/in. of notch when tested according to ASTM D 256, Test Method A.
2. Chemical and Stain Resistance: Tested according to ASTM D 543**.**
3. Self-extinguishing when tested according to ASTM D 635.
4. Flame-Spread Index: 25 or less.
5. Smoke-Developed Index: 450 or less.

C. Solid Wood: Clear hardwood lumber of species indicated, free of appearance defects, and selected for compatible grain and color.

D. Adhesive: As recommended by impact-resistant plastic wall protection manufacturer and with a VOC content of 9.346 oz./gal. or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.3 MATERIALS - MISCELLANEOUS

A. Galvanizing Repair Paint: High-zinc-dust-content paint for re-galvanizing steel, complying with SSPC-Paint 20.

2.4 PROTECTION POSTS

A. Protection Post with Four-Way Anchors:

1. Post: 3-inch O.D. tube made from 11 gage cold rolled steel with a 5-1/2 inch diameter steel flange at the base containing four (4) anchor holes. The top of the post shall be sealed with a fully welded 3 inch diameter cold rolled steel post cap.
2. Post height 36 inches.
3. Anchor post to floor with expansion anchor bolts. Anchor Package consists of four (4) each SB anchors with 3/8 - 16 by 2-1/2 inch HHCS and washers. Each SB anchor is a 1-1/2 inch long by 5/8 inch diameter single-expansion system that expands to lock the anchor bolt securely in place.
4. 16 gage steel form-fit cover plate for covering post base anchors.
5. Finish: All external fabricated materials are composed of cold rolled chrome plated steel and mirror polished.
6. Basis-of-Design Products: Alvarado Mfg. Co., Inc., 3 Inch Diameter Safety Bollard with Anchor Package. 800-423-4143 or www.alvaradomfg.com.
7. See Drawings for locations and details.

2.5 CART RAILS

A. Cart Post and Rail with Four-Way Anchors:

1. Post: 2-1/4-inch O.D. by 16 gage steel tubing welded to 1/4-inch thick by 5-1/2 inch diameter steel base plate, include post cap and railing outlets.
2. Rail: 1-3/4-inch O.D. by 16 gage steel tubing.
3. Anchor each post to floor with expansion anchor bolts. Anchor Package for each post consists of four (4) each SB anchors with 3/8 - 16 by 2-1/2 inch HHCS and washers. Each SB anchor is a 1-1/2 inch long by 5/8 inch diameter single-expansion system that expands to lock the anchor bolt securely in place.
4. Anchor rail to post with a vibration resistant self-locking bolt and railing setscrews.
5. 16 gage steel form-fit cover plate for covering post base anchors.
6. Polished chrome post, post cap, rails, and cover plate.
7. Double Rail System:

   a. Post height: 35-1/2 inches.
   b. Post spacing: Equally spaced, 5 feet on center, maximum.
   c. Rail heights from finished floor, approximate:

      1) Bottom rail: 20-5/8 inches.
      2) Top rail: 34-1/2 inches.

8. Triple Rail System:

   a. Post height: 44-1/2 inches.
   b. Post spacing: 5 feet on center, maximum.
   c. Rail heights from finished floor, approximate:

      1) Bottom rail: 17-1/2 inches.
      2) Intermediate rail: 28 inches.
      3) Top rail: 43-1/2 inches.

9. Basis-of-Design Products: Alvarado Mfg. Co., Inc., Vogue Post - Type V and Rail with Anchor Package. 800-423-4143 or www.alvaradomfg.com.
10. See Drawings for locations and details.

2.6 CART BUMPER

A. Spring Action Cart Bumper:

1. 4-inch wide, 11 gage, steel channel with capped ends and, where required, interconnecting bolt-together assembly and angle ends.
2. 4.5-inch wide spring post support, 0.180 inch thick spring steel treated to RC40 to RC50 that forms a half-circle at its base.
3. Anchor cart bumper to floor with double Keystone expansion anchor bolts. Anchor Package consists of one (1) type SA anchors with 5/8 - 11 by 3-1/4 inch HHCS and washer at each support foot. Each SA anchor is a 2-3/4 inch long by 1 inch diameter double-expansion system that expands to lock the anchor bolt securely in place.
4. Where cart bumper is used to protect sliding doors provide bumper of length not less than door width.
5. Polished chrome finish.
6. Basis-of-Design Products: Alvarado Mfg. Co., Inc., Model CB, Cart Bumper System and Model SA floor anchors. 800-423-4143 or www.alvaradomfg.com.
7. See Drawings for locations and details.

2.7 CASE CORNER GUARDS

A. Corner Protection Semi-Circular Guard with 3 Anchors:

1. Guard: 7-gage steel, 7-1/2 inch diameter by 12 inches high.
2. Anchor case corner guard to floor with expansion anchor bolts through three anchor tabs on the interior of base. Anchor Package consists of three (3) each SB anchors with 3/8 - 16 by 2-1/2 inch HHCS and washers. Each SB anchor is a 1-1/2 inch long by 5/8 inch diameter single-expansion system that expands to lock the anchor bolt securely in place.
3. Polished chrome finish.

B. Basis-of-Design Products: Alvarado Mfg. Co., Inc., Corner Case Protector, Model CRI-C with Anchor Package. 800-423-4143 or www.alvaradomfg.com.

C. See Drawings for locations and details.

2.8 STAINLESS STEEL BUMPER RAIL SYSTEM

A. Removable Case And Fixture Protection Rails:

1. Rail: 1.75-inch diameter by 16 gage stainless steel tubing capped at each end with force fit, impact resistant plastic end caps designed to fit and adhere tightly into the rail.
2. Stem assembly supporting rail: Fully welded assembly constructed of tapered 2-inch by 4-inch long stainless steel tube welded at 90 degrees to a 0.75-inch diameter by 7.5-inch long stainless steel rod for insertion into floor socket. Grind welds smooth.

   a. Provide two 1/4-20 set screws on the underside of each tube to secure stem assembly to rail.
   b. Provide 2 stems with each 2-foot, 4-foot, and 6-foot bumper rail length; 3 stems with each 8-foot and 10-foot bumper rail length; and 4 stems with each 12-foot bumper rail length.

3. Floor Socket: 0.765-inch I.D. by 2.8-inch long stainless steel tube with a 1.7-inch diameter flange at top end. Socket tube is sealed at bottom end.
4. Stainless Steel: Type 304 with No.4 polished satin finish.
5. Install bumper rail system with top of rail 6.75 inches above floor in accordance with manufacturer's written directions and instructions.
6. See Drawings for locations and details.

B. Basis-of-Design Products: Alvarado Mfg. Co., Inc., Stainless Steel Bumper, Model SSB. 800-423-4143 or www.alvaradomfg.com.

2.9 WOOD BUMPER RAIL

A. Salient Characteristics:

1. Quality Standard: Comply with "Architectural Woodwork Standards" Section 03 - Lumber.
2. Grade: Custom.
3. Wood Species: Red oak, plain sawn.
4. Fabrication Method: One-piece lumber, no laminations or veneer construction, with eased edges machined to an 1/8 inch radius on exposed edges.

   a. Smoothness: 120 grit sanding. Cross-sanded finish not acceptable. Tear-outs, knife nicks and hit-or-miss machining not acceptable.

5. Finish: Transparent finish over stain as specified in Division 09 Section Painting and color as indicated on drawings.
6. See Drawings for locations and details.

2.10 IMPACT RESISTANT WALL COVERINGS

A. Salient Characteristics:

1. Basis-of-Design Products: Korogard Wall Protection Systems; Division of RJF International Corporation, Koroseal Korogard 500 Protective Wallcovering. 800-628-0449 or www.korogard.com.
2. Rigid acrylic/polyvinyl chloride sheet, 0.060 inch thick.
3. Color and texture: K-49 Quarry and P-1 Haircell.

4. Adhesive: As recommended by manufacturer.
5. Accessory Moldings and Caulk: Manufacturer's standard moldings and caulk matching wallcovering. Provide top and edge moldings, corners, and divider bars as required for a complete installation.
6. Fire-Test-Response Characteristics: As determined by testing identical wall coverings applied with identical adhesives to substrates according to test method indicated below by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

    a. Surface-Burning Characteristics: As follows, per ASTM E 84:

        1) Flame-Spread Index: 25 or less.
        2) Smoke-Developed Index: 450 or less.

7. See Drawings for locations and details.

2.11 FABRICATION

A. Fabricate impact-resistant wall protection units to comply with requirements indicated for design, dimensions, and member sizes, including thicknesses of components.

2.12 METAL FINISHES

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

1. Remove tool and die marks and stretch lines, or blend into finish.
2. Grind and polish surfaces to produce uniform finish, free of cross scratches.
3. Run grain of directional finishes with long dimension of each piece.
4. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.

B. Protect finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and wall areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.

B. Examine walls to which impact-resistant wall protection will be attached for blocking, grounds, and other solid backing that have been installed in the locations required for secure attachment of support fasteners.

1. For impact-resistant wall protection units attached with adhesive, verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Complete finishing operations, before installing wall and equipment guards, including painting, before installing impact-resistant wall protection system components.

B. Before installation, clean substrate to remove dust, debris, and loose particles.

3.3 INSTALLATION

A. General

1. Install wall and equipment guard units level, plumb, and true to line without distortions. Do not use materials with chips, cracks, voids, stains, or other defects that might be visible in the finished Work.
2. Provide splices, mounting hardware, anchors, and other accessories required for a complete installation.
3. Install wall and equipment guards and impact-resistant wall protection units in locations and at mounting heights indicated on Drawings.
4. Impact-Resistant Wall Covering: Install top and edge moldings, corners, and divider bars as required for a complete installation.

3.4 CLEANING

A. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

B. Impact Resistant Wall covering: Remove excess adhesive using methods and materials recommended in writing by manufacturer.

END OF SECTION

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SECTION 10 28 13

TOILET ACCESSORIES

(Edited from DeCA June 2011 Design Criteria)

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Public-use washroom accessories.
2. Childcare accessories.

B. Related Sections:

1. Division 10 Section Toilet Compartments for compartment-door-mounted coat hooks.
2. Division 26 Sections for Electric Hand Dryer.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated. Include the following:

1. Construction details, dimensions and profiles.
2. Anchoring and mounting requirements, including requirements for cutouts in other work and substrate preparation.
3. Material and finish descriptions and thicknesses.
4. Features that will be included for Project.
5. Manufacturer's warranty.

B. Product Schedule: Indicating types, quantities, sizes, and installation locations by room of each accessory required.

1. Use designations indicated in "Toilet Accessory Schedule" and room designations indicated on Drawings in product schedule.

C. Submittal List:

Reference	Submittal Item	Quantity	Action
1.2A	Product Data	X	R
1.2B	Product Schedule	X	R

X Submit quantity specified in Division 01 Section Administrative Requirements.
R Review each submittal, mark to indicate action taken, and return.
I Submittal is for information or record purposes only. No action will be taken.

1.3 QUALITY ASSURANCE

A. Regulatory Requirements: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's "Architectural Barriers Act (ABA) Accessibility Guidelines for Buildings and Facilities" and ICC/ANSI A117.1 for toilet accessories.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

1.4 COORDINATION

A. Coordinate accessory locations with other work to prevent interference with clearances required for access by disabled persons, proper installation, adjustment, operation, cleaning, and servicing of accessories.

B. Deliver inserts and anchoring devices set into concrete or masonry as required to prevent delaying the Work.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Products: To establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of other manufacturers, a specific manufacturer's product is named and accompanied by the words "basis of design," including make or model number or other designation. Subject to compliance with requirements, provide either the named products or equal products.

2.2 MATERIALS

A. Stainless Steel: ASTM A 666, Type 304, with No. 4 finish (satin), in 0.031-inch minimum nominal thickness, unless otherwise indicated.

B. Steel Sheet: ASTM A 1008/A 1008M, Designation CS (cold rolled, commercial steel), 0.036-inch minimum nominal thickness.

C. Galvanized Steel Sheet: ASTM A 653/A 653M, with G60 hot-dip zinc coating.

D. Mirrors: ASTM C 1503, Mirror Glazing Quality, clear-glass mirrors, nominal 0.236-inch thick.

E. Galvanized Steel Mounting Devices: ASTM A 153/A 153M, hot-dip galvanized after fabrication.

F. Fasteners: Screws, bolts, and other devices of same material as accessory unit, tamper and theft resistant when exposed, and of galvanized steel when concealed.

2.3 FABRICATION

A. General: One, maximum 1-1/2-inch diameter, unobtrusive stamped manufacturer logo is permitted on exposed face of accessories. On interior surface not exposed to view or back

surface of each accessory, provide printed, waterproof label or stamped nameplate indicating manufacturer's name and product model number.

B. Surface-Mounted and Partition-Mounted Toilet Accessories: Unless otherwise indicated, fabricate units with tight seams and joints, and exposed edges rolled. Hang doors and access panels with continuous stainless-steel hinge. Provide concealed anchorage where possible.

C. Recessed Toilet Accessories: Unless otherwise indicated, fabricate units of all-welded construction, without mitered corners. Hang doors and access panels with full-length, stainless-steel hinge. Provide anchorage that is fully concealed when unit is closed.

D. Framed Glass-Mirror Units: Fabricate frames for glass-mirror units to accommodate glass edge protection material. Provide mirror backing and support system that permits rigid, tamper-resistant glass installation and prevents moisture accumulation.

1. Provide galvanized steel backing sheet, not less than 0.034 inch and full mirror size, with nonabsorptive filler material. Corrugated cardboard is not an acceptable filler material.

E. Mirror-Unit Hangers: Provide one of the following mirror-unit mounting systems that permits rigid, tamper- and theft-resistant installation, as follows:

1. One-piece, galvanized steel, wall-hanger device with spring-action locking mechanism to hold mirror unit in position with no exposed screws or bolts.
2. Heavy-duty wall brackets of galvanized steel, equipped with concealed locking devices requiring a special tool to remove.

F. Keys: Provide universal keys for internal access to accessories for servicing and resupplying. Provide minimum of six keys to Government's representative.

2.4 PUBLIC-USE WASHROOM ACCESSORIES

A. Mark A - Grab Bar Mounted Horizontally, Parallel to Side of Water Closet:

1. Where this designation is indicated on Drawings, provide stainless-steel grab bar complying with the following:

a. Basis-of-Design Product: Bobrick Washroom Equipment, Inc., Model No. B-6806.
b. Gripping Surfaces: Smooth.
c. Length: 42 inches.
d. Outside Diameter: 1-1/2 inches for heavy-duty applications.
e. Nominal Wall Thickness: Minimum 0.05 inch.
f. Clearance: 1-1/2 inches between wall surface and inside face of bar.
g. Mounting: Concealed with manufacturer's standard flanges and anchors.

B. Mark B - Grab Bar Mounted Horizontally, Parallel to Back of Water Closet:

1. Where this designation is indicated on Drawings, provide stainless-steel grab bar complying with the following:

a. Basis-of-Design Product: Bobrick Washroom Equipment, Inc., Model No. B-6806.
b. Gripping Surfaces: Smooth.
c. Length: 36 inches.
d. Outside Diameter: 1-1/2 inches for heavy-duty applications.
e. Nominal Wall Thickness: Minimum 0.05-inch.

f. Clearance: 1-1/2 inches between wall surface and inside face of bar.
g. Mounting: Concealed with manufacturer's standard flanges and anchors.

C. Mark C - Stainless-Steel, Angle-Framed Mirror:

1. Where this designation is indicated on Drawings, provide mirror unit complying with the following:

a. Basis-of-Design Product: Bobrick Washroom Equipment, Inc., Model No. B-290.
b. Size: As indicated.
c. Fabricate frame from minimum nominal 0.0375-inch thick stainless-steel angles, with square corners mitered, welded, and ground smooth.

D. Mark D - Liquid Soap Dispenser, Deck Mounted:

1. Where this designation is indicated on Drawings, provide soap dispenser complying with the following:

a. Basis-of-Design Product: Bobrick Washroom Equipment, Inc., Model No. B-822.
b. Piston-and-spout-type unit. Brightly polished stainless-steel piston and 4-inch-long spout; and chrome-plated deck escutcheon.
c. Reservoir: Polyethylene, concealed below deck.
d. Reservoir Capacity: Minimum 34-oz.
e. Mounting: Designed for mounting on lavatory deck.
f. Soap Valve: Designed for dispensing soap in liquid form.

E. Mark E - Waste Receptacle, Semi-Recessed:

1. Where this designation is indicated on Drawings, provide stainless-steel unit complying with the following:

a. Basis-of-Design Product: Bobrick Washroom Equipment, Inc., Model No. B-3644.
b. Designed for 4-inch wall depth with continuous, seamless wall flange.
c. Operation: Empty waste receptacle only after unlocking door.
d. Material: 18-8 S, Type 304, 22 gage, stainless steel, satin finish.
e. Waste Receptacle: Minimum 12-gal. Capacity, equipped with interior hooks for vinyl liner.

F. Mark F - Waste Receptacle, Surface Mounted:

1. Where this designation is indicated, provide stainless-steel unit complying with the following:

a. Basis-of-Design Product: Bobrick Washroom Equipment, Inc., Model No. B-275
b. Designed for surface mounting.
c. Operation: Empty waste receptacle by removal of liner attached to four interior hooks.
d. Material: 18-8 S, Type 304, 22 gage, stainless steel, satin finish.
e. Waste Receptacle: Minimum 20-gal. Capacity, equipped with interior hooks for vinyl liner.

G. Mark G - Sanitary Napkin Disposal Unit, Partition-Mounted, Dual-Access Type:

1. Where this designation is indicated on Drawings, provide stainless-steel sanitary napkin disposal unit complying with the following:

a. Basis-of-Design Product: Bobrick Washroom Equipment, Inc., Model No. B-354.
b. With flanges for partition mounting to serve two toilet compartments; self-closing door; and reusable receptacle that is removable from one side; equipped with a keyed tumbler lock.
c. Material: 18-8 S, Type 304, 22 gage, stainless steel, satin finish.
d. Seamless exposed walls of all-welded construction.
e. Napkin disposal with piano hinged door and removable leak-proof molded polyethylene receptacle.
f. Napkin Disposal Capacity: 1.2 gallon.

H. Mark H - Sanitary Napkin Disposal Unit, Recessed:

1. Where this designation is indicated on Drawings, provide stainless-steel sanitary napkin disposal unit complying with the following:

a. Basis-of-Design Product: Bobrick Washroom Equipment, Inc., Model No. B-353.
b. With flanges for recessed wall mounting; self-closing door; and reusable receptacle that is removable; equipped with a keyed tumbler lock.
c. Material: 18-8 S, Type 304, 22 gage, stainless steel, satin finish.
d. Seamless exposed walls of all-welded construction.
e. Designed for nominal 4-inch wall depth.
f. Napkin disposal with piano hinged door and removable leak-proof molded polyethylene receptacle.
g. Napkin Disposal Capacity: 1.2 gallon.

I. Mark I - Electric Hand Dryer, Surface Mounted:

1. General:

a. Warm air, rapid drying, energy efficient electric hand dryer; entire dryer internally grounded; completely sealed control assembly and optics; automatic, activated by infrared optical sensor; operates while hands are under blower.

2. Salient Characteristics:

a. Basis-of-Design Product: Excel Dryer Inc., Model XL-SB.
b. Warranty Period: 5 years; limited warranty.
c. Mounting: Surface mounted.
d. Operation: Electronic-sensor activated with timed power cut-off switch.

1) Operation Time: Shut-off within 2 seconds when hands removed or 35 seconds if hands not removed.

e. Cover Material and Finish: Stainless steel with brushed finish.
f. Noise Reduction Nozzle: 1.1 noise reduction nozzle. Reduced air deflection noise and 9db decibel level.
g. Nominal Size: 11-3/4 inches wide by 12-11/16 inches high by 6-11/16 inches deep.
h. Weight: 15 pounds with stainless cover.
i. Electrical Requirements: 110/120 V, 12.5 A, 60 hz, 1500 W.
j. Mount dryers at heights indicated on Drawings.

2.5 CHILDCARE ACCESSORIES

A. Item 3-2A20: Baby-Changing Station, Horizontal Type.

B. General: Wall-surface-mounted diaper-changing station, mildew-resistant, molded FDA approved injection molded polypropylene with Microban antimicrobial additive embedded into the bed surface, that folds horizontally against wall when not in use; projects not more than 4 inches from wall when closed. Unit shall conform to ANSI S117.1 Accessible and Usable Building and Facilities, ASTM F 2285 Standard Safety Performance Specification for Diaper Changing Tables for Commercial Use, ANSI Z535.4 Product Safety Signs and Labels, EN 12221-1: 2008, ASTM G 22 Antibacterial standards.

C. Salient Characteristics:

1. Hinges: Concealed, steel-on-steel.
2. Mounting plates.
3. Operation: Concealed pneumatic cylinder and metal mounting chassis, for controlled, slow opening and closing of bed.
4. Replaceable safety straps with snap lock fasteners.
5. Built-in dispenser for sanitary liners.
6. Four cases of 3-ply chemical free biodegradable sanitary liners (500 liners per case).
7. Molded graphic instructions and safety messages in four languages.
8. Identifying door plaque.
9. Color: As selected.
10. Approximate Dimensions: 22 inches high by 35 inches wide by 4 inches deep when closed and 22-1/8 inches deep when open.

D. Basis-of-Design Product: Kare Products, a division of Bobrick Washroom Equipment, Inc.

1. Koala Bear Kare Baby Changing Station, Wall-Surface-Mounted Horizontal Design.
2. Model: KB200-00.
3. See Drawings for location and details.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Install accessories according to manufacturers' written instructions, using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.

B. Secure mirrors to walls in concealed, tamper-resistant manner with special hangers, toggle bolts, or screws. Set units level, plumb, and square at locations indicated, according to manufacturer's written instructions for substrate indicated.

C. Install grab bars to withstand a downward load of at least 250 lbf, when tested according to method in ASTM F 446.

3.2 ADJUSTING AND CLEANING

A. General: Adjust accessories for unencumbered, smooth operation and verify that mechanisms function properly. Replace damaged or defective items.

B. Remove temporary labels and protective coatings.

C. Clean and polish exposed surfaces according to manufacturer's written recommendations.

END OF SECTION

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SECTION 10 44 00

FIRE PROTECTION SPECIALTIES

(Edited from DeCA June 2011 Design Criteria)

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Portable fire extinguishers.
2. Fire extinguisher cabinets.
3. Accessories.
4. Signage.

1.2 SUBMITTALS

A. Product Data:

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for fire-protection specialties.
2. Fire Extinguishers: Include rating and classification.
3. Cabinets: Include roughing-in dimensions, details showing mounting methods, relationships of box and trim to surrounding construction, door hardware, cabinet type, trim style, and panel style.

B. Submittal List:

Reference	Submittal Item	Quantity	Action
1.2A	Product Data	X	R

X Submit quantity specified in Division 01 Section Administrative Requirements.
R Review each submittal, mark to indicate action taken, and return.
I Submittal is for information or record purposes only. No action will be taken.

1.3 QUALITY ASSURANCE

A. Source Limitations:

1. Obtain fire extinguishers and cabinets through one source from a single manufacturer.

B. NFPA Compliance:

1. Fabricate, install, and label fire extinguishers to comply with NFPA 10, "Standard for Portable Fire Extinguishers."

C. ABA Compliance:

1. Install fire extinguisher cabinets in compliance with the ABA Accessibility Standard for Department of Defense Facilities.

D. Fire Extinguishers:

1. Listed and labeled for type, rating, and classification by an independent testing agency acceptable to authorities having jurisdiction.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Products:

1. To establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of other manufacturers, a specific manufacturer's product is named and accompanied by the words "basis of design," including make or model number or other designation. Subject to compliance with requirements, provide either the named products or equal products.
2. Basis-of-Design Products: J.L. Industries, Inc.

a. Unless otherwise indicated provide the following:

1) Portable Fire Extinguisher: Cosmic 10E.
2) Fire-Protection Cabinet: Ambassador - Steel, Model 1017, door style S21 solid with pull handle.
3) Mounting Bracket: MB846.

b. Where Type K is indicated provide the following:

1) Portable Fire Extinguisher: Saturn 15.
2) Fire-Protection Cabinet: Ambassador - Steel, Model 2012, door style S21 solid with pull handle.

c. Signage:

1) Wall surface: Decal, 11-3/4- by 3-1/2-inches, vertical, red and white, FIRE EXTINGUISHER, #DRFA.
2) Cabinet Door: Die cut, 3/4 by 18-inches, vertical, red, FIRE EXTINGUISHER, #FELVR.

2.2 MATERIALS

A. Cold-Rolled Steel Sheet:

1. ASTM A 1008/A 1008M, Commercial Steel (CS), Type B.

2.3 PORTABLE FIRE EXTINGUISHERS

A. Unless otherwise indicated provide multipurpose dry-chemical Type:

1. UL-rated 4A:60BC, 10-lb nominal capacity, in enameled-steel container.

B. Where Type K is indicated provide wet-chemical Type:

1. UL-rated K, 6 quart, nominal capacity, with potassium acetate-based chemical in stainless-steel container; with pressure-indicating gage.

2.4 FIRE EXTINGUISHER CABINETS

A. Cabinet Construction: Non-rated.

1. Provide manufacturer's standard box (tub), with trim, frame, door, and hardware to suit cabinet type, trim style, and door style indicated. Weld joints and grind smooth. Miter and weld perimeter door frames.
2. Cabinet Metal: Enameled-steel sheet.
3. Cabinet Type: Suitable for fire extinguisher.
4. Cabinet Mounting: Suitable for the following mounting conditions:

a. Semi-recessed: Cabinet box partially recessed in walls of shallow depth to suit style of trim indicated.

5. Cabinet Trim Style: Fabricate cabinet trim in one piece with corners mitered, welded, and ground smooth.

a. Exposed Trim: One-piece combination trim and perimeter door frame overlapping surrounding wall surface with exposed trim face and wall return at outer edge (backbend).
b. Return trim with rolled edge.

6. Cabinet Trim Material: Manufacturer's standard, same metal and finish as door.
7. Door Material: Manufacturer's standard, steel sheet.
8. Door Style: Manufacturer's standard design, flush opaque panel, frameless, with no exposed hinges.
9. Door Construction: Fabricate doors according to manufacturer's standards, of materials indicated, and coordinated with cabinet types and trim styles selected.
10. Door Hardware: Provide manufacturer's standard door-operating hardware of proper type for cabinet type, trim style, and door material and style indicated. Provide either lever handle with cam-action latch, or exposed or concealed door pull and friction latch. Provide concealed or continuous-type hinge permitting door to open 180 degrees.

2.5 ACCESSORIES

A. Mounting Brackets:

1. Manufacturer's standard steel, designed to secure extinguisher, of sizes required for types and capacities of extinguishers indicated, with plated or baked-enamel finish.

a. Provide brackets for extinguishers not located in cabinets.

B. Signage:

1. Identify bracket-mounted extinguishers with signage "FIRE EXTINGUISHER" decal applied to wall surface.
2. Identify fire extinguishers in cabinets with signage "FIRE EXTINGUISHER" die cut lettering applied to door.

2.6 FINISHES, GENERAL

A. General:

1. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
2. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
3. Finish fire protection cabinets after assembly.

B. Appearance of Finished Work:

1. Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

C. Cabinet and Door Finishes:

1. Provide manufacturer's standard baked-enamel paint for the following:

a. Exterior of cabinet, door, and trim.
b. Interior of cabinets and doors.

2.7 STEEL FINISHES

A. Surface Preparation:

1. Clean surfaces of dirt, oil, grease, mill scale, rust, and other contaminants that could impair paint bond using manufacturer's standard methods.

B. Baked-Enamel Finish:

1. Immediately after cleaning and pretreating, apply manufacturer's standard two-coat, baked-enamel finish consisting of prime coat and thermosetting topcoat. Comply with paint manufacturer's written instructions for applying and baking to achieve a minimum dry film thickness of 2 mils.

a. Color:

1) Cabinets: Manufacturer’s standard white.
2) Brackets: Manufacturer’s standard red.

PART 3 - EXECUTION

3.1 EXAMINATION

A. General:

1. Examine walls and partitions for suitable framing depth and blocking where recessed and semirecessed cabinets are to be installed.
2. Examine fire extinguishers for proper charging and tagging.

   a. Remove and replace damaged, defective, or undercharged units.

3. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General:

1. Comply with manufacturer's written instructions for installing fire-protection specialties.
2. Install in locations and at mounting heights indicated or, if not indicated, at heights acceptable to authorities having jurisdiction.

   a. Prepare recesses for cabinets as required by type and size of cabinet and trim style.
   b. Fasten mounting brackets to structure and cabinets, square and plumb.
   c. Fasten cabinets to structure, square and plumb.

3. Signage: Apply decals and die cut lettering at locations indicated.

3.3 ADJUSTING, CLEANING, AND PROTECTION

A. Adjust cabinet doors that do not swing or operate freely. Refinish or replace cabinets and doors damaged during installation. Provide final protection and maintain conditions that ensure that cabinets and doors are without damage or deterioration at the time of final acceptance.

END OF SECTION

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SECTION 10 56 23

ROTATING MODULAR SYSTEM

(Edited from DeCA June 2011 Design Criteria)

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. 1R09 Damaged Merchandise Unit.

1.2 PERFORMANCE REQUIREMENTS

A. Seismic:

1. Provide rotating modular system, including anchorage, capable of withstanding, without failure, the effects of operational and seismic loads:
2. Refer to Division 01 Section Summary of Work for seismic-load design criteria.

1.3 SUBMITTALS

A. Product Data:

1. For each item of equipment required, including the manufacturer's standard details and installation and maintenance instructions.

a. Manufacturer's standard commercial warranty.
b. Operating instructions.
c. Specifications and parts manual.

B. Submittal List:

Reference	Submittal Item	Quantity	Action
1.3A	Product Data	X	R

X Submit quantity specified in Division 01 Section Administrative Requirements.
R Review each submittal, mark to indicate action taken, and return.
I Submittal is for information or record purposes only. No action will be taken.

1.4 QUALITY ASSURANCE

A. Installer Qualifications:

1. Manufacturer's authorized representative who is trained and approved for both installation and maintenance of units required for this Project.

B. Source Limitations:

1. Obtain rotating modular system through one source from a single manufacturer.

1.5 WARRANTY

A. Special Warranty for Rotating Modular System:

1. Manufacturer's standard form in which manufacturer agrees to repair or replace rotating modular system components that fail in materials or workmanship within specified warranty period.

a. Warranty Period for Base Assembly: 10 years from date of Substantial Completion.
b. Warranty Period for Balance of Unit: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Products: To establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of other manufacturers, a specific manufacturer's product is named and accompanied by the words "basis of design," including make or model number or other designation. Subject to compliance with requirements, provide either the named products or equal products.

2.2 ITEM 1R09: DAMAGED MERCHANDISE UNIT (ROTATING MODULAR SYSTEM)

A. General:

1. Rotating modular system installed through wall between salvage room and damaged merchandise sales niche. System shall consist of one standard starter unit and standard add-on unit(s) placed side-by-side. Each individual unit capable of being rotated manually by use of foot pedal and locked from inside salvage room. When unlocked and rotated 180 degrees, each unit displays merchandise to the sales area while the back side is being restocked.

B. Salient Characteristics:

1. Standard Unit Includes:

a. Adjustable reversible metal shelves: R-W No. 902 legal size. Five shelves per side (10 shelves total) each unit.
b. 1-3/4-inch shelf height increment adjustment.
c. Closing strips to cover rotation space between unit and wall, panel and another unit. Match unit finish.
d. Extended canopy tops over rotor top to cover the rotation space behind the unit.
e. Full length center panel between back-to-back shelves.
f. Foot pedal activated positive position control for rotating units.

g. Base and Rotor Bottom Assembly:

1) 12 gage steel.
2) Connect base and rotor bottom with 1/2 inch, minimum, diameter carriage bolt.
3) Secure assembly with locknut.
4) Fabricate with an oil impregnated bronze bushing for permanent lubrication to carriage bolt rotation.
5) Install raceways in both base and rotor bottom to capture ball bearings and protect rotating components from excessive and unusual wear, burnishment, and fatigue.
6) 28-inch diameter, minimum, press formed raceways for legal size units. Smaller diameter raceways are not acceptable because they will not control or maintain the cabinet center of gravity during unbalanced loading and rotation.

h. Color coordinated, shrinkage controlled, two-ply vinyl door strips mounted on a reverse beveled post.
i. Powder coat finish in color indicated.

2. Dimensions:

a. Starter unit: 45-1/4 inches wide, 31 inches deep, 82 inches high.
b. Add-on unit: 38-1/8 inches wide, 31 inches deep, 82 inches high.

C. Basis-of-Design Product: Richards-Wilcox, Inc., High Density, Multi Media Rotary Filing System. (800) 277-1699 or www.timestwo.com.

1. Model: "Times-2 Speed Files."

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine openings and surfaces in and on which rotating modular systems are to be installed. Do not proceed with work until unsatisfactory conditions are corrected.

3.2 INSTALLATION

A. Install items where indicated in accordance with manufacturer's assembly and installation Drawings.

3.3 CLEANING AND ADJUSTING

A. Adjust rotating modular systems for proper operation. After completion of installation, clean and polish all exposed surfaces.

B. Repair any damaged finish to match original or replace.

3.4 TRAINING

A. Engage a factory-authorized service representative to train Government's personnel to adjust, operate, and maintain rotating modular system equipment. Conduct training at Project site.

END OF SECTION

SECTION 11 08 00

COMMISSIONING OF EQUIPMENT

(Edited from DeCA June 2011 Design Criteria)

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Division 11 responsibilities in the commissioning process.
2. Commissioning of loading dock equipment.
3. Commissioning of equipment, generic.
4. Commissioning of refrigerated display cases.
5. Commissioning of bakery equipment.
6. Commissioning of grocery equipment.
7. Commissioning of meat department equipment.
8. Commissioning of produce department equipment.
9. Commissioning of safes.
10. Commissioning of baler.

B. Related Sections:

1. Division 01 Section General Commissioning Requirements.

1.2 DEFINITIONS

A. CA: Commissioning Agent.

B. CO: Contracting Officer.

C. GC: Contractor; General Contractor, not a Subcontractor.

D. O&M: Operations and Maintenance.

E. QC: Contractor's Quality Control Manager.

F. TI: Technical Inspector.

1.3 DESCRIPTION

A. This Section describes commissioning requirements applicable to commissioned items and systems specified in Division 11 to ensure that all items and systems are operating in a manner consistent with the Contract Documents.

B. Conform to commissioning requirements and the commissioning plan.

1.4 RESPONSIBILITIES

A. Construction and Acceptance Phases:

1. Include the cost of commissioning in the contract price.
2. In each purchase order or subcontract written, include requirements for submittal data, O&M data and training.
3. Conduct a commissioning scoping meeting and other meetings necessary to facilitate the Commissioning process.
4. Provide requested documentation to the TI developed for functional testing procedures.
5. Provide functional performance test procedures. Subs shall review test procedures to ensure feasibility, safety and equipment protection and provide necessary written alarm limits to be used during the tests.
6. Develop a full start-up and initial checkout plan using manufacturer's start-up procedures and the prefunctional checklists for all commissioned equipment. Submit to QC for review prior to startup. TI will verify plan for compliance. Refer to Division 01 Section General Commissioning Requirements for further details related to start-up.
7. During the startup and initial checkout process, execute the prefunctional checklists for all commissioned equipment.
8. Perform and clearly document all completed startup and system operational checkout procedures, providing a copy to the QC and TI.
9. Correct system deficiencies before functional testing.
10. Provide skilled technicians to execute starting of equipment and to execute the functional performance tests. Ensure that they are available and present during the agreed upon schedules and for sufficient duration to complete the necessary tests, adjustments and problem-solving.
11. Provide all test equipment necessary to fulfill specified testing requirements.
12. Assist the CA and TI in interpreting the monitoring data, as necessary.
13. Correct deficiencies (differences between specified and observed performance) as interpreted by the CA, TI and A/E and retest the equipment.
14. Prepare O&M manuals according to the Contract Documents, including clarifying and updating the original sequences of operation to as-built conditions.
15. During construction, maintain as-built red-line Drawings for all Drawings and final CAD as-builts for Contractor-generated coordination Drawings. Update after completion of commissioning (excluding deferred testing).
16. Coordinate with equipment manufacturers to determine specific requirements to maintain the validity of the warranty.

B. Operation Manuals shall include:

1. A table of all setpoints and implications when changing them.
2. Schedules.
3. Instructions for operation of each piece of equipment for emergencies.
4. Seasonal adjustment.
5. Startup and shutdown.
6. Instructions for energy savings operations and descriptions of the energy savings strategies in the facility (from O&M Manuals).
7. Recommendations for recommissioning frequency by equipment type.
8. Energy tracking recommendations.

C. Warranty Period:

1. Execute seasonal or deferred functional performance testing, witnessed by the CA, according to the specifications.

2. Correct deficiencies and make necessary adjustments to O&M manuals and as-built Drawings for applicable issues identified in any seasonal testing.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 STARTUP

A. Contractors shall follow the start-up and initial checkout procedures listed in the Responsibilities list in this Section and in Division 01 Section General Commissioning Requirements. Division 11 has start-up responsibility and is required to complete systems and sub-systems so they are fully functional, meeting the design objectives of the Contract Documents. The commissioning procedures and functional testing do not relieve or lessen this responsibility or shift that responsibility partially to the Commissioning Agent, Technical Inspector, or Government.

B. Functional testing will generally begin upon completion of a system. Functional testing may proceed prior to the completion of systems or sub-systems at the discretion of the CO. Beginning system testing before full completion does not relieve the Contractor from fully completing the system, including all prefunctional checklists.

3.2 OPERATION AND MAINTENANCE (O&M) MANUALS

A. The following O&M manual requirements are in addition to O&M manual documentation requirements elsewhere in these specifications.

B. Division 11 shall compile and prepare documentation for all commissioned items and systems covered in Division 11 and deliver this documentation to the GC for inclusion in the O&M manuals prior to the training of Government personnel.

3.3 TRAINING OF GOVERNMENT PERSONNEL

A. The GC shall be responsible for training coordination and scheduling to ensure that training is completed.

B. The QC shall be responsible for reviewing the content and adequacy of the training of Government personnel for commissioned equipment or systems. TI will verify compliance.

C. The Subcontractor shall have the following training responsibilities for the commissioned systems:

1. Provide the TI with a training plan four weeks before the planned training.
2. Provide designated Government personnel with comprehensive orientation and training in the understanding of the systems and the operation and maintenance of each piece of commissioned equipment.
3. Training shall start with classroom sessions followed by hands-on training on each piece of equipment.
4. During any demonstration, should the system fail to perform in accordance with the requirements of the O&M manual or sequence of operations, the system will be repaired or adjusted as necessary and the demonstration repeated.

5. The appropriate trade or manufacturer's representative shall provide the instructions on each major piece of equipment. This person may be the start-up technician for the piece of equipment, the installing Contractor or manufacturer's representative. Practical operating expertise as well as in-depth knowledge of all modes of operation of the specific piece of equipment are required. More than one party may be required to execute the training.
6. The training sessions shall follow the outline in the Table of Contents of the operation and maintenance manual and illustrate whenever possible the use of the O&M manuals for reference.
7. Training shall include:

    a. Use of the printed installation, operation and maintenance instruction material included in the O&M manuals.
    b. A review of the written O&M instructions emphasizing safe and proper operating requirements, preventative maintenance, special tools needed and spare parts inventory suggestions. The training shall include start-up, operation in all modes possible, shut-down, seasonal changeover and any emergency procedures.
    c. Discussion of relevant health and safety issues and concerns.
    d. Discussion of warranties and guarantees.
    e. Common troubleshooting problems and solutions.
    f. Explanation of information included in the O&M manuals.
    g. Discussion of any peculiarities of equipment installation or operation.
    h. Classroom sessions shall include the use of overhead projections, slides, video/audio-taped material as might be appropriate.

8. Hands-on training shall include start-up, operation in all modes possible, including manual, shut-down and any emergency procedures and preventative maintenance for all pieces of equipment.
9. Fully explain and demonstrate the operation, function and overrides of any local packaged controls, not controlled by the central control system.
10. Training shall occur after functional testing is complete, unless approved otherwise by the Project Manager.
11. Minimum Duration of Training. Subcontractor shall provide 8 hours of training.

END OF SECTION

SECTION 11 13 00

LOADING DOCK EQUIPMENT

(Edited from DeCA June 2011 Design Criteria)

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Dock bumpers.
2. Dock seals.

1.2 DEFINITIONS

A. Operating Range: Maximum amount of travel above and below the loading dock level.

1.3 SUBMITTALS

A. Product Data:

1. Include construction details, material descriptions, rated capacities, operating characteristics, furnished specialties, accessories, dimensions of individual components and profiles, and finishes.

B. Installer Certification:

1. Submit letter from Manufacturer stating that installer is an authorized representative who is trained and approved for installation of units required for this Project.

C. Shop Drawings:

1. Show fabrication and installation details. Include plans, elevations, sections, details, and attachments to other work.

D. Maintenance Data:

1. For loading dock equipment to include in maintenance manuals.

E. Warranties:

1. Special warranties specified in this Section.

F. Guarantees:

1. Special guarantees specified in this Section.

G. Submittal List:

Reference	Submittal Item	Quantity	Action
1.3A	Product Data	X	R
1.3B	Installer Certification	X	R
1.3C	Shop Drawings	X	R
1.3D	Maintenance Data	X	I
1.3E	Warranties	X	I
1.3F	Guarantees	X	I

X Submit quantity specified in Division 01 Section Administrative Requirements.
R Review each submittal, mark to indicate action taken, and return.
I Submittal is for information or record purposes only. No action will be taken.

1.4 QUALITY ASSURANCE

A. Installer Qualifications:

1. Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.
2. Maintenance Proximity: Not more than two hours' normal travel time from Installer's place of business to Project site.

B. Source Limitations:

1. Obtain all loading dock equipment through one source from a single manufacturer.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Storage and Handling:

1. Store and handle dock seals in a manner to avoid significant or permanent damage to fabric or frame.
2. Comply with manufacturer's written instructions for minimum and maximum temperature requirements for storage.

1.6 PROJECT CONDITIONS

A. Field Measurements: Indicate measurements on Shop Drawings.

1.7 COORDINATION

A. Coordinate Installation of Anchorages for Loading Dock Equipment:

1. Furnish setting Drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Products: To establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of other manufacturers, a specific manufacturer's product is named and accompanied by the words "basis of design," including make or model number or other designation. Subject to compliance with requirements, provide either the named products or equal products.

2.2 MATERIALS

A. Steel Plates, Shapes, and Bars:

1. ASTM 36/A 36M.

B. Rolled-Steel Floor Plate:

1. ASTM A 786/A 786M, rolled from steel plate complying with ASTM A 572/A 572M, Grade 55.

C. Steel Tubing:

1. ASTM A 500, cold formed.

D. Welding Rods and Bare Electrodes:

1. Select according to AWS specifications for metal alloy welded.

2.3 DOCK BUMPERS

A. Laminated-Tread Bumpers:

1. Fabricated from multiple, uniformly thick plies cut from fabric-reinforced rubber tires. Laminate plies under pressure on not less than two 3/4 inch diameter, steel supporting rods that are welded at one end to 1/4 inch thick, structural-steel end angle and secured with a nut and angle at the other end. Fabricate angles with predrilled anchor holes and sized to provide not less than 1 inch of tread plies extending beyond the face of closure angles.
2. Thickness: 6 inches.
3. Horizontal Style:

a. 12 inches high by 15 inches long at dock levelers.
b. 12 inches high by 24 inches long at trash platform.

B. Anchorage Devices:

1. Hot-dip galvanized steel anchor bolts, nuts, washers, bolts, sleeves, cast-in-place plates, and other anchorage devices as required to fasten bumpers securely in place and to suit installation type indicated.

2.4 FOAM-PAD DOCK SEALS

A. General:

1. Dock seals consisting of fabric-covered foam pads designed to compress 4 to 5 inches under pressure of truck body to form an airtight seal at jambs and head of loading dock openings; of type, size, and construction indicated.
2. Basis-of-Design Products: Kelley Company, DSA Series Adjustable Head Pad Dock Seal.
3. Beveled Side Pads: 12 inches wide face and 8 inches wide back.
4. Projection of Side Pads: 10 inches at top, 10 inches at bottom.

B. Adjustable Head Pad:

1. Manufacturer's standard hardware and tension spring or counterweight mechanism for adjusting height of pad.
2. 18 inches high face, 18 inches high back, and same depth as top projection of jamb pads.

C. Construction:

1. Consisting of single- or double-ply, coated, fabric-covered, urethane-foam core with supporting frame. Fabricate jamb and head pads of same depth and sized for opening width.
2. Steel Support Frame: Galvanized steel channel frame of manufacturer's standard weight, shape, and finish, with steel mounting hardware.
3. Side Pad Mounting Brackets: 1-1/2 inch offset flats and angles.
4. Cover Fabric: Vinyl-coated nylon or polyester with minimum total weight of 40 oz./sq. yd.

   a. Color: Black.
   b. Pleated Protectors: Protectors on face of jamb pads of overlapping layers of black vinyl-coated nylon or polyester with minimum total weight of 40 oz./sq. yd fabric attached to base fabric and with 4 inch wide full length, coated, nylon yellow guide stripes stitched to pleats. Wear exposure same width as side pad face.

2.5 FINISHES

A. General:

1. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
2. Finish loading dock equipment after assembly and testing.
3. Galvanizing:

   a. Hot-dip galvanize items as indicated to comply with applicable standard listed below:

      1) ASTM A 123/A 123M for iron and steel loading dock equipment.
      2) ASTM A 153/A 153M for iron and steel hardware for loading dock equipment.

PART 3 - EXECUTION

3.1 EXAMINATION

A. General:

1. Examine areas and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of loading dock equipment.
2. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. General:

1. Coordinate size and location of loading dock equipment indicated to be attached to or recessed into concrete or masonry, and furnish anchoring devices with templates, diagrams, and instructions for their installation.

3.3 INSTALLATION

A. General:

1. Install loading dock equipment accessories as required for a complete installation.

B. Dock Bumpers:

1. Attach dock bumpers to face of loading dock and trash platform in a manner that complies with requirements indicated for spacing, arrangement, and position relative to top of platform and anchorage.
2. Welded Attachment: Plug-weld anchor holes in contact with steel inserts and fillet weld at other locations.
3. Bolted Attachment: Attach dock bumpers to preset anchor bolts embedded in concrete or to cast-in-place inserts or threaded studs welded to embedded-steel plates or angles. If preset anchor bolts, cast-in-place inserts, or threaded studs welded to embedded-steel plates or angles are not provided, attach dock bumpers by drilling and anchoring with expansion anchors and bolts.

C. Dock Seals:

1. Attach dock-seal support frames securely to building structure in proper relation to openings, dock bumpers, and dock levelers to ensure compression of dock seals when trucks are positioned against dock bumpers.

3.4 ADJUSTING AND CLEANING

A. Adjusting:

1. Adjust loading dock equipment for proper, safe, efficient operation and to operate smoothly.

B. Cleaning:

1. Restore marred, abraded surfaces to their original condition.

3.5 DEMONSTRATION

A. Engage a factory-authorized service representative to train Government's personnel to adjust, operate, and maintain loading dock equipment. In addition, detailed "how to operate" books shall be provided as well as user training sessions at a time and place agreed upon by the facility manager.

END OF SECTION

SECTION 11 14 00

PEDESTRIAN CONTROL EQUIPMENT

(Edited from DeCA June 2011 Design Criteria)

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Item 1E06-A Queuing System, Checkout, Traffic Control.

1.2 SUBMITTALS

A. Product Data:

1. For each item of queuing systems required.

B. Operating and maintenance data.

C. Submittal List:

Reference	Submittal Item	Quantity	Action
1.2A	Product Data	X	R
1.2B	O&M Submittal	X	R

X Submit quantity specified in Division 01 Section Administrative Requirements.
R Review each submittal, mark to indicate action taken, and return.
I Submittal is for information or record purposes only. No action will be taken.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Products: To establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of other manufacturers, a specific manufacturer's product is named and accompanied by the words "basis of design," including make or model number or other designation. Subject to compliance with requirements, provide either the named products or equal products.

2.2 ITEM 1E06-A: QUEUING SYSTEM, CHECKOUT, TRAFFIC CONTROL

A. Pedestrian Control Devices:

1. Post: heavy walled T5 tempered continuous aluminum extrusion, 0.1030 inch at its thinnest point. Post shall contain four grooves that run the length of the post. Each groove shall contain a 35-inch by 1-5/8-inch decorative high-pressure color plastic laminated trim strip. Each groove shall also serve as a belt attachment point allowing connection from any of three angles. Bright chrome anodized finish.

   a. Size: 36.88-inch overall height, 3.175-inch diameter.

2. Base Weight: Cast iron with an epoxy coating that fits snugly underneath a base cover. The entire outer rim of the base cover shall contain a non-marring black rubber rim that attaches to the cast base through the use of spru holes. Do not provide rollers.
3. Base Cover: 14 inches in diameter and fits over the base weight; 16 gage stamped steel with a, satin chrome finish.
4. Belt: 2 inches wide woven nylon. The belt shall be able to extend up to 82 inches from post to post center. The bottom of the belt shall be 34 inches from finished floor. Belt color: Black. A 1.269-inch by 3.125-inch plastic belt end shall attach to the end of the belt to allow the belt to be secured to another post. The belt end shall be able to be secured into place with locking tabs supplied with each unit.
5. Belt Spring: Stainless steel, power-wound constant force spring that retracts the complete length of the belt when not in use.
6. Sign Frames and Signs:

   a. Two chrome trimmed sign frames 7 by 11 inches with adapters for mounting on posts.
   b. One double faced sign engraved "PLEASE ENTER HERE" each side.
   c. One single faced sign engraved "PLEASE WAIT HERE FOR THE NEXT AVAILABLE CASHIER."
   d. Sign color, white letters on black background.

7. Basis-of-Design Product: Alvarado Manufacturing. Co., Inc. (800) 423-4143 or www.alvaradomfg.com.

   a. "Escort Retractable Belt Stanchion" system.

2.3 ITEM 3-2D04: DIGITAL "TAKE-A-NUMBER" SYSTEM

A. Salient Characteristics:

1. Electronic L.E.D. number indicator: Black with 2-digit number display, 12 inches long by 2-1/4 inches deep by 9-3/4 inches high.
2. Red ticket dispenser with "Please Take A Number" sign.
3. 12-volt transformer.
4. 100 feet of wire with hardware.
5. 3 push buttons.
6. Set of "Now Serving" decals in 12 languages.
7. 5-foot high portable floor stand for dispenser.
8. Tickets: Disposable, pre-cut, pre numbered, 15 rolls at 3000 tickets per roll. Provide white tickets. If more than one system is used, provide each system with a different roll of colored tickets.

B. Basis-of-Design Products: Hubert. (800) 543-7374 or www.hubert.com.

1. Electronic number indicator kit: Model 51310, includes number display, dispenser with sign, transformer, wire with hardware, pushbuttons, and decals.
2. Dispenser stand: Model 78118.
3. Take-A-Number tickets: Model 96272.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General:

1. Comply with manufacturer's written installation instructions, unless more stringent requirements are indicated.
2. Install units plumb and level, in locations and with mountings shown. Securely attach to the supporting structure with concealed fasteners, in accordance with the manufacturer's installations instructions.
3. Clearances: Verify that clearances are adequate to properly and freely operate queuing systems.
4. Connections: Connect queuing systems to electrical systems.

3.2 FIELD QUALITY CONTROL

A. Testing: Test, adjust, and verify operation of each unit and component of the queuing systems. Repair or replace any item found to be defective or operating below rated capacity.

3.3 ADJUSTING AND CLEANING

A. Adjusting:

1. Verify that operating parts work freely and fit neatly. Adjust and lubricate hardware and moving parts.

B. Cleaning:

1. After completing queuing systems installation, including accessories, inspect exposed finish. Remove protective coverings, if any, and clean queuing systems.

C. Repair or Replace:

1. Repair or replace damaged parts, dents, buckles, abrasions, and other defects affecting appearance or serviceability so queuing systems are in an acceptable condition at time of final acceptance.

END OF SECTION

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SECTION 11 40 00.13

BAKERY EQUIPMENT

(Edited from DeCA June 2011 Design Criteria)

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. 1B29-A Self-Service Non-Refrigerated Bakery Display Case.
2. 1B30-B Self-Service Refrigerated Bakery Display Case.

1.2 SUBMITTALS

A. Product Data:

1. For each item of equipment required, including the manufacturer's standard details and installation and maintenance instructions.

a. Manufacturer's standard commercial warranty.
b. Operating instructions.
c. Specifications and parts manual.
d. Underwriters Laboratories (UL), Inc., listing.
e. National Sanitation Foundation (NSF) approval or acceptance.

B. Submittal List:

Reference	Submittal Item	Quantity	Action
1.2A	Product Data	X	R

X Submit quantity specified in Division 01 Section Administrative Requirements.
R Review each submittal, mark to indicate action taken, and return.
I Submittal is for information or record purposes only. No action will be taken.

1.3 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced installer to perform work of this Section who is an authorized representative of the bakery equipment manufacturer, who has specialized in installing bakery department equipment, who has completed installations similar in design and extent to that indicated for this Project, and who has a record of successful in-service performance.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Products: To establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of other manufacturers, a specific manufacturer's product is named and accompanied by the words "basis of design," including make or model number or other designation. Subject to compliance with requirements, provide either the named products or equal products.

2.2 ITEM 1B29-A: SELF-SERVICE NON-REFRIGERATED BAKERY DISPLAY CASE

A. Salient Characteristics:

1. Self-service non-refrigerated bakery merchandiser with clear acrylic lift-up doors.
2. Color to match display case finish as noted on Finish Schedule.
3. Flat front panel with 1 inch bumper on front and exposed ends.
4. White case interior with **solid back panel**.
5. Full end panels with mirror facing interior of case.
6. One 26-inch deep wire display shelf and one 20-inch deep wire display shelf, removable and adjustable vertically on 1 inch centers at zero-degree, 5-degree, and 10-degree angles.
7. Six clear acrylic lift-up self-service doors.
8. Nine 18-inch by 26-inch trays.
9. Fluorescent T-8 lighting with protective coating at top of case and beneath each wire shelf.
10. Recessed front storage area for packaging supplies.
11. Adjustable levelers.
12. Nominal Dimensions:

    a. 58 inches wide.
    b. 41 inches deep.
    c. 51 inches high.

13. Electrical:

    a. 120 volts, 60 hertz, single phase.
    b. 1.06 amps.
    c. Six-foot power cord with NEMA 5-15P plug configuration.

B. Basis-of-Design Product: Structural Concepts. (231) 798-8888 or www.structuralconcepts.com.

1. Model HVAD56SS.

2.3 ITEM 1B30-B: SELF-SERVICE REFRIGERATED BAKERY DISPLAY CASE

A. Salient Characteristics:

1. Self-service refrigerated bakery merchandiser.
2. Self-contained refrigeration system designed to operate in ambient conditions of 75 deg F and 55 percent relative humidity.

3. Integrated Product Temperature (IPT): 41 deg F.
4. Digital thermometer (Fahrenheit).
5. Electric condensate evaporator pan.
6. Compressor air intake through rear of case and exhaust through front of case.
7. Color to match display case finish as noted on Finish Schedule.
8. Flat front panel with 1 inch bumper on front and exposed ends.
9. White case interior with solid back panel.
10. Full end panels with mirror facing interior of case.
11. One 24-inch deep clear glass display shelf, one 20-inch deep clear glass display shelf, and one 16-inch deep clear glass display shelf, removable and adjustable vertically on 1 inch centers at zero-degree, 5-degree, and 10-degree angles.
12. Fluorescent T-8 lighting with protective coating at top of case and beneath each glass shelf.
13. Adjustable levelers.
14. Nominal Dimensions:

    a. 58 inches wide.
    b. 42 inches deep.
    c. 51 inches high.

15. Electrical:

    a. 220 volts, 60 hertz, single phase (requires 3 wires plus ground).
    b. 12.81 amps.
    c. Six-foot power cord (field installed) with NEMA 14-20P plug configuration.

B. Basis-of-Design Product: Structural Concepts. (231) 798-8888 or www.structuralconcepts.com.

1. Model HV56RSS.

PART 3 - EXECUTION

3.1 INSPECTION

A. Check that surfaces to which work will be secured are sound and free of irregularities interfering with installation.

B. Do not begin installation until satisfactory conditions have been corrected.

3.2 PREPARATION

A. Obtain dimensions from the site affecting work of this Section.

B. Ensure that roughed-in openings, built-in anchorage, and reinforcing required for proper installation of work of this Section are correctly sized, installed and located.

C. Obtain electrical and mechanical service characteristics and rough-in locations from site.

3.3 INSTALLATION

A. Installation of equipment shall be in accordance with NSF Manual On Sanitation Aspects of Food Service Equipment, as applicable.

B. Install items in accordance with manufacturer's instructions and installation procedures. Supervision shall be performed by workers skilled and familiar with installation of the equipment specified.

C. Set units plumb, square and true, securely anchored to building structure.

D. Insulate items to prevent electrolysis between dissimilar metals.

E. Seal spaces between built-in equipment, walls and columns with preformed foam sealants specified in Division 07 Section Joint Sealants, shim level and rigid, use proper type anchoring devices for materials encountered and usage expected.

F. Cut, fit and patch; coordinate with work of other Sections involved.

G. Cut and drill tops, backs, sides and bottoms for service outlets and fixtures. Install fixtures and fittings. Make connections to services.

H. Sequence installation and erection to ensure that mechanical and electrical connections are effected.

I. Deliver instruction sheets to Contracting Officer and instruct Government's personnel in the proper use, adjustment, and maintenance of equipment.

3.4 ADJUSTING AND CLEANING

A. Adjust doors, drawers, hardware fixtures, and other moving and operating parts to function smoothly and correctly.

B. Replace damaged items with new material.

C. On completion of installation, touch up all marred or abraded finished surfaces.

D. Clean equipment cases, counters, shelves, glass, legs, hardware, fittings and fixtures. Wipe down surfaces to remove fingerprints and markings and leave in clean condition.

END OF SECTION

SECTION 11 40 00.16

DELI EQUIPMENT

(Edited from DeCA June 2011 Design Criteria)

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. 1D07 Sushi Preparation Table (Mobile Island, Refrigerated, Self-Contained).

B. Equipment specified in Division 23 Section Product Refrigeration Systems.

1. 1D00 Case, Deli, Refrigerated, Clerk Service.

1.2 SUBMITTALS

A. Product Data:

1. For each item of equipment required, including the manufacturer's standard details and installation and maintenance instructions. In addition, submit the following, as applicable:

a. Manufacturer's standard commercial warranty.
b. Operating instructions.
c. Specifications and parts manual.
d. Underwriters Laboratories (UL), Inc., listing.
e. National Sanitation Foundation (NSF) approval or acceptance.
f. Approval of OSHA accredited safety testing laboratory.
g. Commercial Refrigeration Industry Standard CDS-S1-86.

B. Submittal List:

Reference	Submittal Item	Quantity	Action
1.2A	Product Data	X	R

X Submit quantity specified in Division 01 Section Administrative Requirements.
R Review each submittal, mark to indicate action taken, and return.
I Submittal is for information or record purposes only. No action will be taken.

1.3 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced installer to perform work of this Section who is an authorized representative of the deli equipment manufacturer, who has specialized in installing deli department equipment, who has completed installations similar in design and extent to that indicated for this Project, and who has a record of successful in-service performance.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Products: To establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of other manufacturers, a specific manufacturer's product is named and accompanied by the words "basis of design," including make or model number or other designation. Subject to compliance with requirements, provide either the named products or equal products.

2.2 ITEM 1D07: SUSHI PREPARATION TABLE (MOBILE ISLAND, REFRIGERATED, SELF-CONTAINED)

A. Salient Characteristics:

1. Refer to Division 23 Section Refrigeration Monitoring and Control Systems (RMCS) for refrigeration monitoring sensors installed by that Section.
2. Self-contained refrigeration system with R-404A or R-134A refrigerant, and bottom mounted air-cooled condensing unit designed to maintain a product temperature of 30 – 34 deg F. Designed for operation at maximum of 75 deg F DB and 55 percent RH. Condensing unit shall be designed to slide out for ease of maintenance.
3. Compressor unit with minimum 1/3 horsepower.
4. Electrical: 120 volt, 60 hertz, 1 phase with (30 amp) NEMA L5-30 plug.
5. Electric condensate dissipater pan.
6. Electronic thermostat temperature controls.
7. Electronic temperature sensors.
8. One solar digital thermometer.
9. Energy efficient fans.
10. Off-cycle defrost.
11. On/Off light switch for case lighting with T-8 fluorescent lamps and electronic ballasts.
12. Four casters, 5 inches diameter (NSF). Position locks shall be provided on the two rear casters as a minimum.
13. CFC free foamed-in-place insulation.
14. Seamless, non-corrosive tub.
15. Copper tube aluminum finned coils.
16. Case exterior color as indicated on Drawings, with stainless steel interior.
17. Welded steel chassis.
18. Preparation Table Work Surface:

    a. Corian solid surfacing, white.
    b. Two step work surface consisting of 22 inches deep (f to b) upper surface for food storage pans and 18 inches deep (f to b) lower surface that steps down approximately 6 inches.
    c. Upper work surface equipped with refrigerated insert areas for food ingredient pans. Two insert areas on 1D07-4 case, each approximately 21 inches wide by 13 inches length by 4 inches deep. Insert areas shall accommodate at least six each (total) smaller standard food ingredient pans.
    d. Stainless steel pans with clear lids: Provide two 1/3 size pans, six 1/6 size pans, and two 2/3 size pans per insert area.
    e. Fixed-mount front sneeze guard panel; clear tempered glass; straight profile.
    f. Two tempered glass end panels mounted on top of insulated end panels.

19. Self Service (Front):

    a. One adjustable (height and angle) 15-inch deep shelf with undershelf light, full length of case, stainless steel.
    b. Base deck (adjustable angle) lighted with continuous ledge light, full length of case, stainless steel.
    c. Canopy light (same profile as ledge light), full length of case, stainless steel.
    d. Air dam: 3/8 inch thick clear tempered glass at front of base deck.

20. Case front nosepiece: Painted aluminum extrusion to match exterior case color.
21. Molded bumper (1 inch wide) across front of display case, centered on nosepiece. Color: Black.
22. Kickplate color: Black.
23. Two insulated end panels: Laminated exterior to match case color with stainless steel interior and stainless steel edge molding; fabricate top to receive glass end panel.
24. Rear refrigerated storage, medium temperature, with see-through glass, NSF-7 certified sliding doors, base and adjustable height upper, lighted.
25. Narrow "U" channel chase at top rear of self-service case for wire service to optional electrical outlets.

B. Basis-of-Design Products: Hussman or Hill Phoenix.

1. ITEM 1D07-4: Sushi Preparation Table (Mobile Island, Refrigerated, Self-Contained).

PART 3 - APPROXIMATE DIMENSIONS: 48 INCHES LONG, 58 INCHES DEEP, 55 INCHES HIGH.

PART 4 - EXECUTION

4.1 INSPECTION

A. Check that surfaces to which work will be secured are sound and free of irregularities interfering with installation. Do not begin installation until satisfactory conditions have been corrected.

4.2 PREPARATION

A. Obtain dimensions from the site affecting work of this Section.

B. Ensure that roughed-in openings, built-in anchorage, and reinforcing required for proper installation of work of this Section are correctly sized, installed and located.

C. Obtain electrical and mechanical service characteristics and rough-in locations from site.

4.3 INSTALLATION

A. Installation of equipment shall be in accordance with NSF Manual On Sanitation Aspects of Food Service Equipment, as applicable.

B. Install items in accordance with manufacturer's instructions and installation procedures. Supervision shall be performed by workers skilled and familiar with installation of the equipment specified.

C. Set units plumb, square and true, securely anchored to building structure.

D. Insulate items to prevent electrolysis between dissimilar metals.

E. Seal spaces between built-in equipment, walls and columns with preformed foam sealants specified in Division 07 Section Joint Sealants, shim level and rigid, use proper type anchoring devices for materials encountered and usage expected.

F. Cut, fit and patch; coordinate with work of other Sections involved.

G. Cut and drill tops, backs, sides and bottoms for service outlets and fixtures. Install fixtures and fittings. Make connections to services.

H. Sequence installation and erection to ensure that mechanical and electrical connections are effected.

I. Deliver instruction sheets to Contracting Officer and instruct Government's personnel in the proper use, adjustment, and maintenance of equipment.

4.4 ADJUSTING AND CLEANING

A. Adjust doors, drawers, hardware fixtures, and other moving and operating parts to function smoothly and correctly.

B. Replace damaged items with new material.

C. On completion of installation, touch up all marred or abraded finished surfaces.

D. Clean equipment cases, counters, shelves, glass, legs, hardware, fittings and fixtures. Wipe down surfaces to remove fingerprints and markings and leave in clean condition.

END OF SECTION

SECTION 11 40 00.26

PRODUCE DEPARTMENT EQUIPMENT

(Edited from DeCA June 2011 Design Criteria)

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. 2P08-A Tilt Top Display Table, Produce Items, Wooden, Euro Type.
2. 2P16-A Orchard Bin (For Use without Ice).
3. 2P22-D Four Step Euro End Cap.

B. Equipment specified in Division 23 Section Product Refrigeration Systems.

1. 1P03 Case, Produce, Refrigerated, Single-Deck.
2. 1P07 Case, Produce, Pre-Cut Vegetables, Refrigerated.
3. 2P07-B Produce Misting System.

C. Equipment Specified in Division 22 Section Plumbing Fixtures and as indicated on Drawings.

1. 4S03 Sink, 3-Compartment, Stainless Steel.
2. 4S00 Hand Wash Sink.
3. 2M06 Wall Mount Drench Hose.

1.2 SUBMITTALS

A. Product Data:

1. For each item of equipment required, including the manufacturer's standard details and installation and maintenance instructions.

a. Manufacturer's standard commercial warranty.
b. Operating instructions.
c. Specifications and parts manual.
d. Underwriters Laboratories (UL), Inc., listing.
e. National Sanitation Foundation (NSF) approval or acceptance.

B. Submittal List:

Reference	Submittal Item	Quantity	Action
1.2A	Product Data	X	R

X Submit quantity specified in Division 01 Section Administrative Requirements.
R Review each submittal, mark to indicate action taken, and return.
I Submittal is for information or record purposes only. No action will be taken.

1.3 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced installer to perform work of this Section who is an authorized representative of the produce department equipment manufacturer, who has specialized in installing produce department equipment, who has completed installations similar in design and extent to that indicated for this Project, and who has a record of successful in-service performance.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Products: To establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of other manufacturers, a specific manufacturer's product is named and accompanied by the words "basis of design," including make or model number or other designation. Subject to compliance with requirements, provide either the named products or equal products.

2.2 ITEM 2P08-A: TILT TOP DISPLAY TABLE, PRODUCE ITEMS, WOODEN, EURO TYPE

A. Salient Characteristics:

1. Tilt-top table, European style.
2. Solid Oak construction.
3. Adjustable steel table legs.
4. Table tilt top with safety lock can be positioned at five or more possible angles.
5. Pull-out front drawer that extends for additional display space.
6. Black plastic bumper guard.
7. Four non-marking casters (two locking and two swivel).
8. Wood finish of polyurethane or clear, moisture-resistant protective sealant.
9. Accessories:

    a. Removable Side Rails: Two each (per table) removable oak side rails complete with mounting hardware. Rounded top to reduce product bruising. Pre-drilled and specific length to match table tilt-top depth.
    b. Front Guard: One each (per table) clear front guard (product stop) which allows full view of product. Constructed of heavy duty 0.177 thickness plastic, without holes. Approximate dimensions 6 inches high by 4 inches deep (L-shape) by 48 inches long or sized appropriately to match table tilt-top width.
    c. Leg Ties: Four each (per table) leg ties. Constructed of black nylon straps 1/4 inches by 24 inches with locking mechanism. Designed to prevent movement of tables when two or more tables are joined, and easily removable and reusable.
    d. Horizontal Product Stop: One each (per table) oak horizontal divider (product stop). Designed to divide table into horizontal sections and sized to match width of table.
    e. Vertical Product Stop: One each (per table) oak vertical divider (product stop). Designed to divide the table into vertical sections and sized to match the depth of the table.
    f. Interlocking Pans: Four each (per table) interlocking pans designed to allow merchandising of multiple items on one table. Constructed of black ABS plastic

with interlocking pans to restrict movement. Approximate dimensions 24 inches by 24 inches by 6 inches.

g. Scale Holder: One each (per four tables or fraction thereof) scale holder. Constructed of powder coated steel and designed to fit the Euro table, black in color. Designed to suspend a hanging scale and provided with a swivel (360 degree) top.

h. Bag Holder: One each (per four tables or fraction thereof) angled bag roll holder. Constructed of powder coated steel and designed to fit the Euro table, black in color. Designed to hold one roll of bags vertically.

i. Insulated Ice Pan: One each (per four tables or fraction thereof) insulated ice pan. Constructed of black ABS plastic with polyurethane foam insulation. Ice pan has built-in drain system with hose attachment for easy draining of water and a cut-off valve. Four inches deep and sized (length by width) to match tilt top table.

j. Rolling Reservoir: One each (per four tables or fraction thereof) reservoir pan to be used in conjunction with insulated ice pan. Constructed of black ABS plastic and mounted on 2- to 3- inch non-marking heavy duty casters. Integrated pop valve drain system. Approximate dimensions 30 inches wide by 30 inches long by 12 inches high.

k. "U" Shape Front Guard: One each (per four tables or fraction thereof) u-shape clear front guard (product stop). Constructed of clear heavy duty plastic designed to be used in conjunction with insulated ice pan to allow massive ice presentation and to prevent ice spillovers. Sized to match the insulated ice pan.

10. Approximate Overall Dimensions:

a. 48 inches long.
b. Adjustable 48 to 61 inches deep.
c. Adjustable 18 to 28 inches high.

B. Basis-of-Design Product: The Marco Company. (800) 356-2848 or www.marcofw.com.

1. European style table with pull-out drawer: ET06 O 48X48
2. Removable Side Rails: SR06 48 Two 48-inch side rails for ET06.
3. Front Guard: FG-1774 by 6 by 48 Clear front guard 4 by 6 by 48, 177 gauge.
4. Leg Ties: VEG-106 TIE Black nylon leg ties.
5. Horizontal Product Stop: ET PS 4 H 4-foot horizontal product stop.
6. Vertical Product Stop: ET PS 4 V 4-foot vertical product stop.
7. Interlocking Pans: VEG-106 L PAN 24 by 24 by 6 Interlocking pan.
8. Scale Holder: VEG-106 SCALE Metal scale holder to fit 2-inch round leg Euro Tables.
9. Bag Holder: VEG-106 BH Metal bag holder to fit 2-inch round leg Euro Tables.
10. Insulated Ice Pan: VEG-106 INPAN 48 by 46.5 Insulated ice pan for European style table.
11. Rolling Reservoir: VEG 106RES LG 30 by 30 by 12 Reservoir w/casters.
12. "U" Shape Front Guard: VEG-FG U-106 INPAN 48 by 48.

2.3 ITEM 2P16-A: ORCHARD BIN (FOR USE WITHOUT ICE)

A. Salient Characteristics:

1. Solid oak construction.
2. Designed with a family of available top liners to provide a wide range of display options. Including flat top liner, nut liner, clear lids, multi-pocket lids, and other assorted options for a variety of display choices of various products. <u>Not to be provided with initial orchard bin at this time.</u>

3. Four recessed casters, two swivel and two locking.
4. Hinged drop side on one side for access to interior upper half of bin.
5. Two position adjustable plywood bottom for mass display variation in height and quantity of product.
6. 2-1/2 inch deep plastic bottom liner.
7. Approximate Bin Dimensions:

    a. 48 inches long.
    b. 48 inches wide.
    c. 32 inches high.

8. Accessory Sign Holder:

    a. Double-sided chalkboard with 2-inch oak wood frame.
    b. Chalkboard slides in and out of stand for quick sign change.
    c. Single pole metal stand for easy attachment to orchard bin.
    d. Sign holder extends approximately 18 inches to the base of the chalkboard sign holder.
    e. Chalk and dustless eraser.
    f. Chalkboard Dimensions:

        1) 24 inches long.
        2) 3/4 inches deep.
        3) 12 inches high.

B. Basis-of-Design Product: The Marco Company. (800) 356-2848 or www.marcofw.com.

1. Model OBA-CLS WM O 4-Foot Square Watermelon Bin Oak Wood.
2. Model CB-OB 24x12 C Composition Chalkboard w/Frame & Holder.

2.4 ITEM 2P22-D: FOUR STEP EURO END CAP

A. Salient Characteristics:

1. A four step end cap (deck plus 3 stepped levels).
2. Face of end cap shall extend 2 inches above the deck. Front corners, left and right, shall be cut off on a diagonal line approximately 7 inches from the corner to provide a polygon effect and to eliminate the sharp corners.
3. Three step displays centered on back wall of table. Six-inch step height.
4. ABS plastic liner.
5. Plastic bumper.
6. Colors: As indicated.
7. Adjustable steel legs with casters.
8. Approximate Overall Dimensions:

    a. 81 inches long.
    b. 30 inches deep.
    c. 44 inches high.

9. Approximate Step Dimensions:

    a. Step one: 64 inches long by 20 inches deep.
    b. Step two: 49 inches long by 12 inches deep.
    c. Step three: 35 inches long by 5 inches deep.

d. With diagonal front corners.

10. Back panel: Shall extend full length of deck and 24 inches above the deck. Sloped at both ends with a 31-1/2 inch flat top.

B. Basis-of-Design Product: The Marco Company. (800) 356-2848 or www.marcofw.com

1. Model VEG-106 EC#5 Four Step Euro Table End Cap.

PART 3 - EXECUTION

3.1 INSPECTION

A. General:

1. Check that surfaces to which work will be secured are sound and free of irregularities interfering with installation.
2. Do not begin installation until satisfactory conditions have been corrected.

3.2 PREPARATION

A. General:

1. Obtain dimensions from the site affecting work of this Section.
2. Ensure that roughed-in openings, built-in anchorage, and reinforcing required for proper installation of work of this Section are correctly sized, installed and located.
3. Obtain electrical and mechanical service characteristics and rough-in locations from site.

3.3 EQUIPMENT INSTALLATION

A. General:

1. Installation of equipment shall be in accordance with NSF Manual On Sanitation Aspects of Food Service Equipment, as applicable.
2. Install items in accordance with manufacturer's instructions and installation procedures. Supervision shall be performed by workers skilled and familiar with installation of the equipment specified.
3. Where unit locations coincide with structural building elements such as columns, install unit to shape of element. Anchor unit directly to building element using manufacturer’s recommended method to support shelving capacity of unit.
4. Set units plumb, square and true, securely anchored to building structure.
5. Insulate items to prevent electrolysis between dissimilar metals.
6. Seal spaces between built-in equipment, walls and columns with preformed foam sealants specified in Division 07 Section Joint Sealants, shim level and rigid, use proper type anchoring devices for materials encountered and usage expected.
7. Cut, fit and patch; coordinate with work of other Sections involved.
8. Cut and drill tops, backs, sides and bottoms for service outlets and fixtures. Install fixtures and fittings. Make connections to services.
9. Sequence installation and erection to ensure that mechanical and electrical connections are affected.

10. Deliver instruction sheets to Contracting Officer and instruct Government's personnel in the proper use, adjustment, and maintenance of equipment.

3.4 ADJUSTING AND CLEANING

A. General:

1. Adjust doors, drawers, hardware fixtures, and other moving and operating parts to function smoothly and correctly.
2. Restore finishes damaged during installation and construction period so no evidence remains of correction work. Return items that cannot be refinished in the field to the shop; make required alterations and refinish entire unit or provide new units.
3. On completion of installation, touch up all marred or abraded finished surfaces.
4. Clean equipment cases, counters, shelves, glass, legs, hardware, fittings and fixtures. Wipe down surfaces to remove fingerprints and markings and leave in clean condition.

END OF SECTION

SECTION 12 48 13.13

SURFACE FLOOR MATS

(Edited from DeCA June 2011 Design Criteria)

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Roll-up surface-mounted mats.

1.2 SUBMITTALS

A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, perimeter floor moldings, and finishes.

B. Samples for Verification: Floor Mat: 12 inch square, sections of floor mat including perimeter floor molding.

C. Submittal List:

Reference	Submittal Item	Quantity	Action
1.2A	Product Data	X	R
1.2B	Samples for Verification	X	R

X Submit quantity specified in Division 01 Section Administrative Requirements.
R Review each submittal, mark to indicate action taken, and return.
I Submittal is for information or record purposes only. No action will be taken.

1.3 QUALITY ASSURANCE

A. Source Limitations: Obtain floor mats through one source from a single manufacturer.

1.4 PROJECT CONDITIONS

A. Field Measurements: Indicate measurements on Shop Drawings.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Products: To establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of other manufacturers, a specific manufacturer's product is named and accompanied by the words "basis of design," including

make or model number or other designation. Subject to compliance with requirements, provide either the named products or equal products.

2.2 ENTRANCE MATS

A. Basis-of-Design Product:

1. C/S Group, "DesignStep Duration."

B. Carpet-Type Mats:

1. Manufactured from 100 percent UV resistant polypropylene fibers with a face weight of 50 oz./sq. yd. and total weight of 85 oz./sq. yd. with all-weather skid-resistant rubber backing.
2. Heavy-Duty Vinyl Edging: 1-1/2 inch tapered vinyl edging for surface mounted application, black color.
3. Mat Size: As indicated on Drawings.
4. Colors, Textures, and Patterns: Custom, as indicated on Drawings.

2.3 FABRICATION

A. Floor Mats: Shop fabricate units to greatest extent possible in sizes indicated. Unless otherwise indicated, provide single unit for each mat installation; do not exceed manufacturer's recommended maximum sizes for units that are removed for maintenance and cleaning. Where joints in mats are necessary, space symmetrically and away from normal traffic lanes.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and floor conditions for compliance with requirements for location, sizes, and other conditions affecting installation of floor mats.

1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install surface-type units to comply with manufacturer's written instructions at locations indicated; coordinate with entrance locations and traffic patterns.

END OF SECTION

SECTION 12 93 00

SITE FURNISHINGS

(Edited from DeCA June 2011 Design Criteria)

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Benches.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, finishes, field-assembly requirements, and installation details.

B. Submittal List:

Reference	Submittal Item	Quantity	Action
1.2A	Product Data	X	R

X Submit quantity specified in Division 01 Section Administrative Requirements.
R Review each submittal, mark to indicate action taken, and return.
I Submittal is for information or record purposes only. No action will be taken.

1.3 CLOSEOUT SUBMITTALS

A. Maintenance Data: For site furnishings to include in maintenance manuals.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Products: To establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of other manufacturers, a specific manufacturer's product is named and accompanied by the words "basis of design," including make or model number or other designation. Subject to compliance with requirements, provide either the named products or equal products.

2.2 MATERIALS

A. Steel: Free of surface blemishes and complying with the following:

1. Plates, Shapes, and Bars: ASTM A 36/A 36M.
2. Steel Pipe: Standard-weight steel pipe complying with ASTM A 53/A 53M, or electric-resistance-welded pipe complying with ASTM A 135/A 135M.
3. Anchors, Fasteners, Fittings, and Hardware: Manufacturer's standard, corrosion-resistant-coated or noncorrodible materials; commercial quality; tamperproof, vandal and theft resistant; concealed, recessed, and capped or plugged. Provide as required for site furnishings' assembly, mounting, and secure attachment.

2.3 BENCHES

A. Basis-of-Design Product: Columbia Cascade Company, Timberform "Manor" 2827-6-P (Pedestal Mount).

1. Frame, Armrests and Legs: 0.120 inch thick by 1-1/2 inch square mild steel seamless tubing.
2. Seat and Backrest Slats: 0.085 inch thick by 3/4 inch by 1-1/2-inch mild steel seamless tubing.
3. Arms: Two, one at each end of bench.
4. Arm Height: Standard with product.
5. Seat Height: 16 inches.
6. Overall Height: 35 inches.
7. Overall Width: 23 inches.
8. Overall Length: 74 inches.
9. Seat Surface Shape: Standard with product.
10. Installation Method: Anchor to floor surface is facilitated through 5/8-inch diameter holes in pedestal mount base of each bench leg.
11. Steel Finish: UV resistant exterior grade polyester powder coating applied to a minimum thickness of 6 mils. Liquid, epoxy, and lead-containing powder coatings are not acceptable. Color: Black.

2.4 FABRICATION

A. Metal Components: Form to required shapes and sizes with true, consistent curves, lines, and angles. Separate metals from dissimilar materials to prevent electrolytic action.

B. Welded Connections: Weld connections continuously. Weld solid members with full-length, full-penetration welds and hollow members with full-circumference welds. At exposed connections, finish surfaces smooth and blended so no roughness or unevenness shows after finishing and welded surface matches contours of adjoining surfaces.

C. Exposed Surfaces: Polished, sanded, or otherwise finished; all surfaces smooth, free of burrs, barbs, splinters, and sharpness; all edges and ends rolled, rounded, or capped.

D. Factory Assembly: Assemble components in the factory to greatest extent possible to minimize field assembly. Clearly mark units for assembly in the field.

2.5 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.6 STEEL FINISHES

A. Baked-Enamel, Powder-Coat Finish: Manufacturer's standard, baked, polyester, powder-coat finish complying with finish manufacturer's written instructions for surface preparation, including pretreatment, application, baking, and minimum dry film thickness.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions, with Installer present, for compliance with requirements for correct and level finished grade, mounting surfaces, installation tolerances, and other conditions affecting performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

A. Comply with manufacturer's written installation instructions unless more stringent requirements are indicated. Complete field assembly of site furnishings where required.

B. Unless otherwise indicated, install site furnishings after landscaping and paving have been completed.

C. Install site furnishings level, plumb, true, and securely anchored at locations indicated on Drawings.

D. Anchor site furnishings to floor surfaces with corrosion resistant zinc alloy expansion anchors (bolt size 1/2-inch – 16, 2-3/16-inch anchor length) and washer.

3.3 CLEANING

A. After completing site furnishing installation, inspect components. Remove spots, dirt, and debris. Repair damaged finishes to match original finish or replace component.

END OF SECTION

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SECTION 13 21 26

COLD STORAGE ROOMS

(Edited from DeCA September 2011+ March 2012 Design Criteria)

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Shop fabricated, site assembled, walk-in, cold storage rooms including:

a. Cooler rooms.
b. Ceiling panel supports.
c. Sliding cold storage room doors.

B. Related Sections:

1. Division 08 Section Traffic Doors for flexible vertical strip barrier doors.
2. Division 23 Section Product Refrigeration Systems for refrigeration system.
3. Division 23 Section Refrigeration Monitoring and Control System (RMCS) for monitoring and control system.
4. Division 26 for lighting, electrical wiring, and connections.

1.2 PERFORMANCE REQUIREMENTS

A. Structural Performance:

1. Provide cold storage room ceilings capable of withstanding the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:

a. Live Load: Uniform load of 10 psf or a concentrated load of 300 lbf on an area of 144 sq. in., whichever produces the greater stress. Concentrated and uniform loads need not be assumed to act concurrently.
b. Dead Load: 4 psf or actual weight of panels, fixtures, and equipment supported, whichever is greater.
c. Deflection: L/180.

B. Seismic Performance:

1. Design, engineer, and provide cold storage rooms capable of withstanding the effects of earthquake motions.
2. Refer to Division 01 Section Summary of Work for seismic-load design performance criteria.

1.3 SUBMITTALS

A. Product Data:

1. Submit complete catalog data. Submit catalog cuts of each type of unit, as well as cuts of hardware and accessories proposed for use.

B. Shop Drawings:

1. Provide overall layout drawing indicating location and exact dimensions of cold storage rooms.
2. Show construction and fabrication details of each item.
3. Provide details for structural supports to be used.

   a. For installed products indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

C. Installation Drawings:

1. Submit complete drawings showing details of anchorage and connection, location and method of attachment of installed equipment, method of assembling sections and relationship to adjoining work.
2. Show complete layout of panels, connection details, setting diagrams. Number each panel and show panel numbers on installation drawings.

D. Installation Instructions:

1. Provide complete written installation instructions for cold storage rooms.

E. Ceiling Suspension Structural Calculations:

1. Indicate location and magnitude of loads imposed on building structure.

F. Field Test Reports:

1. Submit cold storage rooms operating and performance tests.

G. Warranties:

1. Provide manufacturer's written sample warranties for review.

H. Submittal List:

Reference	Submittal Item	Quantity	Action
1.3A	Product Data	X	R
1.3B	Shop Drawings	X	R
1.3C	Installation Drawings	X	I
1.3D	Installation Instructions	X	I
1.3E	Ceiling Suspension Structural Calculations	X	I
1.3F	Field Test Reports	X	R
1.3G	Warranties	X	I

X Submit quantity specified in Division 01 Section Administrative Requirements.
R Review each submittal, mark to indicate action taken, and return.
I Submittal is for information or record purposes only. No action will be taken.

1.4 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver store and handle material to prevent damage and marring of finish. Protect finished surfaces from damage. Store units on pallets or other approved devices. Store materials inside building, under protective covering, and protect from weather, moisture, open flames and sparks.

1.5 SPECIAL WARRANTY

A. Provide written warranty covering materials and workmanship of all work of this Section for a period of 2 years and repair or replace all material which becomes defective during warrantee period. The Government shall have continued use of defective equipment until replacement equipment is delivered.

B. Special warranty shall not diminish any standard manufacturer warranty period available for any products specified within this section that are in excess of the stated 2 year requirement.

C. Conform to applicable requirements of Section 017700 Closeout Procedures.

1.6 QUALITY ASSURANCE

A. General:

1. Contract Drawings indicate the extent and general arrangement of the construction. No departures from the Contract Drawings, these Specifications or the approved shop drawings may be made without prior written approval of the Contracting Officer. Units shall be factory prefabricated, job assembled, commercial, walk-in, room type, complete with doors and accessory items as specified.
2. Construction shall be as approved by the National Sanitation Foundation International and shall bear the NSF® Seal of Approval.

B. Supervision:

1. Install work of this Section, and related work specified in other Sections, under the supervision of trained and experienced personnel.

C. Plumbing and Mechanical Work:

1. Where not specified elsewhere, furnish and install equipment, parts, and fittings necessary for the proper operation of the equipment as part of the work of this Section. Conform to applicable requirements of Divisions 22 and 23.

D. Electrical Work:

1. Where not specified elsewhere, furnish and install manual and automatic controls and protective or signal devices required for the operation of the equipment as part of the work of this Section. Conform to applicable requirements of Division 26.

E. Rough-in of Utilities:

1. Install water, waste, vent, gas, electric and other mechanical and electrical work, not included as part of the cold storage room units, in accordance with Divisions 23 and 26. Provide rough-in information, including templates, drawings to scale, and brochures to

enable work of other sections to proceed. Contract drawings are diagrammatic. As part of this work, provide adjustments required for the various parts and the work of the various sections to fit together for a complete and operable system.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Products: To establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of other manufacturers, a specific manufacturer's product is named and accompanied by the words "basis of design," including make or model number or other designation. Subject to compliance with requirements, provide either the named products or equal products.

2.2 PREFABRICATED PANELS

A. Aluminum Panel Construction:

1. Panels, General:

   a. Interior and exterior metal panels uniformly formed with metal dies, insulation, and panel fasteners.
   b. Wood frame panels are not acceptable.
   c. UL approved, or provided with certificate of test from independent testing laboratory, certifying to fire retardant properties of the insulation.

2. Panels Size:

   a. Length: 144 inches, maximum.
   b. Width: 48 inches, maximum.
   c. Thickness, minimum, including insulation and panel skins:

      1) Medium temperature panels: 4 inches.
      2) Low temperature panels: 5 inches.

3. Panel Joints: Interlocking design.
4. Panel Fasteners: Cam action type operable from inside the space and shall not protrude from the panels when in the retracted position.
5. Provide vapor seal at panel joints when joints are assembled. Form seal by compressing closed cell gaskets in the joint. Panel gaskets shall be of synthetic rubber or other suitable material. Refer to Part 3 for additional caulking required at freezer wall and ceiling panels.
6. Panel Skins: 0.032 inch thick stucco embossed aluminum. Provide factory applied USDA acceptable white baked or acrylic enamel finish.

   a. The under side of ceiling panels shall have sufficient strength to support conduit and light fixtures riveted directly to the skin. Light fixture weight is approximately 50 pounds per 8 feet of strip light.
   b. Panel skins shall adhere to the insulation.

B. Insulation:

1. Insulation shall be foamed-in-place polyurethane, 2 pcf minimum density, bonded to inner and outer metal panels.
2. Thermal conductivity (K) shall not exceed 0.14 (BTU) (IN) / (HR.) (FT^2) (DEGREE F).

   a. Low Temperature Panels: 5-inch thickness with a minimum "R" factor of 36.
   b. Medium Temperature Panels: 4-inch thickness with a minimum "R" factor of 28.

3. Insulation shall be Factory Mutual System classified Class I (per ASTM E-84) having a flame spread of no more than 25, fuel contributed of 0, and smoke developed rating not greater than 400 when tested in a 4-inch cross section.

2.3 CEILING PANEL SUPPORTS

A. General:

1. Do not use vertical support columns or posts on interior or exterior of cold storage rooms. Interior of cold storage rooms shall be free and clear of any attachments or penetrations from supporting members.

B. Overhead-Supported Panels:

1. Where ceiling panels cannot be self-supporting on cold storage room wall panels, provide ceiling panel support system, including fasteners and attachments, suspended from building overhead structural system. Do not support panels from metal decking.

   a. Provide supporting members, including fasteners and attachments, required to support ceiling panels from underside of overhead building structural members.
   b. Provide suspension system of structural steel materials complying with Division 05 Section Metal Fabrications.
   c. Provide manufacturer's supports and attachments hangers conforming to panel joint configuration.
   d. Design support system in accordance with performance requirements and AISC Specification for the Design, Fabrication and Erection of Structural Steel for Buildings.

2. Design ceiling panel support system in accordance with performance requirements.

C. Self-Supporting Panels:

1. Where ceiling panels are self-supporting, provide ceiling panels that bear on cold storage wall panels and span from wall to wall.
2. Design ceiling panels in accordance with performance requirements.

2.4 COLD STORAGE ROOM DOORS

A. Sliding Doors:

   a. Provide horizontal sliding cold storage doors where indicated.
   b. Door Frame Assembly: Structurally designed, extruded, insulated, white aluminum header and casings, of dimension required for the proper support of the door.

Aluminum clad wood framing is not acceptable. Refer to Part 3 for caulking required around perimeter of cold storage room door frames.

c. Door Panels:

1) Door Panel Cladding: 0.032 inch thick stucco embossed aluminum with factory applied white baked or acrylic enamel finish matching prefabricated wall panels.
2) Door Panel Assembly: Internal extruded aluminum frame reinforced with heavy gage "L" brackets, vapor sealed, and insulated with foamed-in-place polyurethane insulation.
3) Door overall thickness, including insulation and panel skins:

a) Medium temperature panels: 4 inches.
b) Low temperature panels: 5 inches.

d. Door Hardware:

1) Tamper-proof, with cylinder lock when door is mounted on exterior side of cold storage room wall panel. A chain-lock assembly shall be provided when door is mounted on inside of cold storage room wall panel. Both assemblies must have provisions, when locked, of being opened from the inside without damage to the door assembly.
2) Drop track guide system, with closed hood tracking system, providing immediate gasket clearance as door opens. Track fabricated of extruded aircraft grade aluminum throughout profile. Support sliding door panel with twin trolley roller assembly comprised of four nylon wheels and a solid aluminum tie bar.
3) Attached track and hardware shall have a corrosion resistant coating.
4) Provide manufacturer’s standard 1/4 inch thick steel door hook to engage door guide; and black color polymer sliding floor guide system to provide positive seal when door is in closed position.
5) Provide stainless steel breaker bar handle, mounted on leading edge of door jamb, to break seal and assist door opening.
6) Gaskets: Provide dual wiper perimeter gasket seals on door panel that are resistant to oil, water, fats, and sunlight. Gasket material shall be santoprene which remains pliable to minus 40 degrees F. Mount gaskets in an extrusion on back of door panel. Door frame mounted gaskets are not acceptable. Door bottom gasket shall be twin sweep gasket design. The first gasket shall be located under door panel in an extruded track. The second gasket is an adjustable gasket mounted on interior side of door panel and easily moved up or down with contour of floor.
7) Provide 18 ga. stainless steel wrap at both jambs and head of door opening. Width of stainless steel wrap shall match overall depth of door frame assembly and return 2-inches on both faces.
8) Provide 48-inch high, 0.100 inch thick (measured through the body of plate, not including the raised portion) polished aluminum diamond tread protection plates on both faces of door panel, including 3-1/4 inches wide return on edges of door panel.

e. Basis-of-Design Product: Frank Door Company, (252) 885-6145 or www.frankdoor.com.

B. Freezer Doors (both sliding and swinging):

1. Equip freezer doors with an automatically self-regulating heater cable in an aluminum frame.

2. Install cable in a manner that allows replacement without removing the door panel from the header assembly or swing door hinge assembly, as applicable.
3. Doors shall be both NSF compliant and UL approved, complete with all components required for complete and operational installation.
4. Provide heated stainless steel threshold across width of door opening, to cover freezer floor thermal break, as indicated on drawings.
5. Electrical requirements: 120 V, 60 Hz, single phase.
6. Completely wire heater cables to controls and door switches and terminated them in a junction box adjacent to the door.

2.5 FLEXIBLE VERTICAL STRIP BARRIER DOORS

A. Flexible vertical strip barrier doors are specified in Division 08 Section Traffic Doors.

2.6 ACCESSORIES

A. Lighting:

1. Provide each room with a 3-way light switch mounted near the door, one on the interior of the room and one on the exterior of the room. Provide at additional locations as indicated on drawings.
2. Light switches shall include a red jewel pilot light and cover plate.
3. Lights shall be vapor proof.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Equipment:

1. Installation of equipment shall be in accordance with NSF Manual on Sanitation Aspects of Installation of Food Service Equipment.

B. Materials:

1. All items shall be installed plumb, square, level and at proper elevation, and in alignment with other work. All work shall be arranged to suit field conditions, fitted with proper jointing and intersections. Adjust doors to operate smoothly. At completion of work, thoroughly clean materials and equipment, remove debris from the site, and leave work in condition acceptable to the Contracting Officer.

C. Caulking:

1. Install silicone sealant around entire perimeter of cold storage room door frame, where frame abuts cold storage room wall panel, to assure airtight seal.

D. Additional Caulking:

1. After tests have been completed and approved, all exterior freezer ceiling panel joints and exterior freezer wall panel joints (not sharing common wall with medium temperature cold storage room) shall be sealed with silicone sealant.

E. Closures:

1. Where cold storage rooms abut building walls and partitions, seal-off spaces with stainless steel sheet metal closures.

F. Thermometers:

1. Locate thermometers adjacent to cold storage room door openings with capillary tube at least 5 feet away from door opening.

3.2 PENETRATIONS

A. General:

1. Minimize required penetrations through ceilings, floors, and walls of cold storage rooms.
2. Provide PVC conduit sleeves and resilient gaskets for penetrations as indicated on Drawings.
3. Seal penetrations tightly with silicone sealant.
4. Internally seal electrical and communication conduits to prevent moisture migration through conduit. Conduits shall be sealed on the warm side of the penetration to prevent air movement via convection currents. Do not seal a single conduit at multiple locations as this will trap condensation and result in corrosion.

3.3 FIELD QUALITY CONTROL

A. Tests, General:

1. Perform operating and performance tests on each cold storage room. Submit a written test procedure for approval prior to performance of tests. Furnish instruments, test equipment and personnel required for tests. The Government will furnish necessary water and electricity for the installed equipment to perform tests. Engage and pay for an approved independent testing laboratory to properly calibrate the test instruments immediately prior to performing tests. Prepare written report of tests.

B. Operating Tests:

1. Perform operating tests on each cold storage room after complete adjustment and installation of the refrigeration systems. Operate the refrigerating system long enough at the required control settings to determine that refrigeration, defrost, and control systems operate and cycle properly. Operating failures include component operating failures, system leaks, and inability of the refrigeration system to maintain walk-in cooler and freezer temperatures. Correct failures and rerun tests.

C. Performance Tests:

1. Maintain temperatures inside cold storage rooms for a period of 24 hours. Record temperatures and submit with test report.

END OF SECTION

SECTION 21 08 00

COMMISSIONING OF FIRE SUPPRESSION

(Edited from DeCA June 2011 Design Criteria)

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Division 21 responsibilities in the commissioning process.
2. Commissioning of Fire Suppression.

B. Related Sections:

1. Division 01 Section General Commissioning Requirements.

1.2 DEFINITIONS

A. CA: Commissioning Agent.

B. CO: Contracting Officer.

C. GC: Contractor; General Contractor, not a Subcontractor.

D. O&M: Operations and Maintenance.

E. QC: Contractor's Quality Control Manager.

F. TI: Technical Inspector.

1.3 DESCRIPTION

A. This Section describes commissioning requirements applicable to commissioned items and systems specified in Division 11 to ensure that all items and systems are operating in a manner consistent with the Contract Documents.

B. Conform to commissioning requirements and the commissioning plan.

1.4 RESPONSIBILITIES

A. Construction and Acceptance Phases:

1. Include the cost of commissioning in the Contract price.
2. In each purchase order or subcontract written, include requirements for submittal data, O&M data and training.
3. Conduct a commissioning scoping meeting and other meetings necessary to facilitate the Commissioning process.

4. Provide requested documentation to the TI developed for functional testing procedures.
5. Provide functional performance test procedures. Subs shall review test procedures to ensure feasibility, safety and equipment protection and provide necessary written alarm limits to be used during the tests.
6. Develop a full start-up and initial checkout plan using manufacturer's start-up procedures and the prefunctional checklists for all commissioned equipment. Submit to QC for review prior to startup. TI will verify plan for compliance. Refer to Division 01 Section General Commissioning Requirements for further details related to start-up.
7. During the startup and initial checkout process, execute the prefunctional checklists for all commissioned equipment.
8. Perform and clearly document all completed startup and system operational checkout procedures, providing a copy to the QC and TI.
9. Correct system deficiencies before functional testing.
10. Provide skilled technicians to execute starting of equipment and to execute the functional performance tests. Ensure that they are available and present during the agreed upon schedules and for sufficient duration to complete the necessary tests, adjustments and problem-solving.
11. Provide all test equipment necessary to fulfill specified testing requirements.
12. Assist the CA and TI in interpreting the monitoring data, as necessary.
13. Correct deficiencies (differences between specified and observed performance) as interpreted by the CA, TI and A/E and retest the equipment.
14. Prepare O&M manuals according to the Contract Documents, including clarifying and updating the original sequences of operation to as-built conditions.
15. During construction, maintain as-built red-line Drawings for all Drawings and final CAD as-builts for Contractor-generated coordination Drawings. Update after completion of commissioning (excluding deferred testing).
16. Coordinate with equipment manufacturers to determine specific requirements to maintain the validity of the warranty.

B. Operation Manuals shall include:

1. A table of all setpoints and implications when changing them.
2. Schedules.
3. Instructions for operation of each piece of equipment for emergencies.
4. Seasonal adjustment.
5. Startup and shutdown.
6. Instructions for energy savings operations and descriptions of the energy savings strategies in the facility (from O&M Manuals).
7. Recommendations for recommissioning frequency by equipment type.
8. Energy tracking recommendations.

C. Warranty Period:

1. Execute seasonal or deferred functional performance testing, witnessed by the CA, according to the specifications.
2. Correct deficiencies and make necessary adjustments to O&M manuals and As-Built Drawings for applicable issues identified in any seasonal testing.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 STARTUP

A. Contractors shall follow the start-up and initial checkout procedures listed in the Responsibilities list in this Section and in Division 01 Section General Commissioning Requirements. Division 11 has start-up responsibility and is required to complete systems and sub-systems so they are fully functional, meeting the design objectives of the Contract Documents. The commissioning procedures and functional testing do not relieve or lessen this responsibility or shift that responsibility partially to the Commissioning Agent, Technical Inspector, or Government.

B. Functional testing will generally begin upon completion of a system. Functional testing may proceed prior to the completion of systems or sub-systems at the discretion of the CO. Beginning system testing before full completion does not relieve the Contractor from fully completing the system, including all prefunctional checklists.

3.2 OPERATION AND MAINTENANCE (O&M) MANUALS

A. The following O&M manual requirements are in addition to O&M manual documentation requirements elsewhere in these specifications.

B. Division 11 shall compile and prepare documentation for all commissioned items and systems covered in Division 11 and deliver this documentation to the GC for inclusion in the O&M manuals prior to the training of Government personnel.

3.3 TRAINING OF GOVERNMENT PERSONNEL

A. The GC shall be responsible for training coordination and scheduling to ensure that training is completed.

B. The QC shall be responsible for reviewing the content and adequacy of the training of Government personnel for commissioned equipment or systems. TI will verify compliance.

C. The Subcontractor shall have the following training responsibilities for the commissioned systems:

1. Provide the TI with a training plan four weeks before the planned training.
2. Provide designated Government personnel with comprehensive orientation and training in the understanding of the systems and the operation and maintenance of each piece of commissioned equipment.
3. Training shall start with classroom sessions followed by hands-on training on each piece of equipment.
4. During any demonstration, should the system fail to perform in accordance with the requirements of the O&M manual or sequence of operations, the system will be repaired or adjusted as necessary and the demonstration repeated.
5. The appropriate trade or manufacturer's representative shall provide the instructions on each major piece of equipment. This person may be the start-up technician for the piece of equipment, the installing Contractor or manufacturer's representative. Practical operating expertise as well as in-depth knowledge of all modes of operation of the specific piece of equipment are required. More than one party may be required to execute the training.

6. The training sessions shall follow the outline in the Table of Contents of the operation and maintenance manual and illustrate whenever possible the use of the O&M manuals for reference.
7. Training shall include:

    a. Use of the printed installation, operation and maintenance instruction material included in the O&M manuals.
    b. A review of the written O&M instructions emphasizing safe and proper operating requirements, preventative maintenance, special tools needed and spare parts inventory suggestions. The training shall include start-up, operation in all modes possible, shut-down, seasonal changeover and any emergency procedures.
    c. Discussion of relevant health and safety issues and concerns.
    d. Discussion of warranties and guarantees.
    e. Common troubleshooting problems and solutions.
    f. Explanation of information included in the O&M manuals.
    g. Discussion of any peculiarities of equipment installation or operation.
    h. Classroom sessions shall include the use of overhead projections, slides, video/audio-taped material as might be appropriate.

8. Hands-on training shall include start-up, operation in all modes possible, including manual, shut-down and any emergency procedures and preventative maintenance for all pieces of equipment.
9. Fully explain and demonstrate the operation, function and overrides of any local packaged controls, not controlled by the central control system.
10. Training shall occur after functional testing is complete, unless approved otherwise by the Project Manager.
11. Minimum Duration of Training. Subcontractor shall provide 8 hours of training.

END OF SECTION

SECTION 21 13 00

FIRE-SUPPRESSION SPRINKLER SYSTEMS

(Edited from DeCA June 2011 Design Criteria)

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Wet-pipe sprinkler system.
2. System design, installation, and certification.

B. Related Sections:

1. Division 01 Section Mechanical, Refrigeration, Food Service Equipment and Electrical Coordination.
2. Division 01 Section Quality Control.
3. Division 01 Section Closeout Procedures.
4. Division 07 Section Firestopping
5. Division 26 Electrical.
6. Division 28 Section Fire Detection And Alarm

C. System Description:

1. System to provide complete coverage for the entire building, including exterior canopies.
2. Provide system to Unified Facilities Criteria - UFC 3-600-01 and National Fire Protection Association - NFPA 13, Latest Edition, and occupancy and hazard classifications shown on the preliminary working plans (bid documents) completed by the Engineer Of Record.
3. Determine volume and pressure of incoming water supply from water flow test data. Conduct new water flow tests per NFPA 291. Do not rely on data shown on preliminary working plans. Provide new water flow test data to the Engineer of Record for evaluation and hydraulically design system based on the evaluated data from the Engineer of Record.
4. Interface system with building fire detection and alarm system.
5. Provide fire department connections where indicated.

1.2 QUALITY ASSURANCE

1. Perform Work in accordance with NFPA 13, Latest Edition, and UFC 3-600-01.

1.3 REFERENCES

A. The following publications form a part of this Specification to the extent they are applicable:

1. Division 01 Section Quality Control.
2. NFPA 13, Latest Edition - Installation of Sprinkler Systems.
3. NFPA 20, Latest Edition - Standard for the Installation of Stationary Pumps for Fire Protection.

4. NFPA 70 - Latest Edition - National Electrical Code.
5. NFPA 72 - Latest Edition - National Fire Alarm and Signaling Code.
6. UFC 3-600-01 Fire Protection Engineering for facilities.
7. Underwriters Laboratories - UL 199 - Automatic Sprinklers.
8. American Society of Sanitary Engineering - ASSE 1015 - Double check backflow prevention assemblies and double check fire protection backflow assemblies.

1.4 SUBMITTALS

A. Submittals for Review:

1. Division 01 Section Quality Control: Procedures for submittals.
2. Manufacturer's Descriptive Data: Annotate descriptive data to show clearly the specific model, type, and size of each item. At a minimum, submit data for the following:

   a. Pipe and fittings.
   b. Valves, including gate, check, and globe.
   c. Sprinkler heads.
   d. Pipe hangers and support.
   e. Mechanical couplings/fittings.

3. Shop Drawings (Working Plans):

   a. Submit preliminary layout of finished ceiling areas indicating only sprinkler locations coordinated with ceiling installation.
   b. Indicate hydraulic calculations, detailed pipe layout, hangers and supports, sprinklers, components and accessories. Indicate system controls.
   c. Prepare in accordance with NFPA 13, Latest Edition. All 46 items of NFPA 13, chapter 22, section 22.1 for working plans shall be complied with.
   d. Working plans shall include sufficient information indicating conformance to the preliminary working plans (bid documents) completed by the Engineer of Record.
4. Operation and Maintenance Data.

B. Submittals at Project Closeout:

1. Division 01 Section Closeout Procedures: Procedures for submittals.
2. Project Record Documents: Record actual locations of sprinklers and deviations of piping from drawings. Indicate drain and test locations.
3. Manufacturer's Certificate: The Engineer of Record shall inspect the system and certify that the system has been tested and meets or exceeds specified requirements and code requirements.
4. Operation and Maintenance Data: Include components of system, servicing requirements, record drawings, inspection data, replacement part numbers and availability, and location and numbers of service depot.
5. Warranty: Submit manufacturer warranty and ensure forms have been completed in Government's name and registered with manufacturer.
6. Provide one (1) copy of NFPA 25 - Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems
7. The contractor shall submit all certifications and testing data as a supplement to previously submitted O & M manuals at Contract Closeout. Testing data shall include all applicable "Acceptance Requirements" per NFPA 13.

1.5 DELIVERY, STORAGE, AND PROTECTION

A. Division 01 Section Quality Control: Transport, handle, store, and protect products.

B. Store products in shipping containers and maintain in place until installation.

C. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.

1.6 QUALIFICATIONS

A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this Section with minimum three years documented experience.

B. Installer Qualifications: Company specializing in performing the work of this Section with minimum 5 years documented experience.

C. Design system under direct supervision of a state licensed Professional Fire Protection Engineer.

1.7 REGULATORY REQUIREMENTS

A. Conform to Underwriters Laboratories - UL.

B. Perform Work in accordance with NFPA 13, Latest Edition and the Unified Facilities Criteria UFC 3-600-01. The requirements of the UFC 3-600-01 shall take precedence over the requirements of NFPA 13.

C. Equipment and Components: Bear UL label or marking.

D. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and indicated.

1.8 EXTRA MATERIALS

A. Division 01 Section Closeout Procedures - Maintenance Data.

B. Provide extra sprinklers under provisions of NFPA 13, Latest Edition.

C. Provide suitable wrenches for each sprinkler type.

D. Provide metal storage cabinet in location designated near sprinkler riser.

PART 2 - PRODUCTS

2.1 SPRINKLERS

A. Install sprinklers from reviewed Working Plans.

B. All sprinklers shall be of similar design and from a single manufacturer.

C. The operating temperature of sprinkler heads shall be as required by the specific location of installation.

D. Extended coverage sprinklers shall not be used.

E. Sprinklers shall conform to the following schedule, the requirements of NFPA 13 and as indicated in the preliminary working plans:

1. Suspended Ceiling - Finished Rooms:

a. Match existing.

2.2 FLEXIBLE SPRINKLER HOSE FITTINGS

A. Provide flexible hose assemblies and end fittings with 100 percent Type 304 Stainless steel, with a 175 psi maximum rated pressure. Flexible hose assemblies shall be fully welded non mechanical fittings, braided, leak tested with minimum 1 inch true bore internal corrugated hose diameter.

B. Flexible hose assemblies shall have G90 galvanized steel ceiling bracket, direct attachment type, having integrated snap on clip ends positively attached to the ceiling using tamper resistant screws. Provide flexible hose attachment with removable hub type with set screw.

C. All flexible sprinkler hose fittings shall be UL listed and FM approved.

D. Install flexible sprinkler hose fittings for use in commercial suspended and sheetrock ceilings.

2.3 PIPE AND FITTINGS-INTERIOR

A. Interior piping for automatic sprinkler system shall conform to NFPA 13, UFC 3-600-01 and as follows.

1. Sprinkler piping above ground with threaded fittings shall be Schedule 40 black steel pipe with a corrosion resistance rating equal to or greater than 1.0. Threaded thinwall pipe shall not be used.
2. Fittings for threaded and coupled pipe shall consist of cast iron or malleable threaded fittings joined with Teflon tape thread sealing compound or pipe joint compound. Pressure rating of fittings shall be as required for application.
3. Fittings for grooved end pipe shall in accordance with NFPA 13.
4. Fittings for plain end pipe shall not be used.
5. CPVC piping and fitting shall not be used.
6. All piping shall be identified with pre-manufactured piping identification labels.

2.4 HANGERS AND SUPPORTS

A. Space pipe hangers in accordance with the requirements of NFPA. Construct hangers, hanger rods, inserts and clamps as approved by NFPA 13.

2.5 EARTHQUAKE BRACING

A. Furnish and install all earthquake bracing as required by NFPA 13. Construct bracing as approved by NFPA 13.

2.6 SPECIALTIES

A. Fire Seals:

1. Where piping passes through walls, floors or other building construction which by code requires a fire rating, approved fire rated assemblies shall be used. Proposed protection shall be submitted for approval. Plans shall clearly indicate details and locations of required protection.

B. Escutcheon Plates:

1. Where exposed piping passes through finish work, chrome plated or other finish acceptable to the Government's Designated Inspector wall plates shall be installed. Split wall plates or escutcheons shall be installed to fit snugly around piping. All wall plates shall be metal.
2. Solid galvanized wall plates shall be used at both sides of all exterior walls.

C. Spare Head Supply:

1. Furnish and install a supply of extra sprinklers of each type and degree link installed in the project, complete with mountable box. Mount box on wall next to sprinkler entry; provide wrenches for each type of sprinkler installed in box.

D. Piping Identification:

1. All piping shall be identified at 40 foot maximum spacing and a minimum of one identification label per room. Labels shall be Seton wrap around style or equal.

2.7 ELECTRICAL DEVICES

A. All electrical devices shall be coordinated with Division 26 Electrical and Division 28 Fire Detection and Alarm requirements for compatibility of voltages and manufacturer.

PART 3 - EXECUTION

3.1 DESIGN CRITERIA

A. Design Basis Information: Provide design, materials, equipment, installation, inspection, and testing of the automatic sprinkler system in accordance with the requirements of NFPA 13. Recommendations in appendices shall be treated as requirements.

1. Perform hydraulic calculations in accordance with NFPA 13 utilizing the Area/Density method only.
2. The room design method is not allowed.
3. Sprinkler Protection: To determine spacing and sizing, apply the following coverage classifications:

a. See occupancy design table and notes on preliminary working plans.
b. Request clarification from the Engineer of Record for any hazard classification not identified.

4. Hydraulic Calculations: New and relocated sprinklers shall match, or be below, existing design pressures and flows.
5. Quick response sprinkler reductions are not allowed.
6. Flexible head assemblies shall be in hydraulic calculations using the UL listing equivalent length of Schedule 40, nominal 1 inch diameter pipe.

B. The fire protection system supplier shall design the piping to supply the system. Piping shall be laid out so as not to interfere with the installation of other piping, ductwork or light fixtures.

C. The entire sprinkler system is not shown on preliminary working plans. The intent is to provide complete sprinkler systems as required. This Contractor shall be responsible for surveying the site, existing construction, and new construction, and prepare working plans for the total system.

D. All piping shall be run concealed wherever possible. Where piping is run exposed, special notation on Contractor's working plans to that effect shall be evident and conspicuous on the drawings. Any piping determined to be a problem shall be relocated at no cost to the Government.

E. Meet the Seismic Restraint requirements in NFPA 13, Latest Edition, Vibration Isolation and Seismic Restraints. Seismic coefficient to be provided or derived from Table 9.3.5.6.2, NFPA 13-2010, using site specific seismic data from Table E2, UFC 3-301-01, 27 January 2010.

F. The preparation of all working plans and hydraulic calculations shall be prepared by an FPE or Registered Professional Engineer meeting the requirements of the UFC-600-01.

3.2 INSTALLATION

A. Furnish sprinkler system with the following components:

1. Auxiliary drains shall be provided when a change in piping direction prevents drainage of sections of branch lines or mains through the main drain valve.

B. Installation shall be accomplished by the licensed Contractor. Provide a qualified technician, experienced in the installation and operation of the type of system being installed, to supervise the installation and testing of the system.

C. Installation of Piping:

1. Pipe threads to be deburred, cleaned, and made free of rust prior to installation.
2. Internally and externally cold galvanize all threaded and roll grooved ends cut in the field. Properly clean the pipe per manufacture’s instruction before applying the finish.
3. Accurately cut pipe to measurements established by the installer and work into place without springing or forcing. In any situations where bending of the pipe is required, use a standard pipe-bending template.
4. Install concealed piping in spaces that have finished ceilings. Pipe installed near equipment shall not block or encroach on equipment access or impede maintenance. Where ceiling mounted equipment exists, install sprinklers so as not to obstruct the movement or operation of the equipment or block access. Sidewall heads may need to be utilized.

D. Welding: Conform to the requirements and recommendations of NFPA 13.

E. Drains: Install adequate drains piped to floor drains or out of doors. Pipe drains to discharge at safe points outside of the building or to sight cones attached to drains of adequate size to readily carry the full flow from each drain under maximum pressure. Do not provide a direct drain connection to sewer system or discharge into sinks. Install drips and drains where necessary and required by NFPA 13.

F. Affix cutout disks, which are created by cutting holes in the walls of pipe for flow switches and non-threaded pipe connections to the respective waterflow switch or pipe connection near to the pipe from where they were cut.

G. Securely attach identification signs to control valves, drain valves, and test valves. Locate hydraulic placard information signs at each sectional control valve where there is a zone water flow switch.

H. Repairs: Repair damage to the building or equipment resulting from the installation of the sprinkler system by the installer at no additional expense to the Government.

I. Where details of installation are not given, the installation shall be made using manufacturer's recommended practices or at the direction of the Architect/Engineer.

J. Contractor shall complete the fire protection systems ready for operation, in all respects, as soon as possible. When system is complete and ready for continuous operation, activate the system for its intended use. After system has been activated for continuous use, water charges will be paid by the Government.

K. Install equipment in accordance with manufacturer’s instructions.

L. Conceal piping above suspended ceilings.

M. Run piping as high as possible in areas without ceilings.

N. Place pipe runs to minimize obstruction to other work.

O. Place piping in concealed spaces above finished ceilings.

P. Center sprinklers in one direction in ceiling tile and provide piping offsets as required.

Q. Coordinate sprinkler locations with light fixtures, structure, HVAC ducts, grilles, diffusers, etc. Provide additional heads under ducts, equipment, etc, as per NFPA 13, Latest Edition.

R. Apply masking tape or paper cover to ensure concealed sprinklers, cover plates, and sprinkler escutcheons do not receive field paint finish. Remove after painting.

S. Install guards on sprinklers where indicated or required.

T. Flush entire piping system, new and existing, of foreign matter

U. Provide labels on all controls, valves, etc. as required by NFPA 13, Latest Edition.

V. This Contractor shall remove from the building, all rubbish and unused materials due to or connected with this installation.

W. The surface of all piping shall be cleaned and left ready for painting.

3.3 TESTING

A. The entire sprinkler system shall be hydrostatically tested at not less than 200 psig pressure for a period of not less than two (2) hours with no pressure drop in the system and per NFPA 13.

B. All testing shall be witnessed by a representative of the Engineer or Government.

C. Conduct Preliminary Test in the presence of the Fire Department and the FPE. The test shall include hydrostatic test per NFPA 13, Latest Edition, and operational tests of alarms and all other devices. Make any corrections required. Submit a signed and dated certificate, similar to that specified in NFPA 13, Latest Edition, to the Contracting Officer. The FPE shall prepare a report documenting the test and results.

D. Submit a request for formal test and inspection at least 15 days prior to the desired inspection date and after the Preliminary test is complete and corrections are completed and approved. An experienced technician regularly employed by the system installer shall be present, as well as the Fire Department, and the FPE. The test shall include hydrostatic test per NFPA 13, Latest Edition, and operational tests of alarms and other devices. The Contracting Officer or Government's Designated Inspector shall witness formal tests and approve systems before they are accepted.

E. Where jurisdictional authority's standards are more stringent than the above test, they shall prevail.

3.4 INTERFACE WITH OTHER PRODUCTS

A. Ensure required devices are installed and connected as required to fire alarm system.

END OF SECTION

SECTION 22 05 00

COMMON WORK RESULTS FOR PLUMBING

(Edited from DeCA June 2011 Design Criteria)

GENERAL

1.1 SUMMARY

A. Section Includes:

1. General administrative and procedural requirements for the plumbing installations.

B. Related Sections:

1. General Provisions of the contract, including the following, shall apply to Division 22 Specification Sections: Solicitation Documents and Division 01.

1.2 QUALITY CONTROL

A. The following publications form a part of this Specification to the extent they are applicable.

1. All work must be performed in accordance with the requirements of current editions of local, county, state and national codes and regulations including the requirements of the latest editions of the following:

a. International Building Code.
b. National Electrical Code.
c. International Plumbing Code.
d. International Mechanical Code.
e. Occupational Safety and Health Act of 1970.
f. For work not specifically listed above, use standards and codes of the National Fire Protection Association.

1.3 REGULATORY REQUIREMENTS

1. All equipment, apparatus and systems shall be rated, tested, fabricated and/or installed in accordance with the applicable industry standard mentioned. The following list will serve to clarify abbreviations that appear in other sections of this Specification:

a.	AABC	Associated Air Balance Council
b.	ADC	Air Diffusion Council
c.	AGA	American Gas Association.
d.	AMCA	Air Moving and Conditioning Association
e.	ARI	Air Conditioning and Refrigeration Institute
f.	ANSI	American National Standards Institute
g.	ASE	Association of Safety Engineers
h.	ASHRAE	American Society of Heating, Refrigerating and Air Conditioning Engineer
i.	ASME	American Society of Mechanical Engineers
j.	AWWA	American Water Works Association

k.	EPA	Environmental Protection Agency
l.	FS	Federal Specifications
m.	IBR	Institute of Boiler and Radiator Manufacturers
n.	IEEE	Institute of Electrical and Electronics Engineers
o.	MCAA	Mechanical Contractors' Association of American
p.	NEMA	National Electrical Manufacturers Association
q.	NFPA	National Fire Protection Association
r.	NSC	National Safety Council
s.	NSF	National Sanitation Foundation
t.	SBI	Steel Boiler Institute Industry
u.	SMACNA	Sheet Metal and Air Conditioning Contractors National Association
v.	UL	Underwriters Laboratories
w.	ASTM	American Society for Testing and Materials.
x.	NEBB	National Environmental Balancing Bureau.

1.4 DEFINITIONS

A. Furnish: The term furnish means supply and deliver to the Project Site, ready for unloading, unpacking, assembly, installation and similar operations.

B. Install: The term install describes operations at the Project Site including the actual unloading, unpacking, assembly, erecting, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning and similar operations.

C. Provide: The term provides means to furnish and install, complete and ready for intended use.

1.5 SHOP DRAWINGS AND SUBMITTALS

A. See Division 01 Section Quality Control for requirements for Shop Drawings and product data.

B. Asbestos-Free Material/Product: Prior to approval of the material/product to be used, the manufacturer/supplier shall furnish the Contracting Officer/Contracting Officer Representative with written certification that the material/product contains no asbestos. This certificate is mandatory before approval will be issued. Submittals furnished without the asbestos-free certification will be returned to the Contractor with no action taken until such certification is provided.

C. See applicable Sections to this Division for items requiring Shop Drawings.

1.6 MATERIALS AND WORKMANSHIP

A. Materials, the style, make or quality of which is specifically designated, shall be as specified.

B. Contractor shall furnish necessary materials in ample quantities and as frequently as required to avoid delay in the progress of the Work, and shall so store them as to prevent interference with other work.

1.7 DEFECTIVE WORK AND MATERIAL

A. All materials or work found to be defective or not in strict conformity with the drawings or different from requirements of the drawings and specifications or defaced or injured through negligence of Contractor or his employees, or through action of fire or weather will be rejected and shall be immediately removed from premises by Contractor and satisfactory materials and work substituted without delay.

B. All defective work or imperfect work shall be corrected immediately on notice from Government's Designated Representative. No previous inspection or certificate on account shall be held to relieve Contractor from his obligation to furnish sound materials and to perform good and satisfactory work.

1.8 COOPERATION AND COORDINATION

A. Contractor shall confer with other contractors at the site before installing his work to avoid interferences so that maximum head room and clearances may be maintained. In event that interferences develop between work of various contractors, Government's Designated Representative's decision will be final and no additional compensation will be allowed for changes required.

B. Particular attention shall be paid to situations where recessed equipment, pipes and lights occur, or where the work of several trades occurs together above suspended ceilings, in pipe shafts or in areas where space is limited.

C. All fixtures, equipment, devices, switches, outlets, pumps, etc., shall be positioned to avoid all interferences with and to assure proper coordination with work of all other trades, cases, partitions, wall, floor and ceiling patterns, architectural features, etc. All recessed devices, fixtures, etc., shall be coordinated with all wall, floor and ceiling patterns. Government's Designated Representative will reconcile conflicts and adjustments where such adjustments are warranted.

1.9 PROTECTION OF EQUIPMENT AND SYSTEMS

A. Contractor shall keep all his respective pipe openings closed by means of plugs or caps to prevent entrance of foreign matter during construction and cover all fixtures, equipment, and apparatus as required to protect them against dirt, water, chemical or mechanical damage both before and after installation. Any such fixtures, equipment or apparatus damaged prior to final acceptance of the Work shall be restored to its original condition or replaced by Contractor at no cost to Government.

1.10 CONTRACT DRAWINGS

A. The layout shown on the Contract Drawings is necessarily diagrammatic but shall be followed as closely as actual construction and as other work will allow. The dimensions of work as shown on the Contract Drawings are not as-built dimensions. No measurements shall be scaled from the Drawings and used as definite dimensions for laying out or fitting work in place.

B. The layout of manufactured equipment as shown on the drawings shall be checked and the exact location shall be determined from the dimensions of equipment shop drawings approved by the Government's Designated Representative.

1.11 MAINTENANCE MANUAL AND OPERATING INSTRUCTIONS

A. Upon completion of the Work, Contractors shall provide the Government's Designated Representative with three copies of maintenance manual for all equipment furnished and installed under his Work. Manuals shall be in substantial 3-ring binders with project name and number inscribed on face and hinged back. Manual shall include roster of all Government training session attendees. The manual shall, however, first be approved by the Government's Designated Representative.

B. The manual shall include manufacturer's lubricating and operating instructions and parts list and serial numbers for all operating machinery, including drive information, and motor horsepower, amperage, and voltage readings on all phases, valve chart, sequence of operation, index following the order listed in the specifications, warranties in the name of the Installation, and a list of manufacturers, service firms and subcontractors names and telephone numbers.

C. Training attendance rosters for each training session shall be included in manuals. Roster will identify training subject, date, attendees name, job title, office symbol, grade/rank, and telephone number.

D. All switches, controls, and safety devices shall be clearly and permanently marked with embossed or printed plates as to purpose and as to operation and shall be tested in the presence of the Government's Designated Representative to ensure that he understands their function and purpose.

E. Upon completion of the Work, Contractors shall put the systems into service. Contractors shall be entirely responsible for the equipment during all testing operations including the lubricating and turning on and off of such apparatus.

1.12 PROJECT RECORD AND CLOSEOUT DOCUMENTS

A. Refer to the Division 01 Section Closeout Procedures for requirements. The following paragraphs supplement the requirements of Division 01.

B. Mark Drawings to indicate revisions to piping and ductwork, size and location both exterior and interior; including locations of coils, dampers and other control devices, filters, boxes, and similar units requiring periodic maintenance or repair; actual equipment locations, dimensioned for column lines; actual inverts and locations of underground piping; concealed equipment, dimensioned to column lines; mains and branches of piping systems, with valves and control devices located and numbered, concealed unions located, and with items requiring maintenance located (i.e., traps, strainers, expansion compensators, tanks, etc.); Change Orders; concealed control system devices.

C. Mark Specifications to indicate addenda, approved substitutions, change orders, actual equipment and materials used.

1.13 DELIVERY, STORAGE AND HANDLING

A. Deliver products to project properly identified with names, model numbers, types, grades, compliance labels, and similar information needed for distinct identifications; adequately packaged and protected to prevent damage during shipment, storage and handling.

B. Store equipment and materials at the site, unless off-site storage is authorized in writing. Protect stored equipment and materials from damage.

C. Coordinate deliveries of plumbing materials and equipment to minimize construction site congestion. Limit each shipment of materials and equipment to the items and quantities needed for the smooth and efficient flow of installations.

1.14 COMMISSIONING

A. All Plumbing shall comply with the requirements of Division 01 Section General Commissioning Requirements and Division 22 Section Commissioning of Plumbing.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 ACCESSIBILITY

A. Install equipment and materials to provide required access for servicing and maintenance. Coordinate the final location of concealed equipment and devices requiring access with final location of required access panels and doors. Allow ample space for removal of all parts that require replacement or servicing.

B. Extend all grease fittings to an accessible location.

C. Refer to the Division 08 Section Access Doors and Frames.

3.2 ROUGH-IN

A. Verify final locations for rough-ins with field measurements and with the requirements of the actual equipment to be connected.

B. Refer to equipment Specifications in Divisions 11 through 33 for rough-in requirements.

3.3 PLUMBING INSTALLATIONS

A. General: sequence, coordinate, and integrate the various elements of plumbing systems, materials, and equipment. Comply with the following requirements:

1. Coordinate plumbing equipment and materials installation with other building components.
2. Verify all dimensions by field measurements.
3. Arrange for chases, slots, and openings in other building components to allow for plumbing installation.
4. Coordinate the installation of required supporting devices and sleeves to be set in poured in place concrete and other structural components, as they are constructed.
5. Sequence, coordinate and integrate installations of plumbing materials and equipment for efficient flow of the Work. Give particular attention to large equipment requiring positioning prior to closing-in the building.
6. Coordinate the cutting and patching of building components to accommodate the installation of plumbing equipment and materials.

7. Where mounting heights are not detailed or dimensioned, install plumbing services and overhead equipment to provide maximum headroom possible.
8. Install plumbing equipment to facilitate maintenance and repair or replacement of equipment components. As much as practical, connect equipment for ease of disconnecting, with minimum of interference with other installations.
9. Coordinate the installation of plumbing materials and equipment above ceiling with suspension system, light fixtures, and other installations.
10. Install access panel or doors where units are concealed behind finished surface. Access panels and doors are specified in Division 08 Section Access Doors.
11. Install systems, materials, and equipment giving right-of-way priority to systems required to be installed at a specified slope.
12. Coordinate connection of plumbing systems with exterior underground and overhead utilities and services. Comply with requirements of governing regulations, franchised service companies, and controlling agencies. Provide required connection for each service.
13. Install systems, materials, and equipment to conform with approved submittal data, including coordination drawings, to greatest extent possible. Conform to arrangements indicated by the Contract Documents, recognizing that portions of the Work are shown only in diagrammatic form. Where coordination requirements conflict with individual system requirements, refer conflict to the Government's Designated Representative.
14. Install systems, materials, and equipment level and plumb, parallel and perpendicular to other building systems and components, where installed expose in finished spaces.

3.4 CUTTING AND PATCHING

A. This Article specifies the cutting and patching of plumbing equipment, components, and materials to include removal and legal disposal of selected materials, components, and equipment.

B. Refer to Division 01 Section Quality Control for general requirements for cutting and patching.

C. Refer to Division 26 Electrical for requirements for cutting and patching electrical equipment, components, and materials.

D. Do not endanger or damage installed Work through procedures and processes of cutting and patching.

E. Arrange for repairs required to restore other work, because of damage caused as a result of plumbing installations.

F. No additional compensation will be authorized for cutting and patching Work that is necessitated by ill-timed, defective, or non-conforming installations.

G. Perform cuttings, fittings, and patching of plumbing equipment and materials required to:

1. Uncover Work to provide for installation of ill-timed work.
2. Remove and replace defective work.
3. Remove and replace Work not conforming to requirements of the Contract Documents.
4. Remove samples of installed Work as specified for testing.
5. Upon written instruction from the Government's Designated Representative, uncover and restore Work to provide for Government's Designated Representative’s observation of concealed work.

H. Provide and maintain temporary partitions or dust barriers adequate to prevent the spread of dust and dirt to adjacent areas.

3.5 CLEANING

A. Refer to the Division 01 Section Closeout Procedures for general requirements for final cleaning.

B. Refer to Division 23 Section Testing, Adjusting, and Balancing for HVAC for requirements for cleaning filters, strainers, and mechanical systems prior to final acceptance.

3.6 COMMISSIONING

A. Accomplish commissioning in accordance with the provisions of Division 01 Section General Commissioning Requirements and Division 23 Section Commissioning of Plumbing.

END OF SECTION

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SECTION 22 05 19

PLUMBING SPECIALTIES

(Edited from DeCA June 2011 Design Criteria)

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Roof and floor drains.
2. Cleanouts.
3. Hose bibs.
4. Hydrants.
5. Water hammer arrestors.
6. Thermostatic mixing valves.
7. Gas pressure regulators.
8. Gas meters.
9. Water meters.
10. Flow meters.
11. Pressure gages and pressure gage taps.
12. Thermometers and thermometer wells.
13. Sinks.

B. Related Sections:
1. Division 01 Section Mechanical, Refrigeration, Food Service Equipment and Electrical Coordination.
2. Division 01 Section Government-Furnished Products.
3. Division 01 Section Quality Control.
4. Division 01 Section Closeout Procedures.
5. Division 07 Section Ethylene-Propylene-Diene-Monomer Roofing.
6. Division 22 Section Hangers and Supports for Plumbing Piping and Equipment.
7. Division 22 Section Vibration and Seismic Controls for Plumbing Piping and Equipment.
8. Division 22 Section Plumbing Piping.
9. Division 22 Section Plumbing Fixtures.
10. Division 22 Section Plumbing Equipment.
11. Division 23 Section Hydronic Piping.
12. Division 26 Electrical.

1.2 QUALITY CONTROL

A. The following publications form a part of this Specification to the extent they are applicable:
1. ASME A112.21.1 - Floor Drains.
2. ASME A112.21.2 - Roof Drains.
3. ASME A112.26.1 - Water Hammer Arrestors.
4. ASME B40.1 - Gages - Pressure Indicating Dial Type - Elastic Element.
5. ASME MFC-3M - Measurement of Fluid Flow in Pipes Using Orifice, Nozzle and Venturi.
6. ASSE 1011 - Hose Connection Vacuum Breakers.
7. ASSE 1012 - Backflow Preventers with Immediate Atmospheric Vent.
8. ASSE 1013 - Backflow Preventers, Reduced Pressure Principle.
9. ASSE 1019 - Wall Hydrants, Frost Proof Automatic Draining Anti-Backflow Types.

10. ASTM D2458 - Method of Flow Measurement by the Venturi Motor Tube.
11. ASTM E1 - Standard Specification for ASTM Thermometers.
12. ASTM E77 - Standard Test Method for Inspection and Verification of Thermometers.
13. AWWA C506 - Backflow Prevention Devices - Reduced Pressure Principle and Double Check Valve Types.
14. ISA RP 3.2 - Flange Mounted Sharp Edged Orifice Plates for Flow Measurement.
15. PDI WH-201 - Water Hammer Arrestors.
16. PDI WH-201 - Water Hammer Arrestors.
17. UL 393 - Indicating Pressure Gauges for Fire-Protection Service.
18. UL 404 - Gages, Indicating Pressure, for Compressed Gas Service.

1.3 SUBMITTALS

A. Submittals for Review:
1. Division 01 Section Quality Control: Procedures for submittals.
2. Product Data:
   a. Provide component sizes, rough-in requirements, service sizes, and finishes.
   b. Meters and Gages: Provide manufacturers data and list which indicates use, operating range, total range, accuracy, and location for manufactured components.
3. Shop Drawings: Indicate dimensions, weights, and placement of openings and holes.
4. Operation and Maintenance Data.

B. Submittals for Information:
1. Division 01 Section Quality Control: Procedures for submittals.
2. Certificates: Certify that grease interceptors meet or exceed specified requirements.
3. Manufacturer's Instructions: Indicate Manufacturer's Installation Instructions: Indicate assembly and support requirements.

C. Submittals at Project Closeout:
1. Division 01 Section Closeout Procedures.
2. Project Record Documents: Record actual locations of equipment, cleanouts, backflow preventers, water hammer arrestors, instrumentation, etc.
3. Operation Data: Indicate frequency of treatment required for interceptors.
4. Include instructions for calibrating instruments.
5. Maintenance Data: Include installation instructions, spare parts lists, exploded assembly views.
6. The Contractor shall submit all certifications and testing data as a supplement to previously submitted O & M manuals at contract closeout.

1.4 DELIVERY, STORAGE, AND PROTECTION

A. Accept specialties on site in original factory packaging. Inspect for damage.

B. Do not install instruments when areas are under construction, except for required rough-in, taps, supports and test plugs.

1.5 QUALIFICATIONS

A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this Section with minimum three years documented experience.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Products: To establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of other manufacturers, a specific manufacturer's product is named and accompanied by the words "basis of design," including make or model number or other designation. Subject to compliance with requirements, provide either the named products or equal products.

2.2 ROOF DRAINS

A. See Drawings.

2.3 FLOOR DRAINS

A. See Drawings.

2.4 FLOOR SINKS

A. See Drawings.

2.5 CLEANOUTS

A. See Drawings.

2.6 HOSE BIBS

A. See Drawings.

2.7 HYDRANTS

A. See Drawings.

2.8 WATER HAMMER ARRESTORS

A. ANSI A112.26.1; stainless steel construction, bellows type sized in accordance with PDI WH-201, precharged suitable for operation in temperature range 34 to 250 deg F working pressure.

2.9 THERMOSTATIC MIXING VALVES

A. Valve: Chrome plated cast brass body, stainless steel or copper alloy bellows, integral temperature adjustment.

B. Accessories:
1. Check valve on inlets.
2. Volume control shut-off valve on outlet.
3. Stem thermometer on outlet.
4. Strainer stop checks on inlets.

C. Cabinet: 16 gage stainless steel, for recessed mounting with keyed lock.

2.10 GAS PRESSURE REGULATORS

A. Acceptable Manufacturers:
1. Maxitrol #325-5H or #210-D.
2. Fisher #S102 or S302.
3. Rockwell.

B. Construction:
1. Synthetic rubber seating surface to provide full positive shut-off.
2. Regulators shall maintain reduced pressure under static conditions when no gas is flowing. (lock up type).
3. 2 to 5 psi inlet pressure to 4 in. to 8 in. W.G. outlet pressure. (Verify).
4. See Drawings for required capacities, inlet pressures and outlet pressures.
5. Extend vent to outdoors.

2.11 GAS METER

A. Acceptable Manufacturers:
1. Rockwell "Equimeter."
2. American Meter.
3. Schlumberger.

B. Gas Meters:
1. Shall conform to ANSI B109.3.
2. Meters shall be suitable for accurately measuring and handling gas at pressures, temperatures and flow rates to be encountered.
3. Meters shall have a pulse switch initiator capable of operating up to speeds of 500-pulses per minute with no false pulses and shall require no field adjustments.
4. Initiators shall provide the maximum number of pulses up to 500 per minute that is obtainable from the manufacturer. It shall not provide less than 1-pulse per 100 cubic feet of gas.

2.12 PRESSURE GAGES

A. Gage: ASME B40.1, UL 393 UL 404 drawn steel case, phosphor bourdon tube, rotary brass movement, brass socket, front recalibration adjustment, black scale on white background.

B. Case: Steel with brass bourdon tube or Cast aluminum with phosphor bronze bourdon tube.

C. Size: 4-1/2 inch.

D. Dial Size: 4 inch diameter.

E. Mid-Scale Accuracy: Two percent.

F. Scale: PSI.

2.13 PRESSURE GAGE TAPPINGS

A. Gage Cock:
1. Tee or lever handle, brass for maximum 150 psig.

B. Needle Valve:

C. Brass, 1/4 inch NPT for minimum 150 psig.

D. Ball Valve:
1. Brass, 1/8 inch NPT 250 psi.

E. Pulsation Damper:
1. Pressure snubber, brass with 1/4 inch NPT connections.

2.14 THERMOMETERS

A. Stem Thermometer: ASTM E1, adjustable angle, red-reading liquid, lens front tube, cast aluminum case with enamel finish, cast aluminum adjustable joint with positive locking device. Mercury shall not be used.
1. Size: 7 inch scale.
2. Window: Clear glass or Lexan.

B. Stem: Brass, 3/4 inch NPT.
1. Accuracy: ASTM E77 2 percent.
2. Calibration: Deg F.

C. Dial Thermometer: ASTM E1, stainless steel case, bimetallic helix actuated with silicone fluid damping, white with black markings and black pointer hermetically sealed lens, stainless steel stem.
1. Size: 3-1/2 inch diameter dial.
2. Lens: Clear Lexan.
3. Accuracy: 1 percent.
4. Calibration: Deg F.

2.15 THERMOMETER SUPPORTS

A. Socket: Brass separable sockets for thermometer stems with or without extensions as required, and with cap and chain, to be mounted in piping systems.

B. Flange: 3 inch outside diameter reversible flange, designed to fasten to sheet metal air ducts, with brass perforated stem.

2.16 SINKS

A. Item 4S01L: One Compartment Sink, With One Drainboard:
1. Salient Characteristics:
a. Stainless Steel Sink:

1) Construction: Sink, backsplash, and integral drainboard shall be 14 gauge type 304 stainless steel conforming to AISI-300 series.
2) Sink bowl: Square in dimension with coved corners.
3) Provide sink rims with rolled edges.
4) Sink bowl compartment size:
   a) Length: 22 to 24 inches.
   b) Width: 22 to 24 inches (front to back).
   c) Depth: 13-14 inches.
5) Provide sink bowl compartment with lever operated waste drain, drain plug and overflow fitting.
6) Sink backsplash: 8 to 10 inches high.
7) Sink working height 34 to 36 inch above finished floor.
8) Designed to accommodate 1/2 inch piping for hot and cold connections.
9) Designed with stainless steel legs with adjustable stainless steel bullet feet.
10) Drainboard mounted to the left of the sink bowl.
   a) Length: 24 inches.
   b) Width: 24 inches (front to back).
11) Approximate overall dimensions:
   a) Length: 51 inches.
   b) Width: 28 inches. (front to back).
   c) Height: 44 inches.
   d) Three-inch variance all dimensions.

2. Faucet with Hose Sprayer:
   a. Provide with pre-rinse unit with mixing faucet and integrated hose sprayer.
   b. Designed to be mounted to the backsplash, faucet has 8 inch center.
   c. Provide with a spring action type gooseneck hand-held spray hose unit.
   d. Provide with wall mount bracket to stabilize gooseneck unit.
3. Basis-of-Design Product: Marlo Manufacturing Co. (800) 222-0450 or www.marlomfg.com.
   a. Coved Sink Bowls Model No. ESC-1-2224-24 L (modified to 14 ga stainless steel), with pre-rinse faucet unit and wall bracket.

B. Item 4S02D: Two Compartment Sink, With Two Drainboards:
1. Salient Characteristics:
   a. Stainless Steel Sink:
      1) Construction: Sink, backsplash, and integral drainboards shall be 14 gauge type 304 stainless steel conforming to AISI-300 series.
      2) Sink bowl: Square in dimension with coved corners.
      3) Provide sink rims with rolled edges.
      4) Sink bowl compartment size:
         a) Length: 22 inches.
         b) Width: 28 inches (front to back).
         c) Depth: 13 inches.
      5) Provide sink bowl compartment with lever operated waste drain, drain plug and overflow fitting.
      6) Sink backsplash: 8 to 10 inches high.
      7) Sink working height 34 to 36 inch above finished floor.
      8) Designed to accommodate 1/2 inch piping for hot and cold connections.
      9) Designed with stainless steel legs with adjustable stainless steel bullet feet.
      10) Provide with a 3-1/2 inch sink collar to accommodate the disposal unit.
      11) Drainboards mounted to the left and right of the sink bowls. Size of each drainboard:
         a) Length: 24 inches.
         b) Width: 30 inches (front to back).
      12) Approximate overall dimensions:
         a) Length: 98 inches.

b) Width: 34 inches. (front to back).
c) Height: 44 inches.
d) Four-inch variance all dimensions.

2. Faucet with Hose Sprayer:
   a. Provide with pre-rinse unit with mixing faucet and integrated hose sprayer.
   b. Designed to be mounted to the backsplash, faucet has 8 inch center.
   c. Provide with a spring action type gooseneck hand-held spray hose unit.
   d. Provide with wall mount bracket to stabilize gooseneck unit.
3. Commercial Disposal Unit in Damaged Merchandise Only:
   a. Designed to mount into a drain equipped with a 3-1/2 inch sink collar.
   b. Provide with a minimum .75 HP motor, water control valve, automatic reversing control system, and water drain.
   c. Standard electrical circuit to be 115 V / 60 HZ / 1 PH.
   d. Mount unit in the right sink compartment.
4. Basis-of-Design Product: Marlo Manufacturing Co. (800) 222-0450 or www.marlomfg.com.
   a. Bakery Sink Bowls Model No. ESC-2-4430-24 D with pre-rinse faucet unit and wall bracket.
5. Basis-of-Design Product: The Salvajor Company. (800) 725-8256 or www.salvajor.com.
   a. Disposal Unit Model 75 with ARSS controls. Provide adapter or modify sink as required to facilitate installation of disposal.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Locate devices where shown on Drawings and install in accordance with manufacturer's instructions.

B. Extend cleanouts to finished floor or wall surface. Lubricate threaded cleanout plugs with mixture of graphite and linseed oil. Ensure clearance at cleanout for rodding of drainage system.

C. Encase exterior cleanouts in concrete flush with grade.

D. Install floor cleanouts at elevation to accommodate finished floor.

E. Install approved potable water protection devices on plumbing lines where contamination of domestic water may occur; on boiler feed water lines, janitor rooms, fire sprinkler systems, premise isolation, irrigation systems, flush valves, and interior and exterior hose bibs.

F. Pipe relief from backflow preventer to nearest drain.

G. Install water hammer arrestors complete with accessible isolation valve on hot and cold water supply piping to lavatories, sinks, washing machine outlets, and each washroom or group of fixtures.

H. Install air chambers on hot and cold water supply piping to each fixture or group of fixtures. Fabricate same size as supply pipe or 3/4 inch minimum, and minimum 18 inches long.

I. Install one pressure gage per pump, with taps before strainers and on suction and discharge of pump; pipe to gage with isolating valves.

J. Install pressure gages with pulsation dampers. Provide gage cock, needle valve or ball valve to isolate each gage. Extend nipples to allow clearance from insulation.

K. Install thermometers in piping systems in sockets in short couplings. Enlarge pipes smaller than 2-1/2 inches for installation of thermometer sockets. Ensure sockets allow clearance from insulation.

L. Install Temperature and Pressure Stations in piping adjacent to controls systems thermostat, transmitter, or sensor sockets.

M. Locate additional Temperature and Pressure Stations where indicated.

N. Provide instruments with scale ranges selected according to service with largest appropriate scale.

O. Install gages and thermometers in locations where they are easily read from normal operating level. Install vertical to 45 degrees off vertical.

3.2 SCHEDULES

A. Locate devices where shown on drawings and the following locations.

1. Pressure Gage Schedule:

LOCATION	SCALE RANGE
Cold Water supply to building	0 - 100 psig
Pumps	0 - 100 psig
Expansion tanks	0 - 100 psig
Pressure reducing valves - at inlet and outlet	0 - 100 psig

2. Stem Type Thermometer Schedule - Water Thermometers:

LOCATION	SCALE RANGE
Thermostatic Mixing Valves - three required	50 - 250 deg F
Headers to central equipment	50 - 250 deg F

END OF SECTION

SECTION 22 05 29

HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

(Edited from DeCA June 2011 Design Criteria)

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Pipe and equipment hangers and supports.
2. Equipment bases and supports.
3. Sleeves and seals.
4. Flashing and sealing equipment and pipe stacks.

B. Related Sections:

1. Division 01 Section Mechanical, Refrigeration, Food Service Equipment and Electrical Coordination.
2. Division 01 Section Quality Control.
3. Division 01 Section Closeout Procedures.
4. Division 03 Section Cast-In-Place Concrete
5. Division 22 Section Vibration Isolation and Seismic Restraints.
6. Division 26 Electrical.

1.2 QUALITY CONTROL

A. The following publications for a part of this specification to the extent they are applicable.

1. Division 01 Section Quality Control.
2. ASME B31.1 - Power Piping.
3. ASME B31.2 - Fuel Gas Piping.
4. ASME B31.5 - Refrigeration Piping.
5. ASTM F708 - Design and Installation of Rigid Pipe Hangers.
6. MSS SP58-2009 - Pipe Hangers and Supports - Materials, Design, Manufacturer, Selection, Application and Installation.
7. NFPA 13 - Installation of Sprinkler Systems.
8. UL 203 - Pipe Hanger Equipment for Fire Protection Service.

1.3 REGULATORY REQUIREMENTS

A. Conform to applicable code for support of plumbing piping.

B. Supports for Sprinkler Piping: In conformance with NFPA 13.

C. Supports for Standpipes: In conformance with NFPA 14.

PART 2 - PRODUCTS

2.1 ACCESSORIES

A. Hanger Rods: Mild steel threaded both ends, threaded one end, or continuous threaded.

B. Beam clamps shall not be of the set screw type unless they also have a positive means of securing the clamp against horizontal movement, i.e. horizontal j-bolt extending to the opposite flange of the beam or joist or similar device.

C. Hanger loads of up to 300 pounds can be applied to the top or bottom chord of a bar joist using a threaded rod between the chord angles with washer and double nuts above and below the chord within 6 inches of a panel point. Heavier loads require coordination with the joist manufacturer.

2.2 PIPE HANGERS AND SUPPORTS

A. Plumbing Piping - DWV:

1. Conform to MSS SP58-2009.
2. Hangers for Pipe Sizes 1/2 to 1-1/2 Inch: Malleable iron or Carbon steel, adjustable swivel, split ring.
3. Hangers for Pipe Sizes 2 Inches and Over: Carbon steel, adjustable, clevis.
4. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
5. Wall Support for Pipe Sizes to 3 Inches: Cast iron hook.
6. Wall Support for Pipe Sizes 4 Inches and Over: Welded steel bracket and wrought steel clamp.
7. Vertical Support: Steel riser clamp.
8. Floor Support: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
9. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.

B. Plumbing Piping - Water and Natural Gas:

1. Conform to MSS SP58-2009.
2. Hangers for Pipe Sizes 1/2 to 1-1/2 Inch: Malleable iron or Carbon steel, adjustable swivel, split ring.
3. Hangers for Cold Pipe Sizes 2 Inches and Over: Carbon steel, adjustable, clevis.
4. Hangers for Hot Pipe Sizes 2 to 4 Inches: Carbon steel, adjustable, clevis.
5. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
6. Wall Support for Pipe Sizes to 3 Inches: Cast iron hook.
7. Wall Support for Pipe Sizes 4 Inches and Over: Welded steel bracket and wrought steel clamp.
8. Wall Support for Hot Pipe Sizes 6 Inches and Over: Welded steel bracket and wrought steel clamp with adjustable steel yoke and cast iron roll.
9. Vertical Support: Steel riser clamp.
10. Floor Support for Cold Pipe: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
11. Floor Support for Hot Pipe Sizes to 4 Inches: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
12. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.

2.3 INSERTS

A. Inserts: Malleable iron case of galvanized steel shell and expander plug for threaded connection with lateral adjustment, top slot for reinforcing rods, lugs for attaching to forms; size inserts to suit threaded hanger rods.

B. Self drilling expansion anchors, powder driven anchors, or other similar devices shall be applied in accord with their manufacturers published ratings and instructions.

2.4 FLASHING

A. Metal Flashing: 26 gage galvanized steel.

B. Metal Counterflashing: 22 gage galvanized steel.

2.5 EQUIPMENT CURBS AND ROOF MOUNTING RAILS

A. Fabrication: Welded 18 gage galvanized steel shell and base, mitered 3 inch cant, variable step to match roof insulation, 1-1/2 inch thick insulation, factory installed wood nailer, 14 inches minimum height, higher where noted. Vary height of curbs and rails to compensate for roof pitch and make top of curb level.

B. For piping penetration curbs, provide a curb cap with tapered neoprene pipe flashing sleeves and stainless steel drawbands.

C. Construct to meet the wind loading criteria and local seismic design criteria on Structural Drawings.

2.6 SLEEVES

A. Sleeves for Pipes Through Non-fire Rated Floors: 18 gage galvanized steel.

B. Sleeves for Pipes Through Non-fire Rated Beams, Walls, Footings, and Potentially Wet Floors: Steel pipe or 18 gauge galvanized steel.

C. Sleeves for Pipes Through Fire Rated and Fire Resistive Floors and Walls, and Fire Proofing: Prefabricated fire rated sleeves including seals, AWL listed.

D. Sleeves for pipes through foundation walls below grade.

E. Firestopping Insulation: Glass fiber type, non-combustible.

F. Sealant: Acrylic.

2.7 FLOOR SUPPORTS

A. Concrete housekeeping pads shall comply with Division 03. Concrete pads shall extend 6 inches beyond equipment and be 4 inches high.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions.

1. Support of all equipment, piping, etc. such that it will withstand a force of 5 times its weight in any direction and 1.5 times its weight downward.
2. Do not attach to roof deck, connect to structural members and span between same with structural members, Unistrut, etc.
3. Roof mounted equipment curbs and roof mounting rails shall be installed to withstand the wind and seismic loading required by Division 01 Section Summary of Work.

3.2 INSERTS

A. Provide inserts for placement in concrete formwork.

B. Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.

C. Provide hooked rod to concrete reinforcement section for inserts carrying pipe over 4 inches.

D. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.

E. Where inserts are omitted, drill through concrete slab from below and provide through-bolt with recessed square steel plate and nut recessed into and grouted flush with slab.

3.3 PIPE HANGERS AND SUPPORTS

A. Support horizontal piping as scheduled.

B. Install hangers to provide minimum 1/2 inch space between finished covering and adjacent work.

C. Place hangers within 12 inches of each horizontal elbow.

D. Use hangers with 1-1/2 inch minimum vertical adjustment.

E. Support horizontal cast iron pipe adjacent to each hub, with 5 feet maximum spacing between hangers.

F. Support vertical piping at every floor. Support vertical cast iron pipe at each floor at hub.

G. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.

H. Support riser piping independently of connected horizontal piping.

I. Provide copper plated hangers and supports for copper piping and sheet metal between hanger or support and insulated piping.

J. Design hangers for pipe movement without disengagement of supported pipe.

3.4 EQUIPMENT BASES AND SUPPORTS

A. Provide housekeeping pads of concrete, minimum 4 inches thick and extending 6 inches beyond supported equipment. Refer to Division 03 Section Cast-in-Place Concrete.

B. Provide templates, anchor bolts, and accessories for mounting and anchoring equipment.

C. Construct supports of steel members. Brace and fasten with flanges or plates bolted to structure.

D. Provide rigid anchors for pipes after vibration isolation components are installed.

3.5 FLASHING

A. Provide flexible flashing and metal counterflashing where piping and ductwork penetrate weather or waterproofed walls, floors, and roofs.

B. Provide curbs for mechanical roof installations 14 inches high, minimum, above roofing surface. Flash and counterflash with sheet metal; seal watertight. Attach counterflashing and mechanical equipment, and lap base flashing on roof curbs. Flatten and solder joints.

C. Adjust storm collars tight to pipe with bolts; calk around top edge. Use storm collars above roof jacks. Screw vertical flange section to face of curb.

3.6 SLEEVES

A. Set sleeves in position in formwork. Provide reinforcing around sleeves.

B. Size sleeves large enough to allow for movement due to expansion and contraction. Provide for continuous insulation wrapping.

C. Extend sleeves through floors one inch above finished floor level. Calk sleeves.

D. Where piping or ductwork penetrates floor, ceiling, or wall, close off space between pipe or duct and adjacent work with stuffing (fire stopping at fire walls) insulation and caulk air tight. Provide close fitting metal collar or escutcheon covers at both sides of penetration.

E. Install chrome plated steel escutcheons at finished surfaces.

3.7 HANGER SPACING

HANGER ROD PIPE SIZE Inches	MAX. HANGER SPACING Feet	DIAMETER Inches
1/2 to 1-1/4	6.5	3/8
1-1/2 to 2	10	3/8
2-1/2 to 3	10	1/2
4 to 6	10	5/8

HANGER ROD PIPE SIZE Inches	MAX. HANGER SPACING Feet	DIAMETER Inches
8 to 12	14	7/8
14 and Over	20	1
PVC (All Sizes)	6	3/8
C.I. Bell and Spigot (or No-Hub) and at Joints	5	As above

3.8 ROOF CURBS

A. Fasten curbs to structure and units to curb in such a way as to withstand design wind loading.

END OF SECTION

SECTION 22 05 53

IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

(Edited from DeCA June 2011 Design Criteria)

GENERAL

1.1 SUMMARY

A. Section Includes:
1. Nameplates.
2. Tags.
3. Stencils.
4. Pipe Markers.

B. Related Sections:
1. Division 01 Section Mechanical, Refrigeration, Food Service Equipment and Electrical Coordination.
2. Division 01 Section Quality Control.
3. Division 01 Section Closeout Procedures.

1.2 QUALITY CONTROL

A. The following publications form a part of this Specification to the extent they are applicable:
1. Division 01 Section Quality Control.
2. ASME A13.1 - Scheme for the Identification of Piping Systems.

PART 2 - PRODUCTS

2.1 NAMEPLATES

A. Description: Laminated three-layer plastic with engraved black letters on light contrasting background color, 4 inch by 1-1/2 inch or larger.

2.2 TAGS

A. Plastic Tags: Laminated three-layer plastic, brass, or aluminum with engraved black letters on light contrasting background color. Tag size minimum 1-1/2 inch.

B. Chart: Typewritten letter size list in anodized aluminum frame.

2.3 PIPE MARKERS

A. Color: Conform to ASME A13.1.

B. Plastic Pipe Markers: Factory fabricated, flexible, semi- rigid plastic, preformed to fit around pipe or pipe covering; minimum information indicating flow direction arrow and identification of fluid being conveyed.

C. Plastic Tape Pipe Markers: Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings.

2.4 STENCILS

A. Stencils: With clean cut symbols and letters of following size:
   1. Up to 2 Inch Outside Diameter of Insulation or Pipe: 1/2-inch high letters.
   2. 2-1/2 to 6 Inches Outside Diameter of Insulation or Pipe: 1-inch high letters.
   3. Over 6 Inches Outside Diameter of Insulation or Pipe: 1-3/4 inches high letters.

B. Stencil Paint: As specified in Division 09 Section Painting and Coating, semi-gloss enamel, colors and lettering size conforming to ASME A13.1.

2.5 PIPE MARKERS

A. Color and Lettering: Conform to ASME A13.1.

B. Preformed plastic markers.
   1. Factory fabricated, flexible, semi-rigid plastic, preformed to fit around pipe or pipe covering. Larger sizes may have maximum sheet size with spring fastener.

C. Plastic Tape Pipe Markers:
   1. Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings.

2.6 CEILING TACKS

A. Description: Steel with 3/4 inch diameter color coded head.

B. Color code as follows:
   1. Green - Plumbing equipment or valve.

PART 3 - EXECUTION

3.1 PREPARATION

A. Degrease and clean surfaces to receive adhesive for identification materials.

B. Prepare surfaces in accordance with Division 09 Section Painting and Coating for stencil painting.

3.2 INSTALLATION

A. Install identifying devices after completion of covering and painting.

B. Install plastic nameplates with corrosive-resistant mechanical fasteners, or adhesive. Apply with sufficient adhesive to ensure permanent adhesion and seal with clear lacquer.

C. Install tags with corrosion resistant chain.

D. Apply stencil painting in accordance with Division 09 Section Painting and Coating.

E. Install plastic pipe markers in accordance with manufacturer's instructions.

F. Install plastic tape pipe markers complete around pipe in accordance with manufacturer's instructions.

G. Identify pumps, heat transfer equipment, tanks, and water treatment devices with plastic nameplates. Small devices, such as in-line pumps, may be identified with tags.

H. Identify control panels and major control components outside panels with plastic nameplates.

I. Identify valves in main and branch piping with tags.

J. Tag automatic controls, instruments, and relays. Key to control schematic.

K. Identify piping, concealed or exposed, with plastic pipe markers or plastic tape pipe markers. Delete markers on piping 3/4 inch diameter and smaller. Identify service and flow direction. Install in clear view and align with axis of piping. Locate identification not to exceed 50 feet on straight runs including risers and drops, adjacent to each valve and Tee, at each side of penetration of structure or enclosure, and at each obstruction.

L. Provide ceiling tacks to locate equipment or dampers above T-bar type panel ceilings. Locate in corner of panel closest to equipment.

END OF SECTION

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SECTION 22 07 19

PLUMBING PIPING INSULATION

(Edited from DeCA June 2011 Design Criteria)

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Piping insulation.
2. Jackets and accessories.

B. Related Sections:

1. Division 01 Section Mechanical, Refrigeration, Food Service Equipment and Electrical Coordination.
2. Division 01 Section Quality Control.
3. Division 01 Section Closeout Procedures.
4. Division 22 Section Hangers and Supports for Plumbing Piping and Equipment.
5. Division 22 Section HVAC Piping Insulation.
6. Division 22 Section Identification for Plumbing Piping and Equipment.

1.2 PERFORMANCE REQUIREMENTS

A. Materials: Flame spread/smoke developed rating of 25/50 or less in accordance with NFPA 255 and UL 723.

B. All materials and insulating values shall comply with the International Energy Conservation Code.

1.3 QUALITY CONTROL

A. The following publications form a part of this specification to the extent they are applicable:

1. Division 01 Section Quality Control.
2. ASTM C177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded Hot Plate Apparatus.
3. ASTM C195 - Standard Specification for Mineral Fiber Thermal Insulating Cement.
4. ASTM C449/C449M - Standard Specification for Mineral Fiber Hydraulic-Setting Thermal Insulating and Finishing Cement.
5. ASTM C518 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.
6. ASTM C533 - Standard Specification for Calcium Silicate Block and Pipe Thermal Insulation.
7. ASTM C534 - Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form.
8. ASTM C547 - Standard Specification for Mineral Fiber Preformed Pipe Insulation.
9. ASTM C552 - Standard Specification for Cellular Glass Thermal Insulation.

10. ASTM C578 - Standard Specification for Preformed, Cellular Polystyrene Thermal Insulation.
11. ASTM C591 - Standard Specification for Unfaced Preformed Rigid Cellular Polyisocyanurate Thermal Insulation.
12. ASTM C610 - Standard Specification for Expanded Perlite Block and Pipe Thermal Insulation.
13. ASTM C795 - Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel.
14. ASTM C921 - Standard Practice for Determining the Properties of Jacketing Materials for Thermal Insulation.
15. ASTM D1056 - Standard Specification for Flexible Cellular Materials - Sponge or Expanded Rubber.
16. ASTM D1667 - Standard Specification for Flexible Cellular Materials--Vinyl Chloride Polymers and Copolymers (Closed-Cell Foam).
17. ASTM D1784 - Standard Specification for Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds.
18. ASTM D2842 - Standard Test Method for Water Absorption of Rigid Cellular Plastics.
19. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
20. ASTM E96 - Standard Test Methods for Water Vapor Transmission of Materials.
21. NAIMA National Insulation Standards. North American Insulation Manufacturer’s Association.
22. NFPA 255 - Standard Method of Test of Surface Burning Characteristics of Building Materials.
23. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials.

1.4 SUBMITTALS

A. Submittals for review:

1. Submit under provisions of Division 01Section Quality Control.

2. Product Data: Provide product data for each type of mechanical insulation identifying k-value, thickness, jackets (factory and field applied) and accessories.

3. Operation and Maintenance Data.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Division 01 Section Environmental Management.

B. Deliver materials to site in original factory packaging, labeled with manufacturer's identification, including product density and thickness.

C. Store insulation in original wrapping and protect from weather and construction traffic.

D. Protect insulation against dirt, water, chemical, and mechanical damage.

E. Maintain ambient temperatures and conditions required by manufacturers of adhesives, mastics, and insulation cements.

F. Maintain temperature during and after installation for minimum period of 24 hours.

1.6 QUALIFICATIONS

A. Applicator: Company specializing in performing the work of this section with minimum three years experience.

PART 2 - PRODUCTS

2.1 GLASS FIBER

A. Insulation:

1. Preformed Pipe Insulation, ASTM C547; rigid molded, noncombustible.
2. 'K' Value: ASTM C177, 0.27 at compressed thickness and 75 deg F.
3. Density: 0.75 lb/cu-ft.
4. Maximum Service Temperature: 850 deg F.

B. Vapor Barrier Jacket:

1. ASTM C921, white kraft paper with glass fiber yarn, bonded to aluminized film.
2. Moisture Vapor Transmission: ASTM E96; 0.02 perm-inches.

C. Tie Wire:

1. 16-gauge soft annealed stainless steel with twisted ends on maximum 12 inch centers.

D. Vapor Barrier Lap Adhesive:

1. Compatible with insulation.

E. Fibrous Glass Fabric:

1. Cloth: Untreated; 9 oz/sq yd weight.
2. Blanket: 1.0 lb/cu ft density.

2.2 JACKETS

A. PVC Plastic:

1. Jacket: ASTM D1784, One piece molded type fitting covers and sheet material, off-white color.

a. Minimum service temperature: 0 deg F.
b. Maximum service temperature: 150 deg F.
c. Moisture vapor transmission: ASTM E96; 0.002 perm-inches.
d. Thickness: 10 mil.
e. Connections: Brush on welding adhesive or Pressure sensitive color matching vinyl tape.

2.3 CELLULAR FOAM

A. Insulation: ASTM C534; flexible, cellular elastomeric, molded or sheet.

1. 'K' ('ksi') Value: ASTM C177 or C518; 0.27 at 75 deg F.
2. Minimum Service Temperature: -40 deg F.
3. Maximum Service Temperature: 220 deg F.
4. Maximum Moisture Absorption: ASTM D1056; 1.0 percent (pipe) by volume, 1.0 percent (sheet) by volume.
5. Moisture Vapor Transmission: ASTM E96; 0.20 perm inches.
6. Maximum Flame Spread: ASTM E84; 25.
7. Maximum Smoke Developed: ASTM E84; 50.
8. Connection: Waterproof vapor barrier adhesive.

B. Elastomeric Foam Adhesive:

1. Air dried, contact adhesive, compatible with insulation.

****FOR AREAS OF EXTREME HUMIDITY ONLY_80 degrees wb and higher****

2.4 WICKING PIPE INSULATION

A. Insulation: ASTM C547 and ASTM C795; rigid molded, noncombustible.

1. 'K' ('Ksi') Value: ASTM C177, 0.24 at 75 deg F.
2. Service Temperature: 35 to 70 deg F pipe temperature.
3. Maximum Moisture Absorption: 0.2 percent by volume.
4. Flame Spread/Smoke Developed: 25/50.
5. Wicking material lining core and extending to the surface of the pipe facing.

B. Jacket:

1. White all serviceable jacket with evaporation holes, cap seal joints and butt strips, no staples.
2. Permeance: 0.4 perms maximum.

C. Premolded Fittings:

1. Insulation shall be "Permawick" by Knauf or equal.

2.5 ADHESIVES

A. Flexible Elastomeric Cellular Insulation Adhesive: Solvent-based, contact adhesive recommended by insulation manufacturer. Comply with MIL-A-24179A, Type II, Class 1.

B. Calcium Silicate Adhesive: Fibrous, sodium-silicate-based adhesive with a service temperature range equal to material being bonded.

2.6 JACKET FOR EXTERIOR PIPE INSULATION

A. Fiberglass insulation installed outdoors and subject to water damage shall be provided with an additional 0.016 inch aluminum jacket with lock seam longitudinal joint and stainless steel "Bandit" straps for butted joints as required for a water-tight installation.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that piping has been tested before applying insulation materials.

B. Verify that surfaces are clean, foreign material removed, and dry.

3.2 INSTALLATION

A. General:

1. Install materials in accordance with manufacturer's instructions.
2. On exposed piping, locate insulation and cover seams in least visible locations.
3. Finish insulation at supports, protrusions, and interruptions.
4. For exterior applications, finish insulation with two coats of ultraviolet resistant finish as recommended by the manufacturer.
5. Continue insulation through walls, sleeves, pipe hangers, and other pipe penetrations.
6. Insulate entire system including fittings, valves, unions, flanges, strainers, flexible connections, pump bodies, and expansion joints.
7. Finish at supports, protrusions, and interruptions.
8. Pipe Exposed in Mechanical Equipment Rooms or Finished Spaces Less Than 10 feet Above Finished Floor: Finish with PVC jacket and fitting covers.
9. Install aluminum jacket on piping out of doors.

B. Installation: Glass fiber insulated pipes conveying fluids below ambient temperature:

1. Provide vapor barrier jackets, factory-applied or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure sensitive adhesive. Secure with outward clinch expanding staples and vapor barrier mastic.
2. Insulate fittings, joints, and valves with molded insulation of like material and thickness as adjacent pipe. Finish with glass cloth and vapor barrier adhesive or PVC fitting covers.

C. Installation: Hot piping conveying fluids 140 deg F or less, insulate flanges and unions at equipment completely. Bevel and seal ends of insulation.

1. For hot piping conveying fluids over 140 deg F, insulate flanges and unions at equipment.
2. Glass fiber insulated pipes conveying fluids above ambient temperature:

a. Provide standard jackets, with or without vapor barrier, factory-applied or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure sensitive adhesive. Secure with outward clinch expanding staples.
b. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe. Finish with glass cloth and adhesive or PVC fitting covers.

D. Cellular foam insulation:

1. All longitudinal and butt joints shall be fully glued and sealed.

E. Inserts and Shields:

1. Application: Piping 2 diameter or larger.

a. Shields: Galvanized steel between pipe hangers or pipe hanger rolls and inserts.
b. Insert location: Between support shield and piping and under the finish jacket.
c. Insert configuration: Minimum 6 inches long, of same thickness and contour as adjoining insulation; may be factory fabricated.
d. Insert material: Hydrous calcium silicate insulation or other heavy density insulating material suitable for the planned temperature range.

3.3 TOLERANCE

A. Substituted insulation materials shall provide thermal resistance within 10 percent at normal conditions, as materials indicated.

3.4 CELLULAR FOAM INSULATION SCHEDULE

PIPING SYSTEMS	PIPE SIZE Inch	THICKNESS Inch
A. Plumbing Piping:		
Domestic Hot Water, Hot Recirculated:	Over 2 inch	1.5 inch Over 1 inch 1.0 inch
	1 inch and less	1/2 inch
Domestic Cold Water:	2 inch and larger	1 inch
	Under 2 inch	1/2 inch
Roof Drains:	All	1/2 inch
	Under 4 inch	1.0 inch

3.5 GLASS FIBER INSULATION SCHEDULE

PIPING SYSTEMS	PIPE SIZE Inch	THICKNESS Inch
A. Roof drain bodies, horizontal downspouts above grade, and vertical downspouts from drains to horizontal downspouts:		
	All	1

3.6 EXTERIOR PIPE INSULATION

A. Insulation installed outdoors shall be provided with an additional 0.016 inch aluminum jacket with lock seam longitudinal joint and stainless steel "Bandit" straps for butted joints as required for a water-tight installation.

END OF SECTION

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SECTION 22 08 00

COMMISSIONING OF PLUMBING

(Edited from DeCA June 2011 Design Criteria)

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Division 22 responsibilities in the commissioning process.
2. Commissioning plumbing pumps.
3. Commissioning plumbing fixtures.
4. Commissioning sanitary waste and vent piping.
5. Commissioning storm drainage piping.
6. Commissioning fuel piping.
7. Commissioning domestic water heaters.
8. Commissioning facility water distribution.
9. Commissioning water metering.
10. Commissioning sanitary sewerage.
11. Commissioning domestic water filtration.

B. Related Sections:

1. Division 01 Section General Commissioning Requirements.

1.2 DEFINITIONS

A. CA: Commissioning Agent.

B. CO: Contracting Officer.

C. GC: Contractor; General Contractor, not a Subcontractor.

D. O&M: Operations and Maintenance.

E. QC: Contractor's Quality Control Manager.

F. TI: Technical Inspector.

1.3 DESCRIPTION

A. This Section describes commissioning requirements applicable to commissioned items and systems specified in Division 22 to ensure that all systems are operating in a manner consistent with the Contract Documents.

B. Conform to commissioning requirements and the commissioning plan.

1.4 RESPONSIBILITIES

A. Plumbing,: The commissioning responsibilities applicable to the Plumbing Contractor of Division 22 are as follows (all references apply to commissioned equipment only):

1. Construction and Acceptance Phases:

a. Include the cost of commissioning in the Contract price.
b. In each purchase order or subcontract written, include requirements for submittal data, commissioning documentation, O&M data and training.
c. Conduct a commissioning scoping meeting and other meetings necessary to facilitate the Commissioning process.
d. Provide requested documentation to the TI, developed for functional testing procedures.
e. Provide functional performance test procedures. Subs shall review test procedures to ensure feasibility, safety and equipment protection and provide necessary written alarm limits to be used during the tests.
f. Develop a full start-up and initial checkout plan using manufacturer's start-up procedures and the prefunctional checklists for all commissioned equipment. Submit to QC for review prior to startup. TI will verify plan for compliance. Refer to Division 01 Section General Commissioning Requirements for further details related to start-up.
g. During the startup and initial checkout process, execute the mechanical-related portions of the prefunctional checklists for all commissioned equipment.
h. Perform and clearly document all completed startup and system operational checkout procedures, providing a copy to the QC and TI.
i. Correct system deficiencies before functional testing. Air and water TAB shall be completed with discrepancies and problems remedied before functional testing of the respective air- or water-related systems.
j. Provide skilled technicians to execute starting of equipment and to execute the functional performance tests. Ensure that they are available and present during the agreed upon schedules and for sufficient duration to complete the necessary tests, adjustments and problem-solving.
k. Assist the CA and TI in interpreting the monitoring data, as necessary.
l. Correct deficiencies (differences between specified and observed performance) as interpreted by the CA, TI and A/E and retest the equipment.
m. Prepare O&M manuals according to the Contract Documents, including clarifying and updating the original sequences of operation to as-built conditions.
n. During construction, maintain as-built red-line drawings for all drawings and final CAD as-builts for contractor-generated Coordination Drawings. Update after completion of commissioning (excluding deferred testing).
o. Coordinate with equipment manufacturers to determine specific requirements to maintain the validity of the warranty.

2. Operation Manuals shall include:

a. A table of all setpoints and implications when changing them.
b. Schedules.
c. Instructions for operation of each piece of equipment for emergencies.
d. Seasonal adjustment.
e. Startup and shutdown.
f. Instructions for energy savings operations and descriptions of the energy savings strategies in the facility (from O&M Manuals).
g. Recommendations for recommissioning frequency by equipment type.
h. Energy tracking recommendations.

i. Recommended standard trend logs with a brief description of what to look for in them.

3. Warranty Period:

a. Execute seasonal or deferred functional performance testing, witnessed by the CA, according to the specifications.
b. Correct deficiencies and make necessary adjustments to O&M manuals and As-built Drawings for applicable issues identified in any seasonal testing.

B. Plumbing Contractor: The responsibilities of the Plumbing Contractor, during construction and acceptance phases in addition to those listed in Paragraph A, above, are:

1. Commission the plumbing systems listed in Division 01 Section General Commissioning Requirements and the Commissioning Plan.
2. Provide submittals as required by A/E and those listed on the pre-functional test sheets.
3. During the startup and initial checkout process, execute the plumbing-related portions of the prefunctional checklists for all commissioned equipment.
4. Provide all test equipment necessary to fulfill specified testing requirements.
5. Perform and clearly document all completed startup and system operational checkout procedures, providing a copy to the CA.
6. Refer to Division 01 Section General Commissioning Requirements for specific details on non-conformance issues relating to prefunctional checklists and tests and for issues relating to functional performance tests.
7. The training shall consist of a review of the O&M manuals and hands-on training. Hands-on training shall include start-up, operation in all modes possible, including manual, shut-down and any emergency procedures and preventative maintenance for all pieces of equipment. The Plumbing Contractor shall fully explain and demonstrate the operation, function and overrides of any local packaged controls, not controlled by the central control system. Training shall occur after functional testing is complete, unless approved otherwise by the Contracting Officer.
8. Control Drawings Submittal:

a. The Control Drawings shall have a key to all abbreviations.
b. The Control Drawings shall contain graphic schematic depictions of the systems and each component.
c. The schematics shall include the system and component layout of any equipment that the control system monitors, enables or controls, even if the equipment is primarily controlled by packaged or integral controls.
d. Provide a full points list with at least the following included for each point:

1) Controlled system.
2) Point abbreviation.
3) Point description.
4) Display unit.
5) Control point or setpoint (Yes / No).
6) Monitoring point (Yes / No).
7) Intermediate point (Yes / No).
8) Calculated point (Yes / No).
9) Key:

a) Point description: DB temp, airflow, etc.
b) Control or setpoint: Point that controls equipment and can have its setpoint changed (OSA, SAT, etc.).

c) Intermediate point: point whose value is used to make a calculation which then controls equipment (space temperatures that are averaged to a virtual point to control reset).
d) Monitoring point: point that does not control or contribute to the control of equipment, but is used for operation, maintenance, or performance verification.
e) Calculated point: "virtual" point generated from calculations of other point values.
f) The Controls Contractor shall keep the CA informed of all changes to this list during programming and setup.

9. An updated as-built version of the Control Drawings and sequences of operation shall be included in the final controls O&M manual submittal.
10. Assist and cooperate with the CA in the following manner:

a. Using a skilled technician who is familiar with the installed systems in this building, execute the functional testing of the controls system. Assist in the functional testing of all equipment. Provide two-way radios during the testing.
b. Execute all control system trend logs.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 STARTUP

A. The Plumbing shall follow the start-up and initial checkout procedures listed in the Responsibilities list in this Section and in Division 01 Section General Commissioning Requirements. Division 22 has start-up responsibility and is required to complete systems and sub-systems so they are fully functional, meeting the design objectives of the Contract Documents. The commissioning procedures and functional testing do not relieve or lessen this responsibility or shift that responsibility partially to the commissioning agent, technical inspector or Government.

B. Functional testing is intended to begin upon completion of a system. Functional testing may proceed prior to the completion of systems or sub-systems at the discretion of the CO. Beginning system testing before full completion does not relieve the Contractor from fully completing the system, including all prefunctional checklists as soon as possible.

3.2 OPERATION AND MAINTENANCE (O&M) MANUALS

A. The following O&M manual requirements do not replace O&M manual documentation requirements elsewhere in these Specifications.

B. Division 22 shall compile and prepare documentation for all commissioned systems covered in Division 22 and deliver this documentation to the GC for inclusion in the O&M manuals prior to the training of Government personnel.

C. Special Control System O&M Manual Requirements: In addition to documentation that may be specified elsewhere, the Controls Contractor shall compile and organize at a minimum the following data on the control system in labeled 3-ring binders with indexed tabs.

1. Three copies of the controls training manuals in a separate manual from the O&M manuals.
2. Operation and Maintenance Manuals containing:

    a. Specific instructions on how to perform and apply all functions, features, modes, etc. mentioned in the controls training sections of this specification and other features of this system. These instructions shall be step-by-step. Indexes and clear tables of contents shall be included. The detailed technical manual for programming and customizing control loops and algorithms shall be included.
    b. Full as-built set of Control Drawings.
    c. Full as-built sequence of operations for each piece of equipment.
    d. Full points list: A listing of all rooms shall be provided with the following information for each room:

        1) Floor.
        2) Room number.
        3) Room name.
        4) Reference drawing number.

    e. Full print out of all schedules and set points after testing and acceptance of the system.
    f. Full as-built print out of software program.
    g. Electronic copy on disk of the entire program for this facility.
    h. Marking of all system sensors and thermostats on the as-built floor plan and Mechanical Drawings with their control system designations.
    i. Maintenance instructions, including sensor calibration requirements and methods by sensor type, etc.
    j. Control equipment component submittals, parts lists, etc.
    k. Warranty requirements.
    l. Copies of all checkout tests, other than commissioning tests, and calibrations performed by the Contractor.

3. The manual shall be organized and subdivided with permanently labeled tabs for each of the following data in the given order:

    a. Sequences of operation.
    b. Control drawings.
    c. Points lists.
    d. Controller / module data.
    e. Thermostats and timers.
    f. Sensors and DP switches.
    g. Valves and valve actuators.
    h. Dampers and damper actuators.
    i. Program setups (software program printouts).

4. Field checkout sheets and trend logs should be provided to the GC for inclusion in the on-site Commissioning filing system.

3.3 TRAINING OF GOVERNMENT PERSONNEL

A. The GC shall be responsible for training coordination and scheduling and ultimately to ensure that training is completed.

B. The QC shall be responsible for reviewing the content and adequacy of the training of Government personnel for commissioned equipment or systems. TI will verify compliance.

C. Plumbing Contractors: The Plumbing Contractors shall have the following training responsibilities for their respective commissioned systems:

1. Provide the TI with a training plan four weeks before the planned training.
2. Provide designated Government personnel with comprehensive orientation and training in the understanding of the systems and the operation and maintenance of each piece of commissioned equipment.
3. Training shall start with classroom sessions followed by hands-on training on each piece of equipment.
4. During any demonstration, should the system fail to perform in accordance with the requirements of the O&M manual or sequence of operations, the system shall be repaired or adjusted as necessary and the demonstration repeated.
5. The appropriate trade or manufacturer's representative shall provide the instructions on each major piece of equipment. This person may be the start-up technician for the piece of equipment, the Installing Contractor or manufacturer's representative. Practical building operating expertise as well as in-depth knowledge of all modes of operation of the specific piece of equipment is required. More than one party may be required to execute the training.
6. The Controls Contractor shall attend sessions other than the controls training, as requested, to discuss the interaction of the controls system as it relates to the equipment being discussed.
7. The training sessions shall follow the outline in the Table of Contents of the operation and maintenance manual and illustrate whenever possible the use of the O&M manuals for reference.
8. Training shall include:

    a. Use of the printed installation, operation and maintenance instruction material included in the O&M manuals.
    b. A review of the written O&M instructions emphasizing safe and proper operating requirements, preventative maintenance, special tools needed and spare parts inventory suggestions. The training shall include start-up, operation in all modes possible, shut-down, seasonal changeover and any emergency procedures.
    c. Discussion of relevant health and safety issues and concerns.
    d. Discussion of warranties and guarantees.
    e. Common troubleshooting problems and solutions.
    f. Explanation of information included in the O&M manuals.
    g. Discussion of any peculiarities of equipment installation or operation.
    h. Classroom sessions shall include the use of overhead projections, slides, video/audio-taped material as might be appropriate.

9. Hands-on training shall include start-up, operation in all modes possible, including manual, shut-down and any emergency procedures and preventative maintenance for all pieces of equipment.
10. Fully explain and demonstrate the operation, function and overrides of any local packaged controls, not controlled by the central control system.
11. Training shall occur after functional testing is complete, unless approved otherwise by the Contracting Officer.
12. Minimum Duration of Training: In addition to training hours included in individual 22 Sections, provide training on each system according to the following schedule:

SYSTEM	HOURS

SYSTEM	HOURS
Domestic Water Systems	8

D. Controls Contractor: The Controls Contractor shall have the following training responsibilities:

1. Provide the CA with a training plan four weeks before the planned training.
2. The Controls Contractor shall provide designated Government personnel training on the control system in this facility. The intent is to clearly and completely instruct the Government on all the capabilities of the control system.
3. Training manuals: The standard operating manual for the system and any special training manuals shall be provided for each trainee. In addition, copies of the system technical manual shall be demonstrated during training. Manuals shall include detailed description of the subject matter for each session. The manuals shall cover all control sequences and have a definitions section that fully describes all relevant words used in the manuals and in all software displays. Copies of audiovisuals shall be delivered to the Government.
4. The training sessions shall be tailored to the needs and skill-level of the trainees.
5. The trainers shall be knowledgeable on the system and its use in buildings.
6. During any demonstration, should the system fail to perform in accordance with the requirements of the O&M manual or sequence of operations, the system shall be repaired or adjusted as necessary and the demonstration repeated.
7. The Controls Contractor shall attend sessions other than the controls training, as requested, to discuss the interaction of the controls system as it relates to the equipment being discussed.
8. Provide three training sessions structured as follows:

    a. Training I: Control System. The first training shall consist of 8 hours of actual training. This training may be held on-site or in the supplier's facility. If held off-site, the training may occur prior to final completion of the system installation. Upon completion, each student, using appropriate documentation, should be able to perform elementary operations and describe general hardware architecture and functionality of the system.
    b. Training II: Building Systems. The second session shall be held on-site for a period of 24 hours of actual hands-on training after the completion of system commissioning. The session shall include instruction on:

        1) Specific hardware configuration of installed systems in this building and specific instruction for operating the installed system, including HVAC systems, lighting controls and any interface with security and communication systems.
        2) Security levels, alarms, system start-up, shut-down, power outage and restart routines, changing setpoints and alarms and other typical changed parameters, overrides, freeze protection, manual operation of equipment, optional control strategies that can be considered, energy savings strategies and set points that if changed will adversely affect energy consumption, energy accounting, procedures for obtaining vendor assistance, etc.
        3) All trending and monitoring features (values, change of state, totalization, etc.), including setting up, executing, downloading, viewing both tabular and graphically and printing trends. Trainees shall actually set-up trends in the presence of the trainer.
        4) Every screen shall be completely discussed, allowing time for questions.
        5) Use of keypad or plug-in laptop computer at the zone level.

6) Use of remote access to the system via phone lines or networks.
7) Setting up and changing an air terminal unit controller.
8) Graphics generation.
9) Point database entry and modifications.
10) Understanding DDC field panel operating programming (when applicable).

c. Training III: The third training will be conducted on-site six months after occupancy and consist of 16 hours of training. The session shall be structured to address specific topics that trainees need to discuss and to answer questions concerning operation of the system.

END OF SECTION

SECTION 22 10 00

PLUMBING PIPING

(Edited from DeCA June 2011 Design Criteria)

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Pipe, pipe fittings, valves, and connections for piping systems.

   a. Sanitary sewer.
   b. Domestic water.
   c. Storm water.
   d. Natural gas.

B. Related Sections:

1. Division 01 Section Mechanical, Refrigeration, Food Service Equipment and Electrical Coordination.
2. Division 01 Section Quality Control.
3. Division 01 Section Closeout Procedures.
4. Division 07 Thermal and Moisture Protection.
5. Division 08 Section Access Doors and Frames.
6. Division 33 Section Water Distribution.
7. Division 33 Section Sanitary Sewers.
8. Division 22 Section Hangers and Supports for Plumbing Piping and Equipment.
9. Division 22 Section Vibration and Seismic Controls for Plumbing Piping and Equipment.
10. Division 22 Section Plumbing Piping Insulation.
11. Division 23 Section Identification for HVAC Piping and Equipment.
12. Division 26 Electrical.
13. Division 31 Section Earthwork.
14. Division 33 Section Storm Drainage Utilities.

1.2 QUALITY CONTROL

A. The following publications form a part of this Specification to the extent they are applicable:

1. Division 01 Section Quality Control.
2. AGA Z21.22 - Relief Valves and Automatic Gas Shutoff Devices for Hot Water Supply Systems.
3. ASME B16.1 - Cast Iron Pipe Flanges and Flanged Fittings Class 25, 125, 250 and 800.
4. ASME B16.3 - Malleable Iron Threaded Fittings.
5. ASME B16.4 - Cast Iron Threaded Fittings Class 125 and 250.
6. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings.
7. ASME B16.22 - Wrought Copper and Bronze Solder Joint Pressure Fittings.
8. ASME B16.23 - Cast Copper Alloy Solder Joint Drainage Fittings - DWV.
9. ASME B16.26 - Cast Bronze Fittings for Flared Copper Tubes.

10. ASME B16.29 - Wrought Copper and Wrought Copper Alloy Solder Joint Drainage Fittings - DWV.
11. ASME B31.2 - Fuel Gas Piping.
12. ASME B31.9 - Building Service Piping.
13. ASTM A53 - Pipe, Steel, Black and Hot-Dipped Zinc Coated, Welded and Seamless.
14. ASTM A74 - Cast Iron Soil Pipe and Fittings.
15. ASTM A234/A234M - Pipe Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and Elevated Temperatures.
16. ASTM B32 - Solder Metal.
17. ASTM B42 - Seamless Copper Pipe.
18. ASTM B88 - Seamless Copper Water Tube.
19. ASTM B306 - Copper Drainage Tube (DWV).
20. ASTM C564 - Rubber Gaskets for Cast Iron Soil Pipe and Fittings.
21. ASTM D1785 - Poly Vinyl Chloride (PVC) Plastic Pipe, Schedules 40, 80, and 120.
22. ASTM D2235 - Solvent Cement for Acrylonitrile - Butadiene - Styrene (ABS) Plastic Pipe and Fittings.
23. ASTM D2239 - Polyethylene (PE) Plastic Pipe (SIDR-PR) Based on Controlled Inside Diameter.
24. ASTM D2447 - Polyethylene (PE) Plastic Pipe Schedules 40 and 80, Based on Outside Diameter.
25. ASTM D2466 - Poly Vinyl Chloride (PVC) Plastic Pipe Fittings, Schedule 40.
26. ASTM D2564 - Solvent Cements for Poly Vinyl Chloride (PVC) Plastic Pipe and Fittings.
27. ASTM D2661 - Acrylonitrile-Butadiene-Styrene (ABS) Schedule 40 Plastic Drain, Waste, and Vent Pipe and Fittings.
28. ASTM D2665 - Poly (Vinyl Chloride) (PVC) Plastic Drain, Waste, and Vent Pipe and Fittings.
29. ASTM D2683 - Socket-Type Polyethylene Fillings for Outside Diameter-Controlled Polyethylene Pipe.
30. ASTM D2729 - Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
31. ASTM D2751 - Acrylonitrile-Butadiene-Styrene (ABS) Sewer Pipe and Fittings.
32. ASTM D2855 - Making Solvent-Cemented Joints with Poly Vinyl Chloride (PVC) Pipe and Fittings.
33. ASTM D3034 - Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
34. ASTM F477 - Elastomeric Seals (Gaskets) for Joining Plastic Pipe.
35. ASTM F679 - Poly (Vinyl Chloride) (PVC) Large-Diameter Plastic Gravity Sewer Pipe and Fittings.
36. CISPI 301 - Cast Iron Soil Pipe and Fittings for Hubless Cast Iron Sanitary Systems.
37. CISPI 310 - Joints for Hubless Cast Iron Sanitary Systems.
38. MSS SP58 - Pipe Hangers and Supports - Materials, Design and Manufacturer.
39. MSS SP-67 - Butterfly Valves.
40. MSS SP69 - Pipe Hangers and Supports - Selection and Application.
41. MSS SP-70 - Cast Iron Gate Valves, Flanged and Threaded Ends.
42. MSS SP-71 - Cast Iron Swing Check Valves, Flanged and Threaded Ends.
43. MSS SP-78 - Cast Iron Plug Valves, Flanged and Threaded Ends.
44. MSS SP-80 - Bronze Gate, Globe, Angle and Check Valves.
45. MSS SP-85 - Cast Iron Globe & Angle Valves, Flanged and Threaded Ends.
46. MSS SP89 - Pipe Hangers and Supports - Fabrication and Installation Practices.
47. MSS SP-110 - Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends.
48. NFPA 54 - National Fuel Gas Code.

1.3 QUALITY ASSURANCE

A. Perform Work in accordance with applicable codes and standards.

B. Valves: Manufacturer's name and pressure rating marked on valve body.

C. Welding Materials and Procedures: Conform to ASME SEC IX and applicable state labor regulations.

D. Identify pipe with marking including size, ASTM material classification, ASTM specification, potable water certification, water pressure rating.

1.4 SUBMITTALS

A. Submittals for Review:

1. Division 01 Section Quality Control: Procedures for submittals.
2. Product Data: Provide data on pipe materials, pipe fittings, valves, and accessories. Provide manufacturers catalog information. Indicate valve data and ratings.
3. Operation and Maintenance Data.

B. Submittals at Project Closeout:

1. Division 01 Section Closeout Procedures.
2. Project Record Documents: Record actual locations of valves.
3. The Contractor shall submit all certifications and testing data as a supplement to previously submitted O & M manuals at Contract closeout.

1.5 DELIVERY, STORAGE, AND PROTECTION

A. Division 01 Section Quality Control: Transport, handle, store, and protect products.

B. Accept valves on site in shipping containers with labeling in place. Inspect for damage.

C. Provide temporary protective coating on cast iron and steel valves.

D. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.

E. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

1.6 REGULATORY REQUIREMENTS

A. Perform Work in accordance with International Plumbing Code (IPC) and International Fuel Gas Code (IFGC).

B. Conform to applicable code for installation of backflow prevention devices.

C. Provide certificate of compliance indicating approval of installation of backflow prevention devices.

D. Install gas piping and equipment in accord with NFPA 54 and the IFGC.

1.7 ENVIRONMENTAL REQUIREMENTS

A. Division 01 Section Quality Control: Environmental conditions affecting products on site.

B. Do not install underground piping when bedding is wet or frozen.

1.8 EXTRA MATERIALS

A. Division 01 Section Closeout Procedures.

B. Provide two repacking kits for each size valve.

PART 2 - PRODUCTS

2.1 SANITARY SEWER PIPING, BURIED BEYOND 5 FEET OF BUILDING

A. See Division 33 Section Sanitary Sewers.

2.2 SANITARY SEWER PIPING, BURIED WITHIN 5 FEET OF BUILDING

A. Cast Iron Pipe: ASTM A74 weight.

1. Fittings: Cast iron.
2. Joints: Hub-and-spigot, CISPI HSN compression type with ASTM C564 neoprene gaskets or lead and oakum.

B. Cast Iron Pipe: CISPI 301, hubless.

1. Fittings: Cast iron.
2. Joints: CISPI 310, neoprene gasket and stainless steel clamp and shield assemblies.

2.3 SANITARY SEWER PIPING, ABOVE GRADE

A. Sanitary Sewer Piping, Above Grade, Exposed Locations:

1. Cast Iron Pipe 2 Inches and Larger: CISPI 301, hubless, service weight.

a. Fittings: Cast iron.
b. Joints: CISPI 310, neoprene gaskets and stainless steel clamp-and-shield assemblies.

2. Copper Tube 1-1/2 Inches and Smaller: ASTM B306, DWV Type L, M.

a. Fittings: ASME B16.23, cast bronze, or ASME B16.29, wrought copper.
b. Joints: ASTM B32, solder, Grade 50B.

B. Sanitary Sewer Piping Above Grade, Concealed Locations:

1. ABS Pipe: ASTM D2751:

   a. Fittings: ABS.
   b. Joints: ASTM D2235, solvent weld.

2. PVC Pipe: ASTM D2665 or ASTM D3034:

   a. Fittings: PVC.
   b. Joints: ASTM D2885, solvent weld with ASTM D2564 solvent cement.

2.4 WATER PIPING

A. Water Piping, Buried Beyond 5 Feet of Building:

1. See Division 33 Section Water Distribution.

B. Water Piping, Buried Within 5 Feet of Building:

1. Copper Tubing: ASTM B42, hard drawn or annealed, Type K.

   a. Fittings: ASME B16.18, cast copper alloy or ASME B16.22 wrought copper and bronze.
   b. Joints: AWS A5.8, BCuP silver braze.

C. Water Piping, Above Grade:

1. Copper Tubing: ASTM B88 Type L, hard drawn.

   a. Fittings: ASME B16.18, cast copper alloy or ASME B16.22, wrought copper and bronze.
   b. Joints: ASTM B32, solder, Grade 95TA.

2.5 STORM WATER PIPING

A. Storm Water Piping, Buried Beyond 5 Feet of Building:

1. See Division 33 Section Storm Drainage Utilities.

B. Storm Water Piping, Buried Within 5 Feet of Building:

1. Cast Iron Pipe: ASTM A74 service weight.

   a. Fittings: Cast iron.
   b. Joints: ASTM C564, neoprene gasket system or lead and oakum.

2. ABS Pipe: ASTM D2751.

   a. Fittings: ABS.
   b. Joints: ASTM D2235, solvent weld.

3. PVC Pipe: ASTM D2665 or ASTM D3034.

   a. Fittings: PVC.

b. Joints: ASTM D2855, solvent weld with ASTM D2564 solvent cement.

4. PVC Pipe: ASTM D2665, ASTM D3034, or ASTM F679.

a. Fittings: PVC.
b. Joints: ASTM F477, elastomeric gaskets.

C. Storm Water Piping, Above Grade:

1. Cast Iron Pipe: ASTM A74 service weight.

a. Fittings: Cast iron.
b. Joints: ASTM C564, neoprene gasket system or lead and oakum.

2. Cast Iron Pipe: CISPI 301, hubless, service weight.

a. Fittings: Cast iron.
b. Joints: Neoprene gaskets and stainless steel clamp-and-shield assemblies.

3. ABS Pipe: ASTM D2751.

a. Fittings: ABS.
b. Joints: ASTM D2235, solvent weld.

4. PVC Pipe: ASTM D2665 or ASTM D3034.

a. Fittings: PVC.
b. Joints: ASTM D2855, solvent weld with ASTM D2564 solvent cement.

5. PVC Pipe: ASTM D2665, ASTM D3034, or ASTM F679.

a. Fittings: PVC.
b. Joints: ASTM F477, elastomeric gaskets.

2.6 NATURAL GAS PIPING, BURIED OUTSIDE OF BUILDING

A. See Natural Gas supplier standards.

2.7 NATURAL GAS PIPING, BURIED INSIDE OF BUILDING

A. Not permitted.

2.8 NATURAL GAS PIPING, ABOVE GRADE

A. Steel Pipe: ASTM A53 Schedule 40 black.

1. Fittings: 2 inches and smaller - ASME B16.3, malleable iron. Larger than 2 inches - ASTM A234/A234M, forged steel welding type.
2. Joints: NFPA 54, threaded or welded to ANSI B31.1.

2.9 FLANGES, UNIONS, AND COUPLINGS

A. Pipe Size 3 Inches and Under:

1. Ferrous Pipe: Class 150 malleable iron threaded unions.
2. Copper Tube and Pipe: Class 150 bronze unions with soldered joints.

B. Pipe Size Over 1 Inch:

1. Ferrous Pipe: Class 150 malleable iron threaded or forged steel slip-on flanges; preformed neoprene gaskets.
2. Copper Tube and Pipe: Class 150 slip-on bronze flanges; preformed neoprene gaskets.

C. Grooved and Shouldered Pipe End Couplings:

1. Housing: Malleable iron clamps to engage and lock, designed to permit some angular deflection, contraction, and expansion; steel bolts, nuts, and washers; galvanized for galvanized pipe.
2. Sealing Gasket: "C" shape composition sealing gasket.

D. Dielectric Connections: Union with galvanized or plated steel threaded end, copper solder end, water impervious isolation barrier.

2.10 PIPE HANGERS AND SUPPORTS

A. Plumbing Piping - Drain, Waste, and Vent:

1. Conform to ASME B31.9.
2. Hangers for Pipe Sizes 1/2 to 1-1/2 Inch: Malleable iron or carbon steel, adjustable swivel, split ring.
3. Hangers for Pipe Sizes 2 Inches and Over: Carbon steel, adjustable, clevis.
4. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
5. Wall Support for Pipe Sizes to 3 Inches: Cast iron hook.
6. Wall Support for Pipe Sizes 4 Inches and Over: Welded steel bracket and wrought steel clamp.
7. Vertical Support: Steel riser clamp.
8. Floor Support: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
9. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.

B. Plumbing Piping: Water and natural gas.

1. Conform to ASME B31.9.
2. Hangers for Pipe Sizes 1/2 to 1-1/2 Inch: Malleable iron or Carbon steel, adjustable swivel, split ring.
3. Hangers for Cold Pipe Sizes 2 Inches and Over: Carbon steel, adjustable, clevis.
4. Hangers for Hot Pipe Sizes 2 to 4 Inches: Carbon steel, adjustable, clevis.
5. Hangers for Hot Pipe Sizes 6 Inches and Over: Adjustable steel yoke, cast iron pipe roll, double hanger.
6. Multiple or Trapeze Hangers: Steel channels with welded supports or spacers and hanger rods.
7. Multiple or Trapeze Hangers for Hot Pipe Sizes 6 Inches and Over: Steel channels with welded supports or spacers and hanger rods, cast iron roll.
8. Wall Support for Pipe Sizes to 3 Inches: Cast iron hook.

9. Wall Support for Pipe Sizes 4 Inches and Over: Welded steel bracket and wrought steel clamp.
10. Wall Support for Hot Pipe Sizes 6 Inches and Over: Welded steel bracket and wrought steel clamp with adjustable steel yoke and cast iron pipe roll.
11. Vertical Support: Steel riser clamp.
12. Floor Support for Cold Pipe: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
13. Floor Support for Hot Pipe Sizes to 4 Inches: Cast iron adjustable pipe saddle, locknut, nipple, floor flange, and concrete pier or steel support.
14. Floor Support for Hot Pipe Sizes 6 Inches and Over: Adjustable cast iron pipe roll and stand, steel screws, and concrete pier or steel support.
15. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.

2.11 GATE VALVES

A. Up To and Including 3 Inches:

1. MSS SP-80, Class 150, bronze body, bronze trim, rising stem, handwheel, inside screw, solid wedge disc, solder or threaded ends.

2.12 GLOBE VALVES

A. Up To and Including 3 Inches:

1. MSS SP-80, Class 125, bronze body, bronze trim, handwheel, bronze disc, solder or threaded ends.

2.13 BALL VALVES

A. Construction, 4 Inches and Smaller: MSS SP-110, Class 150, bronze, two piece body, chrome plated brass ball, regular port, Teflon seats and stuffing box ring, blow-out proof stem, lever handle, solder or threaded ends.

2.14 PLUG VALVES

A. Construction 2-1/2 Inches and Larger: MSS SP-78, 175 psi, cast iron body and plug, pressure lubricated, Teflon or Buna N packing, flanged or grooved ends. Provide lever operator with set screw.

2.15 BUTTERFLY VALVES

A. Construction 2 inches or Less: MSS SP-67, 200 psi, bronze iron body, bronze disc, resilient replaceable seat, extended neck, lever handle.

2.16 SWING CHECK VALVES

A. Up to and Including 3 Inches:

1. MSS SP-80, Class 125, bronze body and cap, bronze swing disc with rubber seat, solder or threaded ends.

B. 2 Inches and Larger:

1. MSS SP-71, Class 125, iron body, bronze swing disc, renewable disc seal and seat, flanged or grooved ends.

2.17 RELIEF VALVES

A. Pressure Relief:

1. AGA Z21.22 certified, bronze body, Teflon seat, steel stem and springs, automatic, direct pressure actuated.

B. Temperature and Pressure Relief:

1. AGA Z21.22 certified, bronze body, Teflon seat, stainless steel stem and springs, automatic, direct pressure actuated, temperature relief maximum 210 degrees F, capacity ASME SEC IV certified and labeled.

2.18 STRAINERS

A. Size 2 Inch and Under:

1. Threaded brass body for Class 150, threaded bronze body, Y pattern with 1/32 inch stainless steel perforated screen.

B. Size 1-1/2 Inch to 4 Inch:

1. Class 125, flanged iron body, Y pattern with 1/16 inch stainless steel perforated screen.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Division 01 Section Administrative Requirements for verification of existing conditions before starting work.

B. Verify that excavations are to required grade, dry, and not over-excavated.

3.2 PREPARATION

A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.

B. Remove scale and dirt, on inside and outside, before assembly.

C. Prepare piping connections to equipment with flanges or unions.

3.3 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Provide non-conducting dielectric connections wherever jointing dissimilar metals.

C. Route piping in orderly manner and maintain gradient. Route parallel and perpendicular to walls.

D. Install piping to maintain headroom, conserve space, and not interfere with use of space.

E. Group piping whenever practical at common elevations.

F. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment. Refer to Division 23 Expansion Fittings and Loops for HVAC Piping.

G. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings. Refer to Division 22 Section Plumbing Piping Insulation.

H. Provide access where valves and fittings are not exposed.

I. Establish elevations of buried piping outside the building to ensure not less than 5 foot of cover.

J. Install vent piping penetrating roofed areas to maintain integrity of roof assembly; refer to Division 07 for Roofing.

K. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welding.

L. Provide support for utility meters in accordance with requirements of utility companies.

M. Prepare exposed, unfinished pipe, fittings, supports, and accessories ready for finish painting. Refer to Division 09 Section Painting and Coating.

N. Excavate in accordance with Division 31 Section Earthwork for work of this Section.

O. Backfill in accordance with Division 31 Section Earthwork for work of this Section.

P. Install bell and spigot pipe with bell end upstream.

Q. Install valves with stems upright or horizontal, not inverted.

R. Pipe vents from gas pressure reducing valves to outdoors and terminate in weather proof hood.

S. Install water piping to ASME B31.9.

T. Sleeve pipes passing through partitions, walls and floors.

U. Inserts:

1. Provide inserts for placement in concrete formwork.
2. Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.
3. Provide hooked rod to concrete reinforcement section for inserts carrying pipe over 4 inches.
4. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.
5. Where inserts are omitted, drill through concrete slab from below and provide through-bolt with recessed square steel plate and nut recessed into and grouted flush with slab.

V. Pipe Hangers and Supports:

1. Install in accordance with ASTM B31.9.
2. Support horizontal piping as scheduled.
3. Install hangers to provide minimum 1/2 inch space between finished covering and adjacent work.
4. Place hangers within 12 inches of each horizontal elbow.
5. Use hangers with 1-1/2 inch minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.
6. Support vertical piping at every floor. Support riser piping independently of connected horizontal piping.
7. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.
8. Provide copper plated hangers and supports for copper piping or sheet lead packing between hanger or support and piping.
9. Prime coat exposed steel hangers and supports. Refer to Division 09 Section Painting and Coating. Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed.
10. Provide hangers adjacent to motor driven equipment with vibration isolation; refer to Division 22 Section Hangers and Supports for Plumbing Piping and Equipment.
11. Support cast iron drainage piping at every joint.

3.4 APPLICATION

A. Use grooved mechanical couplings and fasteners only in accessible locations.

B. Install unions downstream of valves and at equipment or apparatus connections.

C. Install brass male adapters each side of valves in copper piped system. Solder adapters to pipe.

D. Install gate ball or butterfly valves for shut-off and to isolate equipment, part of systems, or vertical risers.

E. Install globe ball or butterfly valves for throttling, bypass, or manual flow control services.

F. Provide lug end butterfly valves adjacent to equipment when provided to isolate equipment.

G. Provide spring loaded check valves on discharge of water pumps.

H. Provide plug valves in natural gas systems for shut-off service.

I. Provide flow controls in water recirculating systems where indicated.

3.5 ERECTION TOLERANCES

A. Division 01 Section Quality Control for tolerances.

B. Establish invert elevations, slopes for drainage to 1/4 inch per foot for pipe 3 inches and smaller, 1/8 inch per foot for larger pipes. Maintain gradients.

C. Slope water piping minimum 0.25 percent and arrange to drain at low points.

3.6 DISINFECTION OF DOMESTIC WATER PIPING SYSTEM

A. Prior to starting work, verify system is complete, flushed and clean.

B. Ensure Ph of water to be treated is between 7.4 and 7.6 by adding alkali (caustic soda or soda ash) or acid (hydrochloric).

C. Inject disinfectant, free chlorine in liquid, powder, tablet or gas form, throughout system to obtain 50 to 80.09 ppm residual.

D. Bleed water from outlets to ensure distribution and test for disinfectant residual at minimum 15 percent of outlets.

E. Maintain disinfectant in system for 24 hours.

F. If final disinfectant residual tests less than 25.02 ppm, repeat treatment.

G. Flush disinfectant from system until residual equal to that of incoming water or 1.00 ppm.

H. Take samples no sooner than 24 hours after flushing, from 10 percent of outlets and from water entry, and analyze in accordance with AWWA C651.

3.7 SERVICE CONNECTIONS

A. See Division 22 Section Facility Water Distribution.

3.8 SCHEDULES

A. Pipe Hanger Spacing:

1. Metal Piping:

Pipe Size	Maximum Hanger Spacing, Ft.	Rod Size, Inches
1/2 to 1-1/4 inches:	6.5	3/8
1/2 to 1-1/4 inches:	10	3/8
2-1/2 to 3 inches:	10	1/2
4 to 6 inches:	10	5/8
8 to 12 inches:	14	3/8
14 inches and Over:	20	1

2. Plastic Piping:

Pipe Size	Maximum Hanger Spacing, Ft.	Rod Size, Inches
All Sizes:	6	3/8

3.9 TESTING

A. Hydrostatically test water mains at 150 psi.

B. Air pressure test water mains at 150 psi.

C. Storm and Sanitary: Test at 10 foot water column.

D. Gas: Air test at 20 psig for 2 hours.

END OF SECTION

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SECTION 22 30 00

PLUMBING EQUIPMENT

(Edited from DeCA June 2011 Design Criteria)

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Water heaters.

B. Related Sections:

1. Division 01 Section Mechanical, Refrigeration, Food Service Equipment, and Electrical Coordination.
2. Division 01 Section Quality Control.
3. Division 01 Section Closeout Procedures.
4. Division 22 Section Hangers and Supports for Plumbing Piping and Equipment.
5. Division 22 Section Vibration and Seismic Controls for Plumbing Piping and Equipment.
6. Division 26 Electrical.

1.2 QUALITY CONTROL

A. The following publications form a part of this Specification to the extent they are applicable:

1. Division 01 Section Quality Control.
2. ASHRAE 90A - Energy Conservation in New Building Design.
3. ASME Section 8D - Pressure Vessels.
4. NFPA 30 - Flammable and Combustible Liquids Code.
5. NFPA 54 - National Fuel Gas Code.
6. NFPA 70 - National Electrical Code.

1.3 SUBMITTALS

A. Submittals for Review:

1. Division 01 Section Quality Control: Procedures for submittals.
2. Product Data:

a. Provide dimension drawings of water heaters indicating components and connections to other equipment and piping.
b. Indicate pump type, capacity, and power requirements.
c. Provide certified pump curves showing pump performance characteristics with pump and system operating point plotted. Include NPSH curve when applicable.
d. Provide electrical characteristics and connection requirements.

3. Shop Drawings:

   a. Indicate heat exchanger dimensions, size of tappings, and performance data.
   b. Indicate dimensions of tanks, tank lining methods, anchors, attachments, lifting points, tappings, and drains.

4. Operation and Maintenance Data.

B. Submittals For Information:

1. Division 01 Section Quality Control for procedures for submittals.
2. Manufacturer's Instructions.

C. Submittals at Project Closeout:

1. Division 01 Section Closeout Procedures.
2. Project Record Documents: Record actual locations of components.
3. Operation and Maintenance Data: Include operation, maintenance, and inspection data, replacement part numbers and availability, and service depot location and telephone number.
4. Warranty: Submit water heater manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.
5. The Contractor shall submit all certifications and testing data as a supplement to previously submitted O & M manuals at contract closeout.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this Section with minimum five years documented experience.

B. Provide pumps with manufacturer's name, model number, and rating/capacity identified.

C. Ensure products and installation of specified products are in conformance with recommendations and requirements of the following organizations:

1. American Gas Association (AGA).
2. National Sanitation Foundation (NSF).
3. American Society of Mechanical Engineers (ASME).
4. National Board of Boiler and Pressure Vessel Inspectors (NBBPVI).
5. National Electrical Manufacturers' Association (NEMA).
6. Underwriters Laboratories (UL).

D. Ensure pumps operate at specified system fluid temperatures without vapor binding and cavitation, are non-overloading in parallel or individual operation; operate within 25 percent of midpoint of published maximum efficiency curve.

1.5 REGULATORY REQUIREMENTS

A. Conform to AGA, NSF, NFPA 54 requirements for water heaters.

B. Conform to ASME Section 8D for tanks.

C. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and indicated.

1.6 DELIVERY, STORAGE, AND PROTECTION

A. Division 01 Section Mechanical, Refrigeration, Food Service Equipment and Electrical Coordination.

1. Provide temporary inlet and outlet caps. Maintain caps in place until installation.

1.7 WARRANTY

A. Division 01 Section Closeout Procedures.

1. Provide five year manufacturer warranty for domestic water heaters and water storage tanks.

1.8 EXTRA MATERIALS

A. See Division 01 Section Closeout Procedures paragraph, Parts.

1. Provide two pump seals.

PART 2 - PRODUCTS

2.1 COMMERCIAL GAS FIRED WATER HEATERS

A. Packaged, integrated, separated combustion water heater with storage tank, controls, circulators and local piping. See Drawings for performance.

B. Heater design shall be copper tubes having extruded integral fins and mounted in accessible cast iron headers with an insulated enameled steel jacket. Pressure rating shall be 160 psig. Efficiency shall be 94 percent.

C. Factory installed bronze circulating pump(s) shall be provided**.**

D. Glass lined steel tank, ASME labeled; 2 inches glass fiber, encased in corrosion-resistant steel jacket; baked-on enamel finish; built in drain pan, floor shield and legs.

E. Accessories: Brass water connections and dip tube, drain valve, magnesium anode, and ASME rated temperature and pressure relief valve.

F. Approval: By AGA as automatic storage water heater for operation at 180 deg F.

G. Controls: Automatic direct immersion thermostat with temperature range adjustable minimum 140 deg F differential, automatic reset high temperature limiting thermostat factory set at 195 deg F, gas pressure regulator, multi-ribbon or tabular burner, 100 percent safety shut-off pilot and thermocouple, draft proving switch, intermittent electronic ignition monitoring pilot and main flame, trial for re-ignition for momentary loss of flame, shut down or pilot and main burner in 2-4 seconds after loss of flame, and power venter.

2.2 IN-LINE CIRCULATOR PUMPS

A. Casing: Bronze, rated for 125 psig working pressure, with stainless steel rotor assembly.

B. Impeller: Bronze.

C. Shaft: Alloy steel with integral thrust collar and two oil lubricated bronze sleeve bearings.

D. Seal: Carbon rotating against a stationary ceramic seat.

E. Drive: Flexible coupling.

F. Strap on aquastat wired to cycle hot water recirculating pumps.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install water heaters in accordance with manufacturer's instructions and to AGA requirements.

B. Coordinate with plumbing piping and related fuel piping, gas venting, and electrical work to achieve operating system.

C. Wire circulating pump controls.

END OF SECTION

SECTION 22 40 00

PLUMBING FIXTURES

(Edited from DeCA June 2011 Design Criteria)

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Water closets.
2. Urinals.
3. Lavatories.
4. Kitchen Sink.
5. Electric water coolers.

B. Related Sections:

1. Division 01 Section Mechanical, Refrigeration, Food Service Equipment and Electrical Coordination.
2. Division 01 Section Quality Control.
3. Division 01 Section Closeout Procedures.
4. Division 06 Section Interior Architectural Woodwork: Preparation of counters for sinks.
5. Division 07 Section Joint Sealants: Seal fixtures to walls and floors.
6. Division 11 Equipment Sections: Plumbing fixtures specified elsewhere.
7. Division 22 Section Common Work Results for Plumbing.
8. Division 22 Section Hangers and Supports for Plumbing Piping and Equipment.
9. Division 22 Section Vibration and Seismic Controls for Plumbing Piping and Equipment.
10. Division 22 Section Plumbing Equipment.
11. Division 26 Electrical.

1.2 QUALITY CONTROL

A. The following publications form a part of this specification to the extent they are applicable:

1. Division 01 Section Quality Control.
2. ANSI Z358.1 - Emergency Eye Wash and Shower Equipment.
3. ARI 1010 - Drinking Fountains and Self-Contained Mechanically Refrigerated Drinking Water Coolers.
4. ASME A112.6.1 - Supports for Off-the-Floor Plumbing Fixtures for Public Use.
5. ASME A112.18.1 - Finished and Rough Brass Plumbing Fixture Fittings.
6. ASME A112.19.1 - Enameled Cast Iron Plumbing Fixtures.
7. ASME A112.19.2 - Vitreous China Plumbing Fixtures.
8. ASME A112.19.4 - Porcelain Enameled Formed Steel Plumbing Fixtures.
9. ASME A112.19.5 - Trim for Water-Closet Bowls, Tanks, and Urinals.
10. NFPA 70 - National Electrical Code.

1.3 SUBMITTALS

A. Submittals for Review:

1. Division 01 Section Quality Control: Procedures for submittals.
2. Product Data: Provide catalog illustrations of fixtures, electric/electronic controls for lavatories and flush valves, sizes, rough-in dimensions, utility sizes, trim, and finishes.
3. Operation and Maintenance Data.

B. Submittals For Information:

1. Division 01 Section Quality Control for submittals.
2. Manufacturer's Instructions: Indicate installation methods and procedures.

C. Submittals At Project Closeout:

1. Division 01 Section Closeout Procedures for submittals.
2. Maintenance Data: Include fixture trim exploded view and replacement parts lists.
3. Warranty: Submit manufacturer warranty and ensure forms have been completed in Government's name and registered with manufacturer.
4. The Contractor shall submit all certifications and testing data as a supplement to previously submitted O & M manuals at Contract closeout.

1.4 DELIVERY, STORAGE, AND PROTECTION

A. Accept fixtures on site in factory packaging. Inspect for damage.

B. Protect installed fixtures from damage by securing areas and by leaving factory packaging in place to protect fixtures and prevent use.

1.5 QUALIFICATIONS

A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this Section with minimum five years documented experience.

1.6 REGULATORY REQUIREMENTS

A. International Plumbing code, IPC.

B. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and indicated.

1.7 WARRANTY

A. Division 01 Section Closeout Procedures.

B. Provide five year manufacturer warranty for electric water cooler and water heater.

PART 2 - PRODUCTS

2.1 FLUSH VALVE WATER CLOSET

A. Water Closet:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Kohler.
   b. American Standard.
   c. Zurn Plumbing Products Group, commercial brass operation.

2. Description: Wall-mounting, back-outlet, Elongated, one piece, vitreous-china fixture designed for flushometer valve operation. Flushometer to include brass body with corrosion-resistant internal components, non-hold-open feature, control stop with check valve, vacuum breaker, copper or brass tubing, and polished chrome-plated finish on exposed parts.

   a. Internal Design: Diaphragm operation.
   b. Bowl Type: Elongated with siphon-jet design.
   c. Style: One piece.
   d. Internal Design: Diaphragm operation.
   e. Style: Exposed.
   f. Inlet Size: NPS 1.
   g. Trip Mechanism: Hard-wired, electric-sensor actuator with transformer, and true mechanical override.
   h. Consumption: 1.6 gal./flush.
   i. Tailpiece Size: NPS 1-1/2.
   j. Description: Type I, urinal carrier with fixture support plates and coupling with seal and fixture bolts and hardware matching fixture or wall-mounting, urinal-type fixture. Include steel uprights with feet.
   k. Seat: Elongated, White, Open front, Without cover, Molded or solid plastic, with antimicrobial agent, and check hinge.

2.2 URINALS

A. Urinals:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. American Standard Companies, Inc.
   b. Kohler Co.
   c. Crane.
   d. TOTO USA, Inc.
   e. Zurn Plumbing Products Group; Commercial Brass Operation.

2. Description: Accessible, wall-mounting, back-outlet, washout, vitreous-china fixture designed for flushometer valve operation.

   a. Type: Washout.
   b. Strainer or Trapway: Integral cast strainer with integral trap.

c. Design Consumption: .5 gal./flush.
d. Color: White.
e. Trip Mechanism: Hard-wired, electric-sensor actuator with transformer, and true mechanical override.
f. Supply Spud Size: NPS 3/4.
g. Outlet Size: NPS 1-1/2.
h. Carrier: Combination carrier designed for required mounting height of wall-mounting, urinal fixture. Include single or double, vertical or horizontal, hub-and-spigot or hubless waste fitting as required for piping.

2.3 LAVATORIES

A. Lavatories:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. American Standard Companies, Inc.
   b. Crane Plumbing, L.L.C./Fiat Products.
   c. Kohler Co.
   d. TOTO USA, Inc.

2. Description: Accessible, wall-mounting, vitreous-china fixture.

   a. Type: Ledge back.
   b. Color: White.
   c. Faucet: .5 gpm, electronic, hardwired with transformer.
   d. Mixing valve: .5 gpm, with separate stops, and ASSE 1017 & 1070 rated.
   e. Supplies: NPS 3/8 chrome-plated copper with stops.
   f. Drain: Grid.
   g. Protective Shielding Guard(s): White, molded vinal, ABA compliant.
   h. Fixture Support: Type II, lavatory carrier with concealed arms and tie rod for wall-mounting, lavatory-type fixture. Include steel uprights with feet.

2.4 KITCHEN SINKS

A. Kitchen Sinks

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Elkay Manufacturing Co.
   b. Just Manufacturing Company.

2. Description: Two-bowl, commercial, counter-mounting, stainless-steel kitchen sink.

   a. Metal Thickness: 0.038-inch.
   b. Bowl(s):

      1) Drain: 3-1/2 inch crumb cup.

         a) Location: Centered in bowl.

c. Sink Faucet: Deck mount, single lever, chrome plated, 8 inch swing spout, ABA compliant faucet.
d. Supplies: NPS 1/2 chrome-plated copper with stops.
e. Drain Piping: NPS 1-1/2 chrome-plated, cast-brass P-trap; 0.045-inch thick tubular brass waste to wall; and wall escutcheon(s).
f. Drain Piping: Schedule 40 ABS or PVC, NPS 1-1/2 P-trap; tubular waste to wall; and wall escutcheon(s).

2.5 ELECTRIC WATER COOLERS

A. Electric water coolers:

1. Description: Self-contained, Dual, wall hung, electric refrigerated, Barrier free, stainless steel basin, ABA compliant, with pre filter, and anti-microbial bubbler and electric refrigerated cooler.
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Elkay.
b. Haws.
c. Oasis.
d. Halsey Taylor.

3. Provide the following:

a. Bubbler: Anti-microbial.
b. Construction: Galvanized steel.
c. Cooling system: Lead free with aluminum fins.
d. Filter: Class 1 particulate reduction.
e. Refrigerant: HFC-134A.
f. Compressor: Hermetically sealed, reciprocating.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Division 01 Section Administrative Requirements for verification of existing conditions before starting work.

B. Verify that walls and floor finishes are prepared and ready for installation of fixtures.

C. Verify that electric power is available and of the correct characteristics.

D. Confirm that millwork is constructed with adequate provision for the installation of counter top lavatories and sinks.

3.2 PREPARATION

A. Rough-in fixture piping connections in accordance with minimum sizes indicated in fixture rough-in schedule for particular fixtures.

3.3 INSTALLATION

A. Install each fixture with trap, easily removable for servicing and cleaning.

B. Provide chrome plated rigid or flexible supplies to fixtures with loose key stops, reducers, and escutcheons.

C. Install components level and plumb.

D. Install and secure fixtures in place with wall carriers and bolts.

E. Seal fixtures to wall and floor surfaces with sealant as specified in Division 07 Section Joint Sealants, color to match fixture.

F. Solidly attach water closets to floor with lag screws. Lead flashing is not intended hold fixture in place.

3.4 INTERFACE WITH OTHER PRODUCTS

A. Review millwork Shop Drawings. Confirm location and size of fixtures and openings before rough-in and installation.

3.5 ADJUSTING

A. Division 01 Section Closeout Procedures: Adjusting installed work.

B. Adjust stops or valves for intended water flow rate to fixtures without splashing, noise, or overflow.

3.6 CLEANING

A. Division 01 Section Closeout Procedures for cleaning installed work.

B. Clean plumbing fixtures and equipment.

3.7 PROTECTION OF FINISHED WORK

A. Division 01 Section Closeout Procedures for Protecting installed work.

B. Do not permit use of fixtures.

END OF SECTION

SECTION 23 01 00

MAINTENANCE AND REPAIR FOR HVAC AND REFRIGERATION

(Edited from DeCA June 2011 Design Criteria)

PART 1 - GENERAL

1.1 SUMMARY

A. Scope of Work:

1. Preventive Maintenance (PM): Provide PM on existing HVAC and refrigeration equipment. Provide PM on new HVAC and refrigeration equipment. See description of PM in Part 3, paragraph titled "Contractor Furnished Services."
2. Emergency Response: Provide emergency response to Commissary requests for emergency repair of new or existing HVAC and refrigeration equipment. See description of Emergency Response in Part 3, paragraph titled "Contractor Furnished Services."
3. Emergency Repair: Provide emergency repair of existing HVAC and refrigeration equipment. See description of Emergency Repair in Part 3, paragraph titled "Contractor Furnished Services."
4. Contractor Furnished, Parts and Labor and Refrigerant and Items: Provide Parts and Labor and Refrigerant and Items as indicated in Part 3, paragraph titled "Contractor Furnished, Parts and Labor and Refrigerant and Items."
5. Inspections and Reports: Provide pre-performance inspection, PM inspection, inspection reports, and close out letter. See Part 3, paragraphs titled "Pre-Performance Inspection" and "Preventative Maintenance" and "Closeout Letter."

B. Related Sections: Refer to related Sections:

1. Division 01 Section Mechanical, Refrigeration, Food Service Equipment and Electrical Coordination.
2. Division 01 Section Quality Control.
3. Division 01 Section Closeout Procedures.
4. Division 23 Sections Heating, Ventilating, And Air Conditioning (HVAC).

1.2 PERFORMANCE PERIOD

A. Pre Performance Inspection: Within 10 days after Contract award, conduct a visual inspection of the existing Commissary refrigeration and HVAC equipment to be maintained under this Section. Within 7 days after the inspection, provide a letter to the Contracting Officer.

B. Preventive Maintenance, Emergency Response and Repair Service: Preventive Maintenance, Emergency Response and Repair Service shall commence 60 days after the first notice to proceed has been issued by the Contracting Officer and shall continue until 90 days after final acceptance of the entire construction project.

C. Preventive Maintenance (PM):

1. Initial PM: Initial PM shall be accomplished within 14 days after commencement of Maintenance and Emergency Response and Repair Service.
2. Periodic PM: After Initial PM has been accomplished, provide periodic PM as necessary but not less frequent than once every 45 days until Final Preventative Maintenance occurs.
3. Final PM: Final PM shall be accomplished 14 to 21 days before the end of Maintenance and Emergency Response and Repair Service.
4. Air Filter Changes: Change air filters as part of PM. Provide additional filter changes as necessary to protect equipment and to control construction dust.
5. Closeout Letter: Prior to the end of the performance Period for Maintenance and Emergency Response and Repair Service, provide a letter to the Contracting Officer.

1.3 CONTRACTORS QUALIFICATIONS

A. Contractor Experience: The Contractor (or refrigeration/HVAC subcontractor) shall have operated a minimum of 5 years as a refrigeration repair and installation contractor on commercial supermarket refrigeration systems and supermarket HVAC systems equal in type and complexity to the systems indicated in the Contract.

B. Mechanic Experience: The refrigeration mechanic shall have at least 5 years of journeyman refrigeration experience in the field of commercial supermarket refrigeration and HVAC that is equal to the type and complexity to the systems indicated in this contract. On every occasion where the Contractor performs services at least one qualified mechanic shall be sent to the job site.

1.4 DEFINITIONS

A. Provide: Contractor Furnished and Contractor Installed.

B. New Equipment: New equipment installed under the requirements of another Specification Section of this Construction Contract. (Includes associated controls, piping, and power wiring between system components and back to power distribution panels).

C. Existing Equipment: Equipment listed in Technical Exhibit #1 of this Section. (Includes associated controls, piping, and power wiring between system components and back to power distribution panels).

D. Emergency: Events which are emergencies and require an emergency response and repair:

1. When a refrigerated display case or a conditioned room is not within the temperature limits shown in Technical Exhibit #2 for a period of 2 hours.
2. When electrical power outages occur, that upon restoration of the electrical power, deficient temperatures occur as a result of equipment failing to re-start and commissary personnel are unable to re-start the refrigeration equipment.
3. When the Refrigeration Alarm System (RMCS) becomes inoperable.

PART 2 - PRODUCTS

2.1 PARTS AND MATERIAL QUALITY STANDARD

A. All parts, materials and equipment provided under this contract shall be new. Replacement parts, furnished by others than the original manufacturer, may be used only if the parts are equal to or better than the original and has been approved by the Contracting Officer or Government's Designated Inspector. Remanufactured compressors may be used, provided the compressors are furnished by a manufacturer that is authorized and approved by the original refrigeration equipment manufacturer and the Contractor has obtained written approval from the Contracting Officer.

1. Air Filters: Use filters per equipment manufacturer recommendations. However, as a minimum, pleated media type filters Merv 7 (ASHRAE 52-76) shall be used. Fiberglass or polyester filters shall <u>not</u> be permitted.
2. Refrigerant: All refrigerant shall be new unless it is being charged into an existing piece of equipment, which is to be removed under this Construction Contract.

2.2 REPLACEMENT PARTS

A. Parts for replacement requiring special order due to non-availability locally relieves the Contractor for the 24 hour requirements. The Contractor shall forward written justification for approval by the Contracting Officer. The written justification shall include the non-available parts that are required, the expected delivery date, the means of shipment, and the anticipated completion date. The Contractor shall make every effort to expedite the purchase and delivery of such parts by using special means of shipment.

PART 3 - EXECUTION

3.1 CONTRACTOR FURNISHED SERVICES

A. Pre Performance Inspection: Contractors shall perform inspection within 14 days of arriving on site. Contractors will assume responsibilities for Emergency Response, Emergency Repairs and Preventative Maintenance at the time the inspection report is submitted to the Contracting Officer. Inspection shall include the following as a minimum:

1. Visually inspect all refrigeration equipment.
2. Test refrigerated room lights.
3. Test display case lights.
4. Make record of all display case and storage room temperatures.
5. Make record of all conditioned room temperatures.
6. Visually check all HVAC equipment and controls.
7. Note the operation of, and gasket condition on, refrigerated room doors.
8. Provide report of findings to Contracting Officer within 7 days after inspection.

B. Emergency Response: Provide emergency response to all emergency calls from the Commissary requesting emergency repair of new or existing refrigeration or HVAC equipment. (See definition of emergency, this Section.)

1. Emergency Response Time: The Contractor shall respond to all requests for emergency repair and shall arrive at the Commissary within 2 hours after receiving a request for emergency repair.
2. Emergency Response Availability: The Contractor shall be available for emergency response and repairs 24 hours a day, 7 days a week.
3. Warranty Determination:

    a. If new equipment is determined to be the cause of emergency and repairs of refrigeration equipment is required for new HVAC or refrigeration equipment under warranty, then inform the installing contractor and monitor the warranty repairs.
    b. If existing equipment is determined to be the cause of emergency, then provide emergency repair of the existing equipment.

C. Emergency Repair: Provide Emergency Repair of existing HVAC and refrigeration equipment. Where parts or refrigerant are required, see paragraph titled, "Contractor Furnished, Parts and Labor and Refrigerant and Items."

1. Emergency Repair Time Limitation: Equipment shall be repaired within 24 hours after the Contractor or their representative receives the request for emergency repairs.

    a. Failure to Comply: If the Contractor does not repair the equipment to proper operation within 24 hours of a request for emergency repairs, then the government reserves the right to arrange for repairs by other means and to pay for these repairs, by deduction from the contracted amount for this Construction Contract.

D. Preventative Maintenance (PM): Provide PM on existing and new HVAC and refrigeration equipment. During PM conduct all tests and make coordinate repairs and adjustments necessary to keep all systems operating properly. Where repairs and parts are required, see paragraph titled, "Contractor Furnished, Parts and Labor and Refrigerant and Items."

1. Minimum PM Requirements for Initial PM, Periodic PM, and Final PM: Insure that the following work is accomplished (where repairs and parts are required, see paragraph titled, "Contractor furnished, Parts and Labor and Refrigerant and Items"):

    a. Air Filter Change: Each time filters are changed; date each and every filter being installed in ink, indicating the day, which the filter was installed.
    b. Refrigerant receivers levels are brought to a minimum of 30 percent with heat reclaim on.
    c. All HVAC equipment including boilers are ran to verify automatic controls and equipment operation.
    d. Sales Area Dry bulb and RH sensor is calibrated and recorded for the PM report.
    e. All compressor rooms cleaned.
    f. All refrigerated display cases and walk-ins are adjusted to maintain Technical Exhibit #2 temperatures and manufacturer specified defrosts.
    g. All display case anti sweat heaters and their controllers are working.
    h. All display case and storage/processing room lights are working.
    i. All missing or loose display case trim or kick panels are installed.
    j. All display case and refrigerated room door gaskets are repaired or replaced.
    k. Parts and Labor and Refrigerant: Where repairs and parts or refrigerant are required to complete PM, see breakout of responsibility in paragraph titled, "Contractor Furnished, Parts and Labor and Refrigerant and Items."
    l. Inspection Report: Within 10 days after PM is conducted, provide a PM inspection report to the Contracting Officer. In the letter, specifically identify any item, which was not in proper working condition upon completion of PM.

3.2 CONTRACTOR FURNISHED, PARTS AND LABOR AND REFRIGERANT AND ITEMS

A. Existing Equipment: Provide items and services indicated below to accomplish PM and Emergency Repair on existing equipment.

1. Air Filters: Provide all air filters.
2. Labor: Provide all labor for repair of existing equipment (exception, see Government Reimbursement for labor).
3. Refrigerant and Oil: Provide all refrigerant and oil.
4. Other Parts and Items: Provide parts costing less than $500. (See Reimbursement for Parts/Equipment.)

B. New Equipment: Provide items and services indicated below to accomplish PM and emergency repair on new equipment.

1. Air filters: Provide all air filters.
2. Labor: Notify installing contractor when warranty work is required.
3. Refrigerant and Oil: Notify installing contractor when warranty work is required.
4. Other Parts and Items: Notify installing contractor when warranty work is required.

C. Interconnected New and Existing Equipment: (Example: when an air conditioning condenser, but not the compressor, is replaced under another Specification Section.) Provide items and services indicated below to accomplish PM and emergency repair on interconnected new and existing equipment.

1. Provide all air filters.
2. Labor: Provide all labor for repair of existing portions of the system (exception, see Government Reimbursement for labor). Notify installing contractor when warranty work is required on new equipment.
3. Refrigerant: Provide all refrigerant and oil.
4. Other Parts and Items: Provide parts costing less than $500 each if needed for repair of existing equipment. (See Reimbursement for Parts/Equipment.) Notify installing contractor when warranty work is required on new equipment portions of the system.

3.3 GOVERNMENT REIMBURSEMENT

A. Reimbursement for Parts/Equipment: The Government shall reimburse for individual parts or equipment, which exceeds $500.00. The established cost of parts shall be at actual cost invoiced to the Contractor including cash, trade discounts or rebates. The Contractor shall obtain written approval from the Contracting Officer prior to replacing a part or piece of refrigeration or HVAC equipment costing $500.00 or more. The Contractor shall provide written request indicating the work to be done, the parts to be replaced and the estimated cost prior to starting the work. Additionally, upon request of the Contracting Officer, the Contractor shall provide three quotes for the equipment being replaced.

1. Crane Rental: If a crane is used to lift reimbursable parts, then the Government shall reimburse the rental costs for the crane.
2. Excluded Items: Excluded from reimbursable items are:

a. Equipment/items that are new under other section of this Construction Contract.
b. Refrigerant, refrigerant oil.
c. Labor shall not be reimbursed unless the requirements for Reimbursement for Labor and Overhead are met.

B. Reimbursement for Labor: The Government shall reimburse Labor and Overhead for Emergency Replacement of the existing equipment types listed below. Do not replace any of this equipment unless directed to do so by the Contracting Officer. Note: This Commissary may not contain all of these types of equipment.

1. HVAC Compressors over 11 Horsepower (excludes refrigeration compressors).
2. Condensing units over 11 Horsepower.
3. Condensers over 300 MBH at 20 degree TD.
4. Evaporators over 100 MBH at 25 degree TD.
5. Air handlers over 2000 CFM.
6. Chillers or chiller tube bundles.
7. Boilers or boiler tubes.
8. Display cases.
9. Unit coolers.
10. Refrigerated storage/processing room panels or doors.
11. Cooling towers.

3.4 SECURITY

A. The Contractor shall be responsible for safeguarding government property which the Contractor is given access. At the close of each work period, government facilities, equipment, and materials shall be properly secured. Upon arrival at the Commissary, the Contractor shall request that the Commissary personnel unlock the doors to the mechanical rooms, thus allowing the Contractor or his representative access to the refrigeration or HVAC equipment. The Contractor shall notify the commissary personnel to secure the unlocked doors prior to departure.

3.5 AUTHORIZED GOVERNMENT PERSONNEL (AGP)

A. Commissary personnel or construction inspector authorized by the Contracting Officer to call the Contractor for emergency work and to log the time when the Contractor was called, arrived for the emergency service, and time repairs were completed. The Contractor is responsible for obtaining the names of AGP from commissary officer in writing.

3.6 STORAGE

A. No storage space is available in the Commissary mechanical rooms. The Government is not responsible for theft or damage to Contractor's property that is stored in the mechanical rooms.

3.7 SERVICE STATEMENTS

A. The Contractor shall provide a separate service statement upon completion of each Emergency Service Work Call, and Periodic Preventive Maintenance Visit. The service statement shall list all material (and amount of refrigerant, system charged, and the like for reimbursement purposes) and man hours provided, reason for the call, description of work, serial number of equipment, part repaired or provided, and the names of person(s) doing the work and shall be signed by the AGP. A copy shall be left with the Commissary Officer or representative signing the service statement.

3.8 CLOSE OUT LETTER

A. Prior to the end of the Performance Period for Maintenance and Emergency Repair Service, provide a letter to the Contracting Officer. Indicate in this letter:

1. The date on which the Final PM was completed.
2. That refrigerant receivers levels were checked during Final PM and the levels are all at least 30 percent full with the heat reclaim ON.
3. All HVAC equipment (including boilers) and controls were tested during the Final PM and that all are in proper working condition.
4. All display cases and walk-ins were checked during Final PM and are maintaining Contract specified temperatures.
5. Specifically identify any item, which was not in proper working condition upon completion of the Final PM. Include projected date when the item will be made operational.

TECHNICAL EXHIBIT #1
EXISTING COMMISSARY STORE EQUIPMENT TO BE MAINTAINED

The following listing includes, but not limited to, the major pieces of EXISTING equipment that shall be maintained under this Contract. The Contractor shall also maintain associated controls, piping, wiring, etc., associated with these major pieces of equipment.

EXISTING REFRIGERATION EQUIPMENT LISTING

DISPLAY CASES

QTY (EA.)	LENGTH (FT.)	DESCRIPTION
2	8	Multi Deck Dairy Case
3	12	Multi Deck Frozen Food Case
1	8	Multi Deck Frozen Food Case
2	12	Multi Deck Prepack Meats Case
4	12	Jumbo Island Frozen Food
6	12	Island Frozen Food
1	End	Jumbo Island Ice Cream
6	12	Island Ice Cream
1	End	Dairy/Milk Roll-In Case
2	12	Fresh Meat Case
8	12	Produce Case
8	12	Produce Case
1	8	Deli, Clerk Service
2	8	Deli, Clerk Service
1	12	Multi Deck Dairy Case

UNIT COOLERS

QTY (EA.)	LOCATION Room Name
6	Dairy Storage
8	Frozen Food
8	Carcass Storage
2	Meat Holding
3	Met Cutting
3	Meat Wrapping
3	PrePack Meat Storage
4	Produce Storage
1	Candy Storage
1	Deli Storage
2	Produce Processing
2	Behind Milk Roll-In

COMPRESSOR SYSTEMS

SYSTEM NO.	QTY. (EA.)	HP (EACH COMPRESSOR)
1	3	7.5
2	3	5; 10; 25
3	3	5; 10; 25
4	3	2 at10; 15
5	3	2 at 10; 15
6	3	10
7	3	5; 10; 20

CONDENSERS

QTY. (EA.)	TYPE/DESCRIPTION
7	Remote air Cooled Condensers

HEAT RECLAIM COILS

QTY. (EA.)	TYPE/DESCRIPTION
2	Air (Mounted in Air Handling Unit)

ADDITIONAL EXISTING EQUIPMENT

QTY. (EA.)	TYPE/DESCRIPTION
1	RMCS

EXISTING HVAC EOUIPMENT

MARK	QTY.	DESCRIPTION
AHU w/coils	1	1,100 MBH CLG, 760 MBH HTG
AHU w/coils	1	525 MBH CLG, 383 MBH HTG
AHU w/coils	1	147 MBH CLG, 150 MBH HTG
AHU w/coils	1	98 MBH CLG, 107 MBH HTG
AHU w/coils	1	36 MBH CLG, 53 MBH HTG
AHU w/coils	1	16 MBH CLG, 19 MBH HTG
Air Cooled Condensing Unit	1	1,100 MBH
Air Cooled Condensing Unit	1	525 MBH
Air Cooled Condensing Unit	1	147 MBH
Air Cooled Condensing Unit	1	99 MBH
Air Cooled Condensing Unit	1	36 MBH
Air Cooled Condensing Unit	1	16 MBH
Exhaust Fans	11	Fractional hp
Exhaust Fans	5	3 hp
HVAC Controls	1	Pneumatic/Electric
Hot Water Converter	1	2,615 MBH
Unit Heaters	7	134 MBH
Unit Heaters	1	98 MBH
Unit Heaters	6	10 MBH
Unit Heaters	4	29 MBH
Supply Fans	5	2 hp

EXISTING HVAC EOUIPMENT

MARK	QTY.	DESCRIPTION
Computer Room A/C system	1	22 MBH CLG
Condensate Pump	1	2 hp
Hot Water Pump	1	1.5 hp
Hot Water Pump	1	Fractional hp

NEW COMMISSARY STORE EQUIPMENT TO BE MAINTAINED

The contractors shall reference the Mechanical and Refrigeration drawings for all new HVAC and Refrigeration Equipment that shall be maintained under this Contract. The Contractor shall also maintain associated controls, piping, wiring, etc., associated with these major pieces of equipment.

ROOM ENVIRONMENT LIMITS

AREA	COOLING	HEATING
Sales and Checkout	72-75ºF, 52 deg. F. dew point*	68-71ºF, **52 deg. F. dew point
All Other Areas	75 to 78ºF****	68 to 72ºF***

*Set controls at 40 percent RH max. Environment is not deficient until 50 percent is reached.
**If the system has night setback, let temperature fall to a minimum of 60 deg F during hours that the commissary is closed.
***Should the temperature rise above 72 deg F during the winter due to internal load, cooling should not start until the temperature reaches the temperature requirements for summer.
****Excluding delivery, dry storage and mechanical equipment rooms

END OF SECTION

SECTION 23 05 00

COMMON WORK RESULTS FOR HVAC

(Edited from DeCA June 2011 Design Criteria)

1.1 SUMMARY

A. Section Includes:

1. Section includes general requirements for heating, ventilating, air conditioning, and refrigeration.

1.2 QUALITY CONTROL

A. The following publications form a part of this Specification to the extent they are applicable.

1. All work must be performed in accordance with the requirements of current editions of local, county, state and national codes and regulations including the requirements of the latest editions of the following:

a. International Building Code.
b. National Electrical Code.
c. International Plumbing Code.
d. International Mechanical Code.
e. Occupational Safety and Health Act of 1970.
f. For work not specifically listed above, use standards and codes of the National Fire Protection Association.

1.3 REGULATORY REQUIREMENTS

1. All equipment, apparatus and systems shall be rated, tested, fabricated and/or installed in accordance with the applicable industry standard mentioned. The following list will serve to clarify abbreviations that appear in other Sections of this Specification:

a.	AABC	Associated Air Balance Council
b.	ADC	Air Diffusion Council
c.	AGA	American Gas Association
d.	AMCA	Air Moving and Conditioning Association
e.	ARI	Air Conditioning and Refrigeration Institute
f.	ANSI	American National Standards Institute
g.	ASE	Association of Safety Engineers
h.	ASHRAE	American Society of Heating, Refrigerating and Air Conditioning Engineer
i.	ASME	American Society of Mechanical Engineers
j.	AWWA	American Water Works Association
k.	EPA	Environmental Protection Agency
l.	FS	Federal Specifications
m.	IBR	Institute of Boiler and Radiator Manufacturers
n.	IEEE	Institute of Electrical and Electronics Engineers
o.	MCAA	Mechanical Contractors' Association of American
p.	NEMA	National Electrical Manufacturers Association

q.	NFPA	National Fire Protection Association
r.	NSC	National Safety Council
s.	NSF	National Sanitation Foundation
t.	SBI	Steel Boiler Institute Industry
u.	SMACNA	Sheet Metal and Air Conditioning Contractors National Association
v.	UL	Underwriters Laboratories
w.	ASTM	American Society for Testing and Materials
x.	NEBB	National Environmental Balancing Bureau

1.4 FEES AND PERMITS

A. Contractor shall apply and pay for all permits, inspections, reviews, etc. required by the authorities having jurisdiction.

1.5 DEFINITIONS

A. Furnish: The term furnish means supply and deliver to the Project Site, ready for unloading, unpacking, assembly, installation and similar operations.

B. Install: The term install describes operations at the Project Site including the actual unloading, unpacking, assembly, erecting, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.

C. Provide: The term provides means to furnish and install, complete and ready for intended use.

1.6 SHOP DRAWINGS AND SUBMITTALS

A. See Division 01 Section Quality Control for requirements for Shop Drawings and product data.

B. Asbestos-Free Material/Product: Prior to approval of the material/product to be used, the manufacturer/supplier shall furnish the Contracting Officer/Government's Designated Inspector with written certification that the material/product contains no asbestos. This certificate is mandatory before approval will be issued. Submittals furnished without the asbestos-free certification will be returned to the Contractor with no action taken until such certification is provided.

C. See applicable Sections to this Division for items requiring Shop Drawings.

1.7 MATERIALS AND WORKMANSHIP

A. Materials, the style, make or quality of which is specifically designated, shall be as specified.

B. Contractor shall furnish necessary materials in ample quantities and as frequently as required to avoid delay in the progress of the Work, and shall so store them as to prevent interference with other work.

1.8 DEFECTIVE WORK AND MATERIAL

A. All materials or work found to be defective or not in strict conformity with the drawings or different from requirements of the drawings and specifications or defaced or injured through negligence of Contractor or his employees, or through action of fire or weather will be rejected and shall be immediately removed from premises by Contractor and satisfactory materials and work substituted without delay.

B. All defective work or imperfect work shall be corrected immediately on notice from Government's Designated Inspector. No previous inspection or certificate on account shall be held to relieve Contractor from their obligation to furnish sound materials and to perform good and satisfactory work.

1.9 COOPERATION AND COORDINATION

A. Contractor shall confer with other contractors at the site before installing their work to avoid interferences so that maximum head room and clearances may be maintained. In event that interferences develop between work of various contractors, Government's Designated Inspector's decision will be final and no additional compensation will be allowed for changes required.

B. Particular attention shall be paid to situations where recessed equipment, pipes and lights occur, or where the work of several trades occurs together above suspended ceilings, in pipe shafts or in areas where space is limited.

C. All fixtures, equipment, devices, switches, outlets, pumps, etc., shall be positioned to avoid all interferences with and to assure proper coordination with work of all other trades, cases, partitions, wall, floor and ceiling patterns, architectural features, etc. All recessed devices, fixtures, etc., shall be coordinated with all wall, floor and ceiling patterns. Government's Designated Inspector will reconcile conflicts and adjustments where such adjustments are warranted.

D. Arrange for pipe spaces, chases, slots, and openings in building structure during progress of construction, to allow for mechanical installations.

E. Coordinate installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components as they are constructed.

F. Coordinate requirements for access panels and doors for mechanical items requiring access that are concealed behind finished surfaces. Access panels and doors are specified in Division 08 Section Access Doors and Frames.

1.10 PROTECTION OF EQUIPMENT AND SYSTEMS

A. Contractor shall keep all their respective pipe openings closed by means of plugs or caps to prevent entrance of foreign matter during construction and cover all fixtures, equipment, and apparatus as required to protect them against dirt, water, chemical or mechanical damage both before and after installation. Any such fixtures, equipment or apparatus damaged prior to final acceptance of the Work shall be restored to its original condition or replaced by Contractor at no cost to Government.

1.11 DELIVERY, STORAGE AND HANDLING

A. Deliver products to project properly identified with names, model numbers, types, grades, compliance labels, and similar information needed for distinct identifications; adequately packaged and protected to prevent damage during shipment, storage and handling.

B. Store equipment and materials at the site, unless off-site storage is authorized in writing. Protect stored equipment and materials from damage.

C. Coordinate deliveries of mechanical materials and equipment to minimize construction site congestion. Limit each shipment of materials and equipment to the items and quantities needed for the smooth and efficient flow of installations.

1.12 CONTRACT DRAWINGS

A. The layout shown on the Contract Drawings is necessarily diagrammatic but shall be followed as closely as actual construction and as other work will allow. The dimensions of work as shown on the Contract Drawings are not as-built dimensions. No measurements shall be scaled from the drawings and used as definite dimensions for laying out or fitting work in place.

B. The layout of manufactured equipment as shown on the drawings shall be checked and the exact location shall be determined from the dimensions of equipment shop drawings approved by the Government's Designated Inspector.

1.13 MAINTENANCE MANUAL AND OPERATING INSTRUCTIONS

A. Upon completion of the Work, Contractors shall provide the Government's Designated Inspector with three copies of maintenance manual for all equipment furnished and installed under their Work. Manuals shall be in substantial 3-ring binders with project name and number inscribed on face and hinged back. Manual shall include roster of all Government training session attendees. The manual shall, however, first be approved by the Government's Designated Inspector.

B. The manual shall include manufacturer's lubricating and operating instructions and parts list and serial numbers for all operating machinery, including drive information, and motor horsepower, amperage, and voltage readings on all phases, valve chart, sequence of operation, index following the order listed in the specifications, warranties in the name of the Installation, and a list of manufacturers, service firms and subcontractors names and telephone numbers.

C. Training attendance rosters for each training session shall be included in manuals. Roster will identify training subject, date, attendees name, job title, office symbol, grade/rank, and telephone number.

D. All switches, controls, and safety devices shall be clearly and permanently marked with embossed or printed plates as to purpose and operation and shall be tested in the presence of the Government's Designated Inspector to ensure that he understands their function and purpose.

E. Upon completion of the Work, Contractors shall put the systems into service. Contractors shall be entirely responsible for the equipment during all testing operations including the lubricating and turning on and off of such apparatus.

1.14 PROJECT RECORD AND CLOSEOUT DOCUMENTS

A. Refer to the Division 01 Section Closeout Procedures for requirements. The following paragraphs supplement the requirements of Division 01.

B. Mark Drawings to indicate revisions to piping and ductwork, size and location both exterior and interior; including locations of coils, dampers and other control devices, filters, boxes, and similar units requiring periodic maintenance or repair; actual equipment locations, dimensioned for column lines; actual inverts and locations of underground piping; concealed equipment, dimensioned to column lines; mains and branches of piping systems, with valves and control devices located and numbered, concealed unions located, and with items requiring maintenance located (i.e., traps, strainers, expansion compensators, tanks, etc.); Change Orders; concealed control system devices.

C. Mark Specifications to indicate addenda, approved substitutions, change orders, actual equipment and materials used.

1.15 COMMISSIONING

A. All Mechanical, Plumbing, Controls (Division 23 Section Instrumentation and Control Devices for HVAC and Division 23 Section Refrigeration Monitoring and Control Systems (RMCS), and TAB Contractors shall comply with the requirements of Division 01 Section General Commissioning Requirements and Division 23 Section Commissioning of HVAC.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 ACCESSIBILITY

A. Install equipment and materials to provide required access for servicing and maintenance. Coordinate the final location of concealed equipment and devices requiring access with final location of required access panels and doors. Allow ample space for removal of all parts that require replacement or servicing.

B. Extend all grease fittings to an accessible location.

C. Refer to the Division 08 Section Access Doors and Frames.

3.2 MECHANICAL DEMOLITION

A. Refer to Division 01 Section Cutting and Patching for general demolition requirements and procedures.

B. Disconnect, demolish, and remove mechanical systems, equipment, and components indicated to be removed.

1. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.

2. Piping to Be Abandoned in Place: Drain piping and cap or plug piping with same or compatible piping material.
3. Ducts to Be Removed: Remove portion of ducts indicated to be removed and plug remaining ducts with same or compatible ductwork material.
4. Ducts to Be Abandoned in Place: Cap or plug ducts with same or compatible ductwork material.
5. Equipment to Be Removed: Disconnect and cap services and remove equipment.
6. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make equipment operational.
7. Equipment to Be Removed and Salvaged: Disconnect and cap services and remove equipment and deliver to Government.

C. If pipe, insulation, or equipment to remain is damaged in appearance or is unserviceable, remove damaged or unserviceable portions and replace with new products of equal capacity and quality.

3.3 ROUGH-IN

A. Verify final locations for rough-ins with field measurements and with the requirements of the actual equipment to be connected.

B. Refer to equipment Specifications in Divisions 02 through 33 for rough-in requirements.

3.4 HVAC INSTALLATIONS

A. General: sequence, coordinate, and integrate the various elements of mechanical systems, materials, and equipment. Comply with the following requirements:

1. Coordinate mechanical equipment and materials installation with other building components.
2. Verify all dimensions by field measurements.
3. Arrange for chases, slots, and openings in other building components to allow for mechanical installation.
4. Coordinate the installation of required supporting devices and sleeves to be set in poured in place concrete and other structural components, as they are constructed.
5. Sequence, coordinate and integrate installations of mechanical materials and equipment for efficient flow of the Work. Give particular attention to large equipment requiring positioning prior to closing-in the building.
6. Coordinate the cutting and patching of building components to accommodate the installation of mechanical equipment and materials.
7. Where mounting heights are not detailed or dimensioned, install mechanical services and overhead equipment to provide maximum headroom possible.
8. Install mechanical equipment to facilitate maintenance and repair or replacement of equipment components. As much as practical, connect equipment for ease of disconnecting, with minimum of interference with other installations.
9. Coordinate the installation of mechanical materials and equipment above ceiling with suspension system, light fixtures, and other installations.
10. Install access panel or doors where units are concealed behind finished surface. Access panels and doors are specified in Division 08 Section Access Doors and Frames.
11. Install systems, materials, and equipment giving right-of-way priority to systems required to be installed at a specified slope.

12. Coordinate connection of mechanical systems with exterior underground and overhead utilities and services. Comply with requirements of governing regulations, franchised service companies, and controlling agencies. Provide required connection for each service.
13. Install systems, materials, and equipment to conform with approved submittal data, including coordination drawings, to greatest extent possible. Conform to arrangements indicated by the Contract Documents, recognizing that portions of the Work are shown only in diagrammatic form. Where coordination requirements conflict with individual system requirements, refer conflict to the Architect/Engineer.
14. Install systems, materials, and equipment level and plumb, parallel and perpendicular to other building systems and components, where installed expose in finished spaces.

3.5 CUTTING AND PATCHING

A. This Article specifies the cutting and patching of mechanical equipment, components, and materials to include removal and legal disposal of selected materials, components, and equipment.

B. Refer to Division 01 Section Quality Control for general requirements for cutting and patching.

C. Refer to Division 26 for requirements for cutting and patching electrical equipment, components, and materials.

D. Do not endanger or damage installed Work through procedures and processes of cutting and patching.

E. Arrange for repairs required to restore other work, because of damage caused as a result of mechanical installations.

F. No additional compensation will be authorized for cutting and patching Work that is necessitated by ill-timed, defective, or non-conforming installations.

G. Perform cuttings, fittings, and patching of mechanical equipment and materials required to:

1. Uncover Work to provide for installation of ill-timed work.
2. Remove and replace defective work.
3. Remove and replace Work not conforming to requirements of the Contract Documents.
4. Remove samples of installed Work as specified for testing.
5. Upon written instruction from the Government’s Designated Inspector, uncover and restore Work to provide for Government’s Designated Inspector's observation of concealed work.

H. Provide and maintain temporary partitions or dust barriers adequate to prevent the spread of dust and dirt to adjacent areas.

3.6 CLEANING

A. Refer to the Division 01 Section Closeout Procedures for general requirements for final cleaning.

B. Refer to Division 23 Section Testing, Adjusting, and Balancing for HVAC for requirements for cleaning filters, strainers, and mechanical systems prior to final acceptance.

3.7 COMMISSIONING

A. Accomplish commissioning in accordance with the provisions of Division 01 Section General Commissioning Requirements and Division 23 Section Commissioning of HVAC.

END OF SECTION

SECTION 23 05 13

COMMON MOTOR REQUIREMENTS FOR HVAC EQUIPMENT

(Edited from DeCA June 2011 Design Criteria)

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Single phase electric motors, field and factory installed.
2. Three phase electric motors, field and factory installed.

B. Related Sections:

1. Division 01 Section Mechanical, Refrigeration, Food Service Equipment and Electrical Coordination.
2. Division 01 Section Quality Control.
3. Division 01 Section Closeout Procedures.
4. Division 26 Electrical.

1.2 QUALITY CONTROL

A. The following publications form a part of this Specification to the extent they are applicable.

1. Division 01 Section Quality Control.
2. AFBMA 9 - Load Ratings and Fatigue Life for Ball Bearings.
3. AFBMA 11 - Load Ratings and Fatigue Life for Roller Bearings.
4. IEEE 112 - Test Procedure for Polyphase Induction Motors and Generators.
5. NEMA MG 1 - Motors and Generators.
6. NFPA 70 - National Electrical Code.

1.3 SUBMITTALS

A. Product Data for Field-Installed Motors: For each type and size of motor, provide nameplate data and ratings; shipping, installed, and operating weights; mounting arrangements; size, type, and location of winding terminations; conduit entry and ground lug locations; and information on coatings or finishes.

B. Shop Drawings for Field-Installed Motors: Dimensioned Plans, Elevations, Sections, and Details, including required clearances and service space around equipment. Include the following:

1. Each installed unit's type and details.
2. Nameplate legends.
3. Diagrams of power and control wiring. Provide schematic wiring diagram for each type of motor and for each control scheme.

C. Field quality-control test reports.

D. Operation and Maintenance Data: For field-installed motors to be included in operation and maintenance manuals.

1.4 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacture of electric motors for the intended use, and their accessories, with minimum three years documented product development, testing, and manufacturing experience.

1.5 REGULATORY REQUIREMENTS

A. Conform to all applicable electrical and energy codes, NFPA 70.

B. Products Requiring Electrical Connection: Listed and classified by Underwriters' Laboratories, Inc. as suitable for the purpose specified and indicated.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Division 01 Section Environmental Management.

B. Protect motors stored on site from weather and moisture by maintaining factory covers and suitable weather-proof covering. For extended outdoor storage, remove motors from equipment and store separately.

PART 2 - PRODUCTS

2.1 GENERAL CONSTRUCTION AND REQUIREMENTS

A. Motors Less Than 250 Watts, for Intermittent Service: Equipment manufacturer's standard and need not conform to these Specifications.

B. Refer to Schedules on Contract Drawings for required electrical characteristics.

C. Type:

1. Open drip-proof except where specifically noted otherwise.
2. Motors: Design for continuous operation in 104 deg F environment.
3. Design for temperature rise in accordance with NEMA MG 1 limits for insulation class, service factor, and motor enclosure type.
4. Motors with frame sizes 143T and larger: Energy Efficient Type.

D. Explosion-Proof Motors: UL approved and labeled for hazard classification, with over temperature protection.

E. Visible Nameplate: Indicating motor horsepower, voltage, phase, cycles, RPM, full load amps, locked rotor amps, frame size, manufacturer's name and model number, service factor, power factor, efficiency.

F. Wiring Terminations:

1. Provide terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated. Enclose terminal lugs in terminal box sized to NFPA 70, threaded for conduit.
2. For fractional horsepower motors where connection is made directly, provide threaded conduit connection in end frame.

G. Motors shall be quiet running, free of vibration and magnetic hum.

H. All motors shall be designed for the operating conditions and service requirements of the intended service.

I. All motors shall be designated "NEMA Premium Motors."

2.2 SINGLE PHASE POWER - SPLIT PHASE MOTORS

A. Starting Torque: Less than 150 percent of full load torque.

B. Starting Current: Up to seven times full load current.

C. Breakdown Torque: Approximately 200 percent of full load torque.

D. Drip-proof Enclosure: Class A (122 deg F temperature rise) insulation, NEMA Service Factor, prelubricated sleeve or ball bearings.

E. Enclosed Motors: Class A (122deg F temperature rise) insulation, 1.0 Service Factor, prelubricated ball bearings.

2.3 SINGLE PHASE POWER - PERMANENT-SPLIT CAPACITOR MOTORS

A. Starting Torque: Exceeding one fourth of full load torque.

B. Starting Current: Up to six times full load current.

C. Multiple Speed: Through tapped windings.

D. Open Drip-proof or Enclosed Air Over Enclosure: Class A (122 deg F temperature rise) insulation, minimum 1.0 Service Factor, prelubricated sleeve or ball bearings, automatic reset overload protector.

2.4 SINGLE PHASE POWER - CAPACITOR START MOTORS

A. Starting Torque: Three times full load torque.

B. Starting Current: Less than five times full load current.

C. Pull-up Torque: Up to 350 percent of full load torque.

D. Breakdown Torque: Approximately 250 percent of full load torque.

E. Motors: Capacitor in series with starting winding; provide capacitor-start/capacitor-run motors with two capacitors in parallel with run capacitor remaining in circuit at operating speeds.

F. Drip-proof Enclosure: Class A (122 deg F temperature rise) insulation, NEMA Service Factor, prelubricated sleeve or ball bearings.

G. Enclosed Motors: Class A (122 deg F temperature rise) insulation, 1.0 Service Factor, prelubricated ball bearings.

2.5 THREE PHASE POWER - SQUIRREL CAGE MOTORS

A. Starting Torque: Between 1 and 1-1/2 times full load torque.

B. Starting Current: Six times full load current.

C. Power Output, Locked Rotor Torque, Breakdown or Pull Out Torque: NEMA Design B characteristics.

D. Design, Construction, Testing, and Performance: Conform to NEMA MG 1 for Design B motors.

E. Insulation System: NEMA Class B or better.

F. Testing Procedure: In accordance with IEEE 112. Load test motors to determine free from electrical or mechanical defects in compliance with performance data.

G. Motor Frames: NEMA Standard T-Frames of steel, aluminum, or cast iron with end brackets of cast iron or aluminum with steel inserts.

H. Thermistor System (Motor Frame Sizes 254T and Larger): Three PTC thermistors imbedded in motor windings and epoxy encapsulated solid state control relay for wiring into motor starter; refer to Division 26 Section Motor-Control Centers.

I. Bearings: Grease lubricated anti-friction ball bearings with housings equipped with plugged provision for relubrication, rated for minimum AFBMA 9, L-10 life of 20,000 hours. Calculate bearing load with NEMA minimum V-belt pulley with belt centre line at end of NEMA standard shaft extension. Stamp bearing sizes on nameplate.

J. Sound Power Levels: To NEMA MG 1.

K. Part Winding Start: Where indicated, use part of winding to reduce locked rotor starting current to approximately 60 percent of full winding locked rotor current while providing approximately 50 percent of full winding locked rotor torque.

L. Weatherproof Epoxy Sealed Motors: Epoxy seal windings using vacuum and pressure windings with rotor and starter surfaces protected with epoxy enamel; bearings double shielded with waterproof non-washing grease.

M. Nominal Efficiency: As scheduled at full load and rated voltage when tested in accordance with IEEE 112.

N. Nominal Power Factor: As scheduled at full load and rated voltage when tested in accordance with IEEE 112.

2.6 POLYPHASE MOTORS WITH ADDITIONAL REQUIREMENTS

A. Motors Used with Reduced-Inrush Controllers: Match wiring connection requirements for controller with required motor leads. Provide terminals in motor terminal box, suited to control method.

B. Motors Used with Variable Frequency Controllers: Ratings, characteristics, and features coordinated with and approved by controller manufacturer.

1. Designed with critical vibration frequencies outside operating range of controller output.
2. Temperature Rise: Matched to rating for Class B insulation.
3. Insulation: Class H.
4. Thermal Protection: Comply with NEMA MG 1 requirements for thermally protected motors.

C. Rugged-Duty Motors: Totally enclosed, with 1.25 minimum service factor, greased bearings, integral condensate drains, and capped relief vents. Windings insulated with nonhygroscopic material.

1. Finish: Chemical-resistant paint over corrosion-resistant primer.

D. Source Quality Control: Perform the following tests on each motor according to NEMA MG 1:

1. Measure winding resistance.
2. Read no-load current and speed at rated voltage and frequency.
3. Measure locked rotor current at rated frequency.
4. Perform high-potential test.

PART 3 - EXECUTION

3.1 APPLICATION

A. Single Phase Motors for Shaft Mounted Fans Centrifugal Pumps: Split phase type.

B. Single Phase Motors for Shaft Mounted Fans or Blowers: Permanent split capacitor type.

C. Single Phase Motors for Fans, Pumps, Blowers, Air Compressors: Capacitor start type.

D. Single Phase Motors for Fans, Blowers, Pumps: Capacitor start, capacitor run type.

E. Motors Located in Exterior Locations, Wet Air Streams Downstream Draw Thru Cooling Coils, Air Cooled Condensers: Totally enclosed type.

3.2 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install securely on firm foundation. Mount ball bearing motors with shaft in any position.

C. Check line voltage and phase and ensure agreement with nameplate.

3.3 NEMA OPEN MOTOR SERVICE FACTOR SCHEDULE

HP	3600 RPM	1800 RPM	1200 RPM	900 RPM
1/6-1/3	1.35	1.35	1.35	1.35
1/2	1.25	1.25	1.25	1.15
3/4	1.25	1.25	1.15	1.15
1	1.25	1.15	1.15	1.15
1.5-150	1.15	1.15	1.15	1.15

3.4 PERFORMANCE SCHEDULE: THREE PHASE - ENERGY EFFICIENT, OPEN DRIP-PROOF

HP	RPM(Syn)	NEMA Frame	Minimum Percent Efficiency	Minimum Percent Power Factor
1 & Less	1800	143T	85.4	84
1-1/2	1800	145T	86.5	85
2	1800	145T	86.5	85
3	1800	182T	89.5	86
5	1800	184T	89.5	87
7-1/2	1800	213T	91.0	86
10	1800	215T	91.7	85
15	1800	256T	93.0	86
20	1800	256T	93.6	86
25	1800	284T	94.1	86
30	1800	286T	94.1	88

3.5 PERFORMANCE SCHEDULE: THREE PHASE-ENERGY EFFICIENT, TOTALLY ENCLOSED, FAN COOLED

HP	RPM(Syn)	NEMA Frame	Minimum Percent Efficiency	Minimum Percent Power Factor
1 & Less	1800	143T	85.5	84
1-1/2	1800	145T	86.5	85
2	1800	145T	86.5	85
3	1800	182T	89.5	83
5	1800	184T	89.5	83
7-1/2	1800	213T	91.7	85
10	1800	215T	91.7	84
15	1800	256T	92.4	86

20	1800	256T	93.0	86
25	1800	284T	93.6	86
30	1800	286T	93.6	88

END OF SECTION

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SECTION 23 05 29

HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

(Edited from DeCA June 2011 Design Criteria)

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Pipe and equipment hangers and supports.
2. Equipment bases and supports.
3. Sleeves and seals.
4. Flashing and sealing equipment and pipe stacks.

B. Related Sections:

1. Division 01 Section Mechanical, Refrigeration, Food Service Equipment and Electrical Coordination.
2. Division 01 Section Quality Control.
3. Division 01 Section Closeout Procedures.
4. Division 03 Section Cast-In-Place Concrete: Equipment bases.
5. Division 05 Section Metal Fabrications.
6. Division 23 Section Vibration and Seismic Controls for HVAC Piping and Equipment. .
7. Division 26 Electrical.

1.2 QUALITY CONTROL

A. The following publications for a part of this Specification to the extent they are applicable.

1. Division 01 Section Quality Control.
2. ASME B31.1 - Power Piping.
3. ASME B31.2 - Fuel Gas Piping.
4. ASME B31.5 - Refrigeration Piping.
5. ASTM F708 - Design and Installation of Rigid Pipe Hangers.
6. MSS SP58 - Pipe Hangers and Supports - Materials, Design and Manufacturer.
7. MSS SP69 - Pipe Hangers and Supports - Selection and Application.
8. MSS SP89 - Pipe Hangers and Supports - Fabrication and Installation Practices.
9. UL 203 - Pipe Hanger Equipment for Fire Protection Service.

1.3 REGULATORY REQUIREMENTS

A. Conform to applicable code for support of plumbing piping.

B. Supports for Sprinkler Piping: In conformance with NFPA 13.

C. Supports for Standpipes: In conformance with NFPA 14.

PART 2 - PRODUCTS

2.1 ACCESSORIES

A. Hanger Rods: Mild steel threaded both ends, threaded one end, or continuous threaded.

B. Beam clamps shall not be of the set screw type unless they also have a positive means of securing the clamp against horizontal movement, i.e. horizontal j-bolt extending to the opposite flange of the beam or joist or similar device.

C. Hanger loads of up to 300 pounds can be applied to the top or bottom chord of a bar joist using a threaded rod between the chord angles with washer and double nuts above and below the chord within 6 inches of a panel point. Heavier loads require coordination with the joist manufacturer.

2.2 PIPE HANGERS AND SUPPORTS

A. Hydronic Piping - Above and below ambient air temperature.

1. Conform to MSS SP58, MSS SP69, MSS SP89.
2. Hangers for all Pipe Sizes 1/2 to 1-1/2 Inch: Malleable iron or Carbon steel, adjustable swivel, split ring.
3. Hangers for below ambient air temperature Pipe Sizes 2 Inches and Over: Carbon steel, adjustable, clevis.
4. Hangers for above ambient air temperature Pipe Sizes 2 to 4 Inches: Carbon steel, adjustable, clevis.
5. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
6. Wall Support for Pipe Sizes to 3 Inches: Cast iron hook.
7. Wall Support for Pipe Sizes 4 Inches and Over: Welded steel bracket and wrought steel clamp.
8. Wall Support for Hot Pipe Sizes 6 Inches and Over: Welded steel bracket and wrought steel clamp with adjustable steel yoke and cast iron roll.
9. Vertical Support: Steel riser clamp.
10. Floor Support for Cold Pipe: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
11. Floor Support for Hot Pipe Sizes to 4 Inches: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
12. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.

2.3 INSERTS

A. Inserts: Malleable iron case of galvanized steel shell and expander plug for threaded connection with lateral adjustment, top slot for reinforcing rods, lugs for attaching to forms; size inserts to suit threaded hanger rods.

B. Self drilling expansion anchors, powder driven anchors, or other similar devices shall be applied in accord with their manufacturers published ratings and instructions.

2.4 FLASHING

A. Metal Flashing: 26 gage galvanized steel.

B. Metal Counterflashing: 22 gage galvanized steel.

2.5 EQUIPMENT CURBS AND ROOF MOUNTING RAILS

A. Fabrication: Welded 18 gage galvanized steel shell and base, mitered 3 inch cant, variable step to match roof insulation, 1-1/2 inch thick insulation, factory installed wood nailer, 14 inches minimum height, higher where noted. Vary height of curbs and rails to compensate for roof pitch and make top of curb level.

B. For piping penetration curbs, provide a curb cap with tapered neoprene pipe flashing sleeves and stainless steel drawbands.

C. Construct to meet the wind loading criteria and local seismic design criteria on Structural Drawings.

2.6 SLEEVES

A. Sleeves for Pipes Through Non-Fire Rated Floors: 18 gage galvanized steel.

B. Sleeves for Pipes Through Non-Fire Rated Beams, Walls, Footings, and Potentially Wet Floors: Steel pipe or 18 gauge galvanized steel.

C. Sleeves for Pipes Through Fire Rated and Fire Resistive Floors and Walls, and Fire Proofing: Prefabricated fire rated sleeves including seals, AWL listed.

D. Sleeves for pipes for ducts through foundation walls below grade.

E. Sleeves for Round Ductwork: Galvanized steel.

F. Sleeves for Rectangular Ductwork: Galvanized steel.

G. Firestopping Insulation: Glass fiber type, non-combustible.

H. Sealant: Acrylic.

2.7 FLOOR SUPPORTS

A. Concrete housekeeping pads shall comply with Division 03. Concrete pads shall extend 6 inches beyond equipment and be 4 inches high indoors, 6 inches high out of doors on grade.

2.8 EQUIPMENT SUPPORTS

A. Description: Welded, shop- or field-fabricated equipment support made from structural carbon-steel shapes.

2.9 MISCELLANEOUS MATERIALS

A. Structural Steel: ASTM A 36/A 36M, carbon-steel plates, shapes, and bars; black and galvanized.

B. Grout: ASTM C 1107, factory-mixed and -packaged, dry hydraulic-cement, nonshrink and non metallic grout; suitable for interior and exterior applications.

1. Properties: Nonstaining, noncorrosive, and nongaseous.
2. Design Mix: 5000-psi, 28-day compression strength.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions.

1. Support of all equipment, piping, etc. such that it will withstand a force of 5 times its weight in any direction and 1.5 times its weight downward.
2. Do not attach to roof deck, connect to structural members and span between same with structural members, Unistrut, etc.
3. Roof mounted equipment curbs and roof mounting rails shall be installed to withstand the wind and seismic loading required by Division 01 Section Summary of Work.

3.2 INSERTS

A. Provide inserts for placement in concrete formwork.

B. Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.

C. Provide hooked rod to concrete reinforcement section for inserts carrying pipe over 4 inches.

D. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.

E. Where inserts are omitted, drill through concrete slab from below and provide through-bolt with recessed square steel plate and nut recessed into and grouted flush with slab.

3.3 PIPE HANGERS AND SUPPORTS

A. Support horizontal piping as scheduled.

B. Install hangers to provide minimum 1/2 inch space between finished covering and adjacent work.

C. Place hangers within 12 inches of each horizontal elbow.

D. Use hangers with 1-1/2 inch minimum vertical adjustment.

E. Support horizontal cast iron pipe adjacent to each hub, with 5 feet maximum spacing between hangers.

F. Support vertical piping at every floor. Support vertical cast iron pipe at each floor at hub.

G. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers unless seismic zone dictates individual clevis hangers. Verify seismic zone with Division 23 Section Vibration and Seismic Controls for HVAC Piping and Equipment.

H. Support riser piping independently of connected horizontal piping.

I. Provide **copper plated hangers and supports for copper piping**.

J. Design hangers for pipe movement without disengagement of supported pipe.

3.4 EQUIPMENT BASES AND SUPPORTS

A. Provide housekeeping pads of concrete, minimum 4 inches thick and extending 6 inches beyond supported equipment. Refer to Division 03 Section Cast-in-Place Concrete.

B. Provide templates, anchor bolts, and accessories for mounting and anchoring equipment.

C. Construct supports of steel members. Brace and fasten with flanges or plates bolted to structure.

D. Provide rigid anchors for pipes after vibration isolation components are installed.

3.5 FLASHING

A. Provide flexible flashing and metal counterflashing where piping and ductwork penetrate weather or waterproofed walls, floors, and roofs.

B. Provide curbs for mechanical roof installations 14 inches minimum high above roofing surface. Flash and counterflash with sheet metal; seal watertight. Attach counterflashing and mechanical equipment, and lap base flashing on roof curbs. Flatten and solder joints.

C. Adjust storm collars tight to pipe with bolts; calk around top edge. Use storm collars above roof jacks. Screw vertical flange section to face of curb.

3.6 SLEEVES

A. Set sleeves in position in formwork. Provide reinforcing around sleeves.

B. Size sleeves large enough to allow for movement due to expansion and contraction. Provide for continuous insulation wrapping.

C. Extend sleeves through floors one inch above finished floor level. Calk sleeves.

D. Where piping or ductwork penetrates floor, ceiling, or wall, close off space between pipe or duct and adjacent work with stuffing (fire stopping at fire walls) insulation and caulk air tight. Provide close fitting metal collar or escutcheon covers at both sides of penetration.

E. Install chrome plated steel escutcheons at finished surfaces.

3.7 HANGER SPACING

HANGER ROD PIPE SIZE Inches	MAX. HANGER SPACING Feet	DIAMETER Inches
1/2 to 1-1/4	6.5	3/8
1-1/2 to 2	10	3/8
2-1/2 to 3	10	1/2
4 to 6	10	5/8
8 to 12	14	7/8
14 and Over	20	1
PVC (All Sizes)	6	3/8
C.I. Bell and Spigot (or No-Hub) and at Joints	5	As above

3.8 ROOF CURBS

A. Fasten curbs to structure and units to curb in such a way as to withstand design wind loading.

END OF SECTION

SECTION 23 05 53

IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

(Edited from DeCA June 2011 Design Criteria)

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Nameplates.
2. Tags.
3. Stencils.
4. Pipe Markers.

B. Related Sections:

1. Division 01 Section Mechanical, Refrigeration, Food Service Equipment and Electrical Coordination.
2. Division 01 Section Quality Control.
3. Division 01 Section Closeout Procedures.

1.2 QUALITY CONTROL

A. The following publications form a part of this Specification to the extent they are applicable:

1. Division 01 Section Quality Control.
2. ASME A13.1 - Scheme for the Identification of Piping Systems.

PART 2 - PRODUCTS

2.1 NAMEPLATES

A. Description: Laminated three-layer plastic with engraved black letters on light contrasting background color, 4 inch by 1-1/2 inch or larger.

2.2 TAGS

A. Plastic Tags: Laminated three-layer plastic, brass, or aluminum with engraved black letters on light contrasting background color. Tag size minimum 1-1/2 inch.

B. Chart: Typewritten letter size list in anodized aluminum frame.

2.3 PIPE MARKERS Color: Conform to ASME A13.1 .

A. Plastic Pipe Markers: Factory fabricated, flexible, semi-rigid plastic, preformed to fit around pipe or pipe covering; minimum information indicating flow direction arrow and identification of fluid being conveyed.

B. Plastic Tape Pipe Markers: Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings.

2.4 STENCILS

A. Stencils: With clean cut symbols and letters of following size:

1. Up to 2 Inch Outside Diameter of Insulation or Pipe: 1/2-inch high letters.
2. 2-1/2 to 6 Inches Outside Diameter of Insulation or Pipe: 1-inch high letters.
3. Over 6 Inches Outside Diameter of Insulation or Pipe: 1-3/4 inches high letters.
4. Ductwork and Equipment: 1-3/4 inches high letters.

B. Stencil Paint: As specified in Division 09 Section Painting and Coating, semi-gloss enamel, colors and lettering size conforming to ASME A13.1.

2.5 PIPE MARKERS

A. Color and Lettering: Conform to ASME A13.1.

B. Preformed plastic markers.

1. Factory fabricated, flexible, semi-rigid plastic, preformed to fit around pipe or pipe covering. Larger sizes may have maximum sheet size with spring fastener.

C. Plastic Tape Pipe Markers:

1. Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings.

2.6 CEILING TACKS

A. Description: Steel with 3/4 inch diameter color coded head.

B. Color code as follows:

1. Yellow - HVAC equipment.
2. Blue - Heating/cooling valves.

PART 3 - EXECUTION

3.1 PREPARATION

A. Degrease and clean surfaces to receive adhesive for identification materials.

B. Prepare surfaces in accordance with Division 09 Section Painting and Coating for stencil painting.

3.2 INSTALLATION

A. Install identifying devices after completion of covering and painting.

B. Install plastic nameplates with corrosive-resistant mechanical fasteners, or adhesive. Apply with sufficient adhesive to ensure permanent adhesion and seal with clear lacquer.

C. Install tags with corrosion resistant chain.

D. Apply stencil painting in accordance with Division 09 Section Painting and Coating.

E. Install plastic pipe markers in accordance with manufacturer's instructions.

F. Install plastic tape pipe markers complete around pipe in accordance with manufacturer's instructions.

G. Identify air handling units, pumps, heat transfer equipment, tanks, and water treatment devices with plastic nameplates. Small devices, such as in-line pumps, may be identified with tags.

H. Identify control panels and major control components outside panels with plastic nameplates.

I. Identify thermostats relating to terminal boxes or valves with nameplates.

J. Identify valves in main and branch piping with tags.

K. Identify air terminal units and radiator valves with numbered tags.

L. Tag automatic controls, instruments, and relays. Key to control schematic.

M. Identify piping, concealed or exposed, with plastic pipe markers or plastic tape pipe markers. Delete markers on piping 3/4 inch diameter and smaller. Identify service and flow direction. Install in clear view and align with axis of piping. Locate identification not to exceed 50 feet on straight runs including risers and drops, adjacent to each valve and Tee, at each side of penetration of structure or enclosure, and at each obstruction.

N. Identify ductwork with stenciled painting. Identify with air handling unit identification number and area served. Locate identification at air handling unit, at each side of penetration of structure or enclosure, and at each obstruction.

O. Provide ceiling tacks to locate equipment, valves, or dampers above T-bar type panel ceilings. Locate in corner of panel closest to equipment.

END OF SECTION

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SECTION 23 05 93

TESTING, ADJUSTING, AND BALANCING FOR HVAC

(Edited from DeCA June 2011 Design Criteria)

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Testing, adjustment, and balancing of all air and water systems.

B. Related Work:

1. Division 01 Section Mechanical, Refrigeration, Food Service Equipment and Electrical Coordination.
2. Division 01 Section Quality Control.
3. Division 01 Section Closeout Procedures.
4. Division 26 Electrical.

1.2 QUALITY CONTROL

A. The following publications form a part of this specification to the extent they are applicable:

1. Division 01 Section Quality Control.
2. AABC - National Standards for Total System Balance.
3. ADC - Test Code for Grilles, Registers, and Diffusers.
4. ASHRAE 111 - Practices for Measurement, Testing, Adjusting, and Balancing of Building Heating, Ventilation, Air-conditioning, and Refrigeration Systems.
5. NEBB - Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems.
6. SMACNA - HVAC Systems Testing, Adjusting, and Balancing.

B. Procedures:

1. Perform total system balance in accordance with AABC National Standards for Field Measurement and Instrumentation, Total System Balance.
2. Maintain one copy of document on site.
3. Provide certification of calibration of instruments indicating calibration not less than 6 months prior to date of use.

1.3 QUALIFICATIONS

A. Agency: Company specializing in the testing, adjusting, and balancing of systems specified in this Section with minimum three experience certified by either AABC or NEBB.

B. Perform Work under supervision of AABC Certified Test and Balance Engineer or NEBB Certified Testing, Balancing and Adjusting Supervisor.

1.4 SUBMITTALS

A. Submit under provisions of Division 01 Section Quality Control.

B. Qualification Data: Submit, for approval within 30 days after award of Contract, the name of adjusting and balancing agency and evidence that TAB firm and this Project's TAB team members meet the qualifications specified.

C. Field Reports: Indicate deficiencies in systems that would prevent proper testing, adjusting, and balancing of systems and equipment to achieve specified performance.

D. Prior to commencing work, submit report forms or outlines indicating adjusting, balancing, and equipment data required.

E. Submit draft copies of report for review prior to final acceptance of Project. Provide final copies for Government's Designated Representative and for inclusion in operating and maintenance manuals.

1. Provide reports in soft cover, letter size, 3-ring binder manuals, complete with index page and indexing tabs, with cover identification at front and side. Include set of reduced Drawings with air outlets and equipment identified to correspond with data sheets, and indicating thermostat locations.
2. Test Reports: Indicate data on AABC National Standards for Total System Balance forms containing information indicated in Schedules.
3. Submit technician's field notes with the preliminary report.

F. Operation and Maintenance data.

1.5 QUALITY ASSURANCE

A. Perform total system balance in accordance with AABC National Standards for Field Measurement and Instrumentation, Total System Balance.

B. Certification of TAB Reports: Certify TAB field data reports. This certification includes the following:

1. Review field data reports to validate accuracy of data and to prepare certified TAB reports.
2. Certify that TAB team complied with approved TAB plan and the procedures specified and referenced in this Specification.

C. TAB Report Forms: Use standard forms from NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems." Or from SMACNA's "HVAC Systems - Testing, Adjusting, and Balancing."

D. Maintain one copy of document on site.

E. Provide certification of calibration of instruments indicating calibration not less than 6 months prior to date of use.

1.6 QUALIFICATIONS

A. Agency: Company specializing in the testing, adjusting, and balancing of systems specified in this Section with minimum three years documented experience certified by either AABC or NEBB.

B. Perform Work under supervision of NEBB Certified Testing, Balancing and Adjusting Supervisor.

1.7 SEQUENCING

A. Sequence work to commence after leakage and pressure tests on air and water distribution systems have been satisfactorily completed and before Substantial Completion of Project.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that systems are complete and operable before commencing work. Ensure the following conditions:

1. Systems are started and operating in a safe and normal condition.
2. Temperature control systems are installed complete and operable.
3. Proper thermal overload protection is in place for electrical equipment.
4. Final filters are clean and in place. If required, install temporary media in addition to final filters.
5. Duct systems are clean of debris.
6. Fans are rotating correctly.
7. Fire and volume dampers are in place and open.
8. Air coil fins are cleaned and combed.
9. Access doors are closed and duct end caps are in place.
10. Air outlets are installed and connected.
11. Duct system leakage is minimized.
12. Service and balance valves are open.

B. Submit field reports. Report defects and deficiencies noted during performance of services which prevent system balance.

C. Beginning of work means acceptance of existing conditions.

3.2 PREPARATION

A. Provide instruments required for testing, adjusting, and balancing operations. Make instruments available to Quality Control Representative to facilitate spot checks during testing.

B. Provide additional balancing devices as required.

3.3 INSTALLATION TOLERANCES

A. Air Handling Systems: Adjust to within plus or minus 5 percent of design for supply systems and plus or minus 10 percent of design for return and exhaust systems.

B. Air Outlets and Inlets: Adjust total to within plus 10 percent and minus 5 percent of design to space. Adjust outlets and inlets in space to within plus or minus 10 percent of design.

C. Hydronic Systems: Adjust to within plus or minus 10 percent of design.

3.4 ADJUSTING

A. Ensure recorded data represents actual measured or observed conditions.

B. Permanently mark settings of valves, dampers, and other adjustment devices allowing settings to be restored. Set and lock memory stops.

C. After adjustment, take measurements to verify balance has not been disrupted or that such disruption has been rectified.

D. Leave systems in proper working order, replacing belt guards, closing access doors, closing doors to electrical switch boxes, and restoring thermostats to specified settings.

E. At final inspection, recheck random selections of data recorded in report. Recheck points or areas as selected and witnessed by the Government.

F. Check and adjust systems approximately six months after final acceptance and submit report.

3.5 AIR SYSTEM PROCEDURE

A. Adjust air handling and distribution systems to provide required or design supply, return, and exhaust air quantities at site altitude.

B. Make air quantity measurements in ducts by Pitot tube traverse of entire cross sectional area of duct.

C. Measure air quantities at air inlets and outlets.

D. Adjust distribution system to obtain uniform space temperatures free from objectionable drafts and noise.

E. Use volume control devices to regulate air quantities only to extend that adjustments do not create objectionable air motion or sound levels. Effect volume control by duct internal devices such as dampers and splitters.

F. Vary total system air quantities by adjustment of fan speeds. Provide drive changes required. Vary branch air quantities by damper regulation.

G. Provide system schematic with required and actual air quantities recorded at each outlet or inlet.

H. Measure static air pressure conditions on air supply units, including filter and coil pressure drops, and total pressure across the fan. Make allowances for 50 percent loading of filters.

I. Adjust outside air automatic dampers, outside air, return air, and exhaust dampers for design conditions.

J. Measure temperature conditions across outside air, return air, and exhaust dampers to check leakage.

K. Where modulating dampers are provided, take measurements and balance at extreme conditions. Balance variable volume systems at maximum air flow rate, full cooling, and at minimum air flow rate, full heating.

L. Measure building static pressure and adjust supply, return, and exhaust air systems to provide required relationship between each to maintain approximately 0.05 inches positive static pressure near the building entries.

3.6 SCHEDULES

A. Report Forms:

1. Title Page:

a. Name of Testing, Adjusting, and Balancing Agency.
b. Address of Testing, Adjusting, and Balancing Agency.
c. Telephone number of Testing, Adjusting, and Balancing Agency.
d. Project name.
e. Project location.
f. Project Architect.
g. Project Engineer.
h. Project Contractor.
i. Project altitude.
j. Report date.

2. Summary Comments:

a. Design versus final performance.
b. Notable characteristics of system.
c. Description of systems operation sequence.
d. Summary of outdoor and exhaust flows to indicate amount of building pressurization.
e. Nomenclature used throughout report.
f. Test conditions.

3. Instrument List:

a. Instrument.
b. Manufacturer.
c. Model number.
d. Serial number.
e. Range.
f. Calibration date.

4. Electric Motors:

a. Manufacturer.
b. Model/frame.

c. HP/BHP.
d. Phase, voltage, amperage; nameplate, actual, no load.
e. RPM.
f. Service factor.
g. Starter size, rating, heater elements.
h. Sheave make/size/bore.

5. V-Belt Drive:

a. Identification/location.
b. Required driven RPM.
c. Driven sheave, diameter and RPM.
d. Belt, size and quantity.
e. Motor sheave diameter and RPM.
f. Center to center distance, maximum, minimum, and actual.

6. Air Cooled Condenser:

a. Identification/number.
b. Location.
c. Manufacturer.
d. Model number.
e. Serial number.
f. Entering DB air temperature, design and actual.
g. Leaving DB air temperature, design and actual.
h. Number of compressors.

7. Cooling Coil Data:

a. Identification/number.
b. Location.
c. Service.
d. Manufacturer.
e. Air flow, design and actual.
f. Entering air DB temperature, design and actual.
g. Entering air WB temperature, design and actual.
h. Leaving air DB temperature, design and actual.
i. Leaving air WB temperature, design and actual.
j. Saturated suction temperature, design and actual.
k. Air pressure drop, design and actual.

8. Heating Coil Data:

a. Identification/number.
b. Location.
c. Service.
d. Manufacturer.
e. Air flow, design and actual.
f. Entering air temperature, design and actual.
g. Leaving air temperature, design and actual.
h. Air pressure drop, design and actual.

9. Air Moving Equipment:

a. Location.

b. Manufacturer.
c. Model number.
d. Serial number.
e. Arrangement/Class/Discharge.
f. Air flow, specified and actual.
g. Return air flow, specified and actual.
h. Outside air flow, specified and actual.
i. Total static pressure (total external), specified and actual.
j. Inlet pressure.
k. Discharge pressure.
l. Sheave Make/Size/Bore.
m. Number of Belts/Make/Size.
n. Fan RPM.

10. Return Air/Outside Air Data:

a. Identification/location.
b. Design air flow.
c. Actual air flow.
d. Design return air flow.
e. Actual return air flow.
f. Design outside air flow.
g. Actual outside air flow.
h. Return air temperature.
i. Outside air temperature.
j. Required mixed air temperature.
k. Actual mixed air temperature.
l. Design outside/return air ratio.
m. Actual outside/return air ratio.

11. Exhaust Fan Data:

a. Location.
b. Manufacturer.
c. Model number.
d. Serial number.
e. Air flow, specified and actual.
f. Total static pressure (total external), specified and actual.
g. Inlet pressure.
h. Discharge pressure.
i. Sheave Make/Size/Bore.
j. Number of Belts/Make/Size.
k. Fan RPM.

12. Duct Traverse:

a. System zone/branch.
b. Duct size.
c. Area.
d. Design velocity.
e. Design air flow.
f. Test velocity.
g. Test air flow.
h. Duct static pressure.

i. Air temperature.
j. Air correction factor.

13. Duct Leak Test:

a. Description of ductwork under test.
b. Duct design operating pressure.
c. Duct design test static pressure.
d. Duct capacity, air flow.
e. Maximum allowable leakage duct capacity times leak factor.
f. Test apparatus:

1) Blower.
2) Orifice, tube size.
3) Orifice size.
4) Calibrated.

g. Test static pressure.
h. Test orifice differential pressure.
i. Leakage.

14. Air Distribution Test Sheet:

a. Air terminal number.
b. Room number/location.
c. Terminal type.
d. Terminal size.
e. Area factor.
f. Design velocity.
g. Design air flow.
h. Test (final) velocity.
i. Test (final) air flow.
j. Percent of design air flow.

3.7 DEMONSTRATION

A. Repeat up to 2.5 percent of measurements in the presence of the Division 01 Section General Commissioning Requirements team.

END OF SECTION

SECTION 23 07 13

DUCT INSULATION

(Edited from DeCA June 2011 Design Criteria)

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Ductwork insulation.
2. Duct Liner.
3. Jackets.

B. Related Sections:

1. Division 01Section Mechanical, Refrigeration, Food Service Equipment and Electrical Coordination.
2. Division 01 Section Quality Control.
3. Division 01 Section Closeout Procedures.
4. Division 23 Section Metal Ducts.

1.2 QUALITY CONTROL

A. The following publications form a part of this Specification to the extent they are applicable:

1. Division 01 Section Quality Control.
2. ASTM C553 - Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications.
3. ASTM C612 - Standard Specification for Mineral Fiber Block and Board Thermal Insulation.
4. ASTM C921 - Standard Practice for Determining the Properties of Jacketing Materials for Thermal Insulation.
5. ASTM C1071 - Standard Specification for Fibrous Glass Duct Lining Insulation Thermal and Sound Absorbing Material.
6. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
7. ASTM E96 - Standard Test Methods for Water Vapor Transmission of Materials.
8. ASTM E162 - Standard Test Method for Surface Flammability of Materials Using a Radiant Heat Energy Source.
9. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi.
10. NAIMA National Insulation Standards.
11. NFPA 255 - Standard Method of Test of Surface Burning Characteristics of Building Materials.
12. ASTM E119 - Standard Test Methods for fire Test of Building Construction and Materials.
13. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
14. ASTM E136 - Standard test Method for the Behavior of Materials in a Vertical Tube Furnace at 750 deg C (Non-Combustibility Test).

15. ASTM E814 - Standard Test Method for Fire Tests of Through Penetrations Firestops.
16. ASTM C518 - Standard Test Method for Steady – State heat Flux Measurements and Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.
17. ASTM C411 - Standard Test Method for Hot Surface Performance of High Temperature Thermal Insulation.
18. International Code Council: ICC ES – Evaluation Report ER-5899 (FyreWrap 1.5 and MAX 2.0 Duct Insulation).
19. International Code Council: ICC ES – Evaluation Report ER-6644-2 (Fire Containment = Elements of BGuilding Construction Part 2: Kitchen Extract Ducts).
20. ISO 6944-1985 - Fire Resistance of Ventilation Ducts.
21. UL 723 - Surface Burning Characteristics of Building Materials.
22. UL 1479 - Fire Tests of Through Penetrations Firestops.
23. UL 263 - Fire Tests of Building Construction and Materials.
24. UL 1978 (Section 12 & 13) Standard for Safety Grease Ducts.
25. UL YYET - Grease Duct Enclosures, File R14514.
26. UL XHEZ - Through-Penetration Firestop Systems C-AJ-7007, C-AJ-7048.
27. UL 1887 - Standard for Safety Fire Test of Plastic Sprinkler Pipe for Visible Flame and Smoke Characteristics.

1.3 SUBMITTALS

A. Submittals for Review:

1. Division 01 Section Quality Control - Submittals: Procedures for submittals.

2. Product Data: Provide product data for each type of mechanical insulation identifying k-value, thickness, jackets (factory and field applied) and accessories.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Division 01 Section Environmental Management.

B. Deliver materials to site in original factory packaging, labeled with manufacturer's identification, including product density and thickness.

C. Store insulation in original wrapping and protect from weather and construction traffic.

D. Protect insulation against dirt, water, chemical, and mechanical damage.

E. Maintain ambient temperatures and conditions required by manufacturers of adhesives, mastics, and insulation cements.

F. Maintain temperature during and after installation for minimum period of 24 hours.

1.5 QUALIFICATIONS

A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this Section with minimum 5 years experience.

B. Applicator Qualifications: Company specializing in performing the work of this Section with minimum 3 years experience approved by manufacturer.

1.6 REGULATORY REQUIREMENTS

A. Conform to the requirements of:

1. International Mechanical code.
2. NFPA 96.

PART 2 - PRODUCTS

2.1 GLASS FIBER, FLEXIBLE

A. Insulation: ASTM C553; flexible, noncombustible blanket.

1. 'K' Value: ASTM C518, 0.27 at 75 deg F, at compressed thickness.
2. Maximum service temperature: 250 deg F.
3. Maximum moisture absorption: 0.20 percent by volume.

B. Vapor Barrier Jacket:

1. Kraft paper with glass fiber yarn and bonded to aluminized film.
2. Moisture vapor transmission: ASTM E96; 0.02 perm.
3. Secure with pressure sensitive tape.

C. Vapor Barrier Tape:

1. Kraft paper reinforced with glass fiber yarn and bonded to aluminized film, with pressure sensitive rubber based adhesive, UL rated and 25/20 rated.

D. Tie Wire: Soft annealed galvanized steel, 16 gage.

2.2 GLASS FIBER, RIGID

A. Insulation: ASTM C612; rigid, noncombustible blanket.

1. 'K' value: ASTM C518, 0.23 at 75 deg F.
2. Maximum service temperature: 250 deg F.
3. Maximum moisture absorption: 0.20 percent by volume.
4. Density: 3.0 lb/cu ft.

B. Vapor Barrier Jacket:

1. Kraft paper with glass fiber yarn and bonded to aluminized film.
2. Moisture vapor transmission: ASTM E96; 0.04 perm.
3. Secure with pressure sensitive tape.

C. Vapor Barrier Tape:

1. Kraft paper reinforced with glass fiber yarn and bonded to aluminized film, with pressure sensitive rubber based adhesive.

2.3 GLASS FIBER DUCT LINER

A. Insulation: ASTM C1071; flexible or rigid, noncombustible blanket with poly vinyl acetate polymer or acrylic polymer meeting ASTM G21 impregnated surface and edge coat.

1. 'K' Value: ASTM C1071 or ASTM C518, maximum 0.31 at 75 deg F.
2. Maximum Service Temperature: 250 deg F.
3. Maximum Velocity on Coated Air Side: 5,000 fpm.
4. Minimum Noise Reduction Criteria: ASTM C1071 0.45 for 1 inch thickness.

B. Adhesive:

1. Waterproof, ASTM E162 fire-retardant type.

C. Liner Fasteners: Galvanized steel, self-adhesive pad, impact applied or welded with integral press-on head.

D. Vapor Barrier Tape:

1. Kraft paper reinforced with glass fiber yarn and bonded to aluminized film, with pressure sensitive rubber based adhesive.

2.4 CALCIUM SILICATE (CS) BLOCKS - FOR SURFACES 400 DEG. F. AND HIGHER.

A. Molded rigid sections of hydrous calcium silicate rated at 1200 deg F, 15 pcf, 0.6 Btu-in./hr.-sq. ft - deg F at 500 deg F. (ASTM C177), ASTM C533, 160 psi compressive strength.

B. Insulate each item completely.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Division 01 Section Administrative Requirements: Verification of existing conditions before starting work.

B. Verify that ductwork has been tested before applying insulation materials.

C. Verify that surfaces are clean, foreign material removed, and dry.

3.2 INSTALLATION

A. General:

1. Division 01 Section Quality Control: Manufacturer's instructions.
2. Where replacement is indicated, remove existing insulation, allow duct to warm above dew point and dry thoroughly before applying new insulation. Coordinate with the Commissary Officer to schedule work for hours when the Commissary is closed.
3. Install in accordance with NAIMA National Insulation Standards.

4. Supply and return air ductwork - **New and existing where required**:

   a. Provide insulation with vapor barrier jackets.
   b. Continue insulation through walls, sleeves, hangers, and other duct penetrations.
   c. Insulate entire system including fittings, joints, flanges, fire dampers, flexible connections, and expansion joints.
   d. Return and transfer ducts may be rigid round factory preinsulated ducts.

5. Exterior Applications: Provide duct liner in addition to insulation with vapor barrier jacket. Cover with caulked aluminum jacket with seams located on bottom side of horizontal duct section.

B. Installation - Glass Fiber:

1. External Duct Insulation Application:

   a. Secure insulation with vapor barrier with wires and seal jacket joints with vapor barrier adhesive or tape to match jacket. Pin insulation on sides and bottom with adhesive attached pins 18 inches o.c.
   b. Secure insulation without vapor barrier with staples, tape, or wires.
   c. Install without sag on underside of ductwork. Use adhesive or mechanical fasteners where necessary to prevent sagging. Lift ductwork off trapeze hangers and insert spacers.
   d. Seal vapor barrier penetrations by mechanical fasteners with vapor barrier adhesive.
   e. Stop and point insulation around access doors and damper operators to allow operation without disturbing wrapping.

C. Duct And Plenum Liner Application:

1. Adhere insulation with adhesive for 100 percent coverage.
2. Secure insulation with mechanical liner fasteners 18 inches on center.
3. Seal and smooth joints. Seal and coat transverse joints.
4. Seal liner surface penetrations with adhesive.
5. Duct dimensions indicated are net inside dimensions required for air flow. Increase duct size to allow for insulation thickness.

D. Installation Glass Fiber Ductwork Insulation Schedule:

DUCTWORK	THICKNESS Inch
Combustion Air Duct	1.5
Outside Air Intake Ducts	2
Mixed air Plenums	1.5
Ventilation Equipment Casings	Factory Pre-insulated
Supply Ducts	1.5 covering on round, rectangular or flat oval ducts.
Other Ducts and Plenums	As noted on the Drawings.
Rooftop HVAC Units	8 inches - 3 lbs density rigid insulation inside the roof curb as detailed on the Drawings.
Return Air Ducts	1-1/2 inches covering
Transfer Ducts	1 inch liner
Factory Pre-insulated Ducts	None
Diffusers	1-1/2 inches covering on back of diffuser shell

Where duct is in an equipment room or otherwise exposed to view, provide rigid insulation.

**Ceiling spaces above air conditioned spaces which have lay-in ceilings and are sealed against outside air infiltration are considered to be un air conditioned and insulation is required.

**Where existing insulation is damaged as a result of this work, repair to match existing.

E. Installation Calcium Silicate:

1. Calcium silicate: Install in 2 layers, with joints tightly butted and staggered. Secure with No. 16 gauge stainless steel wire on square or rectangular surfaces - 1/2-inch by 0.015 galvanized steel bands on 12 inches maximum centers on cylindrical areas. Where required, provide studs, clips or angles as anchors for wire and bands. Secure insulation with circumferential steel straps.
2. Finish: 1 in. wire mesh with 1/4-inch thick Keene Super-Powerhouse Finishing Cement and fiberglass cloth jacket. Reinforce all corners with corner bead.
3. Taper insulation to nameplates, cleanouts, manholes, etc. Leave nameplates exposed.
4. Insulate kitchen hood exhaust ducts with 2 inches of calcium silicate.

END OF SECTION

SECTION 23 07 19

HVAC PIPING INSULATION

(Edited from DeCA June 2011 Design Criteria)

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Piping insulation.
2. Jackets and accessories.

B. Related Sections:

1. Division 01 Section Mechanical, Refrigeration, Food Service Equipment and Electrical Coordination.
2. Division 01 Section Quality Control.
3. Division 01 Section Closeout Procedures.
4. Division 22 Section Common Work Results for Plumbing.
5. Division 23 Section Identification for HVAC Piping and Equipment.
6. Division 23 Section Refrigerant Piping.

1.2 PERFORMANCE REQUIREMENTS

A. Materials: Flame spread/smoke developed rating of 25/50 or less in accordance with NFPA 255 and UL 723.

B. All materials and insulating values shall comply with the International Energy Conservation Code.

1.3 QUALITY CONTROL

A. The following publications form a part of this specification to the extent they are applicable:

1. Division 01 Section Quality Control.
2. ASTM C177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded Hot Plate Apparatus.
3. ASTM C195 - Standard Specification for Mineral Fiber Thermal Insulating Cement.
4. ASTM C449/C449M - Standard Specification for Mineral Fiber Hydraulic-Setting Thermal Insulating and Finishing Cement.
5. ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.
6. ASTM C533 - Standard Specification for Calcium Silicate Block and Pipe Thermal Insulation.
7. ASTM C534 - Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form.
8. ASTM C547 - Standard Specification for Mineral Fiber Preformed Pipe Insulation.
9. ASTM C552 - Standard Specification for Cellular Glass Thermal Insulation.

10. ASTM C578 - Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation.
11. ASTM C591 - Standard Specification for Unfaced Preformed Rigid Cellular Polyisocyanurate Thermal Insulation.
12. ASTM C610 - Standard Specification for Molded Expanded Perlite Block and Pipe Thermal Insulation.
13. ASTM C795 - Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel.
14. ASTM C921 - Standard Practice for Determining the Properties of Jacketing Materials for Thermal Insulation.
15. ASTM D1056 - Standard Specification for Flexible Cellular Materials - Sponge or Expanded Rubber.
16. ASTM D1667 - Standard Specification for Flexible Cellular Materials--Vinyl Chloride Polymers and Copolymers (Closed-Cell Foam).
17. ASTM D1784 - Standard Specification for Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds.
18. ASTM D2842 - Standard Test Method for Water Absorption of Rigid Cellular Plastics.
19. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
20. ASTM E96 - Standard Test Methods for Water Vapor Transmission of Materials.
21. NAIMA North American Insulation Manufacturer’s Association.
22. NFPA 255 - Standard Method of Test of Surface Burning Characteristics of Building Materials.
23. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials.

1.4 SUBMITTALS

A. Submittals for review:

1. Submit under provisions of Division 01Section Quality Control.
2. Product Data: Provide product data for each type of mechanical insulation identifying k-value, thickness, jackets (factory and field applied) and accessories.

3. Operation and Maintenance Data.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Division 01 Section Environmental Management.

B. Deliver materials to site in original factory packaging, labeled with manufacturer's identification, including product density and thickness.

C. Store insulation in original wrapping and protect from weather and construction traffic.

D. Protect insulation against dirt, water, chemical, and mechanical damage.

E. Maintain ambient temperatures and conditions required by manufacturers of adhesives, mastics, and insulation cements.

F. Maintain temperature during and after installation for minimum period of 24 hours.

1.6 QUALIFICATIONS

A. Applicator: Company specializing in performing the work of this section with minimum three years experience.

PART 2 - PRODUCTS

2.1 GLASS FIBER

A. Insulation:

1. Preformed Pipe Insulation, ASTM C547; rigid molded, noncombustible.
2. 'K' Value: ASTM C177, 0.27 at compressed thickness and 75 deg F.
3. Density: 0.75 lb/cu-ft.
4. Maximum Service Temperature: 850 deg F.

B. Vapor Barrier Jacket:

1. ASTM C921, white kraft paper with glass fiber yarn, bonded to aluminized film.
2. Moisture Vapor Transmission: ASTM E96; 0.02 perm-inches.

C. Fitting Covers:

1. PVC Plastic: Factory-fabricated fitting covers manufactured from 30-mil-thick, high impact, ultra-violet-resistant PVC.

   a. Mastic around fitting to pipe insulation.

2. Jacket: ASTM D1784, One piece molded type fitting covers and sheet material, off-white color.

   a. Minimum service temperature: 0 deg F.
   b. Maximum service temperature: 150 deg F.
   c. Moisture vapor transmission: ASTM E96; 0.002 perm-inches.
   d. Thickness: 10 mil.

3. Connections: Brush on welding adhesive or Pressure sensitive color matching vinyl tape

D. Tie Wire:

1. 16-gauge soft annealed stainless steel with twisted ends on maximum 12 inch centers.

E. Vapor Barrier Lap Adhesive:

1. Compatible with insulation.

F. Fibrous Glass Fabric:

1. Cloth: Untreated; 9 oz/sq yd weight.
2. Blanket: 1.0 lb/cu ft density.

2.2 CELLULAR FOAM

A. Insulation: ASTM C534; flexible, cellular elastomeric, molded or sheet.

1. 'K' ('ksi') Value: ASTM C177 or C518; 0.27 at 75 deg F.
2. Minimum Service Temperature: -40 deg F.
3. Maximum Service Temperature: 220 deg F.
4. Maximum Moisture Absorption: ASTM D1056; 1.0 percent (pipe) by volume, 1.0 percent (sheet) by volume.
5. Moisture Vapor Transmission: ASTM E96; 0.20 perm inches.
6. Maximum Flame Spread: ASTM E84; 25.
7. Maximum Smoke Developed: ASTM E84; 50.
8. Connection: Waterproof vapor barrier adhesive.

B. Elastomeric Foam Adhesive:

1. Air dried, contact adhesive, compatible with insulation.

2.3 WICKING PIPE INSULATION

A. Insulation: ASTM C547 and ASTM C795; rigid molded, noncombustible.

1. 'K' ('Ksi') Value: ASTM C177, 0.24 at 75 deg F.
2. Service Temperature: 35 to 70 deg F pipe temperature.
3. Maximum Moisture Absorption: 0.2 percent by volume.
4. Flame Spread/Smoke Developed: 25/50.
5. Wicking material lining core and extending to the surface of the pipe facing.

B. Jacket:

1. White all serviceable jacket with evaporation holes, cap seal joints and butt strips, no staples.
2. Permeance: 0.4 perms maximum.

C. Premolded Fittings:

1. Insulation shall be "Permawick" by Knauf or equal.

2.4 ADHESIVES

A. Flexible Elastomeric Cellular Insulation Adhesive: Solvent-based, contact adhesive recommended by insulation manufacturer. Comply with MIL-A-24179A, Type II, Class 1.

B. Calcium Silicate Adhesive: Fibrous, sodium-silicate-based adhesive with a service temperature range equal to material being bonded.

2.5 FIELD APPLIED JACKETS

A. Aluminum Jacket: ASTM B 209, 3003 Alloy, H-14 temper, roll stock ready for shop or field cutting and forming to indicated sizes.

1. Finish and Thickness: Smooth finish, 0.016-inchthick for interior applications and 0.020-inch thick for exterior applications.
2. Moisture Barrier for Indoor Applications: 1 milthick, heat-bonded polyethylene and kraft paper.
3. Moisture Barrier for Outdoor Applications: 3 mil thick, heat-bonded polyethylene and kraft paper.
4. Elbows: Preformed 45-degree and 90-degree, short- and long-radius elbows, same material, finish, and thickness as jacket.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that piping has been tested before applying insulation materials.

B. Verify that surfaces are clean, foreign material removed, and dry.

3.2 INSTALLATION

A. General:

1. Install materials in accordance with manufacturer's instructions.
2. On exposed piping, locate insulation and cover seams in least visible locations.
3. Finish insulation at supports, protrusions, and interruptions.
4. For exterior applications, finish insulation with two coats of ultraviolet resistant finish as recommended by the manufacturer.
5. Continue insulation through walls, sleeves, pipe hangers, and other pipe penetrations.
6. Insulate entire system including fittings, valves, unions, flanges, strainers, flexible connections, pump bodies, and expansion joints.
7. Finish at supports, protrusions, and interruptions.
8. Pipe Exposed in Mechanical Equipment Rooms or Finished Spaces Less Than 10 feet Above Finished Floor: Finish with PVC jacket and fitting covers.
9. Install aluminum jacket on piping out of doors.

B. Installation: Glass fiber insulated pipes conveying fluids below ambient temperature:

1. Provide vapor barrier jackets, factory-applied or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure sensitive adhesive. Secure with outward clinch expanding staples and vapor barrier mastic.
2. Insulate fittings, joints, and valves with molded insulation of like material and thickness as adjacent pipe. Finish with glass cloth and vapor barrier adhesive or PVC fitting covers.

C. Installation: Hot piping conveying fluids 140 deg F or less, insulate flanges and unions at equipment completely. Bevel and seal ends of insulation.

1. For hot piping conveying fluids over 140 deg F, insulate flanges and unions at equipment.
2. Glass fiber insulated pipes conveying fluids above ambient temperature:

   a. Provide standard jackets, with or without vapor barrier, factory-applied or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure sensitive adhesive. Secure with outward clinch expanding staples.

b. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe. Finish with glass cloth and adhesive or PVC fitting covers.

D. Cellular Foam Insulation:

1. All longitudinal and butt joints shall be fully glued and sealed.

E. Installation: Wicking pipe insulation:

1. Install in accordance with NAIMA National Insulation Standards and Knauf installation instructions.
2. Where insulation is indicated to be replaced, remove existing insulation. Allow piping to warm to above the dew point and to dry thoroughly before applying new insulation. Coordinate with the Commissary Officer to schedule work for times when the Commissary is closed.
3. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe. Finish with PVC fitting covers. Install wicking material as directed by manufacturer.
4. Continue insulation through walls, sleeves, pipe hangers, and other pipe penetrations. Finish at supports, protrusions, and interruptions. At fire separations, refer to Division 07 Section Firestopping.
5. Install jacket with evaporation holes aligned with wicking material at the bottom of the pipe.

F. Inserts and Shields:

1. Application: Piping 2 diameter or larger.

a. Shields: Galvanized steel between pipe hangers or pipe hanger rolls and inserts.
b. Insert location: Between support shield and piping and under the finish jacket.
c. Insert configuration: Minimum 6 inches long, of same thickness and contour as adjoining insulation; may be factory fabricated.
d. Insert material: Hydrous calcium silicate insulation or other heavy density insulating material suitable for the planned temperature range.

3.3 TOLERANCE

A. Substituted insulation materials shall provide thermal resistance within 10 percent at normal conditions, as materials indicated.

3.4 CELLULAR FOAM INSULATION SCHEDULE

PIPING SYSTEMS	PIPE SIZE Inch	THICKNESS Inch
A. Air Conditioning Refrigeration Piping:		
Above 40 deg F:	To 2 inch Larger	3/4 inch 1 inch
Below 40 deg F:	To 1 inch Larger	1 inch 1.5 inch

Condensate Inside Buildings	All	3/4 inch

3.5 EXTERIOR PIPE INSULATION

A. Insulation installed outdoors shall be provided with an aluminum jacket with lock seam longitudinal joint and stainless steel "Bandit" straps for butted joints as required for a water-tight installation.

3.6 PRODUCT REFRIGERATION SYSTEM

A. See Division 23 Section Product Refrigeration Systems.

END OF SECTION

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SECTION 23 08 00

COMMISSIONING OF HVAC

(Edited from DeCA June 2011 Design Criteria)

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Division 23 responsibilities in the commissioning process.
2. Commissioning HVAC systems.
3. Commissioning building HVAC systems automation controls.
4. Commissioning plumbing systems.
5. Commissioning fire suppression systems.
6. Commissioning refrigeration and RMCS.
7. Commissioning Testing, Adjusting and Balancing (TAB).

B. Related Sections:

1. Division 01 Section General Commissioning Requirements.

1.2 DEFINITIONS

A. CA: Commissioning Agent.

B. CO: Contracting Officer.

C. GC: Contractor; General Contractor, not a Subcontractor.

D. O&M: Operations and Maintenance.

E. QC: Contractor's Quality Control Manager.

F. TI: Technical Inspector.

1.3 DESCRIPTION

A. This Section describes commissioning requirements applicable to commissioned items and systems specified in Division 23 to ensure that all systems are operating in a manner consistent with the Contract Documents.

B. Conform to commissioning requirements and the commissioning plan.

1.4 RESPONSIBILITIES

A. Mechanical, Controls and TAB Contractors: The commissioning responsibilities applicable to each of the Mechanical, Controls and TAB Contractors of Division 23 are as follows (all references apply to commissioned equipment only):

1. Construction and Acceptance Phases:

a. Include the cost of commissioning in the contract price.
b. In each purchase order or subcontract written, include requirements for submittal data, commissioning documentation, O&M data and training.
c. Conduct a commissioning scoping meeting and other meetings necessary to facilitate the Commissioning process.
d. Provide requested documentation to the TI, developed for functional testing procedures.
e. Provide functional performance test procedures. Subs shall review test procedures to ensure feasibility, safety and equipment protection and provide necessary written alarm limits to be used during the tests.
f. Develop a full start-up and initial checkout plan using manufacturer's start-up procedures and the prefunctional checklists for all commissioned equipment. Submit to QC for review prior to startup. TI will verify plan for compliance. Refer to Division 01 Section General Commissioning Requirements for further details related to start-up.
g. During the startup and initial checkout process, execute the mechanical-related portions of the prefunctional checklists for all commissioned equipment.
h. Perform and clearly document all completed startup and system operational checkout procedures, providing a copy to the QC and TI.
i. Correct system deficiencies before functional testing. Air and water TAB shall be completed with discrepancies and problems remedied before functional testing of the respective air- or water-related systems.
j. Provide skilled technicians to execute starting of equipment and to execute the functional performance tests. Ensure that they are available and present during the agreed upon schedules and for sufficient duration to complete the necessary tests, adjustments and problem-solving.
k. Assist the CA and TI in interpreting the monitoring data, as necessary.
l. Correct deficiencies (differences between specified and observed performance) as interpreted by the CA, TI and A/E and retest the equipment.
m. Prepare O&M manuals according to the Contract Documents, including clarifying and updating the original sequences of operation to as-built conditions.
n. During construction, maintain as-built red-line Drawings for all Drawings and final CAD as-builts for contractor-generated coordination Drawings. Update after completion of commissioning (excluding deferred testing).
o. Coordinate with equipment manufacturers to determine specific requirements to maintain the validity of the warranty.

2. Operation Manuals shall include:

a. A table of all setpoints and implications when changing them.
b. Schedules.
c. Instructions for operation of each piece of equipment for emergencies.
d. Seasonal adjustment.
e. Startup and shutdown.
f. Instructions for energy savings operations and descriptions of the energy savings strategies in the facility (from O&M Manuals).
g. Recommendations for recommissioning frequency by equipment type.

h. Energy tracking recommendations.
i. Recommended standard trend logs with a brief description of what to look for in them.

3. Warranty Period:

a. Execute seasonal or deferred functional performance testing, witnessed by the CA, according to the specifications.
b. Correct deficiencies and make necessary adjustments to O&M manuals and As-built Drawings for applicable issues identified in any seasonal testing.

B. Mechanical Contractor: The responsibilities of the HVAC Mechanical Contractor, during construction and acceptance phases in addition to those listed in Paragraph A, above, are:

1. Commission the mechanical systems listed in Division 01 Section General Commissioning Requirements and the Commissioning Plan.
2. Provide submittals as required by A/E and those listed on the pre-functional test sheets.
3. Provide startup for all HVAC equipment, except for the building automation control system. Clearly document all completed startup and system operational checkout procedures, providing a copy to the CA.
4. Provide all test equipment necessary to fulfill specified testing requirements.
5. Assist and cooperate with the TAB Contractor and CA by:

a. Putting all HVAC equipment and systems into operation and continuing the operation during each working day of TAB and commissioning, as required.
b. Including cost of sheaves and belts that may be required by TAB.
c. Providing test holes in ducts and plenums where directed by TAB to allow air measurements and air balancing. Providing an approved plug.
d. Providing temperature and pressure taps according to the Construction Documents for TAB and commissioning testing.

6. Install a P/T plug at each water and steam sensor which is an input point to the control system.
7. List and clearly identify on the As-built Drawings the locations of all air-flow stations.
8. Prepare a preliminary schedule for Division 23 pipe and duct system testing, flushing and cleaning, equipment start-up and TAB start and completion for use by the CA. Update the schedule as appropriate.
9. Notify the GC when pipe and duct system testing, flushing, cleaning, startup of each piece of equipment and TAB will occur. Be responsible to notify the GC ahead of time, when commissioning activities not yet performed or not yet scheduled will delay construction. Be proactive in seeing that commissioning processes are executed and that the GCR has the scheduling information needed to efficiently execute the commissioning process.
10. Refer to Division 01 Section General Commissioning Requirements for specific details on non-conformance issues relating to prefunctional checklists and tests and for issues relating to functional performance tests.
11. The training shall consist of a review of the O&M manuals and hands-on training. Hands-on training shall include start-up, operation in all modes possible, including manual, shut-down and any emergency procedures and preventative maintenance for all pieces of equipment. The Mechanical Contractor shall fully explain and demonstrate the operation, function and overrides of any local packages controls, not controlled by the central control system. Training shall occur after functional testing is complete, unless approved otherwise by the Contracting Officer.

C. Controls Contractor: The commissioning responsibilities of the Controls Contractor, during construction and acceptance phases in addition to those listed in Paragraph A, above, are:

1. Sequences of Operation Submittals: The Controls Contractor's submittals of Control Drawings shall include complete detailed sequences of operation for each piece of equipment, regardless of the completeness and clarity of the sequences in the specifications. They shall include:

   a. An overview narrative of the system (1 or 2 paragraphs) generally describing its purpose, components and function.
   b. All interactions and interlocks with other systems.
   c. Detailed delineation of control between any packaged controls and the building automation system, listing what points the BAS monitors only and what BAS points are control points and are adjustable.
   d. Written sequences of control for packaged controlled equipment. (Equipment manufacturers' stock sequences may be included, but will generally require additional narrative).
   e. Start-up sequences.
   f. Warm-up mode sequences.
   g. Normal operating mode sequences.
   h. Unoccupied mode sequences.
   i. Shutdown sequences.
   j. Capacity control sequences and equipment staging.
   k. Temperature and pressure control: setbacks, setups, resets, etc.
   l. Detailed sequences for all control strategies, e.g., economizer control, optimum start/stop, staging, optimization, demand limiting, etc.
   m. Effects of power or equipment failure with all standby component functions.
   n. Sequences for all alarms and emergency shut downs.
   o. Seasonal operational differences and recommendations.
   p. Initial and recommended values for all adjustable settings, setpoints and parameters that are typically set or adjusted by operating staff; and any other control settings or fixed values, delays, etc. that will be useful during testing and operating the equipment.
   q. Schedules, if known.
   r. To facilitate referencing in testing procedures, all sequences shall be written in small statements, each with a number for reference. For a given system, numbers shall not repeat for different sequence sections, unless the sections are numbered.

2. Control Drawings Submittal:

   a. The Control Drawings shall have a key to all abbreviations.
   b. The Control Drawings shall contain graphic schematic depictions of the systems and each component.
   c. The schematics shall include the system and component layout of any equipment that the control system monitors, enables or controls, even if the equipment is primarily controlled by packaged or integral controls.
   d. Provide a full points list with at least the following included for each point:

      1) Controlled system.
      2) Point abbreviation.
      3) Point description.
      4) Display unit.
      5) Control point or setpoint (Yes / No).
      6) Monitoring point (Yes / No).
      7) Intermediate point (Yes / No).

8) Calculated point (Yes / No).
9) Key:

a) Point description: DB temp, airflow, etc.
b) Control or setpoint: Point that controls equipment and can have its setpoint changed (OSA, SAT, etc.).
c) Intermediate point: point whose value is used to make a calculation which then controls equipment (space temperatures that are averaged to a virtual point to control reset).
d) Monitoring point: point that does not control or contribute to the control of equipment, but is used for operation, maintenance, or performance verification.
e) Calculated point: "virtual" point generated from calculations of other point values.
f) The Controls Contractor shall keep the CA informed of all changes to this list during programming and setup.

3. An updated as-built version of the Control Drawings and sequences of operation shall be included in the final controls O&M manual submittal.
4. Assist and cooperate with the TAB Contractor in the following manner:

a. Meet with the TAB Contractor prior to beginning TAB and review the TAB plan to determine the capabilities of the control system toward completing TAB. Provide the TAB Contractor any unique instruments needed for setting terminal unit boxes and instruct TAB in their use (handheld control system interface for use around the building during TAB, etc.).
b. For a given area, have all required prefunctional checklists, calibrations, startup and selected functional tests of the system completed prior to TAB.
c. Provide a qualified technician to operate the controls to assist the TAB Contractor in performing TAB, or provide sufficient training for TAB to operate the system without assistance.

5. Assist and cooperate with the CA in the following manner:

a. Using a skilled technician who is familiar with the installed systems in this building, execute the functional testing of the controls system. Assist in the functional testing of all equipment. Provide two-way radios during the testing.
b. Execute all control system trend logs.

6. The Controls Contractor shall prepare a written plan indicating in a step-by-step manner, the procedures that will be followed to test, checkout and adjust the control system prior to functional performance testing. At minimum, the plan shall include for each type of equipment controlled by the automatic controls:

a. System name.
b. List of devices.
c. Step-by-step procedures for testing each controller after installation, including:

1) Process of verifying proper hardware and wiring installation.
2) Process of downloading programs to local controllers and verifying that they are addressed correctly.
3) Process of performing operational checks of each controlled component.
4) Plan and process for calibrating valve and damper actuators and all sensors.

5) A description of the expected field adjustments for transmitters, controllers and control actuators should control responses fall outside of expected values.

d. A copy of the log and field checkout sheets that will document the process. This log must include a place for initial and final read values during calibration of each point and clearly indicate when a sensor or controller has "passed" and is operating within the contract parameters.
e. A description of the instrumentation required for testing.
f. Indicate what tests on what systems should be completed prior to TAB using the control system for TAB work. Coordinate with the CA and TAB Contractor for this determination.

7. Provide a signed and dated certification to the GC upon completion of the checkout of each controlled device, equipment and system prior to functional testing for each piece of equipment or system, that all system programming is complete as to all respects of the Contract Documents, except functional testing requirements.
8. Beyond the control points necessary to execute all documented control sequences, provide monitoring, control and virtual points.
9. List and clearly identify on the As-built duct and Piping Drawings the locations of all monitoring and control sensors.
10. Provide all test equipment necessary to fulfill specified testing requirements.

D. TAB Contractor: The duties of the TAB Contractor, in addition to those listed in Paragraph A, above, are:

1. Submit the outline of the TAB plan and approach for each system and component to the CA, CO, GC and the Controls Contractor six weeks prior to starting the TAB. This plan shall be developed after the TAB has met with the CC and become familiar with the control system.
2. The submitted plan shall include:

a. Certification that the TAB Contractor has reviewed the Construction Documents and the systems with the design engineers and contractors to sufficiently understand the design intent for each system.
b. An explanation of the intended use of the building control system. The Controls Contractor shall comment on feasibility of the plan.
c. All field checkout sheets and logs to be used that list each piece of equipment to be tested, adjusted and balanced with the data cells to be gathered for each.
d. Discussion of what notations and markings will be made on the Duct and Piping Drawings during the process.
e. Final test report forms to be used.
f. Detailed step-by-step procedures for TAB work for each system and issue: terminal flow calibration (for each terminal type), diffuser proportioning, branch / submain proportioning, total flow calculations, rechecking, diversity issues, expected problems and solutions, etc. Criteria for using air flow straighteners or relocating flow stations and sensors shall be discussed. Provide the analogous explanations for the waterside.
g. List of all airflow, water flow, sound level, system capacity and efficiency measurements to be performed and a description of specific test procedures, parameters, formulas to be used.
h. Details of how total flow will be determined (Air: sum of terminal flows via BAS calibrated readings or via hood readings of all terminals, supply (SA) and return air (RA) pitot traverse, SA or RA flow stations. Water: pump curves, circuit setter, flow station, ultrasonic, etc.).

i. The identification and types of measurement instruments to be used and their most recent calibration date.
j. Specific procedures that will ensure that both air and water side are operating at the lowest possible pressures and provide methods to verify this.
k. Confirmation that TAB understands the outside air ventilation criteria under all conditions.
l. Details of whether and how minimum outside air cfm will be verified and set, and for what level (total building, zone, etc.).
m. Details of how building static and exhaust fan / relief damper capacity will be checked.
n. Proposed selection points for sound measurements and sound measurement methods.
o. Details of methods for making any specified coil or other system plant capacity measurements.
p. Details of any TAB work to be done in phases (by floor, etc.), or of areas to be built out later.
q. Details regarding specified deferred or seasonal TAB work.
r. Details of any specified false loading of systems to complete TAB work.
s. Details of all exhaust fan balancing and capacity verifications, including any required room pressure differentials.
t. Details of any required interstitial cavity differential pressure measurements and calculations.
u. Plan for hand-written field technician logs of discrepancies, deficient or uncompleted work by others, contract interpretation requests and lists of completed tests (scope and frequency).
v. Plan for formal progress reports (scope and frequency).
w. Plan for formal deficiency reports (scope, frequency and distribution).

3. The TAB field technicians shall keep a running log of events and issues. Submit hand-written reports of discrepancies, deficient or uncompleted work by others, contract interpretation requests and lists of completed tests to the CA, GC and CO at least twice a week.
4. Communicate in writing to the Controls Contractor all setpoint and parameter changes made or problems and discrepancies identified during TAB which affect the control system setup and operation.
5. Provide a draft copy of the TAB report to the CA within two weeks of completion. The report shall contain a full explanation of the methodology, assumptions and the results in a clear format with designations of all uncommon abbreviations and column headings. The report should follow the latest and most rigorous reporting recommendations by AABC, NEBB or ASHRAE Standard 111.
6. Provide the CA with any updates as a result of A/E review.
7. Provide all test equipment necessary to fulfill specified testing requirements.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 STARTUP

A. The Mechanical and Controls Contractors shall follow the start-up and initial checkout procedures listed in the Responsibilities list in this Section and in Division 01 Section General Commissioning Requirements. Division 23 Sections require start-up and complete systems and

sub-systems that are fully functional, meeting the design objectives of the Contract Documents. The commissioning procedures and functional testing do not relieve or lessen this responsibility or shift that responsibility partially to the commissioning agent, technical inspector or Government.

B. Functional testing is intended to begin upon completion of a system. Functional testing may proceed prior to the completion of systems or sub-systems at the discretion of the CO. Beginning system testing before full completion does not relieve the Contractor from fully completing the system, including all prefunctional checklists as soon as possible.

3.2 OPERATION AND MAINTENANCE (O&M) MANUALS

A. The following O&M manual requirements do not replace O&M manual documentation requirements elsewhere in these Specifications.

B. Division 23 Contractors shall compile and prepare documentation for all commissioned systems covered in Division 23 and deliver this documentation to the GC for inclusion in the O&M manuals prior to the training of Government personnel.

C. Special Control System O&M Manual Requirements: In addition to documentation that may be specified elsewhere, the Controls Contractor shall compile and organize at a minimum the following data on the control system in labeled 3-ring binders with indexed tabs.

1. Three copies of the controls training manuals in a separate manual from the O&M manuals.
2. Operation and Maintenance Manuals containing:

   a. Specific instructions on how to perform and apply all functions, features, modes, etc. mentioned in the controls training sections of this specification and other features of this system. These instructions shall be step-by-step. Indexes and clear tables of contents shall be included. The detailed technical manual for programming and customizing control loops and algorithms shall be included.
   b. Full as-built set of Control Drawings.
   c. Full as-built sequence of operations for each piece of equipment.
   d. Full points list: A listing of all rooms shall be provided with the following information for each room:

      1) Floor.
      2) Room number.
      3) Room name.
      4) Air handler unit ID.
      5) Reference Drawing number.
      6) Air terminal unit tag ID.
      7) Heating and/or cooling valve tag ID.
      8) Minimum cfm.
      9) Maximum cfm.

   e. Full print out of all schedules and set points after testing and acceptance of the system.
   f. Full as-built print out of software program.
   g. Electronic copy on disk of the entire program for this facility.
   h. Marking of all system sensors and thermostats on the as-built floor plan and Mechanical Drawings with their control system designations.

i. Maintenance instructions, including sensor calibration requirements and methods by sensor type, etc.
j. Control equipment component submittals, parts lists, etc.
k. Warranty requirements.
l. Copies of all checkout tests, other than commissioning tests, and calibrations performed by the Contractor.

3. The manual shall be organized and subdivided with permanently labeled tabs for each of the following data in the given order:

a. Sequences of operation.
b. Control Drawings.
c. Points lists.
d. Controller / module data.
e. Thermostats and timers.
f. Sensors and DP switches.
g. Valves and valve actuators.
h. Dampers and damper actuators.
i. Program setups (software program printouts).

4. Field checkout sheets and trend logs should be provided to the GC for inclusion in the on-site Commissioning filing system.

D. Special TAB Documentation Requirements: The TAB Contractor shall compile and submit the following with other documentation that may be specified elsewhere in the Specifications.

1. The TAB Contractor shall mark on the Drawings where all traverse and other critical measurements were taken and cross reference the location in the TAB report.

3.3 TRAINING OF GOVERNMENT PERSONNEL

A. The GC shall be responsible for training coordination and scheduling and ultimately to ensure that training is completed.

B. The QC shall be responsible for reviewing the content and adequacy of the training of Government personnel for commissioned equipment or systems. TI will verify compliance.

C. Mechanical and: The Mechanical and Plumbing Contractors shall have the following training responsibilities for their respective commissioned systems:

1. Provide the TI with a training plan four weeks before the planned training.
2. Provide designated Government personnel with comprehensive orientation and training in the understanding of the systems and the operation and maintenance of each piece of commissioned equipment.
3. Training shall start with classroom sessions followed by hands-on training on each piece of equipment.
4. During any demonstration, should the system fail to perform in accordance with the requirements of the O&M manual or sequence of operations, the system shall be repaired or adjusted as necessary and the demonstration repeated.
5. The appropriate trade or manufacturer's representative shall provide the instructions on each major piece of equipment. This person may be the start-up technician for the piece of equipment, the Installing Contractor or manufacturer's representative. Practical building operating expertise as well as in-depth knowledge of all modes of operation of

the specific piece of equipment is required. More than one party may be required to execute the training.

6. The Controls Contractor shall attend sessions other than the controls training, as requested, to discuss the interaction of the controls system as it relates to the equipment being discussed.
7. The training sessions shall follow the outline in the Table of Contents of the operation and maintenance manual and illustrate whenever possible the use of the O&M manuals for reference.
8. Training shall include:

    a. Use of the printed installation, operation and maintenance instruction material included in the O&M manuals.
    b. A review of the written O&M instructions emphasizing safe and proper operating requirements, preventative maintenance, special tools needed and spare parts inventory suggestions. The training shall include start-up, operation in all modes possible, shut-down, seasonal changeover and any emergency procedures.
    c. Discussion of relevant health and safety issues and concerns.
    d. Discussion of warranties and guarantees.
    e. Common troubleshooting problems and solutions.
    f. Explanation of information included in the O&M manuals.
    g. Discussion of any peculiarities of equipment installation or operation.
    h. Classroom sessions shall include the use of overhead projections, slides, video/audio-taped material as might be appropriate.

9. Hands-on training shall include start-up, operation in all modes possible, including manual, shut-down and any emergency procedures and preventative maintenance for all pieces of equipment.
10. Fully explain and demonstrate the operation, function and overrides of any local packaged controls, not controlled by the central control system.
11. Training shall occur after functional testing is complete, unless approved otherwise by the Contracting Officer.
12. Minimum Duration of Training: In addition to training hours included in individual Division 23 Sections, provide training on each system according to the following schedule:

SYSTEM	HOURS
	8
	24
Air Handling Supply and Exhaust Systems	24

D. Controls Contractor: The Controls Contractor shall have the following training responsibilities:

1. Provide the CA with a training plan four weeks before the planned training.
2. The Controls Contractor shall provide designated Government personnel training on the control system in this facility. The intent is to clearly and completely instruct the Government on all the capabilities of the control system.
3. Training manuals: The standard operating manual for the system and any special training manuals shall be provided for each trainee. In addition, copies of the system technical manual shall be demonstrated during training. Manuals shall include detailed description of the subject matter for each session. The manuals shall cover all control sequences and have a definitions section that fully describes all relevant words used in the manuals and in all software displays. Copies of audiovisuals shall be delivered to the Government.
4. The training sessions shall be tailored to the needs and skill-level of the trainees.
5. The trainers shall be knowledgeable on the system and its use in buildings.

6. During any demonstration, should the system fail to perform in accordance with the requirements of the O&M manual or sequence of operations, the system shall be repaired or adjusted as necessary and the demonstration repeated.
7. The Controls Contractor shall attend sessions other than the controls training, as requested, to discuss the interaction of the controls system as it relates to the equipment being discussed.
8. Provide three training sessions structured as follows:

   a. Training I: Control System. The first training shall consist of 8 hours of actual training. This training may be held on-site or in the supplier's facility. If held off-site, the training may occur prior to final completion of the system installation. Upon completion, each student, using appropriate documentation, should be able to perform elementary operations and describe general hardware architecture and functionality of the system.
   b. Training II: Building Systems. The second session shall be held on-site for a period of 24 hours of actual hands-on training after the completion of system commissioning. The session shall include instruction on:

      1) Specific hardware configuration of installed systems in this building and specific instruction for operating the installed system, including HVAC systems, lighting controls and any interface with security and communication systems.
      2) Security levels, alarms, system start-up, shut-down, power outage and restart routines, changing setpoints and alarms and other typical changed parameters, overrides, freeze protection, manual operation of equipment, optional control strategies that can be considered, energy savings strategies and set points that if changed will adversely affect energy consumption, energy accounting, procedures for obtaining vendor assistance, etc.
      3) All trending and monitoring features (values, change of state, totalization, etc.), including setting up, executing, downloading, viewing both tabular and graphically and printing trends. Trainees shall actually set-up trends in the presence of the trainer.
      4) Every screen shall be completely discussed, allowing time for questions.
      5) Use of keypad or plug-in laptop computer at the zone level.
      6) Use of remote access to the system via phone lines or networks.
      7) Setting up and changing an air terminal unit controller.
      8) Graphics generation
      9) Point database entry and modifications
      10) Understanding DDC field panel operating programming (when applicable)

   c. Training III: The third training will be conducted on-site six months after occupancy and consist of 16 hours of training. The session shall be structured to address specific topics that trainees need to discuss and to answer questions concerning operation of the system.

E. The TAB Contractor shall have the following training responsibilities:

1. TAB shall meet for 8 hours with facility staff after completion of TAB and instruct them on the following:

   a. Go over the final TAB report, explaining the layout and meanings of each data type.
   b. Discuss any outstanding deficient items in control, ducting or design that may affect the proper delivery of air or water.

c. Identify and discuss any terminal units, duct runs, diffusers, coils, fans and pumps that are close to or are not meeting their design capacity.
d. Discuss any temporary settings and steps to finalize them for any areas that are not finished.
e. Other salient information that may be useful for facility operations, relative to TAB.

END OF SECTION

SECTION 23 09 13

INSTRUMENTATION AND CONTROL DEVICES FOR HVAC

(Edited from DeCA June 2011 Design Criteria)

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Thermostats.
2. Control valves.
3. Dampers.
4. Flow switch.
5. Miscellaneous accessories.

B. Related Sections:

1. Division 01 Section Mechanical, Refrigeration, Food Service Equipment and Electrical Coordination.
2. Division 01 Section Quality Control.
3. Division 01 Section Closeout Procedures.
4. Division 23 Section Fuel-Fired Heaters.
5. Division 23 Section Split-System Air Conditioners.
6. Division 23 Section HVAC Power Ventilators.
7. Division 23 Section Metal Ducts.
8. Division 23 Section Refrigeration Monitoring and Control Systems (RMCS).
9. Division 26 Electrical.

1.2 QUALITY CONTROL

A. The following publications form a part of this specification to the extent they are applicable:

1. Division 01 Section Quality Control.
2. NEMA DC 3 - Low-Voltage Room Thermostats.
3. NFPA 70 - National Electrical Code.
4. NFPA 90A Installation of Air Conditioning and Ventilation Systems.

1.3 SUBMITTALS

A. Submittals for Review:

1. Division 01 Section Quality Control: Procedures for submittals.
2. Product Data: Provide description and engineering data for each control system component. Include sizing as requested. Provide data for each system component and software module.

B. Submittals At Project Closeout:

1. Division 01 Section Closeout Procedures.
2. Operation and Maintenance Data: Include inspection period, cleaning methods, recommended cleaning materials, and calibration tolerances.
3. The Contractor shall submit all certifications and testing data as a supplement to previously submitted O & M manuals at contract closeout.

1.4 QUALIFICATIONS

A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this Section with minimum three years experience.

1.5 PREINSTALLATION MEETING

A. Division 01 Section Administration Requirements.

B. Convene one week before starting work of this Section.

C. Attendees shall be Division 23 Section Refrigeration Monitoring and Control Systems (RMCS) Sub-contractor, Division 23 Section Instrumentation and Control Devices for HVAC Sub-contractor, Government's Designated Representative, and General Contractor's Representative.

1.6 REGULATORY REQUIREMENTS

A. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

1.7 MAINTENANCE SERVICE

A. Division 01 Section Closeout Procedures.

B. Provide service and maintenance of control system for one year from date of Substantial Completion.

C. Provide complete service of controls systems, including call backs. Make minimum of 4 complete normal inspections of approximately 42 hours duration in addition to normal service calls to inspect, calibrate, and adjust controls, and submit written reports.

1.8 EXTRA MATERIALS

A. Division 01 Section Closeout Procedures.

B. Provide two of each type of thermostat.

PART 2 - PRODUCTS

2.1 THERMOSTATS

A. Line Voltage Thermostats:

1. Integral manual On/Off/Auto selector switch, single or two pole as required.
2. Dead band: Maximum 2 deg F.
3. Cover: Locking with set point adjustment, setpoint indication, with thermometer.
4. Rating: Load.

B. Thermostats - Programmable:

1. Honeywell T8000 or equal.
2. Non-volatile set point memory.
3. Separate setpoints for Heating-Day, Heating-Night, Cooling-Day and Cooling-Night.
4. Deadband between Heating and Cooling setpoints.
5. Automatic changeover from Heating to Cooling.
6. Choice of constant or cycling fan on Day cycle via concealed switch.
7. Cycling fan control on Night cycle.
8. Relay to close OA MD on Night cycle.
9. Quartz clock.
10. Up to 4 time periods and setpoints.
11. Monday through Friday Program and Saturday Sunday Program.

C. Room Thermostat Accessories: Thermostat Covers:

1. Insulating Bases: For thermostats located on exterior walls.
2. Thermostat Guards: Locking transparent plastic mounted on separate base.
3. Adjusting Key: As required for device.

D. Electric Room Thermostats:

1. Type: NEMA DC 3, 24 volts, with setback/setup temperature control.
2. Service: Cooling and heating one step cooling and one step heating.
3. Covers: Locking with set point adjustment.

E. Outdoor Reset Thermostat:

1. Remote bulb or bimetal rod and tube type, proportioning action with adjustable throttling range, adjustable setpoint.
2. Scale range: -10 to 70 deg F.

F. Immersion Thermostat:

1. Remote bulb or bimetallic rod and tube type, proportional action with adjustable setpoint and adjustable throttling range.

G. Airstream Thermostat:

1. Remote bulb or bimetallic rod and tube type, proportional action with adjustable setpoint in idle of range and adjustable throttling range.
2. Averaging service remote bulb element: 7.5 feet.

2.2 DAMPERS

A. See Section 23 31 13 Metal Ducts.

B. Damper Operators:

C. General: Provide smooth proportional control with sufficient power for air velocities 20 percent greater than maximum design velocity and to provide tight seal against maximum system pressures. Provide spring return for two position control and for fail safe operation.

D. Electric Operators:

1. Spring return, adjustable stroke motor having oil immersed gear train, with auxiliary end switch and 24 V dc, 24 va transformer.
2. Number: Sufficient to achieve unrestricted movement throughout damper range.
3. Verify that operators are compatible with Division 23 Section Refrigeration Monitoring and Control Systems (RMCS).

PART 3 - EXECUTION

3.1 EXHAUST FANS - STAT CONTROL

A. On room temperatures above 85 deg F open intake damper (if shown) and start exhaust fan. Obtain power for intake dampers from the circuit provided for the factory furnished motorized damper in the fan intake. Furnish motorized dampers as specified in Division 23 Section Metal Ducts. Provide all conduit, wiring, relays, etc. to complete the installation of the controls, motors, and dampers.

3.2 ROOFTOP AND SPLIT SYSTEM HVAC UNITS

A. Section 23 09 16 Refrigeration Monitoring and Control Systems (RMCS) shall furnish the controls for these units. Provide wiring, relays, etc. to interface with Section 23 09 16 Refrigeration Monitoring and Control Systems (RMCS) Contact Closures.

B. Units less than 30,000 B/hr. shall have programmable thermostats.

3.3 DUCTLESS SPLIT SYSTEMS

A. Mount and wire the thermostat furnished with the unit. Provide control wiring between indoor and outdoor units.

3.4 GAS FIRED UNIT HEATERS, RADIANT HEATERS, AND ROOF MOUNTED FURNACE

A. Mount and wire the thermostat furnished with the unit.

3.5 EXHAUST FANS

A. Provide control wiring to perform the functions scheduled on the Drawings.

1. D/N - Enable fan to run in Day mode of the air conditioning unit indicated- by Division 23 Section Refrigeration Monitoring and Control Systems (RMCS).
2. Stat - Start fan on temperature rise above 85 deg F - by Division 23 Section Instrumentation and Control Devices for HVAC.
3. MS - Manual switch by Division 26 in series with Division 23 Section Instrumentation and Control Devices for HVAC control.
4. 2S - two speed control.
5. MS/D - Motorized shutter/damper furnished prewired with fan.
6. Intake MD - Intake motorized damper - control to open when fan runs. Provide power to intake damper motor from fan motorized damper circuit.

3.6 DAMPER MOTORS

A. Install new motors on existing dampers where indicated.

END OF SECTION

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SECTION 23 09 16

REFRIGERATION MONITORING AND CONTROL SYSTEMS (RMCS)

(Edited from DeCA June 2011 Design Criteria)

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Refrigeration Monitoring and Control System.

B. Related Sections:

1. Division 01 Section Mechanical, Refrigeration, Food Service Equipment and Electrical Coordination.
2. Division 01 Section Quality Control.
3. Division 01 Section Closeout Procedures.
4. Division 23 Section Product Refrigeration Systems.
5. Division 23 Section Packaged, Outdoor, Air-Handling Units.
6. Division 23 Section Mechanical Dehumidification Units.
7. Division 23 Section Convection Heating and Cooling Units.
8. Division 23 Section Instrumentation and Control Devices for HVAC.
9. Division 26 Electrical.

1.2 SCOPE OF WORK

A. General:

1. Provide a monitoring and control system (RMCS) to monitor and control product refrigeration and HVAC equipment designated for control by RMCS. Items which shall be controlled by the RMCS include:

a. Product Refrigeration System:

1) Compressors: Each new multiplex compressor system compressor indicated in the Contract Drawings.
2) Condensers: Each new multiplex compressor system condenser fan indicated in the Contract Drawings.
3) Defrost Contactors: Each new refrigeration defrost contactor.
4) Solenoid Valves: Each new refrigeration liquid/suction solenoid.
5) Heat Reclaim: Each new heat reclaim 3-way valve (both air and water).
6) Display Case Lighting: New display case lights.

b. Heating Ventilation and Air Conditioning (HVAC):

1) All HVAC devices indicated for control by RMCS on Contract Drawings.

c. Sales Area and Outside Lighting:

1) All lights indicated for control by RMCS on Contract Drawings.

d. Warranty: Provide warranty service specified in paragraph 3.6 "Warranty."
e. Close Out Items: Provide close out items specified in paragraph 3.5 "Close Out Items."
f. Training: Provide training of Commissary personnel as specified in paragraph 3.1 "General Requirement, Training."
g. Parts and Labor: All labor and equipment necessary for Contractor to meet the requirements stated herein this Section shall be Contractor Furnished and Contractor Installed.
h. Coordination: The refrigeration monitoring and control system and its installation shall be approved by and coordinated with the display case manufacturer and the RMCS manufacturer.

1.3 SUBMITTAL

A. Furnish under the provisions of Division 01 Section Quality Control.

B. Contractor shall furnish a RMCS construction submittal for review and approval as herein indicated.

1. Distribution:

a. One (1) copy of RMCS construction submittal to the Contracting Officer.
b. Two (1) copy of submittal to HQ DeCA/DOFC Lackland AFB TX 78236-1039.
c. Date Required: Within 30 days after receipt of Notice to Proceed.

2. Equipment Cut Sheets: Provide manufacturer's cutsheets indicating Contract compliance of the following system components:

a. Thermistors, transducers, and dewpoint sensors.
b. ICUs and DCU.
c. Phase loss protector.

3. Installation Manuals: Provide system installation manual and instructions.
4. Drawings: Provide Drawings showing components locations in commissary and required wiring between components.
5. User Manuals: Provide user's manual on system describing how to use the system and the software.
6. RMCS Manufacturer's Resume: Provide resume of control system manufacturer's experience in supermarket refrigeration. A minimum of ten successful installations using hardware model being provided.
7. Startup Technician's Resume: Provide resume of Startup Technician(s) indicating participation in startup of a least 5 systems using the same hardware as that being provided.
8. RMCS Manufacturer Approval of Startup Technician: Provide letter from RMCS manufacturer indicating their approval of the proposed Startup Technician(s), or, their intent to provide their own startup technician for startup and certification of the RMCS.
9. Display Case/Compressor Manufacturer Coordination: Provide a letter from the manufacturer of the display cases and the manufacturer of the compressor systems, verifying their approval of the RMCS equipment selection and indicating their intent to review all operating setpoints for the RMCS.

10. RMCS Installer's Resume: Provide resume of lead on site technician's experience indicating that he has installed a minimum of 3 control systems of same brand and model as the one being installed on this Project. Lead technician shall **be on site during installation a**nd shall install and or supervise all aspects of the RMCS field installation.

C. Operation and Maintenance data.

PART 2 - REQUIRED EQUIPMENT

2.1 REQUIRED HARDWARE QUANTITIES

A. Modem: Quantity required (1).

B. Laptop Computer with Padded Carrying Case: Quantity required (1).

C. Desktop Computer: Quantity required (1).

D. Printer: Quantity required (1).

E. Refrigeration Alarm Annunciator: Quantity required (1).

F. Phase Loss Protector: Quantity required (1).

G. Individual Control Unit(S): See paragraph 3.2 for quantity required.

H. Sensors: See paragraph 3.2 for quantity required.

2.2 HARDWARE DESCRIPTIONS

A. Modem: A fax capable telephone modem. 56k Baud Minimum.

B. Laptop Computer: Laptop shall be compatible to communicate with RMCS and shall have the following minimum features: modem, read/write CD drive, 60MB hard disk.

C. Desktop Computer: Desktop Computer monitor and keyboard with the following minimum features: R/W CD Drive, 100G Hard disk.

D. Printer: Sheet feed Ink jet printer.

E. Refrigeration Alarm Annunciator: Shall have an audible alarm and reset button.

F. Phase Loss Protector:

1. Phase Unbalance Trip: Shall be adjustable 5 percent to 10 percent.
2. Under Voltage Trip: Shall be adjustable 10 percent to 20 percent of normal voltage.
3. Phase Loss Trip: Trip shall be within 50 msec.
4. Phase Reversal: Trip shall be within 50 msec.
5. Restart: Automatic restart upon return to normal.
6. Product Reference: TimeMark Model 2644 or approved equal.

G. ICU'S: Individual control units (ICUs) shall have the following minimum features:

1. Independent Operation: Each ICU shall operate independent of the other ICUs. If one ICU is taken out of operation, the other ICUs shall continue normal operation. The ICU unit shall retain all setpoints during a "power down" or "power up" and shall automatically reboot and commence normal operation.
2. Memory Storage: System programs shall be stored in EPROM or CMOS memory. If CMOS memory is provided, the contents of memory shall be maintained for a minimum of 1 year by battery. The system shall have battery back up for retention of system clock of at least 1 year.
3. Voltage/Surge Protection: System shall operate from 100V AC to 130V AC 60 HZ power. Power supply to ICU shall have surge protection which meets the following.

    a. EMI/RFI filtering.
    b. Meets Government and military specs for fire panel applications.
    c. User replaceable fusing.
    d. LEDs to indicate protection status, ground presence, ground fault indication, fuse status.
    e. Tested to meet UL 1449 approved.
    f. 120 VAC, 20 amp continuous rating.
    g. 10 year limited warranty.
    h. DITEK Model 120SR or approved equal.

4. Analog Control Features:

    a. The outputs shall be controlled by either; computer automatic operation or manual keyboard on/off (100 percent/0 percent).
    b. The power supply for the control voltage on the control relays shall be fused to protect it from overloading.
    c. The outputs shall be fused for over-current protection.

5. Digital Control Features:

    a. Control relays shall be controlled by computer automatic.
    b. The digital outputs shall be designed so that if high voltage is applied to the contacts of one control relay, then the other points are not damaged.
    c. The power supply for the control voltage on the control relays shall be fused to protect it from overloading.
    d. The contacts on the control relays shall be rated to carry at least 3 amps 220 VAC.
    e. The contacts on the control relay shall be fused to protect the relay from exceeding the current capacity of the contacts.
    f. Control relays on digital outputs shall have SPDT contacts with a; normally open, and normally closed terminal.

6. Communication: Shall be connected to the data collection unit (DCU) through an RS485 port.
7. Acceptable Manufacturers: Danfoss AK-SC255 (Baltimore, MD) or approved equal.

H. Sensors: RMCS sensors/inputs shall be furnished and shall meet or exceed the following required features:

1. Analog Inputs:

   a. Temperature sensors shall be thermistors.

      1) The thermistor temperature probes shall be interchangeable in the field with no required calibration.
      2) The thermistor temperature accuracy shall be (+ or -) 2 deg F.
      3) Analog dewpoint temperatures shall be measured from -30 deg F to 79 deg F with an accuracy of 2 deg F.

   b. Pressure sensors shall be transducers.

      1) The range for the compressor low pressure side shall be 0 psig to 200 psig with plus or minus 1 psig.
      2) The range for the compressor high pressure side shall be 0 psig to 500 psig with accuracy of plus or minus 5 psig.

   c. Dewpoint sensor shall be a lithium chloride saturated salt sensor.
   d. Refrigerant vapor detection sensors shall meet or exceed the following minimum requirements:

      1) Shall measure 0 to 1000 parts per million of all refrigerants provided in this project. Shall operate from 0 deg F to 120 deg F.
      2) Shall not require maintenance more often than every 6 months in order to operate properly.

   e. Outdoor temperature light sensor module.

I. Limit Switches: Provide rotary limit switches with mechanical arm to monitor walk-in freezer doors.

J. Three (3) Phase KWHR Transducer/CT: Three (3) phase KWHR (pulse) transducer, with current transformers on building main power. Provided and installed by Division 26 Contractor (see paragraph 3.2.E). Hawkeye Series H-8050 or approved equal. Veris Industries Inc. 1-800-354-8556.

2.3 SYSTEM CONTROL FEATURES/STRATEGY

A. General: System software shall be furnished, installed, tested, and debugged to provide; control/functions described herein this Specification Section. Control Variables/Setpoints: Setpoints shall be remote selectable by user via "laptop computer" on telephone line and modem. This portion of the software shall be resident on site in the RMCS ICU's. This software shall be protected from loss during power failure.

B. Software Configuration: System software shall allow user to add/remove: digital outputs/inputs, analog inputs, schedules and programs. This software may be either transient or resident. If software is transient, it shall be compatible with an IBM PC and shall allow user to re configure software then downloaded the new configuration to the ICU's at the Commissary (Via phone line and modem).

C. Data Base Features: Data base features of system software shall provide the following features:

1. Downloading Capability: This database software shall allow downloading of on-site data base to an offside location via phone line and IBM PC. Data-base shall contain; setpoints, names, tables, etc.
2. Unattended Phone Line Disconnect Feature: Master controller communication software shall force the modem to hang up the phone line if no data is transferred for 5 minutes. Also, when the modem on the RMCS cannot detect a carrier signal for a period of time (8 to 40 seconds), the RMCS software shall make the modem hang up the phone line.
3. Downloading Software: P.C. software on diskette shall be provided which shall allow the data base to be edited off-site then reloaded via phone line to commissary. This software shall be user friendly and shall have error checking features. This software shall take care of all output data formatting and shall be formatted for 80 column output. A copy of this software shall be provided to HQ DeCA/PMF Lackland AFB TX and HQ DeCA/DOR Ft. Lee VA along with a letter granting the Government the right to use this software.

D. Phase Loss Protector Features: When a phase loss/unbalance occurs, all RMCS controlled 3 phase loads shall be shutdown until power is restored. Systems shall automatically restart upon return of all three phases. Monitor power at panel "CP" on dedicated breaker.

E. Alarm Features:

1. Types Of Alarms: RMCS shall provide for the following types of alarms:

   a. Alarm (A): When an alarm occurs, the audible buzzer in commissary sounds and the alarm dial out begins.
   b. Alarm Logs (L): These are events that are recorded in the system and do not produce any dial out or buzzer.

2. Alarm Dial Out Sequence: The RMCS shall execute the following dial out actions upon each Alarm (A) event:

   a. Alarm To Pager: Dial microwave tower at phone address previously selected by user which in turn triggers a pager(s).
   b. Alarm To Printer/Modem: Dial to modem with printer at phone address previously selected by the user.
   c. Alarm To Fax Machine: Dial facsimile machine (fax) at phone address previously selected by user.
   d. Message Description: The Master controller shall send a message (store name, date, time, sensor name, and sensor number that caused alarm), to each printer and facsimile called during dial out.

3. User Selection/Configuration Of Alarm Dial Out Actions: The RMCS software shall provide the user with the following alarm dial out configuration options:

   a. Phone Numbers To Be Called: Allow user (via keyboard) to enter a minimum of four separate phone numbers/addressees which shall be called during Alarm Dial Out Sequence.
   b. Type Of Devices To Be Called: Allow user to select which devices (pager, fax, printer) are at the phone addresses selected in "PHONE NUMBERS TO BE CALLED."
   c. Pauses During Dialing: Allow user to be able to select time delays to be entered into the phone address selected in "PHONE NUMBERS TO BE CALLED."
   d. Attempts To Reach A Number: Allow user to select the number (1 to 4) of times the Master Controller shall dial the phone number of each pager.
   e. Alarm Test Time: Allow user to select the time of day that the Master controller shall dial out a test refrigerant alarm.)

F. History Logging Features: The RMCS software shall collect data from the ICUs and shall provide the following features:

1. Alarm History: Log the last ten alerts and last ten alarms.
2. User Configuration: Allow user (via keyboard) to, select items to: log, select logging interval (seconds or minutes), select number of samples. The items which shall be logged in this manner shall be all; analog inputs (AI), analog outputs (AO), digital outputs (DO), digital inputs (DI).
3. Compressor Runtime: The compressor cycles per day and total run time per day shall be logged for a period of not less than 4 days.
4. Condenser Runtime: The condenser fan cycles per day and total run time per day shall be logged for a period of not less than 4 days.
5. Refrigeration Runtime: The refrigeration circuits defrost cycles per day and total run time per day; shall be logged for a period of not less than 4 days.

G. Security/Access Features: Software shall require a password(s) in order to access the system. Password shall be for user identification and shall not be echoed on printer or terminal. The system shall be capable of using a password of 4 or more characters. At least four levels of access shall be provided. One level of access shall be provided to view data/setpoints. One password will only permit lighting override and lighting schedule changes. The other two levels shall provide access to change, setpoints and system programs.

H. Compressor Control Features: RMCS control of refrigeration compressors shall incorporate the following features:

1. User Access: Software shall allow the user to select and adjust all setpoints.
2. Control Strategy: Software shall control the compressors on each multiplex compressor system by the following method:

   a. Rate of Change with Temperature Modification: As the refrigerated fixtures get colder than required, the target pressure is raised in increments so as to raise the compressor system operating suction pressure. The reverse takes place as refrigerated fixture temperature increases. For each compressor a minimum ON time and minimum OFF time shall be provided.

I. Subcooler Control Features: The RMCS shall control 2 normally closed liquid line solenoids, one sized for 25 percent subcooler operation, one sized for 75 percent and both open for 100 percent operation. A temperature sensor shall be mounted on the subcooled liquid outlet to maintain the subcooled liquid at a temperature of 50 degrees F.

J. Electronic Evaporative Pressure Regulator Valve Control Features. The RMCS shall control the Electronic Evaporative Pressure Regulator (EEPR) via an interface board which will provide low voltage power (24VDC) and control to the motor in the EEPR.

K. Defrost Termination Control Features: The RMCS shall control the defrost termination of all frozen and ice cream display cases.

1. When all defrost termination Klixons Provided by Case OEM are closed or the RMCS Coil Sensors reach the RMCS Defrost Termination setpoint, the RMCS shall terminate defrost and return circuit to normal refrigeration.

L. HVAC Control Features:

1. Sales Area Dual Path Air Handling Unit AHU1:

a. Space temperature and humidity shall be controlled by a minimum of three individual cooling stages utilizing two air paths. The outside air path will process all of the outside air (no bypass) and provide most of the dehumidification required for the space. An outdoor air precooling coil and dehumidification coils (6-row minimum) shall be used. The return air path will have a cooling coil to cool the return air as required to provide the remaining cooling required for the space. Some return air may be bypassed. The air paths will then mix heating will be accomplished by utilizing reclaimed refrigeration heat through heat reclaim coils, supplemented by a two stage gas fired power burner. The reclaimed heat will be used for reheat if required, and will provide the main heat as reclaimed heat is available. The gas heating will only be used if additional capacity is required.

b. Fan operation shall be continuous. Fan shall run at high speed (100 percent) in occupied mode and for cooling dehumidification operation and at low speed (50 percent) at all other times.

c. Compressors shall be sized to match the cooling/dehumidification requirements of the two paths with the evaporator coils.

d. Multiple Condenser fans shall be controlled from liquid temperature and shall be cycled to maintain a target liquid temperature.

e. Heat reclaim will be used for reheat and for initial stages of heat.

f. Control the gas heating section from space temperature only after maximum utilization of heat reclaim has been realized. Auxiliary heat shall not be used for reheat control.

g. The dehumidification coil in the outdoor air path is stage 1 and the outside air precooling coil is stage 2. The return air cooling coil is stage 3. Stage 1, 2 and 3 coils shall be controlled from space humidity in that order to maintain 52 deg F dewpoint. Precooling coil shall be locked out below an ambient temperature of 72 deg F.

h. Outside air and return air motorized dampers shall be provided. The outside air (or night setback) damper shall be open during the occupied cycle and closed in the unoccupied cycle. The outside air (or night setback) damper shall be mechanically linked to the return air damper so the return air damper shall open when the outdoor air (or night setback) damper closes, allowing return air to follow both air paths.

i. To allow the specified air flow rates in the two paths, an array of static pressure probes shall be positioned to monitoring internal air pressure drops through key elements of the dual path system. Each air path shall have built-in balancing dampers for air volume adjustment.

j. Provide a differential pressure switch to monitor the operation of the main blower.

k. The temperature and humidity set points shall be:

Function	Day	Night
Heat	70 deg F	65 deg F
Cool	75 deg F	75 deg F
Humidity	52 deg F dew point	52 deg F dew point

l. Cooling operation shall be locked out below 45 deg F ambient.

2. Other Conditioned Rooms: Air conditioning systems indicated on Contract Drawings, shall each have the following minimum software control functions:

a. One stage cooling and **one stage heating.**
b. Night set back.
c. Fractional Horsepower AHU fans shall only operate during heating or cooling demand. AHU fans (1) horsepower and greater, shall operate continuously during daytime and on demand at night.
d. Shall have a schedule for user to select on/off hours.
e. Close outdoor air dampers in unoccupied mode.

3. Mechanical Room Exhaust Fans: Exhaust fans in the refrigeration equipment rooms and indicated on Contract Drawings, shall be controlled by the RMCS from room temperature. RMCS shall also control the respective inlet dampers of the exhaust fans being controlled additionally, when the refrigerant vapor sensor in the Mechanical Room senses an elevated vapor level, these fans shall run. An audible alarm shall sound in the room, and the RMCS shall generate an alarm.
4. Miscellaneous Exhaust Fans: Exhaust fans serving multiple rooms and indicated on Contract Drawings, shall be controlled by the RMCS based on time of day.
5. Fan Alarms: Provide alarm indication for failure of EF freezer floor ventilation. The RMCS shall generate an alarm.
6. Panic Button: Provide a push button in the Store Manager's office to stop all controlled ventilation equipment bringing outdoor air into the building in the event of a contaminant event. Label the button "VENTILATION EMERGENCY STOP."

M. Lighting Control Features:

1. The RMCS shall provide contact closures and wiring to the contactors for the following lighting functions:

a. Sales Area Lighting: 4 contactors (1/2 Sales Area, 1/2 Sales Area, Checkout area, and Sales Area track, mass display, etc.). See the Sales Area Lighting Control Details.
b. Exterior Lighting: 3 contactors (Patron Parking, Employee Parking, and Receiving Pole Lights). See Exterior Lighting Control Details.
c. Control the refrigerated case lighting, coordinate with Division 23 Section Product Refrigeration Systems. Control lighting in self contained cases and remote cases.

2. Division 23 Section Refrigeration Monitoring and Control Systems (RMCS) shall provide a 4 wall switch gang box in the Store Director's office, Cover plate, and conduit to the nearest RMCS HVAC system ICU for Division 23 Section Refrigeration Monitoring and Control Systems (RMCS) to install 3 momentary contact override switches plus another momentary contact switch to cancel all of the overrides and the necessary wiring to connect these switches to 4 input terminals in the HVAC RMCS system. The momentary contact switch functions shall be as follows:

a. Sales Area Lighting: Control the second 1/2 Sales Area (first 1/2 Sales Area contactor shall be controlled only by the RMCS schedule), and Checkout area.
b. Refrigerated Case lighting and the Sales Area Mass Display, Track, Dairy, and Produce lighting.
c. All outside lighting.
d. Cancel override.

3. Division 23 Section Refrigeration Monitoring and Control Systems (RMCS) shall program the system such that:

a. When any of the momentary contact switches is closed for 6 seconds, the contactor controlled by that switch shall energize the lighting circuit controlled by

that switch for 240 minutes. One of the Sales Area contactors shall open after 235 minutes to provide an indication to the operators that the lights are about to be turned off so that they may be reset.

b. When the "Cancel" switch is closed for 6 seconds, the contactors shall open and the control shall revert to the original program.

c. Label all switches with the lighting control function, i.e. "Sales and Checkout lighting On," "Case lights and supplementary Lighting On," "Outside Lighting On" and "Cancel All Lighting Control Overrides."

d. Outdoor lighting shall be turned off when the light sensor senses daylight.

N. Condenser Control Features: The RMCS shall provide the following refrigeration condenser control functions.

1. Control Point: Shall cycle fans to meet target condenser pressure.
2. Parallel Fan Operation: Parallel condenser fans shall come on together.
3. "ON" "OFF" Delays: Pre delays and post delays shall be provided for each stage.
4. 50 percent / 50 percent Split: Shall control split condenser valves for condensers provided with such valves. Control shall be based on outdoor ambient setpoint and reset deadband.

PART 3 - EXECUTION/INSTALLATION REQUIREMENTS

3.1 GENERAL INSTALLATION REQUIREMENTS

A. Guide Lines: The entire system shall be installed in accordance with RMCS manufacturers' recommendations and the requirements of these specifications. Where the Contract requirements are in conflict with those of the manufacturer, the more stringent requirement shall be followed.

B. N.E.C. The entire system shall be installed in accordance with the current National Electric Code and the requirements of these Specifications.

C. Lead Technician: Lead technician shall be on site during installation and shall supervise install and or supervise all aspects of the RMCS field installation. Lead technician experience shall have installed a minimum of 3 control systems of same brand and model as the one being installed in this Project, along with being capable of programming and starting up the equipment.

D. Inspection/Certification of Installation:

1. Startup Technician Responsibilities:

a. The manufacturer approved Startup Technician shall personally be on site at the Commissary for at least 3 days to perform operational checkouts of the system.

b. The Startup Technician shall personally inspect the installation of the system to ensure that the RMCS system is installed in accordance with the RMCS manufacturer recommended methods.

c. The Startup Technician shall provide a "Startup Inspection Report" listing all incomplete work and incorrectly installed equipment. This list shall be provided to the Contracting Officer, the RMCS manufacturer, and the display case manufacturer.

2. Certification of Installation: The following installation certifications shall be provided:

   a. Startup Technician Certification: The Startup Technician shall provide a letter certifying that all items indicated in the "Startup Inspection Report" have been corrected. This letter shall be provided to DeCA/PMF Lackland AFB TX. 78236-1039, the RMCS manufacturer, and the display case manufacturer.
   b. RMCS Manufacturer Certification: The Contractor shall submit a letter from the RMCS manufacturer certifying that the installation meets the manufacturer's recommendations. Letter shall be addressed to the Contracting Officer with a copy to DeCA/ DOFC, 2250 Foulois Ave, Lackland AFB TX 78236-1039.
   c. Display Case Manufacturer Certification: The Contractor shall submit a letter from the Display Case Manufacturer certifying that the installation is correct. The letter shall be addressed to the Contracting Officer with a copy to DeCA/ DOFC, 2250 Foulois Ave, Lackland AFB TX 78236-1039.

3.2 HARDWARE INSTALLATION REQUIREMENTS

A. Individual Control Units (ICU's): ICU's shall be provided for the following equipment.

   1. Quantity And Location:

      a. Refrigeration Compressor Systems: Provide one dedicated ICU for each multiplex refrigeration compressor system.
      b. HVAC: Provide at least one dedicated ICU for controlling of the HVAC. This ICU shall be mounted on the main air handler.

   2. Installation/Testing: ICUs shall be installed and tested at the respective factory of the compressor system manufacturer or air handler manufacturer.

B. Analog Temperature Sensors: Analog temperature sensors shall be furnished and installed at the following locations:

   1. Storage Rooms: One temperature probe in each refrigerated walk-in box and refrigerated processing room. Probes shall be in the return air to the unit coolers.
   2. Sales Area: One temperature and one dewpoint probe for each sales area air handler being controlled. Mount these probes 2 feet above store shelving product line. Also provide one temperature sensor in the return air stream and one in the supply and one on the suction line if system is a single compressor DX. Mount supply sensor downstream of all coils. Mount return sensor after outside air intake.
   3. Refrigerated Display Cases: Factory mount one Supply Air Temperature Sensor per evaporator coil in each refrigerated display case. Additionally, provide one Analog Defrost Termination Sensor in each Frozen or Ice Cream display case. Factory mount Defrost Termination Sensor on or near coil per case manufacturer's recommendations.
   4. Probes on Compressor Systems: On each compressor system, provide a temperature probe on the bottom side of the suction header and one on the drop leg to the receiver.
   5. Low Temp Circuits: Provide one suction temperature sensor on each suction circuit operating below 10 deg F SST. Install at compressor suction header.
   6. Outdoor Temp: One temperature probe to measure outside air temperature. This probe shall be mounted on ACC-1 out of the sun, in the condenser air stream, and not more than 8 inches below the bottom of the condenser coil.
   7. Subcooling Temperature: One temperature probe to measure subcooled liquid temperature shall be mounted on the subcooled liquid outlet of each subcooler.

8. Other Conditioned Rooms, HVAC: Install Wall Mounted Zone temperature sensors 6 feet above finished floor. Also install supply and return air sensor and suction temperature sensors on all units indicated for RMCS control on Contract Drawings.
9. Mechanical Room Exhaust Fan: Install wall mounted zone temperature sensors 6 feet above finished floor.

C. Analog Pressure Sensors: Analog pressure sensors shall be furnished and installed at the following locations:

1. Multiplex Systems: On each multiplex compressor system, provide a pressure transducer for the following: system suction pressure, system discharge pressure, system condenser pressure, and suction pressure for any satellite or escort compressors.
2. Single Systems: On single compressor systems, provide a suction pressure transducer when indicated by drawing control notes.

D. Analog Receiver Level Sensors: Furnish and install one sensor in each product refrigeration multiple compressor receiver.

E. Digital Sensors: Digital inputs shall be furnished and installed to monitor the following electrical loads:

1. Compressors: On each refrigeration compressor monitoring the compressor operation.
2. Freezer Doors: on each walk-in freezer door.
3. Condenser Fans: On each condenser fan motor monitoring the fan motor operation.
4. Ahu Fans: On each sales area, Air handler and Desiccant supply fan motors being controlled.
5. **Power Monitoring: Monitor the digital pulse meter provided under Division 26. Provide interface equipment wiring.**
6. Phase Loss Protector: Provide dedicated breaker in panel "CP". Connect protector sensor inputs to breaker. Connect N.C. output contacts in protector to RMCS input.
7. Water and Gas Consumption Monitoring: Connect to the digital pulse meters provided under Division 22, Section Common Work Results for Plumbing.
8. Electrical Energy Consumption: Provide split core current transformers with monitoring interface equipment and wiring to monitor each of the following:

    a. Sales Area Lighting - monitor panel feeder.
    b. Sales Area Accent Lighting - monitor panel feeder.
    c. Processing Area/Staging Area Lighting - monitor individual lighting circuit.
    d. Sales Area HVAC - both indoor and outdoor units, DHU and ACCU.
    e. Refrigeration - monitor feeder circuit at the manual transfer switch.
    f. External Lighting.

F. Refrigeration Alarm Annunciator and Computer Terminal: Furnish and install in the Store Manager's office.

G. Wiring: All RMCS wiring shall as a minimum meet the following requirements.

1. Routing:

    a. All Factory and field installed wiring shall be in EMT.
    b. Analog input (AI) and Analog output (AO) wiring shall not be routed in conduits with conductors which carry alternating current.
    c. The wiring and EMT for space sensors shall be routed and concealed inside of stud walls.

2. Wire Size: All field wiring shall be at a minimum #18 AWG stranded wire.
3. Connections: All splices/connections shall be made in junction boxes and shall utilize either terminal strips or 3M scotch lock crimp connectors.
4. Labeling: Control cables shall be labeled at all junction boxes and at the origination and termination of each cable. The Cable number/letter indicated on the submittal drawings shall be specified on this label.

H. Commercial Phone Line: Before the refrigeration system is tested, the Contractor shall have a commercial (voice grade) telephone line installed for use with the RMCS system. Coordination for installation of the telephone line is as follows:

1. Installation: Through the Contracting Officer, the Contractor shall coordinate the installation of the phone line with the base communication office.
2. Transfer of Billing: Upon final acceptance of this system, the Contractor shall notify the Contracting Officer that the billing for the phone line needs to be transferred to the Commissary effective 30 days after the date of final acceptance. The Contractor shall pay all costs on the phone line up until 30 days after the date of final acceptance.

3.3 INITIAL SETPOINTS

A. Initial Software Setpoints: Initially, the RMCS shall be set to maintain the following setpoints:

1. Walk-In Boxes: Walk-in boxes shall be initially adjusted to maintain the temperatures indicated on the unit cooler schedule of the Contract Drawings.
2. Display Case Temperatures: The display case discharge temperatures shall be initially adjusted to maintain the following:

CASE	ITEM	DISCHARGE TEMPERATURE	
			Deg F
1B06	BAKE		34 to 38
1B08	FZBX		-8 to -5
1B32	BAKE		34 to 38
1D00	SVDL		34 to 38
1D01	MDDI		28 to 30
1D02	MDGD		30 to 34
1D24	MDDL		30 to 34
1F00	FISH		30 to 34
1F01	FISH		30 to 34
1G00	DYCS		30 to 36
1G02	DYCS		30 to 36
1G07/06	FZCS		-10 to -5
1G10	FZGD		-8 to -5
1G12/13	ICGD		-15 to -20
1M02	MTCS		22 to 26
1M04	MDMT		28 to 30
1M07	MDDI		25 to 28
1M05	MDMT		28 to 30
1P02/03	PRCS		36 to 40
1P07	PRCS		36 to 40

3. HVAC Setpoints: The HVAC setpoints controlled by RMCS shall be initially set as follows:

a. Sales Area: Sales Area shall be set as follows:

DEHUMIDIFICATION "ON" at 51 deg F dewpoint "OFF" at 49 deg F.

	Deg F
Cooling Stage 1	75/73
Cooling Stage 2	76/74
Ht Rec Stage 1	69/70
Ht Rec Stage 2	68/69
Aux Ht Stage 1	66/67
Aux Ht Stage 2	65/66

b. Bakery/Deli Setpoints:

	CUTIN/OUT Deg F	
Cooling	75/73	5/5
Heating	69/70	5/5

c. Administration Areas and Breakrooms:

	CUTIN/OUT Deg F	
Cooling	78/76	5/5
Heating	68/70	5/5

d. Exhaust Fans: The Compressor Room exhaust fans shall be set as follows:

	CUTIN/OUT Deg F
Ventilation Stage 1 (EF [<#>])	75/70
Ventilation Stage 2 (EF[<#>])	80/75
Ventilation Stages 1 & 2 (EF[<#>])	75/70
	80/75

4. Alarm Setpoints: The RMCS alarm setpoints shall be initially set as follows with alarm inhibited during defrost:

ALARM SETTINGS AND ACTIONS				DEFROST SETTINGS		
ITEM		HIGH TEMP/TIME		LOW TEMP/ TIME	#PER/LENGTH/TERM	ABB.
RESULT				RESULT		
		^{O}F / MIN		^{O}F / MIN		*
1B06	BAKE	45°F/120	A	28°F/120	L	*
1B08	FZGD	10°F/90	A	-25°F/120	A	*
1B32	BAKE	45°F/120	A	28°F/120	A	*
1D00	SVDL	40°F/90	A	24°F/120	A	*
1D01	MDDI	40°F/90	A	24°F/120	A	*
1D02	MDGD	40°F/90	A	27°F/120	A	*
1D17	SDDL	40°F/90	A	25°F/120	A	*
1D24	MDDL	40°F/90	A	25°F/120	A	*
1F00	FISH	40°F/90	A	27°F/120	A	*

ALARM SETTINGS AND ACTIONS				DEFROST SETTINGS		
ITEM		HIGH TEMP/TIME		LOW TEMP/ TIME	#PER/LENGTH/TERM	ABB.
RESULT				RESULT		
		^{O}F / MIN		^{O}F / MIN		*
1F01	FISH	40°F/90	A	27°F/120	A	*
1G00	DYCS	40°F/60	A	25°F/120	A	*
1G02	DYCS	40°F/60	A	25°F/120	A	*
1G03	DYCS	40°F/60	A	25°F/120	A	*
1G06	FZCS	10°F/90	A	-25°F/120	L	*
1G07	FZCS	10°F/90	A	-25°F/120	L	*
1G09	FZCS	10°F/90	A	-25°F/120	L	*
1G10	FZGD	10°F/90	A	-25°F/120	L	*
1G11	MIGD	40°F/90	A	-32°F/120	A	*
1G15	DYCS	40°F/60	A	25°F/120	A	*
1G12	ICGD	5°F/90	A	-25°F/120	L	*
1G24	GDMT	45°F/90	A	32°F/120	L	*
1M02	MTCS	34°F/90	A	15°F/120	A	*
1M04	MDDI	34°F/90	A	15°F/120	L	*
1M05	MDDI	34°F/90	A	15°F/120	L	*
1M07	MTCS	34°F/90	A	15°F/120	A	*
1M09	MTCS	34°F/90	A	15°F/120	A	*
1P02	PRCS	45°F/90	A	32°F/120	L	*
1P03	PRCS	45°F/90	A	32°F/120	L	*
1P06	PRCS	45°F/90	A	32°F/120	L	*
1P07	PRCS	45°F/90	A	32°F/120	L	*
1P09	PRCS	45°F/90	A	32°F/120	L	*
1P11	PRCS	45°F/90	A	32°F/120	L	*
1P17	PRCS	45°F/90	A	32°F/120	L	*
(ROOMS)						
BKBX		45°F/150	A	32°F/120	A	4/45
BKFZ		10°F/150	A	-25°F/120	L	3/45/50
PRBX		45°F/150	A	32°F/120	A	3/40
PRPR		70°F/150	A	32°F/120	A	1/70 "&"
DLBX		40°F/150	A	28°F/120	A	3/45
MTBX		40°F/150	A	25°F/120	A	3/45/50
POBX		40°F/150	A	25°F/120	A	3/45/50
HDBX		40°F/150	A	25°F/120	A	3/45/50
MTWR		55°F/120	A	40°F/120	L	1/60 "&"
MTPR		55°F/120	A	40°F/120	L	1/60 "&"
FRZV		40° F/120	A	25° F/120	L	1/60 "&"
FZBX		10°F/150	A	-25°F/120	L	3/45/50
DYBX		38°F/120	A	32°F/120	A	4/45
CTBX		72°F/180	A	32°F/120	A	1/70 "&"
Sales Temp		78°F/180	L	32°F/120	A	1/70 "&"
Sales DP		55°D/180	L			
FZDR		OPEN/30	A			
Liquid. Level.		10 percent/120	A			
PHASE LOSS		OFF/05	L			
MON PROOF		/05	L			
MT Suct PR		60PSI/30	A	30PSI/90	A	
LT Suct PR		25PSI/30	A	OPSI/90	A	

ALARM SETTINGS AND ACTIONS				DEFROST SETTINGS		
ITEM		HIGH TEMP/TIME		LOW TEMP/ TIME	#PER/LENGTH/TERM	ABB.
RESULT				RESULT		
		°F / MIN		°F / MIN		*
HIGH HEAD		270/03	A	125/120	L	
Vapor Detectors	Alarm on Sensing of Refrigerant vapor levels exceeding a preset value.					

NOTES:
A=Alarm
L=Log (Record Only)
*= Per manufacturer's published data
"&"= Defrost between 10PM and 4AM

3.4 RMCS SENSORS

A. The RMCS sensors shall be identified as follows:

1. Names: The "Standard RMCS Point Names" shall be used/indicated in the system software (see list, item #5).
2. Inputs: All analog inputs shall have an identification tag at input sensor/transducer to identify input. Except for pressure transducers, tags shall be secured with fasteners (screws or rivets). On pressure transducers, tags can be secured with wire. Identification tags shall be metal or laminated plastic (minimum thickness of 1/16 inch) and the letters on the tag shall be 1/4 to 3/8 inch in height. Typical identification tags shall reflect "Standard RMCS Point Names", input example; MDFF **[_____]**, for Analog Input on Multideck frozen food case #**[_____]**. On display cases, the identification tags shall be mounted at locations shown on Drawings.
3. Probe Layout Sheet: Probe layout sheet shall indicate "Standard RMCS Point Names" which shall match software and analog input identification tags.
4. Cabinets: All system panel/cabinets that contain microprocessor units or circuit boards shall have a tag on outside of panel/cabinet to identify the panel/cabinet number.
5. The "STANDARD RMCS POINT NAMES" shall be as follows.

Refrigeration

Cases and Walk-In Boxes:

Cases/WIB	Abbreviations
Bakery Case	BAKE
Dairy Case	DYCS
Fish Case	FISH
Deli Case	DELI
Multi Deck Deli Case	MDDI
Single Deck Frozen Food	SDFF or FZCS
Frozen Food with Gl Dr	FZGD
Ice Cream with Gl Dr	ICGD
Meat Case	MTCS
Produce Case	PRCS
Dairy Box	DYBX
Poultry Box	POBX
Freezer Vestibule	FRZV
Freezer Box	FZBX
Bakery Box	BKBX

Frozen Baked Box	FZBX
Controlled Temp (Candy)	CTBX
Meat Cutting Room	MTCU
Meat Wrapping Room	MTWR
Meat Holding Box	HDBX
Produce Box	PRBX
Produce Prep	PRPR
Deli Box	DLBX
Fish Box	FIBX
Compressor Systems	SYS##X (where ## is the system number and X is the compressor letter.)
Defrost	DEF## .XX (where ## is system numbered XX designates refr circuit number.)
Air Cooled Condensers	ACC##X (where ## is the condenser number and X is the stage number on the condenser.)
Liquid Line Solenoid	LLSV ## (where ## is the refr circuit number).

Heating, Ventilating and Air-Conditioning (HVAC) Names:

Names	Abbreviations
Main Air Handler	AHU ## (where ## is Air Handler 1, 2, etc. the AHU number)
Cooling Stages more	Cool# (where # designates the stage number. When than one AHU is present, designate as COOL### where ## is for AHU and the 2nd # is for stage.)
Heat Reclaim Stages (HR)	HR### (where ## is AHU number and # is the stag number.)
Auxiliary Duct Heat (AH) (oil) is	AHEH### (electric) AHGH### (gas) AHOH### AHSH### (steam) AHWH### (water) (where ## AHU number and # is stage number.)
Dehumidification	DHUM.## (where ## is the desiccant sys#)
Humidity	HUMD## (where ## is the AHU number.)
Dewpoint	DEWPT## (where ## is the AHU number.)
Condensing Water Temp	COND WTR
Mezzanine Room Temp	MEZ TMP
Outside Air Temperature	OTSD TMP
Pan Water Temperature	PAN WTR
Stock Room Temperature	STCK TMP
Store Temperature	INSD TMP (when only one zone) INSIDE X (where X =zone when more than one.)
Supply Air Temperature	SP## AIR (where X is AHU number)
Compressor Suction /	SYS##ST# or SYS##DT## (where ## is system number and Discharge Temperature # is compressor letter.)
Oil Pressure Monitor	OPMXXX (where ## is system number and # is compressor letter.)
Refrigerant Level	SYSXXLQD (where XX is the system number.)
Chill Water Supply	CWSTMP
Chill Water Return	CWRTMP
System Suction Pressure	SYS##SP (where ## is the system number.)
System Discharge Press	SYS##DP (where ## is the SYS number.)
System Condenser Press	SYS##CP (where ## is the SYS number.)

3.5 CLOSE OUT ITEMS

A. O & M MANUALS: Contractor shall furnish O&M manuals and information as herein indicated.

1. Distribution:

a. Provide one (1) copy and 3 CD ROM copies to DeCA/ DOFC, 2250 Foulois Ave, Lackland AFB TX 78236-1039.
b. Provide one (1) copy to HQ DeCA/ENFS Ft. Lee Virginia.
c. Provide three (3) copies to the Contracting Officer (to be forwarded to Commissary).

2. Date Required: Prior to final acceptance.
3. Bound Notebook: Each set shall be in bound notebooks.
4. Table of Contents: Each set shall have a table of contents identifying the contents.
5. Contents: Each shall contain hardware and software information indicating the following:

a. The names, addresses, and telephone numbers of; the manufacturer of the system and of the nearest service representatives for the system.
b. Shall describe the specifications and capabilities of all equipment provided, including:

1) General description and specification.
2) Installation and checkout procedures.
3) Descriptions of maintenance and repair of defective components (temperature probes, humidity or dewpoint sensors, control relays, digital input sensors, power supplies, etc.).
4) Installation drawings and sketches indicating locations of: analog inputs, control relays, digital outputs, digital inputs, and panels.
5) Computer specifications and peripherals.
6) Use of: system and applications software.
7) Use of Alarm system.

B. CADD Files: Provide CADD files (DWG and DXE format) on CD ROM indicating; analog probe locations, and point to point electrical interface drawings between RMCS connections and other equipment.

1. Distribution of CADD CD: CD shall be mailed to HQ DeCA/PMF Lackland AFB TX 78236-1039.

C. Control Task Manual: Provide a booklet attached by chain to each ICU and one attached to the Desk Top Computer. Each manual shall contain the following:

1. Control Task Description: Provide a written description of each and every control task. Description shall clearly describe at length, how each relay point is affected by changes in the input.
2. Wiring Diagram: Provide a half sized As-Built drawing that folds into booklet, indicating physical location in store of all relays, relay boards, and sensors. Provide one full sized As-Built with same information and mount on equipment room wall with other As-Built drawings.

D. Training: The startup technician give the following training sessions each of which shall be: coordinated with the commissary, scheduled during week days, scheduled at a minimum of 14 days in advance, and coordinated through the Contracting Officer. During these sessions, Commissary Store Personnel shall be instructed on accessing the RMCS temperatures and

alarms using the laptop computer. Additionally during these sessions, Commissary Personnel shall be instructed on changing the lighting schedules by means of using the lighting password.

1. First Training Session: A four hour training session (to a minimum of four Commissary Store Personnel) within 14 days after final acceptance and all RMCS final inspection punch list items are resolved. This training session should be considered in conjunction with 3 day commissioning start up visit.
2. Second Training Session: A second four hour training session (to a minimum of four Commissary Store Personnel) at least 30 days after but no more than 45 days after the final acceptance.

E. Videos: Provide each video described below:

1. User Video: This video should be tailored to equipment installed on this project and will explain to commissary management how to determine what causes a refrigeration alarm and how to change lighting schedules using the local ICU key pad. Video length should be from 15 to 25 minutes.
2. Service Video: Video training tape on "Basic Service Procedure": This video should be tailored to repairing equipment (DCU, ICUs, and sensors) installed on this project. The video should be on the level that would enable a journeyman refrigeration mechanic to make most repairs to the system. Video length shall be 45 to 70 minutes.
3. Distribution of Videos: Provide one copy of each video to: HQ DeCA/PMF Lackland AFB TX 78236-1039.

F. Database Software: Provide the following items:

1. CD ROM: Data base downloading software CD ROM described in 2.3-d (1).
2. Authorization Of Use: Letter granting Government rights to use this software.
3. Distribution: Mail to DeCA/PMF, Lackland AFB TX, 78236-1039.

G. Data Backup: Provide the following items:

1. CD ROM: CD ROM containing backup of all RMCS name, and setpoints for site.
2. Distribution: Mail to DeCA/PMF, Lackland AFB TX, 78236-1039.

H. Spare Parts: The following spare parts shall be provided at least 30 days prior to final acceptance.

1. Probes: Four temperature sensing probes for each type.
2. Transducers: One pressure transducer for each type.
3. Boards: One circuit board of each type; DI, AI, RO, AO, communication.
4. Fuses: Twenty fuses of each type.
5. ICU: One spare individual control unit (ICU) complete with all printed circuit cards, circuit chips, and power supply.
6. Location For Parts: These parts shall be located in the mechanical equipment room in a Contractor furnished cabinet with lockable door.

I. Final Acceptance: Prior to final acceptance, the following shall be accomplished.

1. Temperatures Maintained: All RMCS equipment shall be maintaining Contract specified control.
2. Punch List Complete: All pre final and final punch list items shall have been corrected by the Contractor and their correction approved by DeCA/PMF Lackland AFB TX.
3. O&M Info Received: All O&M information shall have been received by the Government.

4. Warranty Received: Warranty letters from the RMCS and Display case manufacturers shall have been received by the Government.
5. Certification of Installation Received: Certification of installation letters from the RMCS and Display Case Manufacturers shall have been received by the Government (see 3.1.2-b).
6. Transfer of Billing for Phone Line: (See 3.2-H (2)).
7. Alarm Monitoring and Notification: Alarm monitoring and notifications service shall be activated.

J. Alarm Monitoring and Notification: Manufacturer shall provide a 24 hour a day Alarm monitoring and notification service during the first 90 days of the warranty after final acceptance. See 3.6 Warranty.

1. General: RMCS shall dial out alarms to a monitoring service using a toll free (1-800) phone number. Monitoring company shall evaluate all alarms and shall notify designated Commissary personnel as necessary to inform them of refrigeration problems which warrant the store's attention.

3.6 WARRANTY

A. Provide Warranty Guarantees and Services as follows:

1. The manufacturer of the RMCS shall guarantee that the RMCS equipment/software, shall operate and provide specified control without failure for the periods indicated below beginning on the date of final acceptance.

a. First 90 Days: During the first 90 days of the warranty, the Manufacturer shall provide 24 hours a day, 7 days per week (including holidays), service to the Commissary. A technician shall arrive at the Commissary within 2 hours of receipt of a telephone call for warranty service. All parts and labor shall be provided by the Manufacturer at no cost to the Government during this period. Additionally, manufacturer shall provide a 24 hour a day Alarm Monitoring and Notification service.
b. 91 To 365 Day: During the 91st day through the 365 day of the warranty, the Manufacturer shall provide free exchange of parts within 24 hours of notification. Shipping costs shall be paid by the Manufacturer. These parts will be installed by a Maintenance Contractor whose services are provided for under a separate Contract. No installation cost shall be paid by the RMCS Manufacturer for replacement of these parts. Additionally, manufacturer shall provide a 24 hour a day Alarm Monitoring and Notification service.
c. First Five Years: Additionally, during the 91st day through the first five years of the warranty, the manufacturer of the RMCS shall provide assistance (via telecon at no cost to the Government nor Government Contractor) in helping the Government or Contractor personnel locate any problem with the RMCS system. During this warranty period, the manufacture of the RMCS shall unconditionally provide software maintenance at no cost to the Government or Government Contractor.

END OF SECTION

SECTION 23 23 00

REFRIGERANT PIPING

(Edited from DeCA June 2011 Design Criteria)

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Piping.
2. Refrigerant.
3. Flexible connections.

B. Related Sections:

1. Division 01 Section Mechanical, Refrigeration, Food Service Equipment and Electrical Coordination.
2. Division 01 Section Environmental Procedures for Refrigerants.
3. Division 01 Section Quality Control.
4. Division 01 Section Closeout Procedures.
5. Division 23 Section Hangers and Supports for HVAC Piping and Equipment.
6. Division 23 Section HVAC Piping Insulation.
7. Division 23 Section Instrumentation and Control Devices for HVAC.
8. Division 26 Electrical.

1.2 QUALITY CONTROL

A. The following publications form a part of this specification to the extent they are applicable:

1. Division 01 Section Quality Control.
2. ARI 710 - Liquid Line Dryers.
3. ARI 730 - Flow-Capacity Rating and Application of Suction-Line Filters and Filter-Driers
4. ASHRAE 15 - Safety Standard for Refrigeration Systems.
5. ASHRAE 34 - Number Designation and Safety Classifications of Refrigerants.
6. ASME B16.22 - Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.
7. ASME B16.26 - Cast Copper Alloy Fittings For Flared Copper Tubes.
8. ASME B31.5 - Refrigeration Piping and Heat Transfer Components.
9. ASME B31.9 - Building Services Piping.
10. ASTM B88 - Seamless Copper Water Tube.
11. ASTM B280 - Seamless Copper Tube for Air Conditioning and Refrigeration Field Service.
12. ASTM F708 - Design and Installation of Rigid Pipe Hangers.
13. AWS A5.8 - Brazing Filler Metal - Specification for Filler Metals for Brazing and Braze Welding.
14. MSS SP58 - Pipe Hangers and Supports - Materials, Design, Manufacturer, Selection, Application and Installation.
15. MSS SP69 - Pipe Hangers and Supports - Selection and Application.
16. MSS SP89 - Pipe Hangers and Supports - Fabrication and Installation Practices.

1.3 SUBMITTALS

A. Submittals for Review:

1. Submit under provisions of Division 01 Section Quality Control.

B. Indicate schematic layout of system, including equipment, critical dimensions, and sizes developed by the Condensing Unit Manufacture Submittals At Project Closeout:

1. Division 01 Section Closeout Procedures.
2. Project Record Documents: Record actual locations of components.
3. Operation and Maintenance Data: Include operation, maintenance, and inspection data, replacement part numbers and availability, and service depot location and telephone number.
4. Warranty: Submit compressor manufacturer warranty and ensure forms have been completed in Government's name and registered with manufacturer.
5. The Contractor shall submit all certifications and testing data as a supplement to previously submitted O & M manuals at contract closeout.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store piping and specialties in shipping containers with labeling in place.

B. Protect piping and specialties from entry of contaminating material by leaving end caps and plugs in place until installation.

C. Dehydrate and charge components such as piping and receivers, seal prior to shipment, until connected into system.

1.5 QUALIFICATIONS

A. Installer: Company specializing in performing the work of this Section with minimum three years documented experience.

B. Design piping system under direct supervision of a Professional Engineer experienced in design of this work, licensed in one of the states of the United States of America, and employed or approved by the manufacturer of the equipment.

1.6 REGULATORY REQUIREMENTS

A. Conform to IMC ASME B31.9 for installation of piping system.

B. Products Requiring Electrical Connection: Listed and classified by UL, as suitable for the purpose indicated.

PART 2 - PRODUCTS

2.1 PIPING

A. Copper Tubing: ASTM B280, Type ACR hard drawn.

1. Fittings: ASME B16.22 wrought copper.
2. Joints: Braze, AWS A5.8 BCuP silver/phosphorus/copper alloy with melting range 1190 to 1480 deg F.

B. Copper Tubing to 7/8 inch OD: ASTM B88, Type K, annealed.

1. Fittings: ASME B16.26 cast copper.
2. Joints: Flared.

C. Pipe Supports and Anchors:

1. See Division 23 Section Hangers and Supports for HVAC Piping and Equipment.

2.2 REFRIGERANT

A. Refrigerant: ASHRAE 34:

1. R-410A.

2.3 FLEXIBLE CONNECTORS

A. 500 psig minimum operating pressure; seamless tin-bronze core, high-tensile bronze-braid covering, and solder-joint end connections: dehydrated, pressure tested, minimum 7 inches long.

2.4 DRAIN PIPING

A. Type DWV copper with wrought, copper fittings.

PART 3 - EXECUTION

3.1 SYSTEM DESCRIPTION

A. Where more than one piping system material is specified ensure system components are compatible and joined to ensure the integrity of the system is not jeopardized. Provide necessary joining fittings. Ensure flanges, union, and couplings for servicing are consistently provided.

B. Provide pipe hangers and supports in accordance with MSS SP69 unless indicated otherwise.

C. Solenoid Valves:

1. Use in liquid line of systems operating with single pump-out or pump-down compressor control.
2. Use in liquid line of single or multiple evaporator systems.
3. Use in oil bleeder lines from flooded evaporators to stop flow of oil and refrigerant into the suction line when system shuts down.

D. Flexible Connectors: Utilize at or near condensing units or coils in resiliently mounted equipment where piping configuration does not absorb vibration.

3.2 FIELD QUALITY CONTROL

A. Pressure test system with dry nitrogen to 200 psig. Perform final tests at 27 inches vacuum and 200 psig using electronic leak detector. Test to no leakage.

3.3 PREPARATION

A. Ream pipe and tube ends. Remove burrs.

B. Remove scale and dirt on inside and outside before assembly.

C. Prepare piping connections to equipment with flanges or unions.

3.4 INSTALLATION

A. Install refrigerant piping according to ASHRAE 15.

B. Basic piping installation requirements are specified in Division 23 Section Common Work Results for HVAC.

C. Install piping as short and direct as possible, with a minimum number of joints, elbows, and fittings.

D. Arrange piping to allow inspection and service of compressor and other equipment. Install valves and specialties in accessible locations to allow for service and inspection.

E. Install piping with adequate clearance between pipe and adjacent walls and hangers or between pipes for insulation installation. Use sleeves through floors, walls, or ceilings, sized to permit installation of full-thickness insulation.

F. Below ground, install copper tubing in protective PVC Pipe. Install copper tubing in rigid or flexible conduit in locations where copper tubing will be exposed to mechanical injury.

G. Slope refrigerant piping as follows:

1. Install horizontal hot-gas discharge piping with a uniform slope of 1 inch for every 20 feet downward away from compressor.
2. Install horizontal suction lines with a uniform slope of 1 inch for every 20 feet downward to compressor.
3. Install traps and double risers where required to entrain oil in vertical runs.
4. Liquid lines may be installed level.

H. Install bypass around moisture-liquid indicators in lines larger than NPS 2 inch.

I. Install unions to allow removal of solenoid valves, pressure-regulating valves, and expansion valves and at connections to compressors and evaporators.

J. When brazing, remove solenoid-valve coils and sight glasses; also remove valve stems, seats, and packing, and accessible internal parts of refrigerant specialties. Do not apply heat near expansion valve bulb.

K. Hanger, support, and anchor products are specified in Division 23 Section Hangers and Supports for HVAC Piping and Equipment.

L. Install hangers for copper tubing with the following maximum spacing and minimum rod sizes:

1. NPS 1/2: Maximum span, 60 inches; minimum rod size, 1/4-inch.
2. NPS 5/8: Maximum span, 60 inches; minimum rod size, 1/4-inch.
3. NPS 1: Maximum span, 72 inches; minimum rod size, 1/4-inch.
4. NPS 1-1/4: Maximum span, 96 inches; minimum rod size, 3/8-inch.
5. NPS 1-1/2: Maximum span, 96 inches; minimum rod size, 3/8-inch.
6. NPS 2: Maximum span, 96 inches; minimum rod size, 3/8-inch.
7. NPS 2-1/2: Maximum span, 108 inches; minimum rod size, 3/8-inch.
8. NPS 3: Maximum span, 10 feet; minimum rod size, 3/8-inch.
9. NPS 4: Maximum span, 12 feet; minimum rod size, 1/2-inch.

M. Support vertical runs at each floor.

3.5 PIPE JOINT CONSTRUCTION

A. Braze joints according to Division 23 Section Common Work Results for HVAC.

B. Fill pipe and fittings with an inert gas (nitrogen or carbon dioxide) during brazing to prevent scale formation.

3.6 FIELD QUALITY CONTROL

A. Test and inspect refrigerant piping according to ASME B31.5, Chapter VI.

1. Test refrigerant piping, specialties, and receivers. Isolate compressor, condenser, evaporator, and safety devices from test pressure.

2. Test high- and low-pressure side piping of each system with dry nitrogen to 200 psig. Perform final tests at 27 inches vacuum and 200 psig using electronic leak detector. Test to no leakage.

END OF SECTION

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SECTION 23 31 13

METAL DUCTS AND AIR ACCESSORIES

(Edited from DeCA June 2011 Design Criteria)

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Metal ductwork.
2. Casing and plenums.
3. Duct cleaning.
4. Air turning devices.
5. Fire dampers.
6. Smoke dampers.
7. Duct access doors.
8. Duct test holes.
9. Flexible duct connections.
10. Volume control dampers.
11. Motorized dampers.
12. Damper motors.

B. Related Sections:

1. Division 01 Section Mechanical, Refrigeration, Food Service Equipment and Electrical Coordination.
2. Division 01 Section Quality Control.
3. Division 01 Section Closeout Procedures.
4. Division 23 Section Hangers and Supports for HVAC Piping and Equipment.
5. Division 23 Section Duct Insulation.
6. Division 23 Section Diffusers, Registers, and Grilles.
7. Division 23 Section Testing, Adjusting and Balancing for HVAC.
8. Division 26 Electrical.

1.2 QUALITY CONTROL

A. The following publications form a part of this Specification to the extent they are applicable:

1. Division 01 Section Quality Control.
2. ASTM A 36 - Structural Steel.
3. ASTM A 90 - Weight of Coating on Zinc-Coated (Galvanized) Iron or Steel Articles.
4. ASTM A 366 - Steel, Sheet, Carbon, Cold Rolled, Commercial Quality.
5. ASTM A 525 - General Requirements for Steel Sheet, Zinc- Coated (Galvanized) by the Hot-Dip Process.
6. ASTM A 653 - Steel Sheet, Zinc-Coated (Galvanized) by Hot-Dip Process, Lock Forming Quality.
7. ASTM A 568 - Steel, Sheet, Carbon, and High-Strength, Low-Alloy, Hot-Rolled and Cold-Rolled.

8. ASTM A 569 - Steel, Carbon (0.15 Maximum, Percent), Hot-Rolled Sheet and Strip, Commercial Quality.
9. ASTM B209 - Aluminum and Aluminum-Alloy Sheet and Plate.
10. NFPA 90A - Installation of Air Conditioning and Ventilating Systems.
11. NFPA 90B - Installation of Warm Air Heating and Air Conditioning Systems.
12. NFPA 96 - Ventilation of Commercial Kitchens.
13. SMACNA - HVAC Air Duct Leakage Test Manual.
14. SMACNA - HVAC Duct Construction Standards - Metal and Flexible.
15. UL 555 - Fire Dampers and Ceiling Dampers.
16. UL 33 - Heat Responsive Links for Fire Protection Services.

1.3 PERFORMANCE REQUIREMENTS

A. No variation of duct configuration or sizes permitted except by written permission. Size round ducts installed in place of rectangular ducts in accordance with ASHRAE table of equivalent rectangular and round ducts.

1.4 SUBMITTALS

A. Submittals During Construction:

1. Submit under provisions of Division 01 Section Quality Control.
2. Test Reports: Indicate pressure tests performed. Include date; section tested, test pressure, and leakage rate, following SMACNA HVAC Air Duct Leakage Test Manual.
3. Operation and Maintenance data.

B. Submittals at Project Closeout:

1. Division 01 Section Closeout Procedures.
2. Record actual locations of ducts and duct fittings. Record changes in fitting location and type. Show additional fittings used.
3. The Contractor shall submit all certifications and testing data as a supplement to previously submitted O & M manuals at contract closeout.

1.5 QUALITY ASSURANCE

A. Perform Work in accordance with SMACNA - HVAC Duct Construction Standards - Metal and Flexible.

1.6 REGULATORY REQUIREMENTS

A. Construct ductwork to NFPA 90A and NFPA 90B standards.

1.7 ENVIRONMENTAL REQUIREMENTS

A. Do not install duct sealants when temperatures are less than those recommended by sealant manufacturers.

B. Maintain temperatures during and after installation of duct sealants.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Protect dampers from damage to operating linkages and blades.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Galvanized Steel Ducts: ASTM A525 and ASTM A527 galvanized steel sheet, lock-forming quality, having zinc coating of in conformance with ASTM A90.

B. Insulated Flexible Ducts:

1. Two ply vinyl film supported by helically wound spring steel wire; fiberglass insulation; polyethylene vapor barrier film.
2. Pressure Rating: 4 inches WG positive and 1.0 inches WG negative.
3. Maximum Velocity: 4000 fpm.
4. Temperature Range: Minus 10 deg F to 160 deg F.

C. Sealant:

1. Non-hardening, water resistant, fire resistive, compatible with mating materials; liquid used alone or with tape, or heavy mastic.
2. Low Volatile Organic Content (VOC).

D. Hanger Rod: ASTM A36; steel; threaded both ends, threaded one end, or continuously threaded.

2.2 DUCTWORK FABRICATION

A. Fabricate and support in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible, and as indicated. Provide duct material, gages, reinforcing, and sealing for operating pressures indicated.

B. Construct T's, bends, and elbows with radius of not less than 1-1/2 times width of duct on centerline. Where not possible and where rectangular elbows are used, provide air foil turning vanes. Where acoustical lining is indicated, provide turning vanes of perforated metal with glass fiber insulation.

C. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible; maximum 30 degrees divergence upstream of equipment and 45 degrees convergence downstream.

D. Provide standard 45 degree lateral wye takeoffs unless otherwise indicated where 90 degree conical tee connections may be used.

2.3 AIR TURNING DEVICES

A. Multi-blade device with blades aligned in short dimension; steel or aluminum construction; with individually adjustable blades, mounting straps.

2.4 DUCT ACCESS DOORS

A. Fabricate in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible, and as indicated.

B. Fabrication: Rigid and close-fitting of galvanized steel with sealing gaskets and quick fastening locking devices. For insulated ductwork, install minimum 1 inch thick insulation with sheet metal cover.

1. Less Than 12 Inches Square: Secure with sash locks.
2. Up to 18 Inches Square: Provide two hinges and two sash locks.
3. Up to 24 by 48 Inches: Three hinges and two compression.
4. Larger Sizes: Provide an additional hinge.
5. Sash lock.
6. Hinge.

C. Access doors with sheet metal screw fasteners are not acceptable.

2.5 DUCT TEST HOLES

A. Temporary Test Holes: Cut or drill in ducts as required. Cap with neat patches, neoprene plugs, threaded plugs, or threaded or twist-on metal caps.

B. Permanent Test Holes: Factory fabricated, air tight flanged fittings with screw cap. Provide extended neck fittings to clear insulation.

2.6 FLEXIBLE DUCT CONNECTIONS

A. Fabricate in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible, and as indicated.

B. Connector: Fabric crimped into metal edging strip.

1. Fabric: UL listed fire-retardant neoprene coated woven glass fiber fabric to NFPA 90A, minimum density 30 oz per sq yd.
2. Net Fabric Width: Approximately 6 inches wide.
3. Metal: 3 inch wide, 24 gage galvanized steel.

2.7 MANUAL VOLUME DAMPERS

A. Standard, Steel, Manual Volume Dampers:

1. Manufacturers:

a. Air Balance Inc.; a division of Mestek, Inc.
b. American Warming and Ventilating; a division of Mestek, Inc.
c. Cesco Products.
d. Flexmaster U.S.A., Inc.
e. McGill AirFlow LLC.
f. METALAIRE, Inc.
g. Nailor Industries Inc.
h. Penn Ventilation.

i. Ruskin Company.
j. Vent Products Company, Inc.

2. Standard leakage rating**,** with linkage outside airstream.
3. Suitable for horizontal or vertical applications.
4. Frames:

a. Hat-shaped, galvanized-steel channels, 0.064-inch minimum thickness.
b. Mitered and welded corners.
c. Flanges for attaching to walls and flangeless frames for installing in ducts.

5. Blades:

a. Multiple or single blade.
b. Parallel- or opposed-blade design.
c. Stiffen damper blades for stability.
d. Galvanized-steel, 0.064 inch thick.

6. Blade Axles: Galvanized steel.
7. Bearings:

a. Oil-impregnated bronze.
b. Dampers in ducts with pressure classes of 3-inch wg or less shall have axles full length of damper blades and bearings at both ends of operating shaft.

8. Tie Bars and Brackets: Galvanized steel.

B. Standard, Aluminum, Manual Volume Dampers:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Air Balance Inc.; a division of Mestek, Inc.
b. American Warming and Ventilating; a division of Mestek, Inc.
c. Cesco Products.
d. Flexmaster U.S.A., Inc.
e. McGill AirFlow LLC.
f. METALAIRE, Inc.
g. Penn Ventilation Company.
h. Nailor Industries Inc.
i. Ruskin Company.
j. Vent Products Company, Inc.

2. Standard leakage rating**,** with linkage outside airstream.
3. Suitable for horizontal or vertical applications.
4. Frames: Hat-shaped, 0.10-inch- thick, aluminum sheet channels; frames with flanges for attaching to walls and flangeless frames for installing in ducts.
5. Blades:

a. Multiple or single blade.
b. Parallel- or opposed-blade design.
c. Stiffen damper blades for stability.
d. Roll-Formed Aluminum Blades: 0.10-inch- thick aluminum sheet.
e. Extruded-Aluminum Blades: 0.050-inch- thick extruded aluminum.

6. Blade Axles: Stainless steel.
7. Bearings:

   a. Stainless-steel sleeve.
   b. Dampers in ducts with pressure classes of 3-inch wg or less shall have axles full length of damper blades and bearings at both ends of operating shaft.

8. Tie Bars and Brackets: Aluminum.

C. High Efficiency Take-Offs:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Hercules.

2. These take-offs have large 1 inch flanges with an adhesive coated gasket that holds the fitting in position during installation and assures a tight seal.
3. All high Efficiency Take-offs have dampers with standard hardware. Provide damper hardware with 2 inch standoffs (for insulated duct).

D. Round Standard, Steel, Manual Volume Damper:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Jiffy Damper.

2. Blades: Stiffen damper blades for stability. Provide galvanized-steel, 24-gauge (0.024 thick.).
3. Blade axles to be galvanized-steel.

2.8 VOLUME CONTROL DAMPERS.

A. Fabricate in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible, and as indicated.

B. Single Blade Dampers: Fabricate for duct sizes up to 6 by 30 inch.

C. Multi-Blade Damper: Fabricate of opposed blade pattern with maximum blade sizes 8 by 72 inch. Assemble center and edge crimped blades in prime coated or galvanized channel frame with suitable hardware.

D. End Bearings: Except in round ductwork 12 inches and smaller, provide end bearings. On multiple blade dampers, provide oil-impregnated nylon or sintered bronze bearings.

E. Quadrants:

1. Provide locking, indicating quadrant regulators on single and multi-blade dampers.
2. On insulated ducts mount quadrant regulators on stand-off mounting brackets, bases, or adapters.
3. Where rod lengths exceed 30 inches provide regulator at both ends.

2.9 MOTORIZED DAMPERS

A. Dampers shall be as VOLUME CONTROL DAMPERS above except that parallel blade dampers may be used for two position service and dampers shall have blade edge and jamb gaskets.

2.10 DAMPER MOTORS

A. Operators: UL listed and labeled spring return type electric type suitable for 120 volts, single phase, 60 Hz. Locate damper operator on exterior of duct and link to damper operating shaft.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions, and NFPA 90A.

B. Install and seal ducts in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible.

C. Duct Sizes are inside clear dimensions. For lined ducts, maintain sizes inside lining.

D. Provide openings in ductwork where required to accommodate thermometers and controllers. Provide pilot tube openings where required for testing of systems, complete with metal can with spring device or screw to ensure against air leakage. Where openings are provided in insulated ductwork, install insulation material inside a metal ring.

E. Locate ducts with sufficient space around equipment to allow normal operating and maintenance activities.

F. Use crimp joints with or without bead for joining round duct sizes 8 inch and smaller with crimp in direction of air flow.

G. Use double nuts and lock washers on threaded rod supports.

H. Connect diffusers to low pressure ducts directly or with 10 feet maximum length of insulated flexible duct held in place with strap or clamp.

I. Connect flexible ducts to metal ducts with draw bands and sheet metal screws.

J. During construction provide temporary closures of metal or taped polyethylene on open ductwork to prevent construction dust from entering ductwork system.

K. Do not attach hangers to roof deck.

L. Provide backdraft dampers on exhaust fans or exhaust ducts nearest to outside and where indicated.

M. Provide duct access doors for inspection and cleaning before and after filters, coils, fans, automatic dampers, at fire dampers, combination fire and smoke dampers, and elsewhere as indicated. Review locations prior to fabrication.

N. Provide duct test holes where indicated and required for testing and balancing purposes.

O. Provide flexible connections immediately adjacent to equipment in ducts associated with fans and motorized equipment, and supported by vibration isolators.

P. Provide balancing dampers at points on supply, return, and exhaust systems where branches are taken from larger ducts as required for air balancing. Install minimum 2 duct widths from duct take-off.

Q. Use splitter dampers only where indicated.

R. Provide balancing dampers on high velocity systems where indicated. Refer to Division 23 Section Convection Heating and Cooling Units.

S. Provide balancing dampers on duct take-off to diffusers, grilles, and registers, regardless of whether dampers are specified as part of the diffuser, grille, or register assembly.

3.2 TESTING

A. Test in accordance with procedure outlined in SMACNA HVAC Air Duct Leakage Test Manual. Testing shall be required for all pressure classes unless waived by the Contracting officer.

3.3 CLEANING

A. Clean duct system and force air at high velocity through duct to remove accumulated dust. To obtain sufficient air, clean half the system at a time. Protect equipment which may be harmed by excessive dirt with temporary filters, or bypass during cleaning. Provide adequate access into ductwork for cleaning purposes.

3.4 SCHEDULES

A. DUCTWORK MATERIAL SCHEDULE

AIR SYSTEM	MATERIAL
Low Pressure Supply	Steel
Return and Relief	Steel
General Exhaust	Steel
Outside Air Intake	Steel
Combustion Air	Steel

B. DUCTWORK PRESSURE CLASS SCHEDULE

AIR SYSTEM	PRESSURE CLASS
Supply (System with Cooling Coils)	2 inch
Return and Relief	1 inch
General Exhaust	1 inch
Outside Air Intake	1 inch
Combustion Air	1/2 inch

END OF SECTION

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SECTION 23 34 23

HVAC POWER VENTILATORS

(Edited from DeCA June 2011 Design Criteria)

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Power roof ventilators.
2. Inline fan

B. Related Sections:

1. Division 01 Section Mechanical, Refrigeration, Food Service Equipment and Electrical Coordination.
2. Division 01 Section Quality Control.
3. Division 01 Section Closeout Procedures.
4. Division 23 Section Hangers and Supports for HVAC Piping and Equipment.
5. Division 23 Section Common Motor Requirements for HVAC Equipment.
6. Division 23 Section Metal Ducts and Air Accessories.
7. Division 26 Electrical.

1.2 QUALITY CONTROL

A. The following publications form a part of this Specification to the extent they are applicable:

1. Division 01 Section Quality Control.
2. AMCA 99 - Standards Handbook.
3. AMCA 210 - Laboratory Methods of Testing Fans for Rating Purposes.
4. AMCA 261 - Directory of Products Licensed to Bear the AMCA Certified Ratings Seal.
5. AMCA 300 - Reverberant Room Method for Sound Testing of Fans.
6. AMCA 301 Methods for Calculating Fan Sound Ratings from Laboratory Test Data.
7. NEMA MG1 - Motors and Generators.
8. NFPA 70 - National Electrical Code.
9. UL 705 - Power Ventilators.

1.3 SUBMITTALS

A. Submittals for Review:

1. Submit under provisions of Division 01 Section Quality Control.
2. Product Data: Include rated capacities, furnished specialties, and accessories for each type of product indicated and include the following:

   a. Certified fan performance curves with system operating conditions indicated.
   b. Certified fan sound-power ratings.
   c. Motor ratings and electrical characteristics, plus motor and electrical accessories.

d. Material thickness and finishes, including color charts.
e. Dampers, including housings, linkages, and operators.
f. Roof curbs.
g. Fan speed controllers.

3. Manufacturer's Installation Instructions.

B. Submittals at Project Closeout:

1. Division 01 Section Closeout Procedures.
2. Operation and Maintenance Data: Include manufacturers' descriptive literature, instructions for lubrication, motor and drive replacement, spare parts list, and wiring diagrams.
3. The Contractor shall submit all certifications and testing data as a supplement to previously submitted O & M manuals at contract closeout.

PART 2 - PRODUCTS

2.1 ROOF VENTILATORS

A. Product Requirements:

1. Performance Ratings: Conform to AMCA 210 and bear the AMCA Certified Rating Seal.
2. Sound Ratings: AMCA 301, tested to AMCA 300, and bear AMCA Certified Sound Rating Seal.
3. Fabrication: Conform to AMCA 99.
4. UL Compliance: UL listed and labeled, designed, manufactured, and tested in accordance with UL 705.

B. Fan Unit: V-belt or direct driven as indicated, with spun aluminum housing; resilient mounted motor; 1/2 inch mesh, 16 gage aluminum birdscreen; square base to suit roof curb with continuous curb gaskets.

C. Roof Curb: See Division 23 Section Hangers and Supports for HVAC Piping and Equipment.

D. Disconnect Switch: Factory wired, non-fusible, in housing for thermal overload protected motor.

E. Backdraft Dampers: Gravity actuated with counterweight and interlocking aluminum blades with felt edges in steel frame installed on fan discharge.

F. Sheaves: Cast iron or steel, dynamically balanced, bored to fit shafts and keyed; variable and adjustable pitch motor sheave selected so required rpm is obtained with sheaves set at mid-position; fan shaft with self aligning pre-lubricated ball bearings.

2.2 INLINE FANS

A. Centrifugal Fan Unit: V-belt or direct driven with galvanized steel housing , resilient mounted motor, gravity backdraft damper in discharge.

B. Disconnect Switch: In housing for thermal overload protected motor.

C. Sheaves: Cast iron or steel, dynamically balanced, bored to fit shafts and keyed; variable and adjustable pitch motor sheaves selected so required rpm is obtained with sheaves set at mid-position; fan shaft with self-aligning pre-lubricated ball bearings.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install power ventilators level and plumb.

C. Secure roof-mounting fans to roof curbs with cadmium-plated hardware. Refer to Division 07 Section Roof Accessories for installation of roof curbs.

D. Ceiling Units: Suspend units from structure; use steel wire or metal straps.

E. Support suspended units from structure using threaded steel rods and spring hangers having a static deflection of 1 inch. Vibration-control devices are specified in Division 23 Section Vibration and Seismic Controls for HVAC Piping and Equipment.

F. Install units with clearances for service and maintenance.

G. Provide sheaves required for final air balance.

H. Install dampers on inlet to roof exhausters.

I. Do not operate fans for any purpose until ductwork is clean, filters in place, bearings lubricated, and fan has been test run under observation.

J. Label units according to requirements specified in Division 23 Section Identification for HVAC Piping and Equipment.

3.2 CONNECTIONS

A. Duct installation and connection requirements are specified in other related Sections. Drawings indicate general arrangement of ducts and duct accessories. Make final duct connections with flexible connectors. Flexible connectors are specified in Division 23 Section Metal Ducts and Air Accessories.

B. Install ducts adjacent to power ventilators to allow service and maintenance.

C. Ground equipment according to Division 26 Section Grounding and Bonding for Electrical Systems.

3.3 FIELD QUALITY CONTROL

A. Perform the following field tests and inspections and prepare test reports:

1. Verify that shipping, blocking, and bracing are removed.

2. Verify that unit is secure on mountings and supporting devices and that connections to ducts and electrical components are complete. Verify that proper thermal-overload protection is installed in motors, starters, and disconnect switches.

3.4 CONTROL

A. NON-RMCS controlled units: Provide controls as indicated on drawings and Division 23 Section “Instrumentation And Control Devices For HVAC”.

B. RMCS controlled units shall be controlled as indicated on drawings and Division 23Section “REFRIGERATION MONITORING AND CONTROL SYSTEMS (RMCS)”.

C. Bakery Oven exhaust shall be interlocked and operate when oven is operating.

D. Control {Makeup Air Unit}{Filtered Supply Fan} to run when associated exhaust fan runs.

END OF SECTION

SECTION 23 37 13

DIFFUSERS, REGISTERS, AND GRILLES

(Edited from DeCA June 2011 Design Criteria)

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Registers/grilles.
2. Louvers.
3. Roof hoods.

B. Related Sections:

1. Division 01 Section Mechanical, Refrigeration, Food Service Equipment and Electrical Coordination.
2. Division 01 Section Quality Control.
3. Division 01 Section Closeout Procedures.
4. Division 23 Section Hangers and Supports for HVAC Piping and Equipment.

1.2 QUALITY CONTROL

A. The following publications form a part of this specification to the extent they are applicable:

1. Division 01 Section Quality Control.
2. ADC 1062 - Certification, Rating and Test Manual.
3. AMCA 500 - Test Method for Louvers, Dampers and Shutters.
4. ARI 650 - Air Outlets and Inlets.
5. ASHRAE 70 - Method of Testing for Rating the Air Flow Performance of Outlets and Inlets.
6. SMACNA - HVAC Duct Construction Standard - Metal and Flexible.
7. NFPA 90A - Installation of Air Conditioning and Ventilating Systems.

1.3 SUBMITTALS

A. Submittals for Review:

1. Submit under provisions of Division 01 Section Quality Control.
2. Product Data: Provide data for equipment required for this project. Review outlets and inlets as to size, finish, and type of mounting prior to submission. Submit room by room schedule of outlets and inlets showing type, size, location, application, and noise level.
3. Operation and Maintenance data.

1.4 QUALITY ASSURANCE

A. Test and rate air outlet and inlet performance in accordance with ADC Equipment Test Code 1062 and ASHRAE 70.

B. Test and rate louver performance in accordance with AMCA 500.

1.5 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing the Products specified in this Section with minimum three years experience.

PART 2 - PRODUCTS

2.1 SQUARE CEILING DIFFUSERS

A. Type: Square, triple cone adjustable diffuser.

B. Fabrication: Steel or aluminum with baked enamel finish.

C. Accessories: Radial opposed blade damper as detailed on the Drawings with damper adjustable from diffuser face.

2.2 EGGCRATE GRILLES

A. Type: Eggcrate face with ½" x ½" x ½" aluminum core.

B. Fabrication: Aluminum frame and baked enamel finish.

C. Accessories: Opposed blade damper.

2.3 WALL SUPPLY REGISTERS/GRILLES

A. Type: Streamlined and individually adjustable blades, 3/4 inch minimum depth, 3/4 inch maximum spacing with spring or other device to set blades, horizontal face, double deflection.

B. Frame: One inch margin with concealed mounting and gasket.

C. Fabrication: Steel with 20 gage minimum frames and 22 gage minimum blades, steel and aluminum with 20 gage minimum frame, or aluminum extrusions, with factory baked enamel, color to be selected.

D. Damper: Integral, gang-operated opposed blade type with removable key operator, operable from face.

2.4 WALL EXHAUST AND RETURN REGISTERS/GRILLES

A. Type: Streamlined blades, 3/4 inch minimum depth, 3/4 inch maximum spacing, with spring or other device to set blades, horizontal face.

B. Frame: One inch margin with concealed mounting.

C. Fabrication: Steel with 20 gage minimum frames and 22 gage minimum blades, with factory baked enamel finish, color to be selected.

D. Damper: Integral, gang-operated, opposed blade type with removable key operator, operable from face.

2.5 LOUVERS

A. Type: 4 inch deep with blades on 45 degree slope with center baffle and return bend, heavy channel frame, birdscreen with 1/2 inch square mesh.

B. Fabrication: 12 gage thick extruded aluminum, welded assembly, with factory fluropolymer spray finish color to be selected by the Contracting Officer.

C. Mounting: Furnish with screw holes in jambs for installation.

2.6 ROOF HOODS

A. Fabricate air inlet or exhaust hoods in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible.

B. Fabricate of galvanized steel, minimum 16 gage base and 20 gage hood, or aluminum, minimum 16 gage base and 18 gage hood; suitably reinforced; with removable hood; birdscreen with 1/2 inch mesh, and 1 inch internal neoprene faced insulation.

C. Mount unit on minimum 12 inch high curb base with insulation between duct and curb.

D. Make hood outlet area minimum of twice throat area.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Check location of outlets and inlets and make necessary adjustments in position to conform with architectural features, symmetry, and lighting arrangement.

C. Install diffusers to ductwork with air tight connection.

D. Provide balancing dampers on duct take-off to diffusers, and grilles and registers, despite whether dampers are specified as part of the diffuser, or grille and register assembly.

E. Paint ductwork visible behind air outlets and inlets matte black. Refer to Division 09 Section Painting and Coating.

END OF SECTION

SECTION 23 54 16

FUEL-FIRED HEATERS

(Edited from DeCA June 2011 Design Criteria)

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Gas fired unit heaters.

B. Related Sections:

1. Division 01 Section Mechanical, Refrigeration, Food Service Equipment and Electrical Coordination.
2. Division 01 Section Quality Control.
3. Division 01 Section Closeout Procedures.
4. Division 23 Section Hangers and Supports for HVAC Piping and Equipment.
5. Division 23 Section Common Motor Requirements for HVAC Equipment.
6. Division 23 Section Duct Insulation.
7. Division 23 Section Breechings, Chimneys, and Stacks.
8. Division 23 Section Instrumentation and Control Devices for HVAC.
9. Division 26 Electrical.

1.2 QUALITY CONTROL

A. The following publications form a part of this Specification to the extent they are applicable:

1. ASHRAE 103 - Heating Seasonal Efficiency of Central Furnaces and Boilers, Methods of Testing.
2. NEMA MG 1 - Motors and Generators.
3. NFPA 54 (AGA Z223.1) - National Fuel Gas Code.
4. NFPA 70 - National Electrical Code.
5. NFPA 90A - Installation of Air Conditioning and Ventilating Systems.
6. NFPA 90B - Installation of Warm Air Heating and Air Conditioning Systems.
7. NFPA 211 - Chimneys, Fireplaces, Vents, and Solid Fuel Burning Appliances.

1.3 SUBMITTALS

A. Submittals for Review:

1. Division 01 Section Quality Control: Procedures for submittals.
2. Product Data: Provide manufacturer's literature and data indicating rated capacities, weights, accessories, electrical nameplate data, and wiring diagrams.
3. Shop Drawings: Indicate assembly, required clearances, and locations and sizes of field connections.
4. Operation and Maintenance Data.

B. Submittals For Information:

1. Division 01 Section Quality Control: Procedures for submittals.
2. Manufacturer's Instructions: Indicate rigging, assembly, and installation instructions.

C. Submittals At Project Closeout:

1. Division 01 Section Closeout Procedures.
2. Operation and Maintenance Data: Include manufacturer's descriptive literature, operating instructions, maintenance and repair data, and parts listing.
3. Warranty: Submit manufacturers warranty and ensure forms have been filled out in Government's name and registered with manufacturer.
4. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this Section with minimum three years experience.
5. The Contractor shall submit all certifications and testing data as a supplement to previously submitted O & M manuals at contract closeout.

1.4 REGULATORY REQUIREMENTS

A. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

PART 2 - PRODUCTS

2.1 GAS FIRED UNIT HEATERS

A. Acceptable Manufacturers:

1. Reznor/Thomas & Betts Corporation.
2. Lennox Industries, Inc.
3. Modine Manufacturing Company.

B. Units: Self-contained, packaged factory assembled, pre-wired unit consisting of cabinet, supply fan, heat exchanger, burner, controls, and accessories. Provide separated combustion type where scheduled.

1. Heating: Natural gas fired.
2. Discharge Louvers: Individually adjustable horizontal and vertical louvers to match cabinet finish on propeller fan units.
3. Downturn nozzle: 60 degree nozzle to match outlet and cabinet finish on centrifugal fan units.

C. Cabinet: Galvanized steel with baked enamel finish easily removed and secured access doors, glass fiber insulation and reflective liner.

D. Supply Fan: Propeller or Centrifugal forward curved type as scheduled with direct or belt drive.

E. Heat Exchanger: Type E-3 stainless steel welded construction.

F. Gas Burner:

1. Separated combustion type.

2. Gas valve provides 100 percent safety gas shut-off; 24 volt combining pressure regulation, safety pilot, manual set (On-Off), pilot filtration, automatic electric valve.
3. Electronic pilot ignition, with electric spark igniter with electronic flame supervision motor.
4. Non-corrosive combustion air blower with permanently lubricated motor.
5. Concentric flue kit.

G. Operating Controls:

1. Room Sensort: Provide a wall mounted sensor to cycle burner to maintain room temperature setting utilizing RMCS system.
2. Supply Fan Control: Energize from bonnet temperature independent of burner controls, with adjustable timed off delay and fixed timed on delay, with manual switch for continuous fan operation.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Division 01 Section Quality Control: Verification of existing conditions before starting work.

B. Verify that space is ready for installation of units and openings are as indicated on Shop Drawings.

C. Verify that proper power supply is available.

D. Verify that proper fuel supply is available for connection.

3.2 INSTALLATION

A. Install in accordance with NFPA 90A and NFPA 90B.

B. Install gas fired units to NFPA 54.

C. Provide vent connections to NFPA 211. Refer to Division 23 Section Breechings, Chimneys, and Stacks.

D. Install unit heaters and dust furnaces with vibration isolation. Refer to Division 23 Section Vibration and Seismic Controls for HVAC Piping.

E. Provide operating controls; refer to Division 23 Section Instrumentation and Control Devices for HVAC.

F. Provide connection to electrical power systems.

END OF SECTION

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SECTION 23 62 13

AIR COOLED CONDENSING UNITS

(Edited from DeCA June 2011 Design Criteria)

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Condensing unit package.
2. Charge of refrigerant and oil.
3. Controls and control connections.
4. Refrigerant piping connections.
5. Motor starters.

B. Related Sections:

1. Division 01 Section Mechanical, Refrigeration, Food Service Equipment and Electrical Coordination.
2. Division 01 Section Quality Control.
3. Division 01 Section Closeout Procedures.
4. Division 23 Section Common Motor Requirements for HVAC Equipment.
5. Division 23 Section Refrigerant Piping.
6. Division 23 Section Convection Heating and Cooling Units: Fan-coil units.
7. Division 23 Section Instrumentation and Control Devices for HVAC.
8. Division 26 Electrical.

1.2 QUALITY CONTROL

A. The following publications form a part of this specification to the extent they are applicable:

1. ARI 210/240 - Unitary Air-Conditioning and Air-Source Heat Pump Equipment.
2. ASHRAE 14 - Methods of Testing for Rating Positive Displacement Condensing Units.
3. ASHRAE 15 - Safety Code for Mechanical Refrigeration.
4. NEMA MG 1 - Motors and Generators.
5. UL 207 - Refrigerant-Containing Components and Accessories, Non-Electrical.

1.3 SUBMITTALS

A. Submittals for Review:

1. Division 01 Section Quality Control: Procedures for Submittals.
2. Shop Drawings: Indicate components, assembly, dimensions, weights and loadings, required clearances, and location and size of field connections. Include schematic layouts showing condensing units, cooling coils, refrigerant piping, and accessories required for complete system.
3. Product Data: Provide rated capacities, weights specialties and accessories, electrical nameplate data, and wiring diagrams. Make submission with fan-coil units, refer to

Division 23 Section Convection Heating and Cooling Units to ensure capacities are complementary.

4. Operation and Maintenance data.

B. Submittals For Information:

1. Division 01 Section Administrative Requirements: Procedures for submittals.
2. Design Data: Provide a piping schematic. Indicate pipe and equipment sizing.
3. Submit manufacturer's installation instructions.

1.4 DELIVERY, STORAGE, AND PROTECTION

A. Comply with manufacturer's installation instructions for rigging, unloading, and transporting units.

B. Protect units on site from physical damage. Protect coils.

1.5 REGULATORY REQUIREMENTS

A. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

PART 2 - PRODUCTS

2.1 REFRIGERANT

A. Refrigerant shall be R410A.

2.2 EFFICIENCY

A. Equipment shall meet or exceed the minimum efficiency requirements set forth in the International Energy Conservation Code, edition adopted by authority having jurisdiction.

2.3 MANUFACTURED UNITS

A. Units: Self-contained, packaged, factory assembled and pre-wired units suitable for outdoor use consisting of cabinet, compressors, condensing coil and fans, integral sub-cooling coil, controls, liquid receiver, and screen guards.

B. Construction and Ratings: In accordance with ARI 210/240 and UL 207 and UL 303. Testing shall be in accordance with ASHRAE 14.

C. Performance Ratings: Energy Efficiency Rating (EER) and Coefficient of Performance (COP) not less than prescribed by ASHRAE 90A.

2.4 CASING

A. House components in welded steel frame with galvanized steel panels with weather resistant, baked enamel finish.

B. Mount starters, disconnects, and controls in weatherproof panel provided with full opening access doors. Provide mechanical interlock to disconnect power when door is opened.

C. Provide removable access doors or panels with quick fasteners.

2.5 OUTDOOR COILS

A. Coils: Aluminum fins mechanically bonded to seamless copper tubing with corrosion resistant polyethylene coating and coastal filter. Provide sub-cooling circuits. Air test under water to 425 psig, and vacuum dehydrate. Seal with holding charge of refrigerant.

B. Coil Guard: Expanded metal, Louvered, or PVC coat steel wire for hail damage prevention.

2.6 FANS AND MOTORS

A. Vertical discharge direct belt driven propeller type condenser fans with fan guard on discharge. Equip with roller or ball bearings with grease fittings extended to outside of casing.

B. Weatherproof motors suitable for outdoor use, single phase permanent split capacitor or 3 phase, with permanent lubricated ball bearings and built in thermal overload protection.

2.7 COMPRESSORS

A. Compressor: Hermetic or semihermetic or scroll, or reciprocating.

B. Mounting: Statically and dynamically balance rotating parts and mount on vibration isolators.

C. Motor: Suction gas cooled with winding over temperature protection.

D. Crankcase Heater: Evaporates refrigerant returning to crankcase during shut down. Energize heater when compressor is not operating.

2.8 REFRIGERANT CIRCUIT

A. Provide each unit with one refrigerant circuit, factory supplied and piped. Refer to Division 23 Section Refrigerant Piping.

B. For each refrigerant circuit, provide:

1. Filter dryer.
2. Thermal expansion device.
3. Insulated suction line.
4. Suction and liquid line service valves and gage ports.
5. Charging valve.
6. Compressor discharge service valve.
7. Condenser pressure relief device.

8. Moisture and liquid indicator.

2.9 CONTROLS

A. On unit, mount weatherproof steel control panel, NEMA 250, containing power and control wiring, factory wired with single point power connection.

B. Provide compressor starter, control power transformer or terminal for controls power, and condenser fan starter relay.

C. Provide safety controls arranged so any one will shut down machine:

1. High discharge pressure switch.
2. Low suction pressure switch.
3. Low oil pressure cutout switch.
4. Phase loss, Phase reversal, low voltage and voltage spike protection, factory or field installed on three phase units. (SymCom Inc., Motor Saver).
5. Timer to prevent excessive compressor cycling.

D. Provide one of the following controls to permit operation down to 30 deg F ambient temperature:

1. Head pressure switch to cycle fan motors in response to refrigerant condensing pressure.
2. Solid state control to vary speed of one condenser fan motor in response to refrigerant condensing pressure.
3. Electronic control consisting of mixing damper assembly, controlled to maintain constant refrigerant condensing pressure.

E. Provide one of the following controls to permit operation below 30 deg F ambient temperature.

1. Low Ambient Controller: Cycles condenser fan to permit operation down to 0 deg.

F. For heat pump units, provide reversing valve, suction line accumulator, flow control check valve, and solid-state defrost control utilizing thermistors.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install units level and plumb, firmly anchored in locations indicated; maintain manufacturer's recommended clearances.

B. Install ground-mounted condensing units on a minimum 4 inch thick concrete base.

C. Install roof-mounting units on equipment supports as required.

D. Vibration Isolation: Mount ground-mounted condensing units on rubber pads with a minimum deflection of 1/4 inch.

E. Vibration Isolation: Mount ground-mounted condensing units on restrained spring isolators with a minimum deflection of 1 inch. Anchor units to supports.

F. Maintain manufacturer's recommended clearances for service and maintenance.

G. Loose Components: Install electrical components, devices, and accessories that are not factory mounted.

H. Install in accordance with manufacturer's installation instructions.

I. Complete structural, mechanical, and electrical connections in accordance with manufacturer's installation instructions.

J. Provide connection to refrigeration piping system and evaporators. Refer to Division 23 Section Refrigerant Piping. Comply with ASHRAE 15.

K. Furnish charge of refrigerant and oil.

L. Charge system with refrigerant and test entire system for leaks after completion of installation. Repair leaks, put system into operation, and test equipment performance.

M. Securely fasten condensing units to housekeeping pads on roof mounting rails to withstand wind and seismic loading specified in Division 01 Section Summary of Work.

N. Start unit according to manufacturer's written instructions.

END OF SECTION

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SECTION 23 74 13

PACKAGED, OUTDOOR, AIR-HANDLING UNITS

(Edited from DeCA June 2011 Design Criteria)

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Packaged roof top unit.
2. Unit controls.
3. Roof mounting curb and base.

B. Related Sections:

1. Division 01 Section Mechanical, Refrigeration, Food Service Equipment and Electrical Coordination.
2. Division 01 Section Quality Control.
3. Division 01 Section Closeout Procedures.
4. Division 01 Section General Commissioning Requirements.
5. Division 23 Section Hangers and Supports for HVAC Piping and Equipment.
6. Division 23 Section Common Motor Requirements for HVAC Equipment.
7. Division 23 Section Vibration and Seismic Controls for HVAC Piping and Equipment.
8. Division 23 Section Duct Insulation.
9. Division 26 Electrical.

1.2 QUALITY CONTROL

A. The following publications form a part of this Specification to the extent they are applicable:

1. Division 01 Section Quality Control.
2. ARI 210 - Unitary Air-Conditioning Equipment.
3. ARI 240 - Air Source Unitary Heat Pump Equipment.
4. ARI 270 - Sound Rating of Outdoor Unitary Equipment.
5. NFPA 70 - National Electrical Code.
6. NFPA 90A - Installation of Air Conditioning and Ventilation Systems.

1.3 SUBMITTALS

A. Submittals for Review:

1. Submit under provisions of Division 01 Section Quality Control.
2. Shop Drawings: Indicate capacity and dimensions of manufactured products and assemblies required for this project. Indicate electrical service with electrical characteristics and connection requirements, and duct connections.
3. Product Data: Provide capacity and dimensions of manufactured products and assemblies required for this project. Indicate electrical service with electrical characteristics and connection requirements, and duct connections.

4. Operation and Maintenance data.

B. Submittals for Project Closeout:

1. Submit under provisions of Division 01 Section Closeout Procedures.
2. Operation and Maintenance Data: Include manufacturer's descriptive literature, operating instructions, installation instructions, maintenance and repair data, and parts listing.
3. The Contractor shall submit all certifications and testing data as a supplement to previously submitted O & M manuals at contract closeout.

1.4 DELIVERY, STORAGE, AND PROTECTION

A. Protect units from physical damage by storing off site until roof mounting curbs are in place, ready for immediate installation of units.

1.5 QUALITY ASSURANCE

A. Manufacturer: Company specializing in manufacturing the Products specified in this Section with minimum three years documented experience.

1.6 REGULATORY REQUIREMENTS

A. Products Requiring Electrical Connection: Listed and classified by Underwriters' Laboratories, Inc.

1.7 WARRANTY

A. Provide a five year warranty to include coverage for refrigeration compressors and heat exchangers.

1.8 EXTRA MATERIALS

A. Provide one set of filters.

PART 2 - PRODUCTS

2.1 REFRIGERANT

A. Refrigerant shall be R410A.

2.2 EFFICIENCY

A. EER shall not be less than 10.5 for units 10 tons of nominal capacity and above.

B. EER shall not be less than 12 for units 6 to 10 tons of nominal capacity.

C. EER shall not be less than 13 for units 1.5 to 5 tons.

2.3 AIR CONDITIONING UNITS

A. General: Roof mounted units having gas burner, and electric refrigeration, configured as scheduled on the Drawings.

B. Disconnect Switch: Factory mount disconnect switch in control panel.

2.4 FABRICATION

A. Cabinet: Galvanized steel with baked enamel finish, access doors or removable access panels with quick fasteners screwdriver operated flush cam type or locking door handle type with piano hinges. Structural members shall be minimum 18 gage, with access doors or removable panels of minimum 20 gage.

B. Insulation: 1/2 inch thick with neoprene or resin coated glass fiber with edges protected from erosion.

C. Supply Fan: Forward curved centrifugal type, resiliently mounted with V-belt drive and adjustable variable pitch motor pulley, and rubber isolated hinge mounted high efficiency motor or direct drive as indicated. Isolate complete fan assembly. Refer to Division 23 Section Vibration and Seismic Controls for HVAC Piping and Equipment.

D. Air Filters: 2 inches thick pleated media 30 percent NBS, 1 inch thick for units 5 nominal tons and less.

E. Roof Mounting Curb: 14 inches high galvanized steel, channel frame with gaskets, nailer strips, insulated, top to be level, designed in accord with Division 23 Section Hangers and Supports for HVAC Piping and Equipment and Division 23 Section Vibration and Seismic Controls for HVAC Piping and Equipment.

2.5 INDOOR COIL

A. Provide copper tube aluminum fin coil assembly with galvanized drain pan and connection.

B. Provide capillary tubes or thermostatic expansion valves for units of 6 tons capacity and less, and thermostatic expansion valves and alternate row circuiting for units 7.5 tons cooling capacity and larger.

2.6 FILTERS

A. Units shall be equipped with disposable roughing filters ahead of pleated disposable type filters with nonwoven pleated media held in place by a welded wire support grid. All filters shall be mounted such that air bypass is minimized. Pleated media filters shall be 30 percent minimum efficiency per ASHRAE Test Standard 52.2-2007.

2.7 BURNER AND HEAT EXCHANGER

A. Gas Burner: Induced draft type minimum efficiency 80 percent. Burner with adjustable combustion air supply, pressure regulator, gas valves, manual shut-off, intermittent spark or glow coil ignition, flame sensing device, and automatic 100 percent shut-off pilot.

B. Stainless steel heat exchanger.

C. Gas Burner Safety Controls: Energize ignition, limit time for establishment of flame, prevent opening of gas valve until pilot flame is proven, stop gas flow on ignition failure, energize blower motor, and after air flow proven and slight delay, allow gas valve to open.

D. High Limit Control: Temperature sensor with fixed stop at maximum permissible setting, de-energize burner on excessive bonnet temperature and energize burner when temperature drops to lower safe value.

E. Supply Fan Control: Temperature sensor sensing bonnet temperatures and independent of burner controls, with provisions for continuous fan operation.

2.8 COMPRESSOR

A. Provide hermetic scroll compressors, resiliently mounted with positive lubrication, crankcase heater, high and low pressure safety controls, motor overload protection, suction and discharge service valves and gage ports, and filter drier.

B. Five minute timed off circuit to delay compressor start.

C. Provide step capacity control where scheduled by cycling compressors and cylinder unloading.

2.9 OUTDOOR COIL

A. Provide copper tube **copper** fin coil assembly with subcooling rows and coil guard.

B. Provide direct drive propeller fans, resiliently mounted with fan guard, motor overload protection, wired to operate with compressor. Provide high efficiency fan motors.

C. Provide refrigerant pressure switches or outdoor thermostat to cycle condenser fans for operation to 0 deg F.

2.10 MIXED AIR CASING

A. Dampers: Provide motorized outside air dampers for minimum outside air quantity as well as for the economizer cycle. Provide relief air fans where scheduled. Provide control of remote relief air dampers and exhaust fans where scheduled.

B. Damper Operator: 24 volt with gear train sealed in oil with spring return on units 7.5 ton cooling capacity and larger.

2.11 CONTROLS

A. On unit, mount weatherproof steel control panel, NEMA 250, containing power and control wiring, factory wired with single point power connection.

B. Provide unit disconnect switch, compressor starter, control power transformer or terminal for controls power, and condenser fan starter relay.

C. Provide safety controls arranged so any one will shut down machine:

1. High discharge pressure switch.
2. Low suction pressure switch.
3. Phase loss, Phase reversal, low voltage and voltage spike protection, factory or field installed on three phase units. (SymCom Inc., Motor Saver #500.)

D. Provide one of the following controls to permit operation down to 30 deg F ambient temperature:

1. Head pressure switch to cycle fan motors in response to refrigerant condensing pressure.
2. Solid state control to vary speed of one condenser fan motor in response to refrigerant condensing pressure.
3. Electronic control consisting of mixing damper assembly, controlled to maintain constant refrigerant condensing pressure.

E. The RMCS, Division 23 Section Refrigeration Monitoring and Control Systems (RMCS), shall control heating, cooling, fan operation, and the outdoor air motorized damper. Provide a terminal strip for the Division 23 Section Refrigeration Monitoring and Control Systems (RMCS) connection. Coordinate with the Division 23 Section Refrigeration Monitoring and Control Systems (RMCS) contractor to perform the control functions specified in Division 23 Section Refrigeration Monitoring and Control Systems (RMCS).

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that roof is ready to receive work and opening dimensions are as indicated on Shop Drawings.

B. Verify that proper power supply is available.

3.2 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install in accordance with NFPA 90A.

C. Mount units on factory built roof mounting curb providing watertight enclosure to protect ductwork and utility services. Install roof mounting curb level. Secure to withstand wind and seismic loading specified in Division 01 Section Summary of Work.

3.3 MANUFACTURER'S FIELD SERVICES

A. Prepare and start systems.

B. Provide initial factory-authorized service representative start-up and shut-down during first year of operation.

END OF SECTION

SECTION 23 81 26

SPLIT-SYSTEM AIR CONDITIONERS

(Edited from DeCA June 2011 Design Criteria)

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Outdoor unit package.
2. Charge of refrigerant and oil.
3. Controls and control connections.
4. Ductless indoor unit.
5. Precharged refrigerant piping.

B. Related Sections:

1. Division 01 Section Mechanical, Refrigeration, Food Service Equipment and Electrical Coordination.
2. Division 01 Section Quality Control.
3. Division 01 Section Closeout Procedures.
4. Division 23 Section Hangers and Supports for HVAC Piping and Equipment
5. Division 23 Section Vibration and Seismic Controls for HVAC Piping and Equipment.
6. Division 23 Section Air Coils.
7. Division 23 Section Instrumentation and Control Devices for HVAC.
8. Division 26 Electrical.

1.2 QUALITY CONTROL

A. The following publications form a part of this specification to the extent they are applicable:

1. Division 01 Section Quality Control.
2. ARI 210/240 - Unitary Air-Conditioning and Air-Source Heat Pump Equipment.
3. ASHRAE 14 - Methods of Testing for Rating Positive Displacement Condensing Units.
4. ASHRAE 15 - Safety Code for Mechanical Refrigeration.
5. ASHRAE 62.1-2004, Section 4 - Outdoor Air Quality, Section 5 - Systems and Equipment, Section 6 - Procedures, and Section 7 - Construction and System Start-Up.
6. ASHRAE 90A - Energy Conservation in Building Design.
7. NFPA 90A - Installation of Air Conditioning and Ventilation Systems.
8. UL 207 - Refrigerant-Containing Components and Accessories, Non-Electrical.

1.3 SUBMITTALS

A. Submittals for Review:

1. Division 01 Section Quality Control: Procedures for submittals.
2. Shop Drawings: Indicate components, assembly, dimensions, weights and loadings, required clearances, and location and size of field connections. Include schematic

layouts showing condensing units, cooling coils, refrigerant piping, and accessories required for complete system.

3. Product Data: Provide rated capacities, weights specialties and accessories, electrical nameplate data, and wiring diagrams.
4. Operation and Maintenance data.

1.4 DELIVERY, STORAGE, AND PROTECTION

A. Comply with manufacturer's installation instructions for rigging, unloading, and transporting units.

B. Protect units on site from physical damage. Protect coils.

1.5 REGULATORY REQUIREMENTS

A. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

PART 2 - PRODUCTS

2.1 GENERAL

A. Units shall be manufactured in the USA.

B. Basis of design product: EMI America series.

2.2 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Carrier Corporation; Home Comfort and HVAC Building & Industrial Systems.
2. Lennox International Inc.
3. Trane; a business of American Standard companies.
4. YORK; a Johnson Controls company.
5. Sanyo Corporation.

2.3 REFRIGERANT

A. R410A.

2.4 CONDENSING UNITS

A. Units: Self-contained, packaged, factory assembled and pre-wired heat pump units suitable for outdoor use consisting of cabinet, compressors, outdoor coil and fans, integral sub-cooling coil, controls, liquid receiver, and screen guards with separate indoor ductless fan and coil.

B. Construction and Ratings: In accordance with ARI 210/240 and UL 207 and UL 303. Testing shall be in accordance with ASHRAE 14.

C. Performance Ratings: Energy Efficiency Rating (EER) and Coefficient of Performance (COP) not less than prescribed by ASHRAE 90A.

D. Casing:

1. House components in welded steel frame with galvanized steel panels with weather resistant, baked enamel finish.
2. Mount starters, and controls in weatherproof panel provided with full opening access doors.
3. Provide removable access doors or panels with quick fasteners.

E. Condenser Coils:

1. Coils: Aluminum fins mechanically bonded to seamless copper tubing. Provide sub-cooling circuits. Air test under water to 425 psig, and vacuum dehydrate. Seal with holding charge of refrigerant.
2. Coil Guard: Expanded metal, Louvered, or PVC coat steel wire.

F. Fans and Motors:

1. Direct driven propeller type condenser fans with fan guard on discharge.
2. Weatherproof motors suitable for outdoor use, single phase permanent split capacitor with built in thermal overload protection.

G. Compressors:

1. Compressor: Hermetic reciprocating or rotary type.
2. Mounting: Statically and dynamically balance rotating parts and mount on vibration isolators.
3. Motor: Constant speed 3600 rpm suction gas cooled with winding over temperature protection.
4. Crankcase Heater: Evaporates refrigerant returning to crankcase during shut down. Energize heater when compressor is not operating.

2.5 INDOOR DUCTLESS FANCOIL UNIT

A. Wall mounted fan coil unit with condensate pump, and adjustable supply air diffuser.

B. The condensate pump shall have a minimum shut-off head of 15 feet or a separate condensate pump with reservoir, float switch and check valve shall be furnished. (Little Giant VCL-24ULS or equal.)

2.6 REFRIGERANT CIRCUIT

A. Provide each unit with one refrigerant circuit, factory supplied and piped.

B. For each refrigerant circuit, provide:

1. Filter dryer.
2. Thermal expansion device.

3. Insulated suction line.
4. Suction and liquid line service valves and gage ports.
5. Charging valve.
6. Compressor discharge service valve.
7. Condenser pressure relief device.
8. Precharged refrigerant piping.

2.7 CONTROLS

A. On outdoor unit, mount weatherproof steel control panel, containing power and control wiring, factory wired with single point power connection.

B. Provide compressor starter, control power transformer or terminal for controls power, and condenser fan starter relay.

C. Provide safety controls arranged so any one will shut down machine:

1. High discharge pressure switch.
2. Low suction pressure switch.
3. Phase loss, Phase reversal, low voltage and voltage spike protection, factory or field installed on three phase units. (SymCom Inc., Motor Saver.)

D. Provide one of the following controls to permit operation down to 0 deg F ambient temperature:

1. Head pressure switch to cycle fan motors in response to refrigerant condensing pressure.
2. Solid state control to vary speed of one condenser fan motor in response to refrigerant condensing pressure.
3. Electronic control consisting of mixing damper assembly, controlled to maintain constant refrigerant condensing pressure.

E. Wall mounted, hard wired, programmable microprocessor controller with room sensors and self diagnostic feature. Provide locking cover.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's installation instructions.

B. Install seismic restraints per Division 23 Section Vibration and Seismic Controls for HVAC Piping and Equipment.

C. Complete structural, mechanical, and electrical connections in accordance with manufacturer's installation instructions.

D. Provide connection to refrigeration piping system and evaporators. Comply with ASHRAE 15.

E. Furnish charge of refrigerant and oil.

F. Charge system with refrigerant and test entire system for leaks after completion of installation. Repair leaks, put system into operation, and test equipment performance.

G. Provide control wiring between indoor and outdoor units.

H. Securely fasten condensing units to housekeeping pads on roof mounting rails to withstand wind and seismic loading specified in Division 01 Section Summary of Work.

END OF SECTION

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SECTION 23 82 16

AIR COILS

(Edited from DeCA June 2011 Design Criteria)

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Refrigerant coils.

B. Related Sections:

1. Division 01 Section Mechanical, Refrigeration, Food Service Equipment and Electrical Coordination.
2. Division 01 Section Administrative Requirements: Procedures for submittals.
3. Division 01 Section Quality Control.
4. Division 01 Section Closeout Procedures.
5. Division 23 Section HVAC Piping Insulation.
6. Division 23 Section Hydronic Piping Specialties.
7. Division 23 Section Metal Ducts and Air Accessories.
8. Division 26 Electrical.

1.2 QUALITY CONTROL

A. The following publications form a part of this Specification to the extent they are applicable:

1. Division 01 Section Quality Control.
2. ARI 410 - Forced-Circulation Air-Cooling and Air- Heating Coils.
3. SMACNA - HVAC Duct Construction Standards, Metal and Flexible.
4. NFPA 70 - National Electrical Code.

1.3 SUBMITTALS FOR REVIEW

A. Division 01 Section Administrative Requirements: Procedures for submittals.

B. Product Data: Provide coil and frame configurations, dimensions, materials, rows, connections, and rough-in dimensions.

C. Shop Drawings: Indicate coil and frame configurations, dimensions, capacities, materials, rows, connections, and rough-in dimensions.

D. Operation and Maintenance data.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this Section with minimum three years experience.

B. Comply with ARI 410, Standard for Forced-Circulation Air-Cooling and Air-Heating Coils, for components, construction, and rating.

C. Comply with applicable requirements in ASHRAE 62.1, Section 5 Systems and Equipment and Section 7 Construction and Startup.

1.5 REGULATORY REQUIREMENTS

A. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Protect coil fins from crushing and bending by leaving in shipping cases until installation, and by storing indoors.

B. Protect coils from entry of dirt and debris with pipe caps or plugs.

PART 2 - PRODUCTS

2.1 REFRIGERANT COILS

A. Tubes: Seamless copper, complying with ASTM-B-75, arranged in parallel or staggered pattern, expanded into fins, brazed joints, compliant with ARI-410.

B. Fins: **Aluminum** continuous plate type with full fin collars.

C. Casing: Die formed channel frame of 16 gage galvanized steel. Provide tube supports for coils longer than 36 inches.

D. Headers: Seamless copper or brass tubes with silver brazed joints.

E. Liquid Distributors: Brass or copper venturi type distributor with seamless copper distributor tubes.

F. Testing: Air test under water at 300 psig for working pressure of 250 psig; clean, dehydrate, and seal with dry nitrogen charge.

G. Fin Spacing: As required to meet capacity. No more than 14 fins per inch.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturers written instructions.

1. Install in ducts and casings in accordance with SMACNA HVAC Duct Construction Standards, Metal and Flexible.

2. Support coil sections independent of piping on steel channel or double angle frames and secure to casings.
3. Provide frames for maximum three coil sections.
4. Arrange supports to avoid piercing drain pans.
5. Provide airtight seal between coil and duct or casing.
6. Refer to Division 23 Section Metal Ducts and Air Accessories.

B. Protect coils to prevent damage to fins and flanges. Comb out bent fins.

C. Install coils level. Install cleanable tube coils with 1:50 pitch.

D. Make connections to coils with unions and flanges.

E. Hydronic Coils:

1. Hydronic Coils: Connect water supply to leaving air side of coil (counterflow arrangement).
2. Provide shut-off valve on supply line and balancing valve with memory stop on return line.
3. Locate water supply at bottom of supply header and return water connection at top.
4. Provide manual air vents at high points complete with stop valve.
5. Ensure water coils are drainable and provide drain connection at low points.
6. Refer to Division 23 Section Hydronic Piping Specialties.
7. For cooling coils where air velocity exceeds 500 ft/min. provide **three break** moisture eliminators of galvanized steel.
8. Provide drain pan and drain connection for cooling coils.

   a. Fabricate drain pan from 20 gage galvanized steel with connection for drain; insulated and complying with ASHRAE 62.1.
   b. Extend 3 inches from face of coil entering air side 6 inches from face of coil leaving air side.
   c. Pipe drain pans individually to floor drain.

F. Wire electric duct coils in accordance with ANSI/NFPA 70.

G. Refrigerant Coils: Provide sight glass in liquid line within 12 inches of coil. Refer to Division 23 Section Refrigerant Piping.

H. Insulate headers located outside air flow as specified for piping. Refer to Division 23 Section HVAC Piping Insulation.

END OF SECTION

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SECTION 23 84 16

MECHANICAL DEHUMIDIFICATION UNITS

(Edited from DeCA June 2011 Design Criteria)

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Packaged indoor unit with remote air cooled condenser.
2. Unit controls.

B. Related Sections:

1. Division 01Section Mechanical, Refrigeration, Food Service Equipment and Electrical Coordination.
2. Division 01 Section Quality Control.
3. Division 01 Section Closeout Procedures.
4. Division 23 Section Hangers and Supports for HVAC Piping and Equipment.
5. Division 23 Section Vibration and Seismic Controls for HVAC Piping and Equipment.
6. Division 23 Section Product Refrigeration Systems.
7. Division 23 Section Refrigeration Monitoring and Control Systems (RMCS).
8. Division 23 Section Common Motor Requirements for HVAC Equipment.
9. Division 23 Section Commissioning of HVAC.
10. Division 26 - Electrical.

1.2 QUALITY CONTROL

A. The following publications form a part of this Specification to the extent they are applicable:

1. Division 01 Section Quality Control.
2. AMCA 210 - Fan Performance Testing.
3. ANSI B3.16 - Roller Bearings, Load Rating and Fatigue Life.
4. ARI 210 - Unitary Air-Conditioning Equipment.
5. ARI 270 - Sound Rating of Outdoor Unitary Equipment.
6. ARI 410 - Air Cooling and Heating Coils.
7. NFPA 70 - National Electrical Code.
8. NFPA 90A - Installation of Air Conditioning and Ventilation Systems.

1.3 SUBMITTALS

A. Submittals for Review:

1. Division 01 Section Quality Control: Procedures for submittals.
2. Shop Drawings: Indicate capacity and dimensions of manufactured products and assemblies required for this project. Indicate electrical service with electrical characteristics and connection requirements, and duct connections.
3. Product Data: Submit manufacturer's specifications for dehumidifier units showing dimensions, weights, capacities, ratings, fan performance with operating point clearly

indicated, motor electrical characteristics, gages and finishes of materials, and installation instructions.

4. Submittals shall include but shall not be limited to the following:

   a. Equipment schedule containing dehumidification, cooling and heating capacities, fan motor data, electrical power data and filtration schedule.
   b. Technical Data Sheet containing design operating inlet and outlet conditions, air flow indicator settings, electrical power requirements and fan motor data.
   c. A system flow diagram showing air volumes and conditions throughout the system.
   d. A General Arrangement Diagram showing three views of the dehumidifier units with overall dimensions, general utility connection locations, ductwork connection points and bolting patterns, total weight and required service or equipment removal clearances.
   e. Control Diagrams and Parts Lists showing all electric circuits component ratings and any applicable setpoints.
   f. Technical data sheet on the individual control unit (ICU) for the dehumidification system and electrical diagram showing how ICU is connected to the dehumidification system.
   g. Piping Circuit diagrams for all piping circuits supplied.

5. Operation and Maintenance data.

B. Submittals for Project Closeout:

1. Division 01 Section Closeout Procedures.
2. Operation and Maintenance Data: Include manufacturer's descriptive literature, operating instructions, installation instructions, maintenance and repair instructions, including lubrication instructions, desiccant filter replacement, motor and drive replacement, and spare parts lists. Include this data in maintenance manuals.
3. Recommended Spare Parts List with long and short term requirements.
4. The Contractor shall submit all certifications and testing data as a supplement to previously submitted O & M manuals at contract closeout.

1.4 QUALITY ASSURANCE

A. Cooling coils shall be the ARI label.

B. Fans shall be AMCA certified.

1.5 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing the Products specified in this Section with minimum five years documented experience.

1.6 REGULATORY REQUIREMENTS

A. Products Requiring Electrical Connection: Listed and classified by Underwriters' Laboratories, Inc. or ETL.

1.7 DELIVERY, STORAGE, AND PROTECTION

A. Protect units from physical damage by storing off site until roof mounting curbs are in place, ready for immediate installation of units.

1.8 WARRANTY

A. Provide a five year warranty to include coverage for refrigeration compressors and heat exchangers.

1.9 EXTRA MATERIALS

A. Division 01 Section Closeout Procedures.

B. Provide one set of filters.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Seasons 4.

B. Munters.

C. AAON.

2.2 REFRIGERANT

A. Refrigerant shall be R410A.

2.3 EFFICIENCY

A. EER shall not be less than 10.5.

2.4 DEHUMIDIFIERS

A. General: **Indoor with remote air cooled condensing unit** units having gas burner and electric refrigeration using non-ozone depleting refrigerant.

B. Description: Self-contained, packaged, factory assembled and prewired, consisting of cabinet and frame, supply fan, heat exchanger and burner, heat recovery coil) coil provided under Division 23 Section Product Refrigeration Systems and factory installed under this Section), controls, air filters, and refrigerant cooling coils. **Remote condensing unit with** compressors. Coils shall be arranged for reheat control with the cooling coils upstream followed by the heat recovery coil and finally the gas heating section. The cooling coils shall be arranged for cooling

of return and outdoor air by separate refrigeration circuits (dual path) and for complete bypassing of a portion of return air.

2.5 CABINET

A. **Aluminum or galvanized steel double wall panels with baked enamel finish and rigid internal channel frame, fully gasketed joints. Structural members shall be minimum 18 gage.** Drain pans shall be stainless steel.

B. Access doors with flush cam type or locking door handle type with piano hinges and gasketed heads jambs and sills with knife edge meeting gasket for positive seal. Access doors frames shall be a minimum 20 gage.

C. Exterior surface shall be cleaned and finished with an air dry enamel. All coils and controls shall be removable thorough the access doors.

D. Cabinet Insulation shall be 2 inch thick (R-7) for with full inner galvanized steel or aluminum panel.

2.6 SUPPLY FANS

A. Backward inclined airfoil centrifugal type, enameled steel construction, resiliently mounted with V-belt drive and adjustable variable pitch motor pulley to be replaced with fixed pitch sheave after balancing, and rubber isolated hinge mounted premium efficiency open drip proof motor or direct drive as indicated.

B. Isolate complete fan assembly.

C. Refer to Division 23 Section Common Motor Requirements for HVAC Equipment.

D. All fans shall be vibration isolated and factory balanced such that maximum displacement in any plane does not exceed 1.5 mils for fans operating at or below 2000 RPM or 1.0 mils above 2000 RPM. Fans shall operate at 80 percent or less of their first critical speed.

2.7 FILTERS

A. Outside air inlets and return air plenums shall be equipped with disposable roughing filters ahead of pleated disposable type filters with nonwoven pleated media held in place by a welded wire support grid. All filters shall be mounted such that air bypass is minimized. Pleated media filters shall be MERV 8 per ASHRAE Test Standard 52.2-2007.

2.8 DAMPERS

A. Provide manual balancing dampers with position indicating quadrants and locking hardware for balancing of the by pass air stream and motorized dampers for outdoor and return air service.

B. All dampers shall have heavy gauge **galvanized steel frames, galvanized steel blades with oil impregnated or synthetic bushings** and plated interconnecting linkage for smooth operation. Dampers shall be opposed blade type equipped with blade edge and end seals to minimize leakage. All motorized dampers shall be equipped with operators to provide automatic control operation.

2.9 HEAT EXCHANGER AND BURNER

A. Gas Burner: Two stage (**NOT MODULATING)** natural gas burner with adjustable combustion air supply, pressure regulator, gas valves, manual shut-off, intermittent spark or glow coil ignition, flame sensing device, and automatic 100 percent shut-off pilot. Burner shall have a forced draft or combustion blower to provide positive venting.

B. Gas Burner Safety Controls: Energize ignition, limit time for establishment of flame, prevent opening of gas valve until pilot flame is proven, stop gas flow on ignition failure, energize blower motor, and after air flow proven and slight delay, allow gas valve to open.

C. High Limit Control: Temperature sensor with fixed stop at maximum permissible setting, de-energize burner on excessive bonnet temperature and energize burner when temperature drops to lower safe value.

D. Supply Fan Control: Temperature sensor sensing bonnet temperatures and independent of burner controls, with provisions for continuous fan operation.

E. Stainless steel heat exchanger of welded construction.

2.10 EVAPORATOR COILS

A. Provide copper tube aluminum fin coil assembly with stainless drain pan **and coil endplates** and **maximum face velocity shall not exceed 350 fpm to reduce supply fan horsepower requirement** connection for return air coil. Provide copper tube, **aluminum** fin coil with stainless steel drain pan for outdoor air coil.

B. Coils shall be direct expansion type constructed with 1/2 inch or 5/8 inch OD seamless copper tubes mechanically expanded for a compression bond to fins. All evaporator coils shall be counter flow circuited and equipped with seamless copper tube pressure type distributors. DX coil will be designed for a maximum working pressure of 400 PSIG. Coil assemblies shall include 16 gage galvanized steel casings with a support mounting structure that permits coil removal through side access. Assemblies shall include an insulated drain pan complete with exterior trap.

C. All direct expansion coils shall be equipped with a thermostatic expansion valve with external equalization and liquid line solenoid valve. Provide capillary tubes or thermostatic expansion valves for units of 6 tons capacity and less, and thermostatic expansion valves and alternate row circuiting for units 7.5 tons cooling capacity and larger.

2.11 COMPRESSOR

A. Provide hermetic scroll compressors, resiliently mounted with positive lubrication, crankcase heater, high and low pressure safety controls, motor overload protection, suction and discharge service valves and gage ports, and filter drier.

B. Five minute timed off circuit to delay compressor start.

C. Provide step capacity control where scheduled by cycling compressors.

2.12 AIR COOLED CONDENSER

A. **Remote** air cooled condenser.

B. Provide copper tube **aluminum fin** coil assembly **with stainless steel end plates** sub cooling rows and coil guard.

C. Provide direct drive propeller fans, resiliently mounted with fan guard, motor overload protection, wired to operate with compressor. Provide high efficiency fan motors.

D. Provide refrigerant liquid temperature switches to cycle condenser fans for operation to 0 deg F.

E. Maximum working pressure 600 psi.

F. Aluminum or galvanized steel panels with baked enamel finish and rigid internal channel frame. Structural members shall be minimum 18 gage.

2.13 MIXED AIR SECTION

A. Dampers: Provide motorized outside air dampers for fixed outside air quantity. Damper construction shall be specified in "DAMPERS" above.

B. Damper Operator: 24 volt with gear train sealed in oil with spring return on units 7.5 ton cooling capacity and larger.

2.14 HEAT RECOVERY COIL (OR HEAT RECLAIM COIL)

A. Shall be provided under Division 23 Section Product Refrigeration Systems. Under this Section, provide a coil cabinet and mount the coil in the unit at the factory.

B. Coils shall be counterflow circuited. Face air flow velocities shall not exceed 550 FPM. Coils shall be designed for a maximum working pressure of 400 PSIG.

C. The heat reclaim coils shall be provided by the product refrigeration manufacturer and installed by the HVAC contractor or factory installed.

2.15 OPERATING CONTROLS

A. Provide terminal strip on unit for connection of operating controls to the Division 23 Section Refrigeration Monitoring and Control Systems (RMCS). See Division 23 Section Refrigeration Monitoring and Control Systems (RMCS) for control functions required. Install and wire the ICU provided by Division 23 Section Refrigeration Monitoring and Control Systems (RMCS).

B. Interface controls with Division 23 Section Refrigeration Monitoring and Control Systems (RMCS). Provide all controls or devices required to perform the control and monitoring functions specified in Division 23 Section Refrigeration Monitoring and Control Systems (RMCS), but not provided by Division 23 Section Refrigeration Monitoring and Control Systems (RMCS).

2.16 DESCRIPTION OF OPERATION

A. Space temperature and humidity shall be controlled by a minimum of three individual cooling stages utilizing two air paths. The outside air path will process all of the outside air (no bypass) and provide most of the dehumidification required for the space. An outdoor air precooling coil and dehumidification coils (6-row minimum) shall be used. The return air path will have a cooling coil to cool the return air as required to provide the remaining cooling required for the space. Some return air may be bypassed.

B. The air paths will then mix, heating will be accomplished by utilizing reclaimed refrigeration heat through heat reclaim coils as the first stage of heating, with the second and third stages of heating provided by a two stage gas fired power burner or electric heating coil (depending on utility costs and availability). The reclaimed heat will be used when available and will provide the first stage of heat. The gas or electric heating will only be used if additional capacity is required.

C. Fan operation shall be continuous. Fan shall run at high speed (100 percent) in occupied mode and for cooling dehumidification operation and at low speed (50 percent) at all other times.

D. Compressors shall be sized to match the cooling/dehumidification requirements of the two paths with the evaporator coils.

E. Multiple Condenser fans shall be controlled from liquid temperature and shall be cycled to maintain a target liquid temperature.

F. Heat reclaim will be used for reheat and for initial stages of heat.

G. Control the gas heating section from space temperature only after maximum utilization of heat reclaim has been realized. Auxiliary heat shall not be used for reheat control.

H. The dehumidification coil in the outdoor air path is stage 1 and the outside air precooling coil is stage 2. The return air cooling coil is stage 3. Stage 1, 2 and 3 coils shall be controlled from space humidity in that order to maintain 52 deg F dewpoint. Precooling coil shall be locked out below an ambient temperature of 72 deg F.

I. Outside air and return air motorized dampers shall be provided. The outside air (or night setback) damper shall be open during the occupied cycle and closed in the unoccupied cycle. The outside air (or night setback) damper shall be mechanically linked to the return air damper so the return air damper shall open when the outdoor air (or night setback) damper closes, allowing return air to follow both air paths.

J. To allow the specified air flow rates in the two paths, an array of static pressure probes shall be positioned to monitoring internal air pressure drops through key elements of the dual path system. Each air path shall have built-in balancing dampers for air volume adjustment.

K. Provide a differential pressure switch to monitor the operation of the main blower.

L. The temperature and humidity set points shall be:

Function	Day	Night
Heat	70 deg F	65 deg F
Cool	75 deg F	75 deg F
Humidity	52 deg F dew point	52 deg F dew point

M. Cooling operation shall be locked out below 45 deg F ambient.

2.17 ELECTRICAL

A. Unit shall be factory prewired with all controls necessary for complete and satisfactory operation.

B. Unit manufacturer shall mount and wire the ICU provided by the Division 23 Section Refrigeration Monitoring and Control Systems (RMCS) manufacturer.

C. Disconnect Switch: Factory mount disconnect switch in control panels of indoor and outdoor units.

D. Duplex Outlet: Provide a separately fused 120V duplex outlet at the air cooled condenser for service use.

E. Motor starters for motors 20 hp and above shall be reduced voltage solid state type.

F. Lights in each module of the unit with a switch and pilot light on the exterior of the unit.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that roof is ready to receive work and opening dimensions are as indicated on Shop Drawings.

B. Verify that proper power supply is available.

3.2 INSTALLATION

A. Examine areas and conditions under which dehumidifier units are to be installed. Do not proceed with work until satisfactory conditions have been corrected.

B. Install dehumidifier units where indicated, in accordance with equipment manufacturer’s written instructions, and with recognized industry practices, to ensure that units comply with requirements and serve intended purposes.

C. Coordinate with other work, including ductwork, floor construction, roof decking, and piping, as necessary to interface installation of dehumidifier units with other work.

D. Upon completion of installation of dehumidifier units, the services of a factory technician shall be provided to start-up and operate equipment to demonstrate capacity with requirements. Field correct malfunctioning units, then retest to demonstrate compliance.

E. Provide one spare set of belts for each belt-driven dehumidifier component, obtain receipt from Government that belts have been received. Install a fixed pitch motor sheave after balancing is completed.

F. Grounding: Provide positive equipment ground for dehumidifier unit components.

G. Install in accordance with manufacturer's instructions.

H. Install in accordance with NFPA 90A.

I. Mount units on factory built roof mounting curb providing watertight enclosure to protect ductwork and utility services. Install roof mounting curb level. Secure to withstand wind and seismic loading specified in Division 01 Section Work Covered by Contract Documents.

J. Provide control wiring between the indoor and outdoor units.

3.3 MANUFACTURER'S FIELD SERVICES

A. Prepare and start systems.

B. The manufacturer shall provide a factory field service technician for startup supervision and instruction of operating personnel.

END OF SECTION

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SECTION 23 90 00

PRODUCT REFRIGERATION SYSTEMS

(Edited from DeCA June 2011 Design Criteria)

PART 1 - GENERAL

1.1 SUMMARY

A. Related Sections:

1. Division 01 Section Mechanical, Refrigeration, Food Service Equipment and Electrical Coordination.
2. Division 01 Section Quality Control.
3. Division 01 Section Environmental Procedures for Refrigerants.
4. Division 01 Section Environmental Management.
5. Division 01 Section Closeout Procedures.
6. Division 01 General Commissioning.
7. Division 21 Section Hangers and Supports for Fire-Suppression Piping and Equipment.
8. Division 22 Section Hangers and Supports for Plumbing Piping and Equipment.
9. Division 22 Section Vibration and Seismic Controls for Plumbing Piping and Equipment.
10. Division 22 Section Plumbing Piping.
11. Division 22 Section Common Work Results for Plumbing.
12. Division 23 Section Hangers and Supports for HVAC Piping and Equipment.
13. Division 23 Section Vibration and Seismic Controls for HVAC Piping and Equipment.
14. Division 23 Section Refrigeration Monitoring and Control System (RMCS). Division 23 Section Product Refrigeration Systems contractor shall be responsible for Division 23 Section Refrigeration Monitoring and Control System (RMCS).
15. Division 23 Section Maintenance and Repair for HVAC and Refrigeration. Division 23 Section Product Refrigeration Systems Contractor shall be responsible for Division 23 Section Maintenance and Repair for HVAC and Refrigeration.
16. Division 26 Electrical. Division 23 Section Product Refrigeration Systems Contractor shall be responsible for refrigeration electrical, see this Section and Contract Drawings.

B. Total System Responsibility:

1. Division 23 Section Product Refrigeration Systems Contractor shall be either the installer of the refrigeration equipment or the manufacturer of the compressor systems or the manufacturer of the display cases. Division 23 Section Product Refrigeration Systems Contractor shall have total system responsibility for all material and work indicated in Division 23 Section Product Refrigeration Systems and Division 23 Section Refrigeration Monitoring and Control System (RMCS). This includes, refrigeration piping, refrigeration electrical and wiring, refrigeration equipment, RMCS equipment, RMCS wiring. Subcontracts for portions of Division 23 Section Product Refrigeration Systems or Division 23 Section Refrigeration Monitoring and Control System (RMCS), shall be made directly with, and shall be directly under the control of the Division 23 Section Product Refrigeration Systems Contractor.

1.2 SCOPE OF WORK

A. The product refrigeration includes the design, procurement, installation, and testing of all products, equipment, and materials required for a complete, functional and usable system. This includes, but is not limited to display cases, compressors, condensers, heat recovery coils, evaporators, unit coolers, refrigerant piping, pipe insulation, Refrigeration Monitoring and Control System (RMCS), associated controls, and electrical panels and wiring including that not indicated on Drawings.

1.3 SUBMITTAL

A. Provide submittal of equipment and material to be used per submittal requirements indicated below:

1. Submit within 30 days after receipt of Notice to Proceed, and before starting construction or installation of materials.
2. Distribution: Two complete sets shall be provided to the following offices for approval. One set shall be submitted to the PMAC Technical Inspector on site and one set shall be submitted to DeCA Project Manager Each set shall be in a three ring binder with a hard cover.
3. Contract Variances: If departures from the contract Drawings are deemed necessary, details of such departures, including changes in related portions of the project and the reasons therefore, shall be submitted with the drawings. Where such departures require piping or equipment to be supported otherwise than as shown, the details submitted shall include loading and type and kind of frames, brackets, stanchions, or other supports necessary. Approved departures shall be made at no additional cost to the government.
4. Refrigeration Capacity Calculations: For each refrigeration system, capacity data (charts or tabulated information) for evaporator-compressor and compressor-condenser arrangements shall be submitted to assure properly balanced refrigeration equipment at the design conditions.
5. Provide calculations on refrigeration piping pressure drops. (See Part 3 of this Section for piping installation and manufacturer design requirements).
6. Provide completed refrigeration schedules in same format as on Contract Drawings.
7. Installation Drawings: The layout drawings shall include a plan of the proposed piping, wiring, and equipment to establish that the equipment will fit the allocated spaces with clearances for installation and maintenance, and that components of the total product refrigeration system are fully coordinated. Interconnecting piping and wiring between evaporators, unit coolers, heat recovery coils, and refrigerated display cases shall be clearly shown and sizes indicated. The drawings shall include proposed details for attachment, anchoring, and hanging to structural framing of the building; vibration isolation units; and foundation and supports.
8. Provide 12 x 12 inch painted samples of each color used for equipment cases.
9. Electrical: (See Part 3 of this Section for electrical installation and manufacturer design requirements).

    a. Letter Acknowledging Their Submitted Design: The Contractor shall provide with the refrigeration submittal a letter from the display case manufacturer stating that the engineering department of the display case manufacturer has performed the design for the refrigeration electrical power wiring.
    b. Installation Drawings: Provide power layout drawings showing electrical runs with wire sizes, conduit sizes, and connection points. Wiring diagrams shall identify each component, and one diagram shall show interconnected or interlocked components.

c. Breaker Cut Sheets: Provide cut sheets on all circuit breakers showing device termination temperature ratings, interrupting ratings on equipment, and interrupting ratings of breakers.
d. Transformer Cut Sheets: Provide cut sheets on all transformers for refrigeration.

10. Subcontract Plan: Provide flow chart indicating General Contractor, Section Product Refrigeration Systems contractor, and each and every subcontract related to work in Division 23 Section Product Refrigeration Systems and Division 23 Section Refrigeration Monitoring and Control System (RMCS). All subcontracts for work in Division 23 Section Product Refrigeration Systems or Section Refrigeration Monitoring and Control System (RMCS) shall be made with and report to Division 23 Section Product Refrigeration Systems Contractor.
11. Manufacturer Data Sheets: The list of materials and equipment shall be supported by sufficient descriptive materials, such as catalog cuts, diagrams, and other data published by the manufacturer, to demonstrate conformance to the Specification requirements. Model numbers alone will not be acceptable. Submit data concerning the following items for approval. Manufacturers catalog not acceptable, specific cut sheets or equipment data shall be provided for each piece of equipment:

COMPRESSORS-CONDENSERS
HEAT RECOVERY COILS
UNIT COOLERS
SOLENOID VALVES
FILTER-DRIERS
OIL SEPARATOR
OIL PRESSURE SAFETY SWITCH
HEAT RECOVERY DIVERTING VALVES
DISPLAY CASES & ACCESSORIES
RESUME OF PROPOSED INSTALLER
SILVER BRAZE MATERIALS
FIBERGLASS AND UNICELLULAR INSULATION
HEAT EXCHANGERS
EVAPORATOR PRESSURE REGULATOR (EPR)
RECLAIM HOT WATER HEATERS
THERMOSTATS
LOW PRESSURE CONTROL
HIGH PRESSURE CONTROL (CONVENTIONAL & SOLID STATE) WITH MANUAL RESET BUTTON
COLORS FOR DISPLAY CASES PER ARCHITECTURAL FINISH SCHEDULE
RECEIVER CAPACITY
REFRIGERANT OILS

12. Manufacturer Approval of Installer: As part of the submittal, the display case manufacturer shall submit a letter acknowledging their responsibility to inspect and certify the system installation with an employee of the manufacturing company and their approval of the contractor or sub contractor installing the equipment (see paragraph 1.3). No installation work on refrigeration systems shall start until this information is provided to the contracting officer.
13. Installer Resume: As part of the submittal, the installing contractor shall furnish resumes and EPA certification of the key refrigeration mechanics and field superintendent responsible for installation of the refrigeration piping and components (see paragraph 1.3). No installation work on refrigeration systems shall start until this information is provided to the contracting officer.

PART 2 - PRODUCTS

2.1 COMPRESSOR SYSTEMS

A. Compressor Quantity/Capacity Selection: Compressor systems shall have the number of compressors as indicated on Drawings. On multiplex compressor systems, the minimum capacities shall be as required by the refrigerated display case loads determined by the display case manufacturers and by the refrigerated room loads indicated on the Drawings. The capacities shall be as indicated on Drawings and as approved by the display case manufacturer. On multiplex compressor systems, the approximate horsepower of compressors is indicated on the Drawings only as a method of indicating the steps of capacity reduction that is required. The capacity difference between steps shall be between 8 and 12 percent. Compressors shall be selected for maximum energy efficiency and operating reliability. Each compressor unit shall conform to and consist of the equipment and accessories as listed in ANSI/AHRI Standard 540-2004. The compressor unit shall be tested and rated in accordance with ASHRAE Standard 23-2005.

B. Type Compressors: Compressors 2 KW (2 hp) and less may be welded hermetic type. Compressors above 2 KW (2 hp) shall be the accessible, semi-hermetic. Compressors shall be integrally cast housings of close-grained iron with oil- level bull's eye, cast cylinder heads, cast-aluminum or forged steel connecting rods, and cast iron or forged-steel crankshafts. The lubrication system on compressors 5 KW (5 hp) or larger shall be the forced-feed, positive-displacement type with oil strainer. The oil pump shall be reversible. Suction and discharge valves shall be flange connected, wrench-operated, rising stem with cap. Rotating parts shall be statically and dynamically balanced at the factory to eliminate vibration.

C. Compressor Accessories:

1. Refrigerant: Systems shall use refrigerant R-404A unless otherwise indicated on Drawings.
2. Provide permanent labels indicating the refrigerant type on the compressor systems.
3. Motors: Motors shall be of the constant-speed, squirrel-cage, induction, hermetically sealed, low-starting-current, high-torque type.
4. Oil Safety: Each compressor 5 KW (5 hp) or larger shall have a solid state oil pressure safety switch with a manual reset with auxiliary alarm contacts. Time delay duration shall be as recommended by compressor manufacturer.
5. Crankcase Heater: Each compressor shall have a crankcase oil heater that is fused and wired through auxiliary contacts. Control of the heaters shall be as recommended by the compressor manufacturer.
6. Filters: Each compressor shall have a suction filter, replaceable core type, with felt element, brass housing and Schrader valve.
7. Overload: Compressors shall have electrical over current protection and inherent thermal protection.

D. Compressor System Fabrication/Configuration:

1. Mounting: Compressor systems shall be factory-mounted and piped on a welded steel base mounted on vibration isolators and complete with controls and accessories.
2. Electrical: Electrical panels containing breakers and contactors for compressors, unit cooler fans, defrost, and controls shall also be mounted on the compressor system.

   a. Lights: Pilot lights shall be provided to indicate status of heat reclaim valves, compressors, and to indicate when each refrigeration circuit is in defrost or in the refrigeration mode.

b. Switches: Provide double pull, double throw toggle switches for each refrigeration circuit liquid line solenoid valve. Single point 208 volt and 460 volt electrical connections shall be provided on compressor units.

3. Liquid line filter driers: Filter-driers shall be installed in main liquid lines leaving the receiver. Filter-driers Sizes 1/2 inch and larger shall be the full flow, replaceable core type. Sizes smaller than 1/2 inch shall be the sealed type. Cores shall be of suitable desiccant that will not plug, cake, dust, channel, or break down. The desiccant shall remove water, acid, and foreign material from the refrigerant. The filter-drier shall be constructed so that none of the desiccant will pass into the refrigerant lines. The minimum bursting pressure shall be 1,500 psi. Filter-driers shall be provided where recommended by manufacturer of display cases. Liquid line filter-driers shall be wax removal desiccant or approved equivalent.
4. Sight Glass: A moisture indicator sight-glass shall be provided in the liquid line preceding the liquid manifold. The moisture indicating elements shall be removable. Moisture indicators shall have a reversible color indicator which has an easily distinguished color change. Sight glasses shall be provided with a protective cover and shall have solder-type connections.
5. Oil Separator: A 99 percent or higher efficiency discharge line oil separator, shall be provided in the discharge line from each multiplex compressor system. Oil separator shall have removable flanged head for ease in removing float assembly and removable screen cartridge assembly. Provide a line size shutoff valve and sight glass in the oil return line leaving the oil separator. Insure that oil separator is installed such that float removal is easily accomplished. Pipe oil return to oil reservoir.
6. Oil Reservoir: An oil reservoir adequately sized for the system with two sight glass ports shall be installed above the compressor system. Provide 3/8 inch angle service valves on top and bottom of reservoir. Install Reservoir Pressure Valve on top of reservoir and pipe to suction header. Provide manufacturer's standard filter on oil return line to oil level regulators.
7. Separator/Reservoir: As an alternate to paragraphs above, an oil separator-reservoir assembly similar to the Hussmann "TurboShed" system is acceptable. This type of system shall consist of a combination separator-reservoir assembly and oil pressure regulation valve.
8. Oil Regulators: On each compressor, provide an adjustable oil level regulator with shut-off valve on each inlet. This will allow removal of individual compressors without shutting down the whole system.
9. Manifolds: Liquid and suction manifolds shall be provided on each multiplex system. Each manifold shall have the required number of service valves to permit servicing unit coolers and display cases. Each manifold shall have one spare 5/8 inch liquid stub and 1-3/8 inch suction stub. Each service valve shall have a full ported gauge port which can be closed by back-seating the valve and a front seat which can close-off the line connected to the manifold. Service valves shall have a removable cap over the valve stem. Insulate suction header-manifolds with 3/4 inch thick unicellular plastic insulation.
10. Subcoolers: One subcooler will be provided on each low temperature multiplex system. They will be piped on site to the medium temperature multiplex system with the highest design suction temperature, as indicated on contract drawings R-101 through R-102. Subcoolers shall be plate type heat exchangers.

    a. Sizing: Subcooler to be sized to provide 50 deg F liquid refrigerant temperature, as monitored by one temperature sensor on the subcooled liquid outlet.
    b. TEV Valves: Two thermostatic expansion valves (TEV) are to be piped in parallel before the liquid inlet of the medium temperature system on the subcooler. One is to be sized for 25 percent of the subcooling load and the other for 75 percent. Prior to each TEV will be a liquid line solenoid. All will be connected to the RMCS. See Division 23 Section Refrigeration Monitoring and Control System (RMCS).

c. EPR Valves: One Evaporator Pressure Regulator (EPR) valves of the adjustable type shall be installed on the medium temperature multiplex compressor system when indicated on refrigeration schedules for subcooling. Unless otherwise noted on the Drawings, the EPR valve shall be an internally piloted valve. Provide on each EPR valve a schrader type valve so upstream pressure can be measured with a pressure gauge.

d. Insulation: Both the subcooler and all refrigerant lines connected to it shall be insulated. (See paragraph 2.12)

11. Electronic Evaporator Pressure Regulators (EEPR): EEPR valves shall be installed when indicated on refrigeration schedules. Unless otherwise noted on the refrigeration schedule, the EEPR valve shall be installed at the compressor systems. Provide on each EEPR valve a Schrader type valve so upstream pressure can be measured with a gauge. Wiring from the EEPR shall be run to the RMCS for control. See Division 23 Section Refrigeration Monitoring and Control System (RMCS).
12. Receiver: Liquid receivers shall be horizontal-type, designed, and rated in accordance with the recommendations of ANSI/AHRI Standard 495-2005, except as modified herein. The receiver shall be constructed and tested in accordance with requirements of Section VIII of the ASME Boiler and Pressure Vessel Code. Each receiver shall be equipped with inlet, outlet drop pipe, service ports on inlet and outlet, purging valve, relief valves of capacity and setting required by ANSI/ASHRAE Standard 15-2010. Provide calculations on receiver capacity sizing. On multiplex systems, provide liquid level gauge or liquid level indicators on receivers. Each receiver should have a storage capacity not less than 500 lbs at 80 percent capacity. Each receiver shall have an analog liquid level sensor connected to the RMCS. See Division 23 Section Refrigeration Monitoring and Control System (RMCS).
13. Suction Accumulator: On multiplex systems, suction accumulators shall be installed and shall be designed within the suction header to provide a positive trap for liquid carry-over and to assure oil return to compressor. The accumulator internal liquid holding volume shall be at least 0.4 cubic feet. Design shall insure that oil is not trapped in the accumulator.
14. Pressure Tap: Provide on discharge line, receiver inlet, and suction manifolds a 1/8 inch FPT with shut-off valve for installation of pressure transducers.

2.2 DISTRIBUTED PARALLEL COMPRESSOR SYSTEMS

A. Location:

1. Indoor applications shall have vertical frame and housing to maximize floor space and be located per Drawing.
2. Outdoor and warehouse applications shall have either vertical or horizontal frame and housing and be located per Drawing.
3. Outdoor housing protections shall be rain tight.

a. Compressor Quantity/Capacity Selection: Compressor systems shall have the number of compressors as indicated on Drawings, with a maximum of 6 hp. System capacity shall range from 80-90 percent loaded for low temperature systems, and 82-93 percent loaded for medium temperature systems. Satellites may be utilized however satellite compressors that are loaded less than 75 percent shall incorporate manufacturer approved load matching technology. Digital unloader technology is acceptable.

B. Compressor Type: Compressors to be of scroll technology.

C. Compressor Accessories:

1. Refrigerant: Systems shall use refrigerant R-404A unless otherwise indicated on Drawings.
2. Provide permanent labels indicating the refrigerant type on the compressor systems.
3. Motors: Motors shall be of the constant-speed, squirrel-cage, induction, hermetically sealed, low-starting-current, high-torque type.
4. Oil Safety: An adjustable, low pressure safety control is required for each scroll compressor to protect the compressor from operating in deep vacuum.
5. Filters: Each suction group shall have a suction filter, replaceable core type, with felt element, brass housing and Schrader valve.
6. Overload: Compressors shall have electrical over current protection and inherent thermal protection.
7. Sound attenuating housing.

D. Compressor System Fabrication/Configuration:

1. Mounting: Compressor systems shall be factory-mounted and piped on a welded steel base mounted on vibration isolators and complete with controls and accessories.
2. Electrical: Electrical panels containing breakers and contactors for compressors, unit cooler fans, defrost, case lights, and fans, and controls shall also be mounted on the compressor system.
3. Liquid Line Filter Driers: Filter-driers shall be field installed in main liquid lines leaving the receiver. Filter-driers Sizes 1/2 inch and larger shall be the full flow, replaceable core type. Sizes smaller than 1/2 inch shall be the sealed type. Cores shall be of suitable desiccant that will not plug, cake, dust, channel, or break down. The desiccant shall remove water, acid, and foreign material from the refrigerant. The filter-drier shall be constructed so that none of the desiccant will pass into the refrigerant lines. The minimum bursting pressure shall be 1,500 psi. Filter-driers shall be provided where recommended by manufacturer of display cases. Liquid line filter-driers shall be wax removal desiccant or approved equivalent.
4. Sight Glass: A moisture indicator sight-glass shall be field installed in the liquid line. The moisture indicating elements shall be removable. Moisture indicators shall have a reversible color indicator which has an easily distinguished color change. Sight glasses shall be provided with a protective cover and shall have solder-type connections.
5. Separator/Reservoir: An oil separator-reservoir assembly similar to the Hussmann "TurboShed" system is acceptable. This type of system shall consist of a combination separator-reservoir assembly and oil pressure regulation valve.
6. Oil Regulators: On each compressor, provide an adjustable oil level regulator with shut-off valve on each inlet. This will allow removal of individual compressors without shutting down the whole system.
7. Manifolds: Distributed parallel systems shall be loop piped and do not require a manifold. Each system shall have a suction and liquid line connection piped to the exterior of the unit for field connection. Control valves and solenoids shall be field mounted at the display case.
8. Electronic Evaporator Pressure Regulators (EEPR): EEPR valves shall be installed when indicated on refrigeration schedules. The EEPR valves shall be field installed at the location shown on the contract drawings. Provide on each EEPR valve a Schrader type valve so upstream pressure can be measured with a gauge. Wiring from the EEPR shall be run to the RMCS for control. See Division 23 Section Refrigeration Monitoring and Control System (RMCS).
9. Receiver shall be mounted on the air cooled condenser. (see paragraph 2.5.K).

2.3 CONDENSING UNITS

A. Performance Standard: Condensing units shall be as described herein and in the schedule. Each unit shall conform to and shall consist of the equipment and accessories as listed in ANSI/AHRI Standard 520-2004, Performance Rating of Positive Displacement Condensing Units. The units shall be tested and rated in accordance with ANSI/ASHRAE Standard 23-2005 (Methods of Testing for Rating Positive Displacement Refrigerant Compressors and Condensing Units).

B. Capacity Selection: Air-cooled condensing unit shall be sized for a maximum condensing temperature of 15 deg F above ambient temperature. Condensers shall have a maximum of 12 fins per inch.

C. Compressors: Compressors shall be as specified in paragraph Compressor Systems, this Section.

D. Condenser: Condenser tubes shall be copper with aluminum fins. Where condensing units are to be installed within 30 miles of a salt water body of water, condensers are to have copper fins.

E. Head Pressure Control: Provide head pressure controls. Condensing pressure controls shall enable condensing temperature to drop from that indicated on Drawings to 90 deg F, shall maintain proper condensing temperatures at outdoor temperatures down to 0 deg F, and shall be automatic in operation without daily or seasonal adjustment. To maintain desired condensing temperatures, variable speed or standard condenser fan controls shall be provided along with a receiver heater Suction Accumulator: Suction accumulator shall be installed on condensing units serving unit coolers with electric defrost.

F. Receivers: Receivers shall have a storage capacity not less than 20 percent in excess of the following: refrigerant (liquid) in liquid line(s); refrigerant (vapor) in evaporator and discharge line; refrigerant (liquid) in condenser drain line; refrigerant (liquid) in condenser circuit (100 percent flooded); and sufficient liquid seal of at least 20 percent in receiver with the above conditions.

G. Fabrication:

1. Mounting: Compressors shall be factory mounted with condensers, and piped on a welded steel base mounted on vibration isolators and complete with controls and accessories.
2. Electrical: Panels on condensing units shall contain breakers and contactors for compressors and electric defrost. The defrost time clock(s) shall be factory mounted. Single point 208 Volt, 3 Phase, 60 HZ electrical connections shall be provided on condensing units. Also, electrical connection for defrost shall be provided on condensing units, where applicable.
3. Liquid line solenoid valves shall be factory mounted and wired to defrost time clocks.
4. Covers: Outdoor condensing units shall be provided with weather hoods.

2.4 CONTROLS

A. Scope: Controls shall include those required for automatic operation of each compressor, air-cooled condenser, and defrost cycle as specified herein, as indicated under Division 23 Section Refrigeration Monitoring and Control System (RMCS), as indicated on the Drawings, and as recommended by the manufacturer of the insulated cold storage room unit coolers and refrigerated display cases.

B. Factory Controls Installation: The compressor system manufacturer shall factory mount, install, and test each ICU installed on each compressor system. See Division 23 Section Refrigeration Monitoring and Control System (RMCS).

C. Voltage/Interface: Control voltage for compressor control circuits, condenser control circuits, heat reclaim control valves, and liquid line solenoid valves shall be 208 volts 60 Hz. The RMCS shall be interfaced to these control circuits using relays.

D. Back-up Controls: Each compressor on the system shall have a conventional low pressure control wired in series with controls provided under the Refrigeration Monitor and Control System. Low-pressure control shall have automatic reset and micro adjustable cut-in and cut-out range. Use ultra cap super hose or approved equal.

E. High Pressure Control: Each compressor shall have a single high-pressure control with manual reset, adjustable set-point, and auxiliary alarm contact. Use ultra cap super hose or approved equal.

F. Heat Reclaim: Heat recovery coil circuits shall be "pumped out" when circuit is not in heat reclaim. RMCS controls on compressor system shall have adjustable lockout set points.

G. Head Pressure Control. Automatic condensing pressure controls shall be provided to enable the condensing temperature to drop from that indicated on Drawings to 75 deg F. They will maintain proper condensing temperatures at outdoor temperatures down to 0 deg F and shall be automatic in operation without daily or seasonal adjustment. Head pressure controls, consisting of modulating valves and bypass check valves, shall be provided to control head pressure by flooding the condenser coil with liquid refrigerant to maintain desired condensing temperatures. On upstream pressure regulating valves, provide a schrader type of valve to measure upstream pressure on regulating valve.

H. Defrost: The defrost shall be initiated by the RMCS.

I. Subcoolers: Liquid line solenoids on subcooler inlet lines shall be controlled via temp sensor on the subcooled liquid outlet.

J. Fixture and Unit Cooler Suction Pressure Control: Suction pressure control shall be by the RMCS via an EEPR valve for each system. EEPR valves are installed on the compressor system, unless otherwise noted on Drawings, and wired through an interface board to the RMCS.

2.5 COMPRESSOR SYSTEM CONDENSERS

A. Service: Air-cooled condensers shall be suitable for remote installation.

B. Fabrication: The air-cooled condensers shall be a complete factory-fabricated and assembled units consisting of coils, fans, and electric-motor drive.

C. Coils: The condenser coil shall be of the extended-surface fin-and-tube type and constructed of seamless copper tubes with aluminum fins. The fins shall be soldered or mechanically bonded to the tubes and installed in a metal casing. Condenser coil shall have a maximum of 10 fins per inch. The coil shall be dried to remove free moisture and capped to prevent entrance of foreign matter. A purging valve shall be installed on top of the inverted trap of the refrigerant inlet to condenser.

D. Fans: Fans shall be the propeller-type, directly connected to the motor shaft and statically and dynamically balanced.

E. Cabinets and Structures: Aluminum or galvanized steel panels with baked enamel finish and rigid internal channel frame fully gasketed joints. Structural members shall be minimum 18 gage.

F. Motors: Provide premium efficiency 850 rpm electric motors not to exceed 1.0 hp per 30 inch diameter fan. Motors shall be totally enclosed or open drip-proof type so located within an enclosure as to be fully protected from the weather. Motor starters shall be magnetic, across-the-line type with a general-purpose enclosure. Motors shall have built-in overload protection and breaker protection. Control circuit on 480 VAC condenser motors shall be 208 VAC maximum. Provide transformer at condenser for 208 VAC control.

G. Capacity: Sizing of the condensers for full capacity at design conditions shall be based on the following:

1. Temperature difference (TD), condensing temperature minus entering air temperature, shall be as indicated on the condenser schedule.
2. Condenser capacity, watts at TD (BTUH at TD), shall meet or exceed the heat of rejection for the compressor system(s). The heat of rejection shall be calculated by using the compressor system operating conditions and capacity at design conditions and the appropriate heat of rejection factor for the compressors on the system.

H. Fan Control: On multiplex compressor systems, condenser fans shall be located so that each refrigerant circuit of a compressor system is under a set of fans which, when cycled, shall not affect another compressor system. The first fan at the header end of the condenser shall be first "ON" and last "OFF". Other fans shall be controlled by the RMCS (see Division 23 Section Refrigeration Monitoring and Control System (RMCS)). Provide motor starters for each fan.

I. Low Ambient Capacity Control: In climates with the winter design temperature lower than 30 deg F. Condensers with a heat of rejection capacity greater than 23 MBH at 1 inch TD shall have a 50 percent /50 percent split header to circuit OFF 50 percent of the condenser at the RMCS programmed low outdoor ambient setpoint.

J. Receiver for Distributed Parallel Systems: Liquid receivers shall be horizontal-type, designed, and rated in accordance with the recommendations of ANSI/AHRI Standard 495-2005, except as modified herein. The receiver shall be constructed and tested in accordance with requirements of Section VIII of the ASME Boiler and Pressure Vessel Code. Each receiver shall be equipped with inlet, outlet drop pipe, service ports on inlet and outlet, purging valve, relief valves of capacity and setting required by ANSI/ASHRAE 15-2010, provide liquid level gauge or liquid level indicators on receivers. All receivers shall be insulated and shall have white Armaflex paint, or equivalent, to protect from UV rays. For distributed systems containing 6 compressors or less, maximum receiver capacity at 80 percent full shall be 174 lbs. Systems up to 8 compressors shall have receiver maximum capacity ratings at 80 percent full of 261 lbs. or less. Ratings are based on R-404A refrigerant.

2.6 HEAT RECOVERY COILS

A. Heat recovery coils shall be furnished as an integral part of the product refrigeration system and shall be approved by the display case manufacturer who shall coordinate the installation of heat recovery coils with the HVAC.

B. Circuiting: Coils shall be single or multi-circuited as required and shall comply with the requirements outlined under condensers above. Coils shall be mounted for counter-flow service.

C. Valves: Diverting valves for heat recovery shall be furnished by display case manufacturer.

D. Controls: Other controls for the heat recovery are specified in Division 23 Section Refrigeration Monitoring and Control System (RMCS).

E. Capacity: Heat recovery coils shall be sized for the capacity of circuits as indicated on Drawings and rated at 27 F degrees temperature difference. Required refrigerant pressure drop across the coil shall not exceed 9 psi between the inlet and outlet header. Static air pressure drop across the coil shall not exceed .4 inch of water. Coils shall have a maximum of 12 fins per inch. Tubing joints shall be brazed with silver brazing alloy. Performance of heat recovery coils shall be as scheduled on Drawings.

2.7 UNIT COOLERS

A. Fabrication: Unit coolers shall be the suspended type. Each unit cooler shall be self-contained, enclosed in a suitable metallic casing which is the manufacturer's standard. Unit coolers shall be quiet in operation. Fans shall be of the propeller type directly connected to the motor shaft. Evaporator coils shall have copper tubes and aluminum fins.

B. Heat Exchangers: Heat exchangers shall be provided on unit coolers to sub-cool liquid refrigerant and shall be sized for each unit cooler at the operating conditions.

C. Capacity: Capacities of unit coolers after derating for motor heat shall be not less than required to meet or exceed the refrigerated room loads indicated on the Drawings and based on the operating conditions specified. The quantity of unit cooler(s) required, temperature difference, fins per inch, capacities and the type of airflow (Type I or II), and type of defrost shall be as indicated on Drawings.

D. Valves: Unit coolers shall have a liquid line shut-off valve (soldered type). Provide Schrader type valve with cap on suction outlet of unit cooler. Provide balanced port thermal expansion valve (sweat fitting) with removable screen for each unit cooler, properly sized and designed for use with the type of refrigerant indicated.

E. Motors: Provide premium efficiency 208/230V ECM (electrically commutated motors) fan motors. Shaded pole motors are not acceptable.

F. Filter Drier: Provide a (sweat type) filter drier at inlet of each expansion valve. Filter drier shall filter contaminants down to 20 microns. Flow capacity shall meet coil requirements.

2.8 DISPLAY CASES

A. General:

1. Scope: The Work includes the furnishing, installing, and adjusting of the display cases and accessories indicated, specified, or necessary for operation. The material, equipment, and appurtenances specified herein shall be the standard products of an established manufacturer and shall have a history of satisfactory commercial operating service.

2. Basis-of-Design Products: To establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of other manufacturers, a specific manufacturer's product is named and accompanied by the words "basis-of-design", including make or model number or other designation. Subject to compliance with requirements, provide either the named products or equal products.
3. Standards: Case ratings shall be based on ANSI/AHRI 1200-2010, "Performance Rating of Commercial Refrigerated Display Merchandisers and Storage Cabinets." Or ANSI/ASHRAE Standard 72-2005, "Method of Testing Commercial Refrigerators and Freezers." The ratings which shall be employed are for a store environment of 75 deg F dry bulb and 55 percent relative humidity.
4. Temperature performance shall be based on the product temperatures maintained by the display cases. The intended result is preservation of the foods in such a fashion as is generally considered acceptable for displayed retail foods.
5. Color: Color of display cases interior and exterior, end panels and toe panels (kicks) shall be as specified in the Contract Drawings and approved by the Contracting Officer. See Architectural finish schedule for colors.
6. Accessibility: Cooling coils, thermal expansion valves, air circulators, and drains shall be accessible for ease of maintenance, removal, and replacement.
7. Insulation: Spaces between inner and outer walls of basic case shall be completely filled with not less than 2 inch of polyurethane insulation foamed in place throughout, including end panels. Insulation "K" factor shall be equivalent to 0.13 BTU deg F, per inch of thickness. Insulation shall be enclosed and waterproofed to prevent moisture penetration, and allow high pressure spray cleaning without damage to insulation.
8. All sheet metal and framing to be galvanized steel, stainless steel or anodized aluminum.
9. Floor Air Gap: Where return air for HVAC is drawn from under a refrigerated display case, that case shall be equipped for return air with a 1 inch opening the full length of the case.
10. End Panels: Cases located adjacent to solid walls shall have boxed end panels. Cases with exposed ends shall have contour end panels coordinated with case profile See Architectural finish schedule for colors.
11. Mirrored Panels: End panels on produce cases shall have a mirror on panel side towards the product.
12. Local Thermometers: Provide and install a solar powered digital thermometer with a minimum 3/8 inch high display to read entering air temperature on each display case. Provide one digital thermometer for each side of the 1G07 display cases.
13. Descriptive dimensions of display cases are only approximate. Some variation is permissible. However, minimum product capacity requirements shall be met or exceeded.
14. Controls: For controls, see Refrigeration Drawings, and Division 23 Section Refrigeration Monitoring and Control System (RMCS). Provide a sensor in each refrigerated case, pre-wired at the factory.
15. Exterior Material: The exterior of the display case shall not be less than 20 gauge steel finished in baked porcelain enamel, baked refrigerator synthetic enamel, baked acrylic enamel, or a combination of these as standard with the manufacturer and as indicated in manufacturer's current catalogs and sales literature.
16. Interior Material: The interior area of the case shall be baked enamel on steel, minimum spangled zinc grip, or acid-resistant porcelain on steel, or bare aluminum with natural drainage outlets. When required by display case manufacturer, drain heaters shall be provided. Joints in lower compartments shall be waterproof.
17. Bumpers: Front of cases shall have a bumper rail of high impact rubber, PVC, or vinyl. Provide matching bumper rail on exposed end panels. All bumpers shall be black in color unless otherwise specified in Architectural finish drawings.
18. Lights: Display case lights shall be T-8 fluorescent fixtures with electronic ballast except where LED lighting is specified. All fluorescent lights in display cases require protective shields.

19. LED lighting in glass door cases shall be vertical LED strips at the ends of cases delivering 500 lumens and at vertical mullions delivering 1000 lumens. LED lights in glass door cases shall be provided with one motion sensor for each case to control lights in that case. These lights will also be controlled by the case lighting contactors to be permitted to operate only during the hours the store is open.
20. LED lighting in 1G06/7, 1G06X/7X, and 1GXX cases shall be controlled by the RMCS only.
21. Fluorescent and LED lamps shall be 3500 degrees K.
22. Motors: Display case fan motors shall be the highest efficiency type available. Provide electronically commuted motors (ECM).
23. Filter Drier: Provide a (sweat type) filter drier at inlet of each expansion valve. Filter drier shall filter contaminants down to 20 microns. Flow capacity shall meet fixture requirements.
24. Factory install RMCS temperature probe in discharge air stream.
25. Defrost shall be off cycle or electric as scheduled on the Drawings.
26. Evaporator coils shall have aluminum fins on copper or aluminum tubes with seamless, non-corrosive drain pan. Each liquid line connection shall have a hand valve.
27. All refrigerated cases shall have a 1 inch to 2 inch drain at the low point of the drain pan.
28. Electrical requirements shall be:

    a. 120 V for fans and lights and anti-sweat heaters.
    b. 208V, 1 phase defrost heaters and self contained cases except as noted.

29. Transparent reach-in doors shall be of triple-pane glass with either heat-reflective treated glass or gas fill requiring no anti-sweat heaters to prevent external condensation in stores with less than 60 percent relative humidity. The door frames shall be constructed of non conductive composite material (Hussmann Innovator II) or insulated aluminum with thermal break (Anthony Innovator II) or similar construction requiring heat only to prevent freezing of the door gasket seal.
30. Night curtains shall be provided on all multideck cases except 1P07. Standard is Super Market Energy Technologies "Night Shield Night Covers" magnetically mounted, manually operated, spring loaded, retractable, anti-bacterial treated, aluminized fabric screen. The screens shall be integrated into the design of the case so that they are concealed form view when retracted.

B. 1D00 -12 Case, Deli, Refrigerated, Clerk Service, 12 Foot:

1. Salient Characteristics:

    a. Nominal Dimensions:

        1) Length:

            a) 1D00-12: 144-1/2 inches.

        2) Height: 51-7/8 inches.
        3) Depth: 46 inches.

    b. Lights: Two rows of fluorescent lights in top of case and one row beneath each shelf the length of case.
    c. Shelving: Two 12 inch or one 12 inch and one 10 inch stainless steel or epoxy coated mezzanine shelves full length of case.
    d. Glass Front: Curved, lift up design, lockable, with fully gasketed perimeter.
    e. Sliding glass rear doors, lockable.
    f. Wrapping Board: Full length at rear of case.

g. 9 inch deep package ledge continuous on front of case.
h. Mirrored inside end panels.
i. Convenience Outlet: 120V duplex receptacle for scales.
j. Designed to maintain average product temperature of 36 deg F.
k. Maximum refrigeration load for parallel system 375 B/hr/lf.

2. Basis-of-Design Product: Hussmann, Model SMB.

C. 1D22-12, Case, Wide Island Display, Low Profile, Fresh Meat, Prepack, or Deli, with Deli Shelf, Self-Contained Refrigeration, 12 Foot:

1. Salient Characteristics:

a. Nominal Dimensions:

1) Length:
a) 1D22-12: 144 inches.

2) Height: 44-3/8 inches.
3) Width: 72 inches.
4) Height to Bumper: 23-7/8 inches.

b. Product display depth to be a minimum of 5 inch with adjustable angle wire racks.
c. Case to be provided with one adjustable wire rack and one non-refrigerated top display area.
d. Curved 9-7/8 inch high Plexiglas perimeter.
e. Color shall be as indicated on Architectural Drawings.
f. Self-contained refrigeration designed to maintain a product temperature of 28 to 34 deg F for fresh meat, 34 to 38 deg F for prepak meat or deli foods. With bottom mounted air cooled condensing unit, designed to slide out for ease of maintenance, electric temperature control, defrost controls, and anti-condensation heaters and condensate pan.
g. Electrical requirement 208V, single phase.
h. Case to be provided without requirement for floor drain to allow mobility for relocation. Seamless, non-corrosive electric condensate dissipater pan shall be included.
i. Place a label in the bottom of the case every 3 feet behind the front sill stating "Do not flush with water. There is no direct drain connection and the floor will be flooded."
j. Provide power cord with suitable twist lock plug and receptacle.

2. Basis-of-Design Product: Hussmann, Model RI1.

D. 1G10-3 Case, Frozen Food, 3 Glass Doors, Low Temperature, Upright:

1. Salient Characteristics:

a. Nominal Dimensions:

1) Length:
a) 1G10-3: 3 Dr, 92-1/2 inches L, w/o ends (1 inch to 2 inch each end panel).

2) Height: 83-1/2 inches.
3) Depth: 39-3/4 inches.

4) Door Width: 30 inches.
5) Upper Shelves: 22 inches deep.
6) Sill Height: 13-1/8 inches (max).

b. Lights: Vertical LED lighting assembly, one at each end and one between all doors.
c. Shelves: Five solid adjustable upper shelves per door section with price tag molding. One bottom epoxy coated wire rack per door section with price tag molding.
d. Doors: Constructed per paragraph 2.8.A.29; 67 inches high with magnetic gaskets, automatic door closures, doors hinged on left side.
e. Designed to maintain a product temperature of 0 deg F.
f. Maximum refrigeration load for parallel system 1250 B/hr/door.

2. Basis-of-Design Product: Hussmann, Model RLN.

E. 1G24--8 Merchandiser, Grab-N-Go, Self-Contained, Medium Temperature, Multi-Deck, Upright:

1. Salient Characteristics:

a. Upright refrigerated merchandiser case, multi-deck, open type, medium temperature. Shall be customer self-service, grab-n-go type for home meal replacement. Case for use as an end cap or wall merchandiser.
b. Nominal Dimensions:

1) Length:
a) 1G24-8: 96 inches, plus 1-1/8 inch each end panel thickness.

2) Width: 30-5/8 inches.
3) Height: 88-5/8 inches.
4) Sill Height: 16-3/4 inches.

c. Self-contained refrigeration designed to maintain a product temperature of 33 to 37 deg F with bottom mounted air cooled condensing unit, designed to slide out for ease of maintenance, electronic temperature control, defrost controls, and anti-condensation heaters and condensate pan.
d. Shelves: Deck and five rows of upper adjustable/removable white powder coated sheet metal shelves with product stop extending full length of case. Shelves can be removed and adjusted to be flat or slanted (0 to 10 degrees).
e. Lighting: Full-length rows of fluorescent lighting at canopy and shelves.
f. Price Tag Molding: Front edge of each shelf and deck shall be equipped with price tag molding to hold standard size price tags and labels.
g. Electrical requirement 208 volt single phase.
h. Solid end panel with mirror bright stainless steel on interior side of panel.
i. Case to be provided without requirement for floor drain to allow mobility for relocation. Seamless, non-corrosive electric condensate dissipater pan shall be included.
j. Place a label in the bottom of the case every 3 feet behind the front sill stating "Do not flush with water. There is no direct drain connection and the floor will be flooded."
k. Provide power cord.

2. Basis-of Design-Product: Hussmann Model RGD 30.

F. 1M07 Case, Meat, Multi-Deck, Medium Temperature, Open Type, 8 or 12 Foot:

1. Salient Characteristics:

   a. Nominal Dimensions:

      1) Length:

         a) 1M07-8: 96-3/8 inches.
         b) 1M07-12: 144-1/2 inches.

      2) Height: 78-3/8 inches.
      3) Depth: 42 inches.
      4) Height of front shall be 23 inches.

   b. Two full rows of fluorescent lighting at canopy.
   c. Shelves: One row of 16 inch shelves to be placed on top row of case. Four rows of 18 inch shelves to be placed below the row of 16 inch shelves.
   d. Designed to maintain a product temperature of 28 to 34 deg F.
   e. Front edges of shelves and deck equipped with price tag molding to hold standard size price tags/labels.
   f. Provide night curtains (2.10.A.30.).
   g. Maximum refrigeration load for parallel system 1400 B/hr/lf.

2. Basis-of-Design Product: Hussmann, Model M5X-EP.

G. 1P03-8, -12 Case, Produce, Single deck, Medium Temperature, 8 or 12 Foot:

1. Salient Characteristics:

   a. Nominal Dimensions:

      1) Length:

         a) 1P03-8: 96-3/8 inches.
         b) 1P03-12: 144-1/2 inches.

      2) Height: 74-3/8 inches.
      3) Depth: 42 inches.
      4) Sill height: 31 inches.

   b. One full length double row of fluorescent lighting at canopy.
   c. Cases to have a single deck and a superstructure with a 30 inch slanted mirror. Mirror to be full length of case.
   d. Drain pan shall be stainless steel or fiberglass.
   e. Designed to maintain a product temperature of 34-38 deg F.
   f. Front edge of deck equipped with price tag molding to hold standard size price tags/labels.
   g. Case to have minimum of 5 metal dividers per case.
   h. Quick disconnect fitting for water hose. Furnish one 24 foot water hose with shutoff spray nozzle for each 6 cases.
   i. Maximum refrigeration load for parallel system 950 B/hr. lf.

2. Basis of Design Product: Hussmann P2X-EP.

H. 1P07-12 Case, Produce, Pre-cut Packaged Vegetables and Juices, Upright, Refrigerated, 5 Adjustable Upper Shelves, 12 Foot:

1. Salient Characteristics:

   a. Nominal Dimensions:

      1) Length:

         a) 1P07-12: 144-1/2 inches.

      2) Height: 81-3/4 inches.
      3) Sill Height: 19-1/4 inches.
      4) Depth: 42 inches.

   b. Top discharge air curtain.
   c. Fluorescent lights, double row full length of case.
   d. 5 rows of adjustable 20-inch deep upper shelves.

      1) Three clear or black color acrylic product dividers per four foot section of shelf.
      2) Three inch high wire or acrylic front product stop, the entire length of each shelf.
      3) Price Tag Molding: On front of each shelf.

   e. Interior of case to be black finish.
   f. Designed to maintain a product temperature of 35-38 deg F.
   g. Quick disconnect fitting for water hose. Furnish one 24 foot water hose with shutoff spray nozzle for each 6 cases.
   h. Maximum refrigeration load for parallel system 1265 B/hr. lf.

2. Basis Of Design Product: Hussmann, Model D5X -LEP.

I. 2P07B Produce Misting System:

1. Salient Characteristics:

   a. Designed to provide a controlled delivery moist environment for produce cases except 1P07. Adaptable to single deck, multi-deck, or island style cases.
   b. Primary components include a controller, timer, tunes, mist bars, and a reverse osmosis water filtering system.

2. Operational Characteristics by Component:

   a. Controller designed to control water flow upon direction from the timer mechanism.
   b. Controller designed to be mounted separately from the timer by as much as fifty feet apart.
   c. Water shut off valve for service.
   d. Controller to operate concurrently with the reverse osmosis unit.
   e. Timer:

      1) Designed as a 24V system stepped down from 110-120V by a transformer/power supply.
      2) Unit to be UL listed.

3) Designed with solid state board and pre-programmed, unchangeable computer chip to permanently set the cycle to seven (7) seconds of mist every 16 minutes.
4) LED light display and off / run / test selections.
5) Timer will not have manual rocker arms, slide switches or dial settings.
6) Timer designed to be mounted separately from the controller by as much as fifty feet apart.

f. Tunes:

1) Designed as a 24V system stepped down from 110-120V by a transformer/power supply.
2) Unit to be UL listed.
3) Designed as a compact audio system with sound machine/amplifier, two strobe lights, and two water-resistant three way acoustic speakers.
4) Designed to be compatible and coordinated with the misting system timer.
5) Designed with pre-recorded tunes selection to include mist alerts lightning and thunder music / Misty tunes.
6) Designed to allow user recorded tune or message from CD or cassettes. Provided with volume control.

g. Mist Bars:

1) Constructed of virgin PVC co-extruded outside layer which is UV resistant and a co-extruded black inner core with UV and antibacterial resistance.
2) Tubing designed with a one inch square (4-sided) tube with at least 2 inch round water supply through the center. Diagonal exterior corners are acceptable.
3) All fittings must be quick connect to minimize install/service time. No glue, lubricants, sealants or screw together connections.
4) Provided with double nozzle mist head. Designed with 360 degree rotation in both vertical and horizontal planes, adjustable and auto-locking.
5) Each double nozzle head will be capable of being turned off independently. Nozzle head spray mist outflow to be adjustable for volume of spray.
6) Double nozzle head to be spaced at 18 inches.
7) Color of tubing to be white.

h. Reverse Osmosis Water Filtering System:

1) Reverse osmosis (RO) system with a minimum capacity of 600 GPD (gallon per day), expandable to 900 GPD.
2) Compact unit in an enclosed powder coated metal box for easy mounting in a produce prep room.
3) Provided with quick connect water fittings.
4) Four pre-filters: one 50-micron sediment filter, two 5-micron wrapped carbon filters, and one 5-micron sediment filter.
5) Self-diagnostic filter replacement notification system with a "call for service" light and a reset button.

3. Basis-of-Design Product: KES Misting Systems or equal.

2.9 REFRIGERATION PIPING AND ACCESSORIES

A. Scope: The refrigeration piping system shall consist of HVAC and product piping systems and heat reclaim piping systems handling fluorocarbon refrigerants.

B. Copper Tubing/Piping Classification: Copper tubing shall be type "L" hard-drawn. Tubing shall be dehydrated, marked "ACR", capped, sealed, and delivered to the job site in that condition.

C. Quality Assurance: Tubing delivered to the job site or found on the job site without capped ends shall be tagged and rejected from installation on this project.

D. Accessories:

1. Product Standards: Refrigerant piping, valves, fittings, and accessories shall conform to the requirements of ANSI/ASHRAE Standard 15-2010, and ANSI B31.5unless otherwise specified.
2. Fittings: Fittings for brazed joints shall be wrought copper or forged-brass sweat fittings. Cast sweat-type fittings shall not be allowed for brazed joints. Ells shall be of long radius type. No 45 degree elbows shall be used.
3. Hand Valves: Refrigerant shut-off valves shall be designed for use with the refrigerant used and shall have pressure ratings compatible with system pressures encountered. Gate valves shall not be acceptable. Valves shall be all brass, handwheel-operated, diaphragm, packless-type, globe or angle valves in sizes up to and including 5/8 inch. For valves 5/8 inch and larger, ball valves designed specifically for refrigerant service shall be used.
4. Check Valves: Check valves shall be steel or brass body, lift or swing type suitable for refrigerant liquid or gas service.
5. Solenoid Vales: Solenoid valves shall be bronze, brass or steel body, packless type, with stainless-steel trim, rated for continuous-duty service, direct or pilot operated, provided with manual lift stem and designed for or use with the type of refrigerant used. Valves shall have a safe working pressure of 400 psi and a maximum operating pressure differential of at least 200 psi at 85 percent of rated voltage. Valves shall have an operating pressure differential suitable for the refrigerant used. Valves shall have adequate capacity for the installation at a pressure drop suitable for the refrigerant used. Solenoids shall have moisture proof insulation and shall be UL approved.
6. Expansion valves (sweat fitting) shall be designed for use with the type of refrigerant used and with a pressure rating suitable for the pressure encountered. The valves shall be of the thermostatic type, diaphragm or bellows operated, with removable screens and external super heat adjustment set at the factory for 10 deg F super heat. Power elements and valve size shall be as recommended by the manufacturer for the service intended. Multi range expansion valves are not acceptable.

2.10 REFRIGERATION PIPING INSULATION

A. Refrigerant Suction Lines:

1. Suction lines operating above 0 deg F saturated suction temperature (SST) shall be insulated with elastomeric pipe insulation with wall thickness of 1 inch. Where the 2.5 percent design wet bulb temperature exceeds 78 deg F insulation wall thickness shall be 1.5 inch.
2. Suction lines operating at a 0 deg F and lower shall be insulated with elastomeric pipe insulation of 1 inch wall thickness.

a. Where the 2.5 percent design wet bulb temperature exceeds 75 deg F insulation wall thickness shall be 1.5 inch.

b. Where the 2.5 percent design wet bulb temperature exceeds 78 deg F insulation wall thickness shall be 2 inch and may be applied in two layers with only the outer layer being of the factory split self adhesive type.

1) This additional insulation shall not be required in tunnels or below cases in the sales area but will be required above ceilings, in soffits above cases, and in all non-air conditioned spaces. Wall thickness in these areas shall be 1 inch.

B. Refrigerant Liquid Lines: Liquid lines shall be insulated with elastomeric pipe insulation with 1/2 inch wall thickness. Liquid lines in return air tunnels, ducts, refrigerated cases, and walk-in boxes do not require insulation.

C. Drains on Unit Coolers in Refrigerated Rooms: In refrigerated rooms that operate at less than 32 deg F, drains shall be insulated with elastomeric pipe insulation with 1/2 inch wall thickness.

D. Elastomeric Pipe Insulation Standard: Elastomeric flexible pipe insulation. Flame-spread rating not greater than 25 and a smoke-developed rating not greater than 50. Insulation shall have a K factor of .28 or less at 75 deg F mean temperature. Insulation shall have a water vapor permeability of .10 or less and a water absorption by volume of 1 percent or less. Insulation shall be assembled with all-temperature adhesive (Armstrong 520 or equivalent). Splitting of joints of insulation is not allowed except for the outer layer of two layer pipe insulation where the total thickness exceeds 1 inch. Butt joints of insulation shall not be sealed until pressure tests and leak tests are completed. Insulation installed outdoors and subject to water damage shall be provided with an additional (0.016 inch aluminum jacket with lock seam longitudinal joint and stainless steel "Bandit" straps for butted joints as required for a water-tight installation.

E. Refrigerant Hot Gas Lines: Hot gas lines from the compressor systems to heat recovery coils shall be insulated with 1 inch of fiberglass. Outlet lines on heat recovery coils do not require insulation. Fiberglass insulation shall be installed after pressure and leak tests are completed. Refrigerant line leaving heat reclaim coil does not require insulation.

F. Fiberglass Insulation Standard: Fiberglass insulation shall have composite (insulation, jacket or facing, and adhesive used to adhere the facing or jacket to the insulation) fire rating of 25 and smoke hazard rating of 50 as tested by procedure ASTM E-84, NFPA 225 or UL 723. Insulation material should have a maximum K factor of 0.28 or less at 75 deg F mean temperature with factory-applied fire retardant vapor barrier jacket. Jacking materials installed in exposed locations (mechanical equipment rooms, exposed in finished areas, etc.) shall be Owens-Corning ASJ or pre-sized glass cloth, neither requiring painting but suitable or direct application of finish without surface preparation. Jackets furnished for installation in concealed locations (in chases, above ceiling, etc. may be ASJ or FRJ. ASJ and FRJ jackets shall have self-sealing joints. Insulation shall be provided with a vapor barrier having vapor permeability rating suitable for the service intended, and joints shall be properly sealed.

G. Insulation installed outdoors shall be provided with an additional 0.016 inch aluminum jacket with lock seam longitudinal joint and stainless steel "Bandit" straps for butted joints as required for a water-tight installation.

PART 3 - EXECUTION

3.1 QUALITY ASSURANCE

A. Manufacturer Responsibility: The manufacturer of the refrigerated display cases or the compressor system shall:

1. Furnish the refrigeration compressor units, condensers, heat recovery coils, heat reclaim hot water heaters, diverting valves for heat recovery, unit coolers, display cases and RMCS.
2. Coordination: Coordinate the installation of the total refrigeration system.
3. Submittal: Shall review the construction project Electrical Drawings and Specifications and provide electrical power and control wiring and refrigeration piping not specifically provided for in the Drawings and Specifications.
4. Factory Testing: Shall factory mount, install, and test the control system for each compressor system.
5. Interim Inspections/Reports: An Employee of the Display Case Manufacturer, not of the dealer or installing contractor, shall conduct inspections of the installation of the product refrigeration systems every 60 days beginning upon delivery of the first piece of refrigeration equipment. Within 5 days after each inspection by the manufacturer, an inspection report shall be submitted to the Contracting Officer. The inspection report shall detail whether or not the product refrigeration equipment is being installed in accordance with the Manufacturer's recommendations. All items of non-compliance shall be noted on this report. failure to provide these reports in a timely manner may result in the Contracting Officer's attainment of a manufacturer inspection visit and subsequent deduction of payment from the Contractor. The representative shall have been employed by the same manufacturer's which furnished the display cases, for a minimum of two years and shall have a minimum of 5 years journeyman refrigeration "hands on" experience.
6. Piping Certifications: A letter signed by the manufacturer of the display cases certifying the piping is installed in accordance with the manufacturer's requirements shall be submitted to the contracting officer prior to charging the systems with refrigerant. All items of non-compliance shall be noted in this report.
7. Startup: Display case manufacturer's technical representative, not of the dealer or installing contractor, shall be provided to "fine tune" and commission the system prior to conducting the five day performance test. For projects where the equipment is installed in phases, the manufacturer’s representative shall inspect each major phase of refrigeration work.
8. Final Certification: A letter signed by the manufacturer of the display cases certifying the systems are installed in accordance with the manufacturer's requirements shall be submitted to the contracting officer prior to final acceptance of the systems. All items of non-compliance shall be noted in this letter.
9. The contractor installing the equipment must be an installer who is approved by the display case manufacturer.

B. Contractor Experience: The installer shall have successfully completed not less than three installations of equal or greater size and complexity within the past three years.

C. Mechanic's Experience: The installing contractor or subcontractor shall employ EPA certified refrigeration mechanics to install the system. The mechanics installing the system shall have a minimum of three years experience installing supermarket refrigeration systems. As part of the submittal, the installing contractor shall furnish resumes and EPA certification of the key refrigeration mechanics and field superintendent responsible for installation of the refrigeration piping and components.

D. Testing: Provide water tightness test(s) and pressure test(s) and performance test(s) per paragraph 3.2, prior to stocking fixtures.

3.2 INSTALLATION, GENERAL

A. Product Delivery/Storage: The Contractor shall coordinate delivery of materials and equipment with the construction schedule. Materials and equipment stored on site must be protected from damage. Display cases, unit coolers, and compressor racks must be stored in a covered storage area and be kept clean and dry until installed in the commissary.

B. System Identification: Compressor systems, unit coolers, condensers, heat reclaim coils, and refrigerated display cases shall have a permanent metal or laminated plastic identification tag to identify compressor system, refrigerant circuit numbers, and alarm probe. The identification scheme must be coordinated with and match the RMCS system identification scheme. Letters on tag shall be 1/4 inch to 3/8 inch in height. Mechanically fasten the tag.

C. Supports/Penetrations: Excessive cutting or other weakening of the building structure to facilitate piping installation will not be permitted without written approval. Supports shall be attached only to structural framing members and concrete slabs. Supports shall not be anchored to metal decking unless a means is provided and approved for preventing the anchor from puncturing the metal decking. Where supports are required between structural framing members, suitable intermediate metal framing shall be provided and detailed. Necessary supports shall be provided for equipment, appurtenances and pipe. These include frames or supports for compressors, condensers, evaporators, and other similar items requiring supports.

D. Filter and Oil Change: Upon completion of the performance test, the Contractor shall perform the following on each refrigeration system and show the removed filter-drier to the Government's Designated Inspector:

1. Change liquid line filter-drier cores.
2. Change suction filter-drier cores.
3. Change oil filter.

E. Refrigerant Charge: Provide refrigerant charge to maintain not less than 30 percent receiver level with heat reclaim "ON".

3.3 ELECTRICAL INSTALLATION AND DESIGN

A. Comply with Division 26, especially Section Raceways and Boxes which limits the number of conductors per conduit.

B. Scope: Provide all wiring for product refrigeration system including wiring necessary for operation of system which is not specifically shown on drawings. All equipment shall have disconnect switches.

C. Design Scope: In accordance with the Drawings and this Section of the Specification, the Contractor shall have the electrical power wiring for the refrigeration system designed by the engineering department of the display case manufacturer.

D. Material: Electric wiring shall be copper and installed in conduit.

E. Grounding: Provide a grounding conductor in all branch circuit conduits. Do not use conduit as the only means of grounding for the refrigeration electrical system.

F. General: Wire sizes shall be in accordance with NEC Latest Edition.

G. Conductor Temperature Design Standard: All power wiring in the refrigeration compressor rooms shall be designed for 9 deg F higher than the 1 percent ambient summer design temperature.

H. Transformer Temperature Design Standard: All transformers provided for the refrigeration shall have copper windings and shall be rated for 144 deg F temperature rise.

I. Breaker Ir Standard: Minimum interrupting rating (Ir, RMS) for refrigeration electrical feeders and branch circuits circuit breakers shall be as follows:

J. Circuit Breaker:

Voltage	Interrupting Rating
480V	Main Building Transformer 500 KVA, Ir = 12,000
480V	Main Building Transformer 750 KVA, Ir = 18,000
480V	Main Building Transformer 1000 KVA, Ir = 24,000
480V	Main Building Transformer 1500 KVA, Ir = 35,000
480V	Main Building Transformer 2000 KVA, Ir = 48,000
208V	Refrigeration Power Transformer 225 KVA, Ir = 15,000
208V	Refrigeration Power Transformer 300 KVA, Ir = 20,000

K. Defrost Feeder Design Loading: The minimum size of feeder for 208V defrost panels shall be as follows:

1. On multiplex compressor systems with 5 or less refrigeration circuits the feeder shall be sized for the following combined loads: largest defrost load, control circuit on compressor system, and unit cooler fan motor loads.
2. On multiplex compressor systems with more than 5 refrigeration circuits the feeder shall be sized for the following combined loads: largest defrost load plus one other defrost load, control circuit on compressor system, and unit cooler fan motor loads.

L. Penetrations: Seal electrical penetrations in walk-in boxes and display cases with silicon sealant inside and outside of conduits. See Division 13 Section Cold Storage Rooms and Electrical details.

3.4 REFRIGERATION PIPING INSTALLATION AND DESIGN

A. Brazing Material: Copper joints shall be brazed with AWS BCUP5 (14.5-15.5 percent Silver) Silver Braze and copper to brass or steel shall be brazed with AWS BAG4 (40 percent Silver).

B. Purging: During brazing operations, the tubing and fitting being brazed shall have a continuous purge of dry nitrogen at a rate which will preclude oxidation of the tubing and fitting. Tubing and fittings shall be properly cleaned prior to brazing. Copper tubing joints that are assembled on the job site shall be assembled with fittings.

C. Cutting: Joints in copper tubing shall be cut square with tubing cutter, ends shall be reamed, and fillings and dust removed from interior of pipe

D. Piping Design: Refrigeration piping shall be sized by the refrigeration equipment manufacturer and shall be based on the following:

1. Pressure Drop Liquid and Discharge: Pressure drop in the liquid and discharge line shall not be greater than 3 psi.
2. Pressure Drop Suction Line: Pressure drop in the suction line shall not be greater than 2 psi.
3. Velocity Suction line: Minimum gas velocity for horizontal suction line shall be 700 FPM and 1500 FPM for vertical suction line.
4. Maximum velocity for liquid line from condenser to receiver line shall be 100 FPM.
5. Traps/Risers: Every suction riser shall have an oil trap sized the same as the horizontal suction line. The oil trap shall be long radius wrought copper manufactured for use as a trap. Traps constructed of several 90 degree elbows are not permitted. For risers exceeding 16 feet a second trap shall be installed at the mid-point of the riser. Suction and discharge horizontal lines shall be continuously pitched a minimum of 1/2 inch per 10 feet in the direction of flow.
6. The first three support points from the compressor racks of each piping circuit shall have hydrazorb or equal clamps securing both suction and liquid lines to trapeze hangers with other circuits. See DeCA detail "clamp assembly for uninsulated refrigeration line or electrical conduit".
7. Condenser Piping: 50 percent/ 50 percent split:

   a. Hot Gas Lines: Parallel and equivalent, hot gas lines shall be installed to accommodate condensers which are indicated for 50 percent / 50 percent condenser split. See this Section and or contract drawings.
   b. Liquid Lines: Parallel and equivalent, liquid lines shall be installed to accommodate condensers which are indicated for 50 percent / 50 percent condenser split. See this Section and or contact drawings.

8. Provide risers, traps, offsets, and drops as required to coordinate with the building structure and the work of other trades.

E. System Cleanliness: Pipes, strainers, and valves shall be cleaned free of scale and thoroughly flushed of foreign matter. Strainers and valves shall be thoroughly cleaned. The interior and exterior (tubes and fins) of air-cooled condensers, evaporative condensers, unit coolers, and display cases shall be thoroughly cleaned of debris and blown free of small particles of rubbish and dust. Equipment shall be wiped clean, with oil, dust, dirt, and-or paint spots removed. It shall be the responsibility of the Contractor to maintain the system in this clean condition until final acceptance.

F. Copper Piping/Tubing: Refrigeration tubing/piping delivered to the job site or found on the job site without capped ends, shall be tagged and rejected from installation on this project.

G. Fitting: Pipes shall be cut accurately to measurements established at the job site and worked into place without springing or forcing, and properly clearing windows, doors, and other openings. Pipes shall be installed to permit free expansions and contraction without damage to joints or hangers. Changes in direction shall be made with fittings. Bent pipe showing kinks, wrinkles, flattening or other malformations will not be accepted. Open ends of pipes or equipment shall be properly capped or plugged during installation to keep dirt and other foreign material out of the system.

H. Isolation Valves: Hand valves shall be installed on each side of each piece of equipment such as compressors, heat recovery coils, hot water heater, heat exchanges, condensers, receivers, and other similar items, and at other points indicated or required for maintenance, isolation, charging, or sectionalizing purposes. Additional valves necessary for safe and proper operation of the refrigeration system shall be included in the installation. Valves are not required on the outlet of evaporators in cases and unit coolers.

I. Hangers: Pipe supports and hangers shall conform to the requirements of the Specifications. Hangers shall be located within 3 feet of the ends of each run out, not over 1 foot from each change of direction, and at intervals indicated on the Drawings in the table entitled "Pipe Support Spacing for Refrigerant Piping."

3.5 UNIT COOLER INSTALLATION

A. Drains:

1. Union: Unit cooler drains shall be piped to be easily disconnected and to allow the drain pan to be easily dropped for service.
2. Piping material shall be type L or M hard-drawn copper.
3. Traps: Traps are required on unit cooler condensate drains where the drains are extended to a floor drain outside the room. Drains for unit coolers in frozen food and carcass rooms storage shall be trapped outside of the room.
4. Heat tape: Heat tape and 1/2 inch unicellular plastic insulation is required on condensate drains in rooms where temperature is maintained at 32 deg F or lower. Heat tape shall be the type that regulates its own heat output as its temperature changes (FreezGard or equivalent). Avoid piping drain lines above doorways. Maximum length of a drain line shall be 50 feet.
5. Heat Exchanger: Provide a heat exchanger for each unit cooler.
6. Valves: Unit coolers shall have a liquid line shutoff valve (sweat type). Provide Schrader type valve with cap on suction outlet of unit cooler. Provide balanced port thermal expansion valve (sweat fitting) for each unit cooler, properly sized and designed for use with the type of refrigerant indicated.
7. See unit cooler mounting detail.

3.6 DISPLAY CASE INSTALLATION

A. Install in accordance with the manufacturer's recommendations and supervision as specified.

B. Valves: Each refrigerated case having a remote compressor system shall have a liquid line hand shutoff valve (solder type). Balanced port thermostatic expansion valve (sweat fitting). At each TX valve bulb location, provide a Schrader type valve with cap.

C. Heat Exchanger: Provide a heat exchanger in each display case that is not served by a subcooled circuit.

D. Shims: Shim cases level using galvanized steel shims.

E. Sensors: Probes for the alarm and monitoring system shall be pre-wired at the factory. Mount probes in the discharge air at the center of the cases.

F. Each refrigerated display case shall have a decal or metal tag marking the location of the thermal expansion valve, thermostat, and solenoid valve. The decal or metal tag shall be placed on the lower part of the case or on the kick plate.

G. Close-off Panels: Provide close-off panels as necessary to ensure return air is only drawn from the front of the display cases. Back to back display cases must be sealed with closure panels at the top and sides of the display cases. Use stainless steel or other visually appealing material for closure panels in visible locations.

H. Condensate Piping: Case drain piping shall be sized as recommended by the case manufacturer. Drains shall be accessible for ease of maintenance. Except for seafood and rear roll-in dairy case(s), drain pipe may be schedule 40 PVC or type M hard-drawn copper. On seafood and roll-in dairy cases, use type M or L hard-drawn copper.

1. Accessible: Drains shall be accessible for ease of maintenance.

I. Condensate Drain Strainer: Provide a 1/4 inch mesh stainless steel strainer inside the case at each drain. Secure strainer to drain.

J. Stat Location: When display case thermostats are required, install so that set-point adjustments can be made without unloading or removing panels from the cases.

K. Partitions: Provide and install a plexiglass partition between display cases with electric defrost which are connected to different refrigeration circuits. Partitions are to match interior of case. Seal the edge joints.

L. Defrost requirements will be as indicated on Drawings.

M. Anti Condensate Fans: Where back to back display cases occur without floor level return air pulled from under the cases; provide ventilation fans to circulate store air through this area.

N. Light Tube Covers: All lights in display cases require protective shields.

O. Produce Water Connection: Provide quick connect domestic cold water connection: Provide and install quick connections for spraying water on the produce. Provide connection in every 1P02 produce case.

3.7 TESTING

A. Entire System: Upon completion of each refrigeration system, and at a time designated by the Contracting Officer, refrigerant piping fabricated at the job site shall be pressure-tested for leaks and the entire system shall be tested as hereinafter specified. The tests shall be conducted in the presence of the Government's Designated Inspector. The Contractor shall furnish instruments, test equipment, and personnel who are required for the tests.

B. Piping:

1. Pressure Test: After components of the refrigerant system have been installed and the piping connected, the total product refrigeration system shall be subjected to a pneumatic test. The pneumatic testing shall be done by charging system with a sufficient amount of anhydrous carbon dioxide or dry nitrogen to bring the pressure to 300 psi for high side and 150 psi for low side. The system shall be proven tight and free of leaks by testing joints with a halide or electronic leak detector and by allowing the leak test pressure to remain on the system for 12 hours with no drop in pressure. Correction of .3 psi will be allowed for each degree change in the initial and final temperature of the surrounding air, plus for an increase and minus for a decrease.
2. Evacuation Test: After the foregoing tests have been satisfactorily completed and the pressure relieved, the system shall be evacuated to an absolute pressure of 500 microns.

During evacuation of the system the ambient temperature shall be higher than 34 deg F. No more than one system shall be evacuated at one time by one vacuum pump. When a vacuum of 500 microns is obtained, close off vacuum pump for 30 minutes and observe the magnitude and rate of pressure rise. If pressure continues to rise, check the system for leaks, repair them, and repeat the evacuation procedure. If pressure rises to a point and holds, but rises above 1000 microns, repeat the evacuation and close off procedure until the rise is small enough to indicate that the system is dry. The Contractor shall maintain records of test pressures and vacuum reading on each system and shall indicate length of time test pressures and vacuums were maintained. This record shall be submitted to the Contracting Officer at the completion of the pressure and leak tests.

3. Electronic Leak Test: Upon completion of the evacuation test, the vacuum shall be broken by completely charging with dry refrigerant for which the system is designed and shall be subjected to the performance tests and halide torch or electronic leak-detector tests herein specified. Upon satisfactory completion of the tests, charge the systems with adequate refrigerant to maintain a minimum of 20 percent receiver capacity reserve during all operating conditions including simultaneous heat reclaim and condenser flood back during cold weather operation. Loss of refrigerant during the warranty period shall be guaranteed and refrigerant required shall be Contractor-furnished.

C. Case Water Tightness Test: Test the water tightness of all display cases joints and refrigeration line penetrations with a hose stream of water. Conduct this test prior to cases start up and in the presence of the Government's Designated Inspector. Provide written copy of test witnessed by Government's Designated Inspector prior to turning cases over to government.

D. Performance Test: After the pressure tests have been completed, systems are operational, and before the total product refrigeration system is accepted, performance tests to demonstrate the capacity specified and general operating characteristics of equipment shall be conducted in the presence of the Government's Designated Inspector, by a competent, experienced engineer from the display case manufacturer who will attest the reliability of the results. The operational test shall cover a period of not less than 5 days for each system and shall demonstrate that the entire system is functioning in accordance with the Drawings and Specifications. Corrections and adjustments shall be made as necessary to produce specified conditions. The Contractor shall assure full responsibility for satisfactory operation of the integrated system. Typed, tabulated data taken during the performance tests that indicate that the system will produce the required capacity, shall be provided. Performance tests shall include the following specific information in the report and conclusions regarding the adequacy of the system:

1. Time, dates, and duration of test.
2. Dry-bulb temperatures maintained inside each of the refrigerated rooms and display cases during every hour of the test. The digital display on the refrigeration monitoring system shall be used to determine these temperatures.
3. Outside and sales area dry-bulb and wet-bulb conditions every 6 hours as determined with a sling psychrometer or with refrigeration monitoring system.
4. Compressor suction and discharge pressures taken every hour with the compressor in operation; compressor model and manufacturer, and type of refrigerant employed.
5. The Contractor shall furnish instruments, test equipment, and test personnel required for the tests. Four copies of the test report shall be submitted to the Contracting Officer.

3.8 PHASE COMPLETION/ACCEPTANCE

A. Prior to phase completion and government usage of any piece of new refrigeration equipment, the following shall be accomplished:

1. Temperatures Maintained: Equipment shall be maintaining contract specified control.

2. Certification of Installation Received: Certification of proper installation of that piece of equipment shall have been received by the government, from the Display Case Manufacturer (see paragraph 1.3).
3. Test Report: Provide written copies of witnessed water tightness tests and pressure tests, for the equipment being turned over for government use.
4. Interim Inspection Reports: Inspection reports from the Display Case Manufacturer shall have been received by the government for that phase of equipment. (See Quality Assurance this Section.)

3.9 PREFINAL INSPECTION

A. Prior to prefinal inspection, the following shall be accomplished:

1. Temperatures Maintained: All equipment shall be maintaining contract specified control.
2. O&M Info Received: All O&M information shall have been received by the government.
3. Warranty Received: Warranty letters from the RMCS and Display case manufacturers shall have been received by the government.
4. Test Reports: Provide written copies of witnessed water tightness tests, and pressure tests. Provide these prior to turning over cases for use.
5. Certification of Refrigeration System Installation Received: Certification of installation letter from the Display Case Manufacturer shall have been received by the government (see Quality Assurance this Section).
6. Certification of RMCS System Installation Received: Certification of installation letter from the RMCS manufacturer has been received by the government. (See Division 23 Section Refrigeration Monitoring and Control System (RMCS).)
7. Interim Inspection Reports: Inspection reports from the Display Case Manufacturer shall have been received by the government for that phase of equipment. (See Quality Assurance this Section.)

3.10 OPERATING AND MAINTENANCE INSTRUCTIONS

A. Distribution:

1. Provide one (1) copy to DeCA/PMF 2250 Foulois St. Suite 2, Lackland AFB TX 78236-1039.
2. Provide one (1) copy to HQ DeCA/ENFS Ft. Lee, VA. 2301-1800.
3. Provide two (2) copies to the Contracting Officer (to be forwarded to commissary).

B. Contents: Each set shall have the following contents.

1. Cover: The following identification shall be inscribed on the covers: "OPERATING AND MAINTENANCE INSTRUCTIONS," the location of the building, the name of the installer, and the contract number. A fly sheet shall be placed before instructions covering each subject. The instruction sheets shall be approximately 8-1/2 inch by 11 inch, with large sheets of drawings folded in. The instructions shall include, but shall not be limited to, the following:

a. Notebook: Each set shall be in bound notebooks.
b. CAD drawings of system layout showing equipment locations on the floor plan, piping, valves, and controls. Provide three (3) copies. One shall be provided for local engineer files, one set shall to go to DeCA/PMF, one set to DeCA/ENFS. Each set of Drawings shall be one hard copy and one on CD.

c. Approved wiring and control diagrams with data to explain the detailed operation and control of each component. Include interface and connection to the refrigeration monitoring control system (RMCS).
d. In each set of instructions provide a copy of refrigeration system drawings. Drawings shall include refrigeration schedules, refrigeration circuit layout, and refrigeration electrical wiring.
e. Operating and maintenance (including lubrication) instructions for each piece of equipment.
f. Display case manufacturer's bulletins, catalogue cuts and descriptive data, installation and operation data.
g. Parts lists and recommended spare parts.
h. Warranty certificates for compressors, display cases, etc., including procedures for getting warranty items replaced.
i. Approved pressure control settings, refrigeration schedule and refrigeration circuit layout drawings of the entire system and layout drawings on RMCS, framed under laminated plastic, shall be posted, in the Refrigeration Equipment Room where directed by the Contracting Officer. Drawings shall be fixed so that they will not fade. The framed drawings shall be posted before acceptance testing of the systems. Each set shall be in bound notebooks.

3.11 TRAINING OF MAINTENANCE PERSONNEL

A. Training of DeCA's contracted maintenance personnel shall be conducted by a case manufacturer’s employee, not an employee of the dealer or contractor, within 30 days and not more than 45 days after final acceptance of the system. The instruction (8 hrs) shall be conducted at the commissary by the display case manufacturer. Instruction shall be given to personnel who will be responsible for maintenance and operation of the refrigeration system after the contractor completes the contract. Coordinate this meeting in advance with DeCA/ENFS at Fort Lee, VA to schedule attendance by contracted maintenance personnel. A written list of personnel attending instruction shall be provided by the Contractor to the Contracting Officer.

3.12 FINAL ACCEPTANCE

A. Prior to final acceptance, the following shall be accomplished:

1. Temperatures Maintained: All equipment shall be maintaining contract specified control.
2. Punch List Complete: All pre final and final punch list items shall have been corrected by the contractor and their correction approved by DeCA/PMF Lackland AFB TX.
3. O&M Info Received: All O&M information shall have been received by the government.
4. Warranty Received: Warranty letters from the RMCS and Display case manufacturers shall have been received by the government.
5. Certification of Installation Received: Certification of installation letters from the Display Case Manufacturers shall have been received by the government. (See paragraph 3.1.)
6. Test Reports: Provide written copies of witnessed water tightness tests, and pressure tests.
7. Training: Training of Maintenance Personnel has been completed.

3.13 WARRANTY GUARANTEES AND SERVICE

A. The manufacturer shall guarantee that the equipment furnished shall operate without excessive noise or vibration; deliver the specified capacities indicated in the schedule and nameplate

ratings without overloading; and shall satisfactorily operate for a period of 1 year from the date of final acceptance of the units by the Contracting Officer.

B. Work and equipment shall be guaranteed by the installing contractor to be free from defects in the materials or workmanship for a period of one year from date of final acceptance of the total construction project by the Contracting Officer. The refrigeration systems shall be guaranteed to perform satisfactorily for 1 year from date of final acceptance of the total construction project by the Contracting Officer. Satisfactory performance shall mean that the refrigerated cases and insulated cold storage rooms shall maintain the design discharge air temperature while operating at design conditions. Design conditions and temperatures shall be based on ASHRAE Standard No. 72-83.

C. Emergency Repair Warranty: In addition to the warranty of construction, the following repair service is a part of the specifications and shall be binding on the installing contractor:

1. The manufacturer of the equipment shall guarantee that the equipment shall operate without failure for the periods indicated below beginning on the date of final acceptance of the total construction contract by the contracting officer.
2. First 90 Days: During the first 90 days of the warranty, the Manufacturer shall provide 24 hours a day, 7 days per week (including holidays), service to the Commissary. A technician shall arrive at the Commissary within 2 hours of receipt of a telephone call for warranty service. All parts and labor shall be provided by the Manufacturer at no cost to the government during this period.
3. 91 to 365 Day: During the 91st day through the 365 day of the warranty, the Manufacturer shall provide free exchange of parts within 24 hours of notification. Shipping costs shall be paid by the Manufacturer. These parts will be installed by the installing contractor and billed to the manufacturer.

3.14 REFRIGERANT HANDLING AND RECOVERY

A. General: All Work shall be accomplished in accordance with current regulatory requirements established by the Environmental Protection Agency, including final regulations to implement the Clean Air Act.

B. Recover all refrigerant in accord with all State, Local, and Federal regulations regarding the recover, handling, and storage of refrigerants.

C. For Contractor responsibilities, ownership requirements of refrigerant and log book and record keeping procedures see Division 01 Section Environmental Procedures for Refrigerants.

END OF SECTION

SECTION 26 05 00

COMMON WORK RESULTS FOR ELECTRICAL

(Edited from DeCA June 2011 Design Criteria)

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Supporting devices for electrical components.
2. Concrete equipment bases.
3. Electrical demolition.
4. Cutting and patching for electrical construction.
5. Touchup painting.

1.2 SUBMITTALS

A. Product Data: For electricity-metering equipment.

B. Shop Drawings: Dimensioned plans and sections or elevation layouts of electricity-metering equipment.

C. Field Test Reports: Indicate and interpret test results for compliance with performance requirements.

1.3 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Comply with NFPA 70.

1.4 COORDINATION

A. Coordinate chases, slots, inserts, sleeves, and openings with general construction work and arrange in building structure during progress of construction to facilitate the electrical installations that follow.

1. Set inserts and sleeves in poured-in-place concrete, masonry work, and other structural components as they are constructed.

B. Sequence, coordinate, and integrate installing electrical materials and equipment for efficient flow of the Work. Coordinate installing large equipment requiring positioning before closing in the building.

C. Coordinate electrical service connections to components furnished by utility companies.

1. Coordinate installation and connection of exterior underground and overhead utilities and services, including provision for electricity-metering components.
2. Comply with requirements of authorities having jurisdiction and of utility company providing electrical power and other services.

D. Coordinate location of access panels and doors for electrical items that are concealed by finished surfaces. Access doors and panels are specified in Division 08 Section Access Doors and Frames.

PART 2 - PRODUCTS

2.1 SUPPORTING DEVICES

A. Material: Cold-formed steel, with corrosion-resistant coating acceptable to authorities having jurisdiction.

B. Metal Items for Use Outdoors or in Damp Locations: Hot-dip galvanized steel.

C. Slotted-Steel Channel Supports: Flange edges turned toward web, and 9/16 inch diameter slotted holes at a maximum of 2 inches o.c., in webs.

D. Slotted-Steel Channel Supports: Comply with Division 05 Section Metal Fabrications for slotted channel framing.

1. Channel Thickness: Selected to suit structural loading.
2. Fittings and Accessories: Products of the same manufacturer as channel supports.

E. Nonmetallic Channel and Angle Systems: Structural-grade, factory-formed, glass-fiber-resin channels and angles with 9/16 inch diameter holes at a maximum of 8 inches o.c., in at least one surface.

1. Fittings and Accessories: Products of the same manufacturer as channels and angles.
2. Fittings and Accessory Materials: Same as channels and angles, except metal items may be stainless steel.

F. Raceway and Cable Supports: Manufactured clevis hangers, riser clamps, straps, threaded C-clamps with retainers, ceiling trapeze hangers, wall brackets, and spring-steel clamps or click-type hangers.

G. Pipe Sleeves: ASTM A 53, Type E, Grade A, Schedule 40, galvanized steel, plain ends.

H. Cable Supports for Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug for nonarmored electrical cables in riser conduits. Plugs have number and size of conductor gripping holes as required to suit individual risers. Body constructed of malleable-iron casting with hot-dip galvanized finish.

I. Expansion Anchors: Carbon-steel wedge or sleeve type.

J. Toggle Bolts: All-steel springhead type.

K. Powder-Driven Threaded Studs: Heat-treated steel.

2.2 EQUIPMENT FOR UTILITY COMPANY'S ELECTRICITY METERING

A. Current-Transformer Cabinets: Comply with requirements of electrical power utility company.

B. Meter Sockets: Comply with requirements of electrical power utility company.

2.3 EQUIPMENT FOR ELECTRICITY METERING BY OWNER

A. Meter: Electronic kilowatt-hour/demand measuring to record electricity used and highest peak demand over a time period according to electric utility. Meter is designed for use on the type and rating of circuit indicated for its application.

1. Kilowatt-Hour Display: Digital liquid crystal.
2. Kilowatt-Demand Display: Digital, liquid-crystal type to register highest peak demand.
3. Enclosure: NEMA 250, Type 1, minimum, with hasp for padlocking or sealing.
4. Memory Backup: Self-contained to maintain memory throughout power outages of 72 hours, minimum.
5. Sensors: Current-sensing type, with current or voltage output, selected for optimum range and accuracy for the ratings of the circuits indicated for this application.

   a. Type: Solid core.

6. Accuracy: Nationally recognized testing laboratory certified to meet ANSI C12.16 specifications.

B. Current-Transformer Cabinets: Listed or recommended by metering equipment manufacturer for use with sensors indicated.

C. Available Metering Equipment Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. E-MON Corporation.
2. National Meter Industries, Inc.
3. Osaki Meter Sales, Inc.
4. Power Measurement.
5. Square D; Schneider Electric.

2.4 CONCRETE BASES

A. Concrete Forms and Reinforcement Materials: As specified in Division 03 Section Cast-in-Place Concrete.

B. Concrete: 3000-psi, 28-day compressive strength as specified in Division 03 Section Cast-in-Place Concrete.

2.5 TOUCHUP PAINT

A. For Equipment: Equipment manufacturer's paint selected to match installed equipment finish.

B. Galvanized Surfaces: Zinc-rich paint recommended by item manufacturer.

PART 3 - EXECUTION

3.1 ELECTRICAL EQUIPMENT INSTALLATION

A. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide the maximum possible headroom.

B. Materials and Components: Install level, plumb, and parallel and perpendicular to other building systems and components, unless otherwise indicated.

C. Equipment: Install to facilitate service, maintenance, and repair or replacement of components. Connect for ease of disconnecting, with minimum interference with other installations.

D. Right of Way: Give to raceways and piping systems installed at a required slope.

3.2 ELECTRICAL SUPPORTING DEVICE APPLICATION

A. Damp Locations and Outdoors: Hot-dip galvanized materials or nonmetallic, U-channel system components.

B. Dry Locations: Steel materials.

C. Support Clamps for PVC Raceways: Click-type clamp system.

D. Selection of Supports: Comply with manufacturer's written instructions.

E. Strength of Supports: Adequate to carry present and future loads, times a safety factor of at least four; minimum of 200 pound design load.

3.3 SUPPORT INSTALLATION

A. Install support devices to securely and permanently fasten and support electrical components.

B. Install individual and multiple raceway hangers and riser clamps to support raceways. Provide U-bolts, clamps, attachments, and other hardware necessary for hanger assemblies and for securing hanger rods and conduits.

C. Support parallel runs of horizontal raceways together on trapeze- or bracket-type hangers.

D. Size supports for multiple raceway installations so capacity can be increased by a 25 percent minimum in the future.

E. Support individual horizontal raceways with separate, malleable-iron pipe hangers or clamps.

F. Install 1/4 inch diameter or larger threaded steel hanger rods, unless otherwise indicated.

G. Arrange supports in vertical runs so the weight of raceways and enclosed conductors is carried entirely by raceway supports, with no weight load on raceway terminals.

H. Simultaneously install vertical conductor supports with conductors.

I. Separately support cast boxes that are threaded to raceways and used for fixture support. Support sheet-metal boxes directly from the building structure or by bar hangers. If bar hangers are used, attach bar to raceways on opposite sides of the box and support the raceway with an approved fastener not more than 24 inches from the box.

J. Install metal channel racks for mounting cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices unless components are mounted directly to structural elements of adequate strength.

K. Install sleeves for cable and raceway penetrations of concrete slabs and walls unless core-drilled holes are used. Install sleeves for cable and raceway penetrations of masonry and fire-rated gypsum walls and of all other fire-rated floor and wall assemblies. Install sleeves during erection of concrete and masonry walls.

L. Securely fasten electrical items and their supports to the building structure, unless otherwise indicated. Perform fastening according to the following unless other fastening methods are indicated:

1. Wood: Fasten with wood screws or screw-type nails.
2. Masonry: Toggle bolts on hollow masonry units and expansion bolts on solid masonry units.
3. New Concrete: Concrete inserts with machine screws and bolts.
4. Existing Concrete: Expansion bolts.
5. Instead of expansion bolts, threaded studs driven by a powder charge and provided with lock washers may be used in existing concrete.
6. Steel: Welded threaded studs or spring-tension clamps on steel.

   a. Field Welding: Comply with AWS D1.1.

7. Welding to steel structure may be used only for threaded studs, not for conduits, pipe straps, or other items.
8. Light Steel: Sheet-metal screws.
9. Fasteners: Select so the load applied to each fastener does not exceed 25 percent of its proof-test load.

3.4 UTILITY COMPANY ELECTRICITY-METERING EQUIPMENT

A. Install equipment according to utility company's written requirements. Provide grounding and empty conduits as required by utility company.

3.5 FIRESTOPPING

A. Apply firestopping to cable and raceway penetrations of fire-rated floor and wall assemblies to achieve fire-resistance rating of the assembly. Firestopping materials and installation requirements are specified in Division 07 Section Firestopping.

3.6 CONCRETE BASES

A. Construct concrete bases of dimensions indicated, but not less than 4 inches larger, in both directions, than supported unit. Follow supported equipment manufacturer's anchorage recommendations and setting templates for anchor-bolt and tie locations, unless otherwise

indicated. Use 3000-psi, 28-day compressive-strength concrete and reinforcement as specified in Division 03 Section Cast-in-Place Concrete.

3.7 DEMOLITION

A. Protect existing electrical equipment and installations indicated to remain. If damaged or disturbed in the course of the Work, remove damaged portions and install new products of equal capacity, quality, and functionality.

B. Accessible Work: Remove exposed electrical equipment and installations, indicated to be demolished, in their entirety.

C. Abandoned Work: Cut and remove buried raceway and wiring, indicated to be abandoned in place, 2 inches below the surface of adjacent construction. Cap raceways and patch surface to match existing finish.

D. Remove demolished material from Project site.

E. Remove, store, clean, reinstall, reconnect, and make operational components indicated for relocation.

3.8 CUTTING AND PATCHING

A. Cut, channel, chase, and drill floors, walls, partitions, ceilings, and other surfaces required to permit electrical installations. Perform cutting by skilled mechanics of trades involved.

B. Repair and refinish disturbed finish materials and other surfaces to match adjacent undisturbed surfaces. Install new fireproofing where existing firestopping has been disturbed. Repair and refinish materials and other surfaces by skilled mechanics of trades involved.

3.9 FIELD QUALITY CONTROL

A. Inspect installed components for damage and faulty work, including the following:

1. Supporting devices for electrical components.
2. Electricity-metering components.
3. Concrete bases.
4. Electrical demolition.
5. Cutting and patching for electrical construction.
6. Touchup painting.

B. Test Owner's electricity-metering installation for proper operation, accuracy, and usability of output data.

1. Connect a load of known kW rating, 1.5 kW minimum, to a circuit supplied by the metered feeder.
2. Turn off circuits supplied by the metered feeder and secure them in the "off" condition.
3. Run the test load continuously for eight hours, minimum, or longer to obtain a measurable meter indication. Use a test load placement and setting that ensure continuous, safe operation.

4. Check and record meter reading at end of test period and compare with actual electricity used based on test load rating, duration of test, and sample measurements of supply voltage at the test load connection. Record test results.
5. Repair or replace malfunctioning metering equipment or correct test setup; then retest. Repeat for each meter in installation until proper operation of entire system is verified.

3.10 REFINISHING AND TOUCHUP PAINTING

A. Refinish and touch up paint. Paint materials and application requirements are specified in Division 09 Section Painting and Coating.

1. Clean damaged and disturbed areas and apply primer, intermediate, and finish coats to suit the degree of damage at each location.
2. Follow paint manufacturer's written instructions for surface preparation and for timing and application of successive coats.
3. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
4. Repair damage to PVC or paint finishes with matching touchup coating recommended by manufacturer.

3.11 CLEANING AND PROTECTION

A. On completion of installation, including outlets, fittings, and devices, inspect exposed finish. Remove burrs, dirt, paint spots, and construction debris.

B. Protect equipment and installations and maintain conditions to ensure that coatings, finishes, and cabinets are without damage or deterioration at time of Substantial Completion.

END OF SECTION

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SECTION 26 05 19

LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

(Edited from DeCA June 2011 Design Criteria)

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Building wires and cables and associated connectors, splices, and terminations for wiring systems rated 600 V and less.

B. Related Sections:

1. Division 27 Section Communications Horizontal Cabling for transmission media used for control and signal circuits.
2. Division 26 Section Medium-Voltage Cables for single-conductor and multiconductor cables, cable splices, and terminations for electrical distribution systems with 2001 to 35,000 V.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Field Quality-Control Test Reports: From Contractor.

1.3 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the manufacturers specified.

2.2 CONDUCTORS AND CABLES

A. Available Manufacturers:

1. American Insulated Wire Corp.; a Leviton Company.
2. General Cable Corporation.
3. Southwire Company.

B. Refer to Part 3 "Conductor and Insulation Applications" Article for insulation type, cable construction, and ratings.

C. Conductor Material: Copper complying with NEMA WC 70; solid conductor for No. 10 AWG and smaller, stranded for No. 8 AWG and larger.

D. Conductor Insulation Types: Type THW, THHN-THWN XHHW, USE, and SO complying with NEMA WC 70.

E. Multiconductor Cable: Power and Control Tray Cable, Type TC; Metal-clad cable, Type MC; and Type SO with ground wire.

2.3 CONNECTORS AND SPLICES

A. Available Manufacturers:

1. AFC Cable Systems, Inc.
2. AMP Incorporated/Tyco International.
3. Hubbell/Anderson.
4. O-Z/Gedney; EGS Electrical Group LLC.
5. 3M Company; Electrical Products Division.

B. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.

PART 3 - EXECUTION

3.1 CONDUCTOR AND INSULATION APPLICATIONS

A. Service Entrance: Type THHN-THWN, single conductors in raceway, or XHHW, single conductors in raceway.

B. Exposed Feeders: Type THHN-THWN, single conductors in raceway.

C. Feeders Concealed in Ceilings, Walls, and Partitions: Type THHN-THWN, single conductors in raceway.

D. Feeders Concealed in Concrete, below Slabs-on-Grade, and in Crawlspaces: Type THHN-THWN, single conductors in raceway.

E. Exposed Branch Circuits: In Crawlspaces and Casework - Type THHN-THWN, single conductors in raceway. In shelving - Metal-clad multi-conductor cable, Type MC. In cable trays, power poles and raceways - Power and Control Tray Cable, Type TC, or Metal-clad multi-conductor cable, Type MC.

F. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THHN-THWN, single conductors in raceway.

G. Branch Circuits Concealed in Concrete and below Slabs-on-Grade: Type THHN-THWN, single conductors in raceway. MC cable is allowable to be used in spaces that are difficult to access; lengths shall not exceed 50 feet. All homerun circuits shall be contained in conduit.

H. Cord Drops and Portable Appliance Connections: Type SO, hard service cord.

I. Fire Alarm Circuits: Type THHN-THWN, in raceway; Power-limited, fire-protective, signaling circuit cable, in raceway. Armored Fire Alarm Cable, red in color, is permitted in lieu of conduit.

J. Class 1 Control Circuits: Type THHN-THWN, in raceway.

K. Class 2 Control Circuits: Type THHN-THWN, in raceway; Power-limited cable, concealed in building finishes; Power-limited tray cable, in cable tray.

L. Unless otherwise noted, conductor sizes given on the drawings are for Type THWN 167 deg F copper conductors, not more than 3 conductors in a raceway, in ambient temperature not exceeding 86 deg F. If other insulation types or conditions are proposed, conductor size shall be adjusted in accordance with requirements of the N.E.C. at no increase of cost to the Government; however size shall not be decreased without written approval of the Contracting Officer on advice of the engineer.

3.2 INSTALLATION

A. Conceal cables in finished walls, ceilings, and floors, unless otherwise indicated.

B. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.

C. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.

D. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.

E. Support cables according to Division 26 Section Common Work Results for Electrical.

F. Seal around cables penetrating fire-rated elements according to Division 07 Section Firestopping.

G. Identify and color-code conductors and cables according to Division 26 Section Identification for Electrical Systems.

3.3 CONNECTIONS

A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

B. Make splices and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.

C. Wiring at Outlets: Install conductor at each outlet, with at least 6 inches of slack.

3.4 FIELD QUALITY CONTROL

A. Testing: Perform the following field quality-control testing:

1. After installing conductors and cables and before electrical circuitry has been energized, test for compliance with requirements.
2. Perform each electrical test and visual and mechanical inspection stated in NETA ATS, Section 7.3.1. Certify compliance with test parameters.

B. Test Reports: Prepare a written report to record the following:

1. Test procedures used.
2. Test results that comply with requirements.
3. Test results that do not comply with requirements and corrective action taken to achieve compliance with requirements.

END OF SECTION

SECTION 26 05 26

GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

(Edited from DeCA June 2011 Design Criteria)

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Grounding of electrical systems and equipment. Grounding requirements specified in this Section may be supplemented by special requirements of systems described in other Sections.

B. Related Sections:

1. Division 33 Section Underground Electrical Distribution for ground test wells.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Product Data: For the following:

1. Ground rods.
2. Chemical rods.

1.3 Qualification Data: For firms and persons specified in "Quality Assurance" Article.

1.4 Field Test Reports: Submit written test reports to include the following:

A. Test procedures used.

B. Test results that comply with requirements.

C. Results of failed tests and corrective action taken to achieve test results that comply with requirements.

1.5 QUALITY ASSURANCE

A. Testing Agency Qualifications: Testing agency as defined by OSHA in 29 CFR 1910.7 or a member company of the InterNational Electrical Testing Association and that is acceptable to authorities having jurisdiction.

1. Testing Agency's Field Supervisor: Person currently certified by the InterNational Electrical Testing Association to supervise on-site testing specified in Part 3.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

1. Comply with UL 467.

C. Comply with NFPA 70; for overhead-line construction and medium-voltage underground construction, comply with IEEE C2.

D. Comply with NFPA 780 and UL 96 when interconnecting with lightning protection system.

PART 2 - PRODUCTS

2.1 GROUNDING CONDUCTORS

A. For insulated conductors, comply with Division 26 Section Low-Voltage Electrical Power Conductors and Cables.

B. Material: Copper.

C. Equipment Grounding Conductors: Insulated with green-colored insulation.

D. Isolated Ground Conductors: Insulated with green-colored insulation with yellow stripe. On feeders with isolated ground, use colored tape, alternating bands of green and yellow tape to provide a minimum of three bands of green and two bands of yellow.

E. Grounding Electrode Conductors: Stranded cable.

F. Underground Conductors: Bare, tinned, stranded, unless otherwise indicated.

G. Bare Copper Conductors: Comply with the following:

1. Solid Conductors: ASTM B 3.
2. Assembly of Stranded Conductors: ASTM B 8.
3. Tinned Conductors: ASTM B 33.

H. Copper Bonding Conductors: As follows:

1. Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG copper conductor, 1/4 inch in diameter.
2. Bonding Conductor: No. 4 or No. 6 AWG, stranded copper conductor.
3. Bonding Jumper: Bare copper tape, braided bare copper conductors, terminated with copper ferrules; 1-5/8 inches wide and 1/16-inch thick.
4. Tinned Bonding Jumper: Tinned-copper tape, braided copper conductors, terminated with copper ferrules; 1-5/8 inches wide and 1/16-inch thick.

I. Ground Conductor and Conductor Protector for Wood Poles: As follows:

1. No. 4 AWG minimum, soft-drawn copper conductor.
2. Conductor Protector: Half-round PVC or wood molding. If wood, use pressure-treated fir, or cypress or cedar.

J. Grounding Bus: Bare, annealed copper bars of rectangular cross section, with insulators.

2.2 CONNECTOR PRODUCTS

A. Comply with IEEE 837 and UL 467; listed for use for specific types, sizes, and combinations of conductors and connected items.

B. Bolted Connectors: Bolted-pressure-type connectors, or compression type.

C. Welded Connectors: Exothermic-welded type, in kit form, and selected per manufacturer's written instructions.

2.3 GROUNDING ELECTRODES

A. Ground Rods: Copper-clad steel.

B. Ground Rods: Sectional type; copper-clad steel.

1. Size: 3/4 inch diameter by 120 inches long.

C. Chemical Electrodes: Copper tube, straight or L-shaped, filled with nonhazardous chemical salts, terminated with a 4/0 bare conductor. Provide backfill material recommended by manufacturer.

D. Test Wells: Provide handholes as specified in Division 33 Section Underground Electrical Distribution.

PART 3 - EXECUTION

3.1 APPLICATION

A. In raceways, use insulated equipment grounding conductors.

B. Exothermic-Welded Connections: Use for connections to structural steel and for underground connections, except those at test wells.

C. Equipment Grounding Conductor Terminations: Use bolted pressure clamps.

D. Ground Rod Clamps at Test Wells: Use bolted pressure clamps with at least two bolts.

E. Grounding Bus: Install in electrical and telephone equipment rooms, in rooms housing service equipment, and elsewhere as indicated.

1. Use insulated spacer; space 1 inch from wall and support from wall 6 inches above finished floor, unless otherwise indicated.
2. At doors, route the bus up to the top of the door frame, across the top of the doorway, and down to the specified height above the floor.

F. Underground Grounding Conductors: Use copper conductor, No. 2/0 AWG minimum. Bury at least 24 inches below grade or bury 12 inches above duct bank when installed as part of the duct bank.

3.2 EQUIPMENT GROUNDING CONDUCTORS

A. Comply with NFPA 70, Article 250, for types, sizes, and quantities of equipment grounding conductors, unless specific types, larger sizes, or more conductors than required by NFPA 70 are indicated.

B. Install equipment grounding conductors in all feeders and branch circuits.

C. Busway Supply Circuits: Install insulated equipment grounding conductor from the grounding bus in the switchgear, switchboard, or distribution panel to equipment grounding bar terminal on busway.

D. Computer Outlet Circuits: Install insulated equipment grounding conductor in branch-circuit runs from computer-area power panels or power-distribution units.

E. Isolated Grounding Receptacle Circuits: Install an insulated equipment grounding conductor connected to the receptacle grounding terminal. Isolate grounding conductor from raceway and from panelboard grounding terminals. Terminate at equipment grounding conductor terminal of the applicable derived system or service, unless otherwise indicated. Install an additional insulated equipment grounding conductor connected to the receptacle outlet box, terminated on the system panel equipment ground bar.

F. Nonmetallic Raceways: Install an equipment grounding conductor in nonmetallic raceways unless they are designated for telephone or data cables.

G. Air-Duct Equipment Circuits: Install an equipment grounding conductor to duct-mounted electrical devices operating at 120 V and more, including air cleaners and heaters. Bond conductor to each unit and to air duct.

H. Water Heater, Heat-Tracing, and Antifrost Heating Cables: Install a separate equipment grounding conductor to each electric water heater, heat-tracing, and antifrost heating cable. Bond conductor to heater units, piping, connected equipment, and components.

I. Signal and Communication Systems: For telephone, alarm, voice and data, and other communication systems, provide No. 6 AWG minimum insulated grounding conductor in raceway from grounding electrode system to each service location, terminal cabinet, wiring closet, and central equipment location.

1. Service and Central Equipment Locations and Wiring Closets: Terminate grounding conductor on a 1/4 by 2 by 12 inch grounding bus.
2. Terminal Cabinets: Terminate grounding conductor on cabinet grounding terminal.

3.3 COUNTERPOISE

A. Ground the steel framework of the building with a driven ground rod at the base of every corner column and at intermediate exterior columns at distances not more than 60 feet apart. Provide a grounding conductor (counterpoise), electrically connected to each ground rod and to each steel column, extending around the perimeter of the building. Use tinned-copper conductor not less than No. 2/0 AWG for counterpoise and for tap to building steel. Bury counterpoise not less than 18 inches below grade and 24 inches from building foundation.

3.4 INSTALLATION

A. Ground Rods: Install at least three rods spaced at least one-rod length from each other and located at least the same distance from other grounding electrodes.

1. Drive ground rods until tops are 2 inches below finished floor or final grade, unless otherwise indicated.
2. Interconnect ground rods with grounding electrode conductors. Use exothermic welds, except at test wells and as otherwise indicated. Make connections without exposing steel or damaging copper coating.

B. Grounding Conductors: Route along shortest and straightest paths possible, unless otherwise indicated. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.

C. Bonding Straps and Jumpers: Install so vibration by equipment mounted on vibration isolation hangers and supports is not transmitted to rigidly mounted equipment. Use exothermic-welded connectors for outdoor locations, unless a disconnect-type connection is required; then, use a bolted clamp. Bond straps directly to the basic structure taking care not to penetrate any adjacent parts. Install straps only in locations accessible for maintenance.

D. Metal Water Service Pipe: Provide insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes by grounding clamp connectors. Where a dielectric main water fitting is installed, connect grounding conductor to street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.

E. Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with grounding clamp connectors.

F. Bond each aboveground portion of gas piping system upstream from equipment shutoff valve.

G. Install one test well for each service at the ground rod electrically closest to the service entrance. Set top of well flush with finished grade or floor.

H. Ufer Ground (Concrete-Encased Grounding Electrode): Fabricate according to NFPA 70, using a minimum of 20 feet of bare copper conductor not smaller than No. 4 AWG.

1. If concrete foundation is less than 20 feet long, coil excess conductor within base of foundation.
2. Bond grounding conductor to reinforcing steel in at least four locations and to anchor bolts. Extend grounding conductor below grade and connect to building grounding grid or to grounding electrode external to concrete.

3.5 CONNECTIONS

A. General: Make connections so galvanic action or electrolysis possibility is minimized. Select connectors, connection hardware, conductors, and connection methods so metals in direct contact will be galvanically compatible.

1. Use electroplated or hot-tin-coated materials to ensure high conductivity and to make contact points closer to order of galvanic series.
2. Make connections with clean, bare metal at points of contact.

3. Make aluminum-to-steel connections with stainless-steel separators and mechanical clamps.
4. Make aluminum-to-galvanized steel connections with tin-plated copper jumpers and mechanical clamps.
5. Coat and seal connections having dissimilar metals with inert material to prevent future penetration of moisture to contact surfaces.

B. Exothermic-Welded Connections: Comply with manufacturer's written instructions. Welds that are puffed up or that show convex surfaces indicating improper cleaning are not acceptable.

C. Equipment Grounding Conductor Terminations: For No. 8 AWG and larger, use pressure-type grounding lugs. No. 10 AWG and smaller grounding conductors may be terminated with winged pressure-type connectors.

D. Noncontact Metal Raceway Terminations: If metallic raceways terminate at metal housings without mechanical and electrical connection to housing, terminate each conduit with a grounding bushing. Connect grounding bushings with a bare grounding conductor to grounding bus or terminal in housing. Bond electrically noncontinuous conduits at entrances and exits with grounding bushings and bare grounding conductors, unless otherwise indicated.

E. Connections at Test Wells: Use compression-type connectors on conductors and make bolted- and clamped-type connections between conductors and ground rods.

F. Tighten screws and bolts for grounding and bonding connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A.

G. Compression-Type Connections: Use hydraulic compression tools to provide correct circumferential pressure for compression connectors. Use tools and dies recommended by connector manufacturer. Provide embossing die code or other standard method to make a visible indication that a connector has been adequately compressed on grounding conductor.

H. Moisture Protection: If insulated grounding conductors are connected to ground rods or grounding buses, insulate entire area of connection and seal against moisture penetration of insulation and cable.

3.6 OVERHEAD-LINE GROUNDING

A. Comply with IEEE C2 requirements. Use 2 or more parallel ground rods if a single ground rod electrode resistance to ground exceeds 25 ohms.

B. Drive ground rods to a depth of 12 inches below finished grade in undisturbed earth.

C. Ground Rod Connections: Use clamp-type connectors listed for the purpose for underground connections and connections to rods.

D. Lightning Arresters: Separate arrester grounds from other grounding conductors.

E. Secondary Neutral and Tank of Transformer: Interconnect and connect to grounding conductor.

F. Protect grounding conductors running on surface of wood poles with molding extended from grade level up to and through communication service and transformer spaces.

3.7 UNDERGROUND DISTRIBUTION SYSTEM GROUNDING

A. Manholes and Handholes: Install a driven ground rod close to wall and set rod depth so 4 inches will extend above finished floor. If necessary, install ground rod before manhole is placed and provide a No. 1/0 AWG bare, tinned-copper conductor from ground rod into manhole through a waterproof sleeve in manhole wall. Protect ground rods passing through concrete floor with a double wrapping of pressure-sensitive tape or heat-shrunk insulating sleeve from 2 inches above to 6 inches below concrete. Seal floor opening with waterproof, nonshrink grout.

B. Connections to Manhole Components: Connect exposed-metal parts, such as inserts, cable racks, pulling irons, ladders, and cable shields within each manhole or handhole, to ground rod or grounding conductor. Make connections with No. 4 AWG minimum, stranded, hard-drawn copper conductor. Train conductors level or plumb around corners and fasten to manhole walls. Connect to cable armor and cable shields as recommended by manufacturer of splicing and termination kits.

C. Pad-Mounted Transformers and Switches: Install two ground rods and counterpoise circling pad. Ground pad-mounted equipment and noncurrent-carrying metal items associated with substations by connecting them to underground cable and grounding electrodes. Use tinned-copper conductor not less than No. 2 AWG for counterpoise and for taps to equipment ground pad. Bury counterpoise not less than 18 inches below grade and 6 inches from the foundation.

3.8 FIELD QUALITY CONTROL

A. Testing: Perform the following field quality-control testing:

1. After installing grounding system but before permanent electrical circuitry has been energized, test for compliance with requirements.
2. Test completed grounding system at each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal, and at ground test wells. Measure ground resistance not less than two full days after the last trace of precipitation, and without the soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance. Perform tests, by the fall-of-potential method according to IEEE 81.
3. Provide drawings locating each ground rod and ground rod assembly and other grounding electrodes, identify each by letter in alphabetical order, and key to the record of tests and observations. Include the number of rods driven and their depth at each location and include observations of weather and other phenomena that may affect test results. Describe measures taken to improve test results.

    a. Equipment Rated 500 kVA and Less: 10 ohms.
    b. Equipment Rated 500 to 1000 kVA: 5 ohms.
    c. Equipment Rated More Than 1000 kVA: 3 ohms.
    d. Substations and Pad-Mounted Switching Equipment: 5 ohms.
    e. Manhole Grounds: 10 ohms.

4. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Contracting Officer promptly and include recommendations to reduce ground resistance.

3.9 GRADING AND PLANTING

A. Restore surface features, including vegetation, at areas disturbed by Work of this Section. Reestablish original grades, unless otherwise indicated. If sod has been removed, replace it as soon as possible after backfilling is completed. Restore areas disturbed by trenching, storing of dirt, cable laying, and other activities to their original condition. Include application of topsoil, fertilizer, lime, seed, sod, sprig, and mulch. Comply with Division 32 Section Planting. Maintain restored surfaces. Restore disturbed paving as indicated.

END OF SECTION

SECTION 26 05 33

RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS

(Edited from DeCA June 2011 Design Criteria)

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Raceways, fittings, boxes, enclosures, and cabinets for electrical wiring.

B. Related Sections:

1. Division 26 Section Common Work Results for Electrical for supports, anchors, and identification products.
2. Division 26 Section Vibration and Seismic Controls for Electrical Systems for seismic restraints and bracing of raceways, boxes, enclosures, and cabinets.
3. Division 26 Section Wiring Devices for devices installed in boxes and for floor-box service fittings.

1.2 DEFINITIONS

A. EMT: Electrical metallic tubing.

B. FMC: Flexible metal conduit.

C. RMC: Rigid metal conduit.

D. IMC: Intermediate metal conduit.

E. LFMC: Liquidtight flexible metal conduit.

F. RNC: Rigid nonmetallic conduit.

1.3 SUBMITTALS

A. Product Data: For raceways, wireways and fittings, outlet boxes, floor boxes, hinged-cover enclosures, and cabinets.

B. Shop Drawings: Show fabrication and installation details of components for custom raceways, fittings, boxes, enclosures, and cabinets not completely described by published Product Data.

C. Shop Drawings: Signed and sealed by a qualified professional engineer.

1. Design Calculations: Calculate requirements for selecting seismic restraints.
2. Detail assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

D. Manufacturer Seismic Qualification Certification: Submit certification that enclosures, cabinets, accessories, and components will withstand seismic forces defined in Division 26 Section Vibration and Seismic Controls for Electrical Systems. Include the following:

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.

a. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified."

2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

1.4 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Comply with NFPA 70.

1.5 COORDINATION

A. Coordinate layout and installation of raceways, boxes, enclosures, cabinets, and suspension system with other construction that penetrates ceilings or is supported by them, including light fixtures, loudspeakers, HVAC equipment, fire-suppression system, and partition assemblies.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the manufacturers specified.

2.2 METAL CONDUIT AND TUBING

A. Available Manufacturer**s**:

1. AFC Cable Systems, Inc.
2. Alflex Inc.
3. Anamet Electrical, Inc.; Anaconda Metal Hose.
4. Electri-Flex Co.
5. Grinnell Co./Tyco International; Allied Tube and Conduit Div.
6. LTV Steel Tubular Products Company.

7. Manhattan/CDT/Cole-Flex.
8. O-Z Gedney; Unit of General Signal.
9. Wheatland Tube Co.

B. Rigid Steel Conduit: ANSI C80.1.

C. IMC: ANSI C80.6.

D. Plastic-Coated Steel Conduit and Fittings: NEMA RN 1.

E. Plastic-Coated IMC and Fittings: NEMA RN 1.

F. EMT and Fittings: ANSI C80.3.

1. Fittings: Set-screw or compression type.

G. FMC: Zinc-coated steel.

H. LFMC: Flexible steel conduit with PVC jacket.

I. Fittings: NEMA FB 1; compatible with conduit and tubing materials.

2.3 NONMETALLIC CONDUIT AND TUBING

A. Available Manufacturers:

1. American International.
2. Anamet Electrical, Inc.; Anaconda Metal Hose.
3. Arnco Corp.
4. Cantex Inc.
5. Certainteed Corp.; Pipe & Plastics Group.
6. Condux International.
7. ElecSYS, Inc.
8. Electri-Flex Co.
9. Lamson & Sessions; Carlon Electrical Products.
10. Manhattan/CDT/Cole-Flex.
11. RACO; Division of Hubbell, Inc.
12. Spiralduct, Inc./AFC Cable Systems, Inc.
13. Thomas & Betts Corporation.

B. RNC: NEMA TC 2, Schedule 40 and Schedule 80 PVC.

C. RNC Fittings: NEMA TC 3; match to conduit or tubing type and material.

D. LFNC: UL 1660.

2.4 METAL WIREWAYS

A. Available Manufacturers:

1. Hoffman.
2. Square D.

B. Material and Construction: Sheet metal sized and shaped as indicated, NEMA 1 or 3R as appropriate for location.

C. Fittings and Accessories: Include couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.

D. Select features, unless otherwise indicated, as required to complete wiring system and to comply with NFPA 70.

E. Wireway Covers: Hinged type unless otherwise indicated.

F. Finish: Manufacturer's standard enamel finish.

2.5 NONMETALLIC WIREWAYS

A. Available Manufacturers:

1. Hoffman.
2. Lamson & Sessions; Carlon Electrical Products.

B. Description: Fiberglass polyester, extruded and fabricated to size and shape indicated, with no holes or knockouts. Cover is gasketed with oil-resistant gasket material and fastened with captive screws treated for corrosion resistance. Connections are flanged, with stainless-steel screws and oil-resistant gaskets.

C. Fittings and Accessories: Include couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.

D. Select features, unless otherwise indicated, as required to complete wiring system and to comply with NFPA 70.

2.6 SURFACE RACEWAYS

A. Surface Metal Raceways: Galvanized steel with snap-on covers. Furnish with manufacturer's standard prime coating. Paint to match surrounding wall finish.

1. Available Manufacturers:

a. Airey-Thompson Sentinel Lighting; Wiremold Company (The).
b. Thomas & Betts Corporation.
c. Walker Systems, Inc.; Wiremold Company (The).
d. Wiremold Company (The); Electrical Sales Division.

B. Types, sizes, and channels as indicated and required for each application, with fittings that match and mate with raceways.

2.7 BOXES, ENCLOSURES, AND CABINETS

A. Available Manufacturers:

1. Cooper Crouse-Hinds; Div. of Cooper Industries, Inc.
2. Emerson/General Signal; Appleton Electric Company.
3. Erickson Electrical Equipment Co.
4. Hoffman.
5. Hubbell, Inc.; Killark Electric Manufacturing Co.
6. O-Z/Gedney; Unit of General Signal.
7. RACO; Division of Hubbell, Inc.
8. Robroy Industries, Inc.; Enclosure Division.
9. Scott Fetzer Co.; Adalet-PLM Division.
10. Spring City Electrical Manufacturing Co.
11. Thomas & Betts Corporation.
12. Walker Systems, Inc.; Wiremold Company (The).
13. Woodhead, Daniel Company; Woodhead Industries, Inc. Subsidiary.

B. Sheet Metal Outlet and Device Boxes: NEMA OS 1.

C. Cast-Metal Outlet and Device Boxes: NEMA FB 1, Type FD, with gasketed cover.

D. Nonmetallic Outlet and Device Boxes: NEMA OS 2.

E. Floor Boxes: Cast metal, fully adjustable, rectangular.

F. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.

G. Cast-Metal Pull and Junction Boxes: NEMA FB 1, galvanized cast iron or cast aluminum with gasketed cover.

H. Hinged-Cover Enclosures: NEMA 250, Type 1, with continuous hinge cover and flush latch.

1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.

I. Cabinets: NEMA 250, Type 1, galvanized steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel. Hinged door in front cover with flush latch and concealed hinge. Key latch to match panelboards. Include metal barriers to separate wiring of different systems and voltage and include accessory feet where required for freestanding equipment.

2.8 FACTORY FINISHES

A. Finish: For raceway, enclosure, or cabinet components exposed in finished spaces, provide manufacturer's standard prime-coat finish ready for field painting.

B. Finish: For raceway, enclosure, or cabinet components in other than finished spaces, provide manufacturer's standard gray paint applied to factory-assembled surface raceways, enclosures, and cabinets before shipping.

PART 3 - EXECUTION

3.1 RACEWAY APPLICATION

A. Outdoors:

1. Exposed: Rigid steel or IMC.
2. Concealed: Rigid steel or IMC.
3. Underground, Single Run: RNC.
4. Underground, Grouped: RNC.
5. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
6. Boxes and Enclosures: NEMA 250, Type 3R or 4 as appropriate for the location.

B. Indoors:

1. Exposed: EMT; RMC where likely to be physically damaged; Schedule 40 PVC only in refrigerated cooler boxes, above 48 inches AFF.
2. Concealed: EMT or RMC.
3. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC; except use LFMC in damp or wet locations.
4. Damp or Wet Locations: Schedule 40 PVC.
5. Boxes and Enclosures: NEMA 250, Type 1, except as follows:

   a. Damp or Wet Locations: NEMA 250, Type 4, stainless steel in food prep or display areas,

C. Minimum Raceway Size: 1/2-inch trade size.

D. Raceway Fittings: Compatible with raceways and suitable for use and location.

1. Intermediate Steel Conduit: Use threaded rigid steel conduit fittings, unless otherwise indicated.
2. PVC Externally Coated, Rigid Steel Conduits: Use only fittings approved for use with that material. Patch all nicks and scrapes in PVC coating after installing conduits.

3.2 INSTALLATION

A. Keep raceways at least 6 inchesaway from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.

B. Complete raceway installation before starting conductor installation. Plan raceways so that no more than 9 current-carrying conductors (including neutrals) will be enclosed in any single conduit more than 24 inches in length.

C. Support raceways as specified in Division 26 Section Common Work Results for Electrical.

D. Provide pull boxes as required to facilitate pulling in conductors.

E. Install temporary closures to prevent foreign matter from entering raceways.

F. Protect stub-ups from damage where conduits rise through floor slabs. Arrange so curved portions of bends are not visible above the finished slab.

G. Make bends and offsets so ID is not reduced. Keep legs of bends in the same plane and keep straight legs of offsets parallel, unless otherwise indicated.

H. Conceal conduit and EMT within finished walls, ceilings, and floors, unless otherwise indicated.

1. Install concealed raceways with a minimum of bends in the shortest practical distance, considering type of building construction and obstructions, unless otherwise indicated.

I. Raceways Embedded in Slabs are not allowed.

J. Install exposed raceways parallel or at right angles to nearby surfaces or structural members and follow surface contours as much as possible.

1. Run parallel or banked raceways together on common supports.
2. Make parallel bends in parallel or banked runs. Use factory elbows only where elbows can be installed parallel; otherwise, provide field bends for parallel raceways. Take care that all conduits of a parallel circuit are of equal length from source to load.

K. Join raceways with fittings designed and approved for that purpose and make joints tight.

1. Use insulating bushings to protect conductors.

L. Tighten set screws of threadless fittings with suitable tools.

M. Terminations:

1. Where raceways are terminated with locknuts and bushings, align raceways to enter squarely and install locknuts with dished part against box. Use two locknuts, one inside and one outside box.
2. Where raceways are terminated with threaded hubs, screw raceways or fittings tightly into hub so end bears against wire protection shoulder. Where chase nipples are used, align raceways so coupling is square to box; tighten chase nipple so no threads are exposed.

N. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200 pound tensile strength. Leave at least 12 inches of slack at each end of pull wire.

O. Telephone and Signal System Raceways, 2-Inch Trade Size and Smaller: In addition to above requirements, install raceways in maximum lengths of 150 feetand with a maximum of two 90-degree bends or equivalent. Separate lengths with pull or junction boxes where necessary to comply with these requirements.

P. Install raceway sealing fittings at suitable, approved, and accessible locations and fill them with UL-listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings at the following points:

1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
2. Where otherwise required by NFPA 70.

Q. Stub-up Connections: Where specifically shown on drawings, extend conduits through concrete floor for connection to freestanding equipment. Install with an adjustable top or coupling threaded inside for plugs set flush with finished floor. Extend conductors to equipment with rigid steel conduit; FMC may be used 6 inches above the floor. Install screwdriver-operated, threaded plugs flush with floor for future equipment connections.

R. Flexible Connections: Use maximum of 72 inchesof flexible conduit for recessed and semirecessed lighting fixtures; for equipment subject to vibration, noise transmission, or movement; and for all motors. Use LFMC in damp or wet locations. Install separate ground conductor across flexible connections.

S. Surface Raceways: Install a separate, green, ground conductor in raceways from junction box supplying raceways to receptacle or fixture ground terminals.

T. Set floor boxes level and flush with finished floor surface.

U. Install hinged-cover enclosures and cabinets plumb. Support at each corner.

3.3 PAINTING

A. Exposed conduits and boxes in the Sales Area shall be painted to match the surrounding surfaces. Coordinate colors and painting with other related trades.

3.4 PROTECTION

A. Provide final protection and maintain conditions that ensure coatings, finishes, and cabinets are without damage or deterioration at time of Substantial Completion.

1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
2. Repair damage to PVC or paint finishes with matching touchup coating recommended by manufacturer.

3.5 CLEANING

A. After completing installation of exposed, factory-finished raceways and boxes, inspect exposed finishes and repair damaged finishes.

END OF SECTION

SECTION 26 05 36

CABLE TRAYS FOR ELECTRICAL SYSTEMS

(Edited from DeCA June 2011 Design Criteria)

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Steel cable trays and accessories.

B. Related Sections:

1. Division 26 Section Common Work Results for Electrical for cable tray supports not specified in this Section.
2. Division 26 Section Vibration and Seismic Controls for Electrical Systems for mounting and anchoring cable trays.

1.2 SUBMITTALS

A. Product Data: Include data indicating dimensions and finishes for each type of cable tray indicated.

B. Shop Drawings: For each type of cable tray.

1. Show fabrication and installation details of cable tray, including plans, elevations, and sections of components and attachments to other construction elements. Designate components and accessories, including clamps, brackets, hanger rods, splice-plate connectors, expansion-joint assemblies, straight lengths, and fittings.
2. For installed products indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
3. Seismic-Restraint Details: Signed and sealed by a qualified professional engineer.

a. Design Calculations: Calculate requirements for selecting seismic restraints.
b. Detail fabrication, including anchorages and attachments to structure and to supported cable trays.

C. Coordination Drawings: Floor plans and sections drawn to scale. Include scaled cable tray layout and relationships between components and adjacent structural and mechanical elements. Show the following:

1. Vertical and horizontal offsets and transitions.
2. Clearances for access above and to side of cable trays.
3. Vertical elevation of cable trays above floor or bottom of ceiling structure.

D. Product Certificates: For each type of cable tray, signed by product manufacturer.

E. Manufacturer Seismic Qualification Certification: Submit certification that cable trays, accessories, and components will withstand seismic forces defined in Division 26 Section Vibration and Seismic Controls for Electrical Systems. Include the following:

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.

a. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified."

2. Dimensioned Outline Drawings of Cable Tray Units: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

F. Field Test Reports: Written reports specified in Part 3.

G. Operation and Maintenance Data: For cable trays to include in emergency, operation, and maintenance manuals.

1.3 QUALITY ASSURANCE

A. Source Limitations: Obtain cable tray components through one source from a single manufacturer.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

C. Comply with NEMA VE 1, "Metal Cable Tray Systems," if cable tray types specified are defined in the standard.

D. Comply with NFPA 70.

1.4 COORDINATION

A. Coordinate layout and installation of cable trays and suspension system with other construction that penetrates ceilings or is supported by them, including light fixtures, loudspeakers, HVAC equipment, fire-suppression system, and partition assemblies.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. B-Line Systems, Inc.
2. GS Metals Corp.
3. Thomas & Betts Corporation.

2.2 MATERIALS AND FINISHES

A. Cable Trays, Fittings, and Accessories (Above Checkout Stands): Steel, solid ventilated bottom with the following finish:

1. Epoxy-resin paint over paint manufacturer's recommended primer and corrosion-inhibiting treatment. Where exposed in public areas, paint to match surrounding finishes.

B. Cable Trays, Fittings, and Accessories (Other than above Checkout Stands): Basket Type Tray.

1. Electro-Galvanized Zinc: Support accessories and miscellaneous hardware shall be coated in accordance with ASTM B633 SC3. All threaded components shall be coated in accordance with ASTM B633 SC1.
2. Protect steel hardware against corrosion by galvanizing according to ASTM B 633.
3. Fabricate cable tray products with rounded edges and smooth surfaces.

C. Sizes and Configurations: Refer to the Drawings for specific requirements for types, materials, sizes, and configurations.

2.3 CABLE TRAY ACCESSORIES

A. Fittings: Tees, crosses, risers, elbows, and other fittings as indicated, of same materials and finishes as cable tray.

B. Covers (Solid type only): Solid, ventilated type of same materials and finishes as cable tray. Provide hinged latching covers on all cable trays.

C. Barrier Strips: Steel.

D. Cable tray supports and connectors, including bonding jumpers, as recommended by cable tray manufacturer.

2.4 WARNING SIGNS

A. Lettering: 1-1/2 inch high, black letters on yellow background with legend "WARNING! NOT TO BE USED AS WALKWAY, LADDER, OR SUPPORT FOR LADDERS OR PERSONNEL."

B. Materials and fastening are specified in Division 26 Section Identification for Electrical Systems.

2.5 SOURCE QUALITY CONTROL

A. Perform design and production tests according to NEMA VE 1.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions for compliance with requirements for installation tolerances and other conditions affecting performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 CABLE TRAY INSTALLATION

A. Remove burrs and sharp edges from cable trays.

B. Fasten cable tray supports securely to building structure as specified in Division 26 Section Common Work Results for Electrical, unless otherwise indicated.

1. Locate and install supports according to NEMA VE 1.

C. Install expansion connectors where cable tray crosses building expansion joint and in cable tray runs that exceed 90 feet. Space connectors and set gaps according to NEMA VE 1.

D. Make changes in direction and elevation using standard fittings.

E. Make cable tray connections using standard fittings.

F. Locate cable tray above piping unless accessibility to cable tray is required or unless otherwise indicated.

G. Seal penetrations through fire and smoke barriers according to Division 07 Section Firestopping.

H. Sleeves for Future Cables: Install capped sleeves for future cables through firestop-sealed cable tray penetrations of fire and smoke barriers.

I. Workspace: Install cable trays with sufficient space to permit access for installing cables.

J. Install barriers to separate cables of different systems, such as power, communications, and data processing; or of different insulation levels, such as 600, 5000, and 15 000 V.

K. Install covers after installation of cable is completed.

L. After installation of cable trays is completed, install warning signs in visible locations on or near cable trays.

3.3 CONNECTIONS

A. Ground cable trays according to manufacturer's written instructions.

B. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.4 FIELD QUALITY CONTROL

A. Testing: Perform the following field quality-control testing:

1. After installing cable trays and after electrical circuitry has been energized, test for compliance with requirements.
2. Perform the following electrical test and visual and mechanical inspections:

a. Visually inspect each cable tray joint and each ground connection for mechanical continuity.
b. Measure ground resistance of each system of cable tray from the most remote element to the point where connection is made to service disconnect enclosure grounding terminal. Record resistance in ohms.

3. Report results in writing.

3.5 PROTECTION

A. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure cable tray is without damage or deterioration at time of Substantial Completion.

1. Repair damage to galvanized finishes with zinc-rich paint recommended by cable tray manufacturer.
2. Repair damage to PVC or paint finishes with matching touchup coating recommended by cable tray manufacturer.

END OF SECTION

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SECTION 26 05 48

VIBRATION AND SEISMIC CONTROLS FOR ELECTRICAL SYSTEMS

(Edited from DeCA June 2011 Design Criteria)

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Seismic restraints and other earthquake-damage-reduction measures for electrical components. It complements optional seismic construction requirements in the various electrical component Sections.

1.2 DEFINITIONS

A. UFC: United Facilities Criteria.

B. IBC: International Building Code.

C. Seismic Restraint: A fixed device (a seismic brace, an anchor bolt or stud, or a fastening assembly) used to prevent vertical or horizontal movement, or both vertical and horizontal movement, of an electrical system component during an earthquake.

D. Mobile Structural Element: A part of the building structure such as a slab, floor structure, roof structure, or wall that may move independent of other mobile structural elements during an earthquake.

1.3 SUBMITTALS

A. Product Data: Illustrate and indicate types, styles, materials, strength, fastening provisions, and finish for each type and size of seismic restraint component used.

1. Anchor Bolts and Studs: Tabulate types and sizes, complete with report numbers and rated strength in tension and shear as evaluated by an agency approved by authorities having jurisdiction.

B. Shop Drawings: For anchorage and bracing not defined by details and charts on Drawings. Indicate materials, and show designs and calculations signed and sealed by a professional engineer.

1. Design Analysis: To support selection and arrangement of seismic restraints. Include calculations of combined tensile and shear loads.
2. Details: Detail fabrication and arrangement. Detail attachment of restraints to both structural and restrained items. Show attachment locations, methods, and spacings, identifying components and listing their strengths. Indicate direction and value of forces transmitted to the structure during seismic events.
3. Preapproval and Evaluation Documentation: By an agency approved by authorities having jurisdiction, showing maximum ratings of restraints and the basis for approval (tests or calculations).

C. Coordination Drawings: Plans and sections drawn to scale and coordinating seismic bracing for electrical components with other systems and equipment, including other seismic restraints, in the vicinity.

D. Product Certificates: Signed by manufacturers of seismic restraints certifying that products furnished comply with requirements.

E. Qualification Data: For firms and persons specified in "Quality Assurance" Article.

F. Material Test Reports: From a qualified testing agency indicating and interpreting test results of seismic control devices for compliance with requirements indicated.

1.4 QUALITY ASSURANCE

A. Comply with seismic restraint requirements in UFC 3-310-04 Seismic Design for Building, and IBC, unless requirements in this Section are more stringent.

B. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing seismic engineering services, including the design of seismic restraints, that are similar to those indicated for this Project.

C. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, with the experience and capability to conduct the testing indicated.

1.5 PROJECT SITE SPECIFIC SEISMIC CRITERIA

A. Project site class as defined in UFC: **D**.

B. Seismic Risk Occupancy Category as defined in UFC: **III**.

C. Seismic Design Category as defined in UFC: **B**.

D. Design spectral response acceleration as short periods, SDS, as defined in UFC: **0.203.**

1.6 COORDINATION

A. Coordinate layout and installation of seismic bracing with building structural system and architectural features, and with mechanical, fire-protection, electrical, and other building features in the vicinity.

B. Coordinate concrete bases with building structural system.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Amber/Booth Company, Inc.
2. B-Line Systems, Inc.
3. Erico, Inc.
4. GS Metals Corp.
5. Loos & Company, Inc.
6. Mason Industries, Inc.
7. Powerstrut.
8. Thomas & Betts Corp.
9. Unistrut Corporation.

2.2 MATERIALS

A. Use the following materials for restraints:

1. Indoor Dry Locations: Steel, zinc plated.
2. Outdoors and Damp Locations: Galvanized steel.
3. Corrosive Locations: Stainless steel.

2.3 ANCHORAGE AND STRUCTURAL ATTACHMENT COMPONENTS

A. Strength: Defined in reports by ICBO Evaluation Service or another agency acceptable to authorities having jurisdiction.

1. Structural Safety Factor: Strength in tension and shear of components used shall be at least two times the maximum seismic forces to which they will be subjected.

B. Concrete and Masonry Anchor Bolts and Studs: Steel-expansion wedge type.

C. Concrete Inserts: Steel-channel type.

D. Through Bolts: Structural type, hex head, high strength. Comply with ASTM A 325.

E. Welding Lugs: Comply with MSS SP-69, Type 57.

F. Beam Clamps for Steel Beams and Joists: Double sided. Single-sided type is not acceptable.

G. Bushings for Floor-Mounted Equipment Anchors: Neoprene units designed for seismically rated rigid equipment mountings, and matched to the type and size of anchor bolts and studs used.

H. Bushing Assemblies for Wall-Mounted Equipment Anchorage: Assemblies of neoprene elements and steel sleeves designed for seismically rated rigid equipment mountings, and matched to the type and size of attachment devices used.

2.4 SEISMIC BRACING COMPONENTS

A. Slotted Steel Channel: 1-5/8-by-1-5/8-inchcross section, formed from 0.1046-inchthick steel, with 9/16-by-7/8-inchslots at a maximum of 2 incheso.c. in webs, and flange edges turned toward web.

1. Materials for Channel: ASTM A 570, GR 33.
2. Materials for Fittings and Accessories: ASTM A 575, ASTM A 576, or ASTM A 36.

3. Fittings and Accessories: Products of the same manufacturer as channels and designed for use with that product.
4. Finish: Baked, rust-inhibiting, acrylic-enamel paint applied after cleaning and phosphate treatment, unless otherwise indicated.

B. Channel-Type Bracing Assemblies: Slotted steel channel, with adjustable hinged steel brackets and bolts.

C. Cable-Type Bracing Assemblies: Zinc-coated, high-strength steel wire rope cable attached to steel thimbles, brackets, and bolts designed for cable service.

1. Arrange units for attachment to the braced component at one end and to the structure at the other end.
2. Wire Rope Cable: Comply with ASTM 603. Use 49- or 133-strand cable with a minimum strength of 2 times the calculated maximum seismic force to be resisted.

D. Hanger Rod Stiffeners: Slotted steel channels with internally bolted connections to hanger rod.

PART 3 - EXECUTION

3.1 APPLICATION

A. Generator Sets: Comply with Division 23 Section Vibration and Seismic Controls for HVAC Piping and Equipment.

3.2 INSTALLATION

A. Install seismic restraints according to applicable codes and regulations and as approved by authorities having jurisdiction, unless more stringent requirements are indicated.

3.3 STRUCTURAL ATTACHMENTS

A. Use bolted connections with steel brackets, slotted channel, and slotted-channel fittings to spread structural loads and reduce stresses.

B. Attachments to New Concrete: Bolt to channel-type concrete inserts or use expansion anchors.

C. Attachments to Existing Concrete: Use expansion anchors.

D. Holes for Expansion Anchors in Concrete: Drill at locations and to depths that avoid reinforcing bars.

E. Attachments to Solid Concrete Masonry Unit Walls: Use expansion anchors.

F. Attachments to Hollow Walls: Bolt to slotted steel channels fastened to wall with expansion anchors.

G. Attachments to Wood Structural Members: Install bolts through members.

H. Attachments to Steel: Bolt to clamps on flanges of beams or on upper truss chords of bar joists.

3.4 ELECTRICAL EQUIPMENT ANCHORAGE

A. Anchor rigidly to a single mobile structural element or to a concrete base that is structurally tied to a single mobile structural element.

B. Anchor panelboards, motor-control centers, motor controls, switchboards, switchgear, transformers, unit substations, fused power-circuit devices, transfer switches, busways, battery racks, static uninterruptible power units, power conditioners, capacitor units, communication system components, and electronic signal processing, control, and distribution units as follows:

1. Size concrete bases so expansion anchors will be a minimum of 10 bolt diameters from the edge of the concrete base.
2. Concrete Bases for Floor-Mounted Equipment: Use female expansion anchors and install studs and nuts after equipment is positioned.
3. Bushings for Floor-Mounted Equipment Anchors: Install to allow for resilient media between anchor bolt or stud and mounting hole in concrete.
4. Anchor Bolt Bushing Assemblies for Wall-Mounted Equipment: Install to allow for resilient media where equipment or equipment-mounting channels are attached to wall.
5. Torque bolts and nuts on studs to values recommended by equipment manufacturer.

3.5 SEISMIC BRACING INSTALLATION

A. Install bracing according to spacings and strengths indicated by approved analysis.

B. Expansion and Contraction: Install to allow for thermal movement of braced components.

C. Cable Braces: Install with maximum cable slack recommended by manufacturer.

D. Attachment to Structure: If specific attachment is not indicated, anchor bracing to the structure at flanges of beams, upper truss chords of bar joists, or at concrete members.

3.6 ACCOMMODATION OF DIFFERENTIAL SEISMIC MOTION

A. Make flexible connections in raceways, cables, wireways, cable trays, and busways where they cross expansion and seismic control joints, where adjacent sections or branches are supported by different structural elements, and where they terminate at electrical equipment anchored to a different mobile structural element from the one supporting them.

3.7 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform the following field quality-control testing:

B. Testing: Test pull-out resistance of seismic anchorage devices.

1. Provide necessary test equipment required for reliable testing.
2. Provide evidence of recent calibration of test equipment by a testing agency acceptable to authorities having jurisdiction.
3. Schedule test with Owner, through Government Designated Representative, before connecting anchorage device to restrained component (unless post-connection testing has been approved), and with at least ten days' advance notice.

4. Obtain Contracting Officer's approval before transmitting test loads to the structure. Provide temporary load-spreading members.
5. Test at least four of each type and size of installed anchors and fasteners selected by Government Designated Representative.
6. Test to 90 percent of rated proof load of device.
7. If a device fails the test, modify all installations of same type and retest until satisfactory results are achieved.
8. Record test results.

END OF SECTION

SECTION 26 05 53

IDENTIFICATION FOR ELECTRICAL SYSTEMS

(Edited from DeCA June 2011 Design Criteria)

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Electrical identification materials and devices required to comply with ANSI C2, NFPA 70, OSHA standards, and Authorities Having Jurisdiction.

1.2 SUBMITTALS

A. Product Data: For each electrical identification product indicated.

1.3 QUALITY ASSURANCE

A. Comply with ANSI C2.

B. Comply with NFPA 70.

C. Comply with ANSI A13.1 and NFPA 70 for color-coding.

PART 2 - PRODUCTS

2.1 RACEWAY AND CABLE LABELS

A. Comply with ANSI A13.1, Table 3, for minimum size of letters for legend and for minimum length of color field for each raceway and cable size.

1. Color: Black letters on orange field.
2. Legend: Indicates voltage.

B. Adhesive Labels: Preprinted, flexible, self-adhesive vinyl with legend over laminated with a clear, weather- and chemical-resistant coating.

C. Pre-tensioned, Wraparound Plastic Sleeves: Flexible, preprinted, color-coded, acrylic band sized to suit the diameter of the line it identifies and arranged to stay in place by pretensioned gripping action when placed in position.

D. Colored Adhesive Tape: Self-adhesive vinyl tape not less than 3 mils thick by 1 to 2 inches wide.

E. Underground-Line Warning Tape: Permanent, bright-colored, continuous-printed, vinyl tape.

1. Not less than 6 inches wide by 4 mils thick.
2. Compounded for permanent direct-burial service.

3. Embedded continuous metallic strip or core.
4. Printed legend indicating type of underground line.

F. Tape Markers: Vinyl or vinyl-cloth, self-adhesive, wraparound type with preprinted numbers and letters.

G. Aluminum, Wraparound Marker Bands: Bands cut from 0.014-inch-thick aluminum sheet, with stamped or embossed legend, and fitted with slots or ears for permanently securing around wire or cable jacket or around groups of conductors.

H. Plasticized Card-Stock Tags: Vinyl cloth with preprinted and field-printed legends. Orange background, unless otherwise indicated, with eyelet for fastener.

I. Aluminum-Faced, Card-Stock Tags: Weather-resistant, 18-point minimum card stock faced on both sides with embossable aluminum sheet, 0.002 inch thick, laminated with moisture-resistant acrylic adhesive, punched for fasteners, and preprinted with legends to suit each application.

J. Brass or Aluminum Tags: 2 by 2 by 0.05-inchmetal tags with stamped legend, punched for fastener.

2.2 NAMEPLATES AND SIGNS

A. Safety Signs: Comply with 29 CFR, Chapter XVII, Part 1910.145.

B. Engraved Plastic Nameplates and Signs: Engraving stock, melamine plastic laminate, minimum 1/16 inch thick for signs up to 20 sq. in. and 1/8 inch thick for larger sizes.

1. Engraved legend with black letters on white face.
2. Punched or drilled for mechanical fasteners.

C. Baked-Enamel Signs for Interior Use: Preprinted aluminum signs, punched or drilled for fasteners, with colors, legend, and size required for the application. 1/4 inch grommets in corners for mounting.

D. Exterior, Metal-Backed, Butyrate Signs: Weather-resistant, non-fading, preprinted, cellulose-acetate butyrate signs with 0.0396-inchgalvanized-steel backing; and with colors, legend, and size required for the application. 1/4 inch grommets in corners for mounting.

E. Fasteners for Nameplates and Signs: Self-tapping, stainless-steel screws or No. 10/32, stainless-steel machine screws with nuts and flat and lock washers.

2.3 MISCELLANEOUS IDENTIFICATION PRODUCTS

A. Cable Ties: Fungus-inert, self-extinguishing, one-piece, self-locking, Type 6/6 nylon cable ties.

1. Minimum Width: 3/16 inch.
2. Tensile Strength: 50 lb minimum.
3. Temperature Range: Minus 40 to plus 185 deg F.
4. Color: According to color-coding.

B. Paint: Formulated for the type of surface and intended use.

1. Primer for Galvanized Metal: Single-component acrylic vehicle formulated for galvanized surfaces.
2. Primer for Concrete Masonry Units: Heavy-duty-resin block filler.
3. Primer for Concrete: Clear, alkali-resistant, binder-type sealer.
4. Enamel: Silicone-alkyd or alkyd urethane as recommended by primer manufacturer.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Identification Materials and Devices: Install at locations for most convenient viewing without interference with operation and maintenance of equipment.

B. Lettering, Colors, and Graphics: Coordinate names, abbreviations, colors, and other designations with corresponding designations in the Contract Documents or with those required by codes and standards. Use consistent designations throughout Project.

C. Sequence of Work: If identification is applied to surfaces that require finish, install identification after completing finish work.

D. Self-Adhesive Identification Products: Clean surfaces before applying.

E. Circuits with More Than 600 V: Identify raceway and cable with "DANGER--HIGH VOLTAGE" in black letters 2 inches high, stenciled with paint at 10-footintervals over a continuous, painted orange background. Identify the following:

1. Entire floor area directly above conduits running beneath and within 12 inches of a basement or ground floor that is in contact with earth or is framed above unexcavated space.
2. Wall surfaces directly external to conduits concealed within wall.
3. All accessible surfaces of concrete envelope around conduits in vertical shafts, exposed in the building, or concealed above suspended ceilings.
4. Entire surface of exposed conduits.

F. Install painted identification according to manufacturer's written instructions and as follows:

1. Clean surfaces of dust, loose material, and oily films before painting.
2. Prime surfaces using type of primer specified for surface.
3. Apply one intermediate and one finish coat of enamel.

G. Caution Labels for Indoor Boxes and Enclosures for Power and Lighting: Install pressure-sensitive, self-adhesive labels identifying system voltage with black letters on orange background. Install on exterior of door or cover.

H. Paths of Underground Electrical Lines: During trench backfilling, for exterior underground power, control, signal, and communication lines, install continuous underground plastic line marker located directly above line at 6 to 8 inches below finished grade. Where width of multiple lines installed in a common trench or concrete envelope does not exceed 16 inches overall, use a single line marker. Install line marker for underground wiring, both direct-buried cables and cables in raceway.

I. Color-Coding of Secondary Phase Conductors: Use the following colors for service, feeder and branch-circuit phase conductors:

1. 208/120-V Conductors:

   a. Phase A: Black.
   b. Phase B: Red.
   c. Phase C: Blue.

2. 480/277-V Conductors:

   a. Phase A: Yellow.
   b. Phase B: Brown.
   c. Phase C: Orange.

3. Factory apply color the entire length of conductors, except the following field-applied, color-coding methods may be used instead of factory-coded wire for sizes larger than No. 10 AWG:

   a. Colored, pressure-sensitive plastic tape in half-lapped turns for a distance of 6 inches from terminal points and in boxes where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding. Use 1-inch-wide tape in colors specified. Adjust tape bands to avoid obscuring cable identification markings.
   b. Colored cable ties applied in groups of three ties of specified color to each wire at each terminal or splice point starting 3 inches from the terminal and spaced 3 inches apart. Apply with a special tool or pliers, tighten to a snug fit, and cut off excess length.

J. Power-Circuit Identification: Metal tags or aluminum, wraparound marker bands for cables, feeders, and power circuits in vaults, pull and junction boxes, manholes, and switchboard rooms.

1. Legend: 1/4 inch steel letter and number stamping or embossing with legend corresponding to indicated circuit designations.
2. Tag Fasteners: Nylon cable ties.
3. Band Fasteners: Integral ears.

K. Apply identification to conductors as follows:

1. Conductors to Be Extended in the Future: Indicate source and circuit numbers.
2. Multiple Power or Lighting Circuits in the Same Enclosure: Identify each conductor with source, voltage, circuit number, and phase. Use color-coding to identify circuits' voltage and phase.
3. Multiple Control and Communication Circuits in the Same Enclosure: Identify each conductor by its system and circuit designation. Use a consistent system of tags, color-coding, or cable marking tape.

L. Apply warning, caution, and instruction signs as follows:

1. Warnings, Cautions, and Instructions: Install to ensure safe operation and maintenance of electrical systems and of items to which they connect. Install engraved plastic-laminated instruction signs with approved legend where instructions are needed for system or equipment operation. Install metal-backed butyrate signs for outdoor items.

2. Emergency Operation: Install engraved laminated signs with white legend on red background with minimum 3/8 inch high lettering for emergency instructions on power transfer, load shedding, and other emergency operations.

M. Equipment Identification Labels: Engraved plastic laminate. Install on each unit of equipment, including central or master unit of each system. This includes power, lighting, communication, signal, and alarm systems, unless units are specified with their own self-explanatory identification. Unless otherwise indicated, provide a single line of text with 1/2 inch high lettering on 1-1/2 inch high label; where two lines of text are required, use labels 2 inches. Use black lettering on white field. Apply labels for each unit of the following categories of equipment using mechanical fasteners:

1. Panelboards, electrical cabinets, and enclosures.
2. Access doors and panels for concealed electrical items.
3. Electrical switchgear and switchboards.
4. Electrical substations.
5. Emergency system boxes and enclosures.
6. Motor-control centers.
7. Disconnect switches.
8. Enclosed circuit breakers.
9. Motor starters.
10. Push-button stations.
11. Power transfer equipment.
12. Contactors.
13. Remote-controlled switches.
14. Dimmers.
15. Control devices.
16. Transformers.
17. Inverters.
18. Rectifiers.
19. Frequency converters.
20. Battery racks.
21. Power-generating units.
22. Telephone switching equipment.
23. TV/audio-monitoring master station.
24. Fire alarm master station or control panel.
25. Security-monitoring master station or control panel.

END OF SECTION

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SECTION 26 08 00

COMMISSIONING OF ELECTRICAL SYSTEMS

(Edited from DeCA June 2011 Design Criteria)

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Division 26 responsibilities in the commissioning process.
2. Commissioning medium voltage cables.
3. Commissioning grounding and bonding.
4. Commissioning dry type transformers.
5. Commissioning liquid filled transformers.
6. Commissioning electric metering.
7. Commissioning switchboards.
8. Commissioning panelboards.
9. Commissioning motor control centers.
10. Commissioning safety switches.
11. Commissioning battery equipment.
12. Commissioning emergency lighting.
13. Commissioning interior lighting.
14. Commissioning electrical generator assemblies.
15. Commissioning of cathodic protection.

B. Related Sections:

1. Division 01 Section General Commissioning Requirements.

1.2 DEFINITIONS

A. CA: Commissioning Agent.

B. CO: Contracting Officer.

C. GC: Contractor; General Contractor, not a Subcontractor.

D. O&M: Operations and Maintenance.

E. QC: Contractor's Quality Control Manager.

F. TI: Technical Inspector.

1.3 DESCRIPTION

A. This Section describes commissioning requirements applicable to commissioned items and systems specified in Division 26 to ensure that all systems are operating in a manner consistent with the Contract Documents.

B. Conform to commissioning requirements and the commissioning plan.

1.4 RESPONSIBILITIES

A. Construction and Acceptance Phases:

1. Include the cost of commissioning in the Contract price.
2. In each purchase order or subcontract written, include requirements for submittal data, O&M data and training.
3. Conduct a commissioning scoping meeting and other meetings necessary to facilitate the Commissioning process.
4. Provide requested documentation to the TI, developed for functional testing procedures.
5. Assist in clarifying the operation and control of commissioned equipment in areas where the Specifications, Control Drawings or equipment documentation is not sufficient for writing detailed testing procedures.
6. Provide functional performance test procedures. Subs shall review test procedures to ensure feasibility, safety and equipment protection and provide necessary written alarm limits to be used during the tests.
7. Develop a full start-up and initial checkout plan using manufacturer's start-up procedures and the prefunctional checklists for all commissioned equipment. Submit to QC for review prior to startup. TI will verify plan for compliance. Refer to Division 01 Section General Commissioning Requirements for further details related to start-up.
8. During the startup and initial checkout process, execute and document the electrical-related portions of the prefunctional checklists provided by the CA for all commissioned equipment.
9. Perform and clearly document all completed startup and system operational checkout procedures, providing a copy to the QC and TI.
10. Address current A/E punch list items before functional testing. Fire and life safety systems shall be completed with discrepancies and problems remedied before functional testing of the respective systems.
11. Provide skilled technicians to execute starting of equipment and to execute the functional performance tests. Ensure that they are available and present during the agreed upon schedules and for sufficient duration to complete the necessary tests, adjustments and problem-solving.
12. Provide all test equipment necessary to fulfill specified testing requirements.
13. Perform functional performance testing under the direction of the CA for specified equipment. Assist the CA and TI in interpreting the monitoring data, as necessary.
14. Correct deficiencies (differences between specified and observed performance) as interpreted by the CA, TI and A/E and retest the equipment.
15. Prepare O&M manuals according to the Contract Documents, including clarifying and updating the original sequences of operation to as-built conditions.
16. During construction, maintain As-built red-line Drawings for all Drawings and final CAD as-builts for Contractor-generated coordination Drawings. Update after completion of commissioning (excluding deferred testing). Prepare red-line As-built Drawings for all Drawings and final as-builts for Contractor-generated coordination Drawings.
17. Provide training of the Government's operating personnel as specified.
18. Coordinate with equipment manufacturers to determine specific requirements to maintain the validity of the warranty.

B. Operation Manuals shall include:

1. A table of all setpoints and implications when changing them.
2. Schedules.
3. Instructions for operation of each piece of equipment for emergencies.

4. Startup and shutdown.
5. Recommendations for recommissioning frequency by equipment type.

C. Warranty Period:

1. Execute seasonal or deferred functional performance testing, witnessed by the CA, according to the Specifications.
2. Correct deficiencies and make necessary adjustments to O&M manuals and as-built drawings for applicable issues identified in any seasonal testing.

1.5 SUBMITTALS

A. Provide submittal documentation relative to commissioning as required in this Section, Division 01 Section General Commissioning Requirements and other specified requirements.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 STARTUP

A. The Electrical Contractors shall follow the start-up and initial checkout procedures listed in the Responsibilities list in this Section and in Division 01 Section General Commissioning Requirements. Division 26 has start-up responsibility and is required to complete systems and sub-systems so they are fully functional, meeting the design objectives of the Contract Documents. The commissioning procedures and functional testing do not relieve or lessen this responsibility or shift that responsibility partially to the Commissioning Agent, Technical Inspector, or Government.

B. Functional testing is intended to begin upon completion of a system. Functional testing may proceed prior to the completion of systems, or sub-systems at the discretion of the PM and GC. Beginning system testing before full completion does not relieve the Contractor from fully completing the system, including all prefunctional checklists as soon as possible.

3.2 OPERATIONS AND MAINTENANCE (O&M) MANUALS

A. The following O&M manual requirements do not replace O&M manual documentation requirements elsewhere in these specifications.

B. Division 26 shall compile and prepare documentation for all commissioned systems covered in Division 26 and deliver this documentation to the GC for inclusion in the O&M manuals prior to the training of Government personnel.

3.3 TRAINING OF GOVERNMENT PERSONNEL

A. The GC shall be responsible for training coordination and scheduling and ultimately to ensure that training is completed.

B. The QC shall be responsible for reviewing the content and adequacy of the training of Government personnel for commissioned equipment or systems. TI will verify compliance.

C. Electrical Contractor: The Electrical Contractor shall have the following training responsibilities:

1. Provide the TI with a training plan four weeks before the planned training.
2. Provide designated Government personnel with comprehensive orientation and training in the understanding of the systems and the operation and maintenance of each major piece of commissioned electrical equipment or system.
3. Training shall start with classroom sessions, if necessary, followed by hands on training on each piece of equipment, which shall illustrate the various modes of operation, including startup, shutdown, fire/smoke alarm, power failure, etc.
4. During any demonstration, should the system fail to perform in accordance with the requirements of the O&M manual or sequence of operations, the system will be repaired or adjusted as necessary and the demonstration repeated.
5. The appropriate trade or manufacturer's representative shall provide the instructions on each major piece of equipment. This person may be the start-up technician for the piece of equipment, the installing contractor or manufacturer’s representative. Practical building operating expertise as well as in-depth knowledge of all modes of operation of the specific piece of equipment are required. More than one party may be required to execute the training.
6. The training sessions shall follow the outline in the Table of Contents of the operation and maintenance manual and illustrate whenever possible the use of the O&M manuals for reference.
7. Training shall include:

    a. Use the printed installation, operation and maintenance instruction material included in the O&M manuals.
    b. A review of the written O&M instructions emphasizing safe and proper operating requirements, preventative maintenance, special tools needed and spare parts inventory suggestions. The training shall include start-up, operation in all modes possible, shut-down, seasonal changeover and any emergency procedures.
    c. Discussion of relevant health and safety issues and concerns.
    d. Discussion of warranties and guarantees.
    e. Common troubleshooting problems and solutions.
    f. Explanation of information included in the O&M manuals.
    g. Discussion of any peculiarities of equipment installation or operation.
    h. Classroom sessions shall include the use of overhead projections, slides, video and audio taped material as might be appropriate.

8. Hands-on training shall include start-up, operation in all modes possible, including manual, shut-down and any emergency procedures and maintenance of all pieces of equipment.
9. Fully explain and demonstrate the operation, function and overrides of any local packaged controls, not controlled by the central control system.
10. Training shall occur after functional testing is complete, unless approved otherwise by the Project Manager.
11. Minimum Duration of Training: The electrical contractor shall provide training on each piece of equipment according to the periods indicated in the individual Division 26 Sections.

END OF SECTION

SECTION 26 09 23

LIGHTING CONTROL DEVICES

(Edited from DeCA June 2011 Design Criteria)

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. The following lighting control devices:

a. Adjust list below to suit Project.
b. Time switches.
c. **Outdoor** photoelectric switches.
d. Switch-box occupancy sensors.
e. Indoor occupancy sensors.
f. Outdoor motion sensors.
g. Multipole contactors.

B. Related Sections:

1. Division 26 Section Wiring Devices for wall-box dimmers and manual light switches.

C. LED: Light-emitting diode.

D. PIR: Passive infrared.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Show installation details for occupancy and light-level sensors.

1. Lighting plan showing location, orientation, and coverage area of each sensor.
2. Interconnection diagrams showing field-installed wiring.

C. Field quality-control test reports.

D. Operation and Maintenance Data: For each type of product to include in emergency, operation, and maintenance manuals.

1.3 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

1.4 COORDINATION

A. Coordinate layout and installation of ceiling-mounted devices with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.

2.2 GENERAL LIGHTING CONTROL DEVICE REQUIREMENTS

A. Line-Voltage Surge Protection: An integral part of the devices for 120- and 277-V solid-state equipment. For devices without integral line-voltage surge protection, field-mounting surge protection shall comply with IEEE C62.41 and with UL 1449.

2.3 TIME SWITCHES

A. Available Manufacturers:

1. Area Lighting Research, Inc.
2. Fisher Pierce.
3. Grasslin Controls Corporation.
4. Intermatic, Inc.
5. Leviton Mfg. Company Inc.
6. Lightolier Controls; a Genlyte Company.
7. Lithonia Lighting.
8. Paragon Electric Co.
9. Square D.
10. TORK.
11. Touchplate Technologies, Inc.
12. Watt Stopper (The).

2.4 OUTDOOR PHOTOELECTRIC SWITCHES

A. Available Manufacturers:

1. Area Lighting Research, Inc.
2. Fisher Pierce.
3. Grasslin Controls Corporation.
4. Intermatic, Inc.
5. Lithonia Lighting.
6. Novitas, Inc.

7. Paragon Electric Co.
8. Square D.
9. TORK.
10. Touchplate Technologies, Inc.
11. Watt Stopper (The).

B. Description: Solid state, with **SPST** dry contacts rated for **1800-VA tungsten or 1000-VA inductive**, to operate connected relay, contactor coils, microprocessor input, and complying with UL 773A.

1. Light-Level Monitoring Range: 1.5 to 10 fc, with an adjustment for turn-on and turn-off levels within that range.
2. Time Delay: 15-second minimum, to prevent false operation.
3. Surge Protection: Metal-oxide varistor type, complying with IEEE C62.41 for Category A1 locations.
4. Mounting: Twist lock complying with IEEE C136.10, with base-and-stem mounting or stem-and-swivel mounting accessories as required to direct sensor to the North sky exposure.

2.5 INDOOR PHOTOELECTRIC SWITCHES

A. Available Manufacturers:

1. Allen-Bradley/Rockwell Automation.
2. Area Lighting Research, Inc.
3. Cutler-Hammer; Eaton Corporation.
4. Fisher Pierce.
5. Grasslin Controls Corporation.
6. Intermatic, Inc.
7. Lithonia Lighting.
8. MicroLite Corporation.
9. Novitas, Inc.
10. Paragon Electric Co.
11. Square D.
12. TORK.
13. Touchplate Technologies, Inc.
14. Watt Stopper (The).

B. Ceiling-Mounting Photoelectric Switch: Solid-state, light-level sensor unit, with separate relay unit mounted on luminaire, to detect changes in lighting levels that are perceived by the eye. Cadmium sulfide photoresistors are not acceptable.

1. Sensor Output: Contacts rated to operate the associated relay, complying with UL 773A. Sensor shall be powered from the relay unit.
2. Relay Unit: Dry contacts rated for 20-A ballast load at 120- and 277-V ac, for 13-A tungsten at 120-V ac, and for 1 hp at 120-V ac. Power supply to sensor shall be 24-V dc, 150-mA, Class 2 power source as defined by NFPA 70.
3. Light-Level Monitoring Range: 10 to 200 fc, with an adjustment for turn-on and turn-off levels within that range.
4. Time Delay: Adjustable from 5 to 300 seconds to prevent cycling, with deadband adjustment.
5. Indicator: Two LEDs to indicate the beginning of on and off cycles.

C. Skylight Photoelectric Sensors: Solid-state, light-level sensor; housed in a threaded, plastic fitting for mounting under skylight, facing up at skylight; with separate relay unit mounted on luminaire, to detect changes in lighting levels that are perceived by the eye. Cadmium sulfide photoresistors are not acceptable.

1. Sensor Output: Contacts rated to operate the associated relay, complying with UL 773A. Sensor shall be powered from the relay unit.
2. Relay Unit: Dry contacts rated for 20-A ballast load at 120- and 277-V ac, for 13-A tungsten at 120-V ac, and for 1 hp at 120-V ac. Power supply to sensor shall be 24-V dc, 150-mA, Class 2 power source as defined by NFPA 70.
3. Light-Level Monitoring Range: 1000 to 10,000 fc, with an adjustment for turn-on and turn-off levels within that range.
4. Time Delay: Adjustable from 5 to 300 seconds to prevent cycling, with deadband adjustment.
5. Indicator: Two LEDs to indicate the beginning of on and off cycles.

2.6 SWITCH-BOX OCCUPANCY SENSORS

A. Available Manufacturers:
1. Hubbell Lighting Inc.
2. Leviton Mfg. Company Inc.
3. Sensor Switch, Inc.
4. Watt Stopper (The).

B. Description: PIR type with integral power-switching contacts rated for 800 W at 120-V ac, suitable for incandescent light fixtures, fluorescent light fixtures with magnetic or electronic ballasts, or 1/6-hp motors; and rated for 1000 W at 277-V ac, suitable for incandescent light fixtures, fluorescent light fixtures with magnetic or electronic ballasts, or 1/3-hp motors, minimum.

1. Include ground wire.
2. Automatic Light-Level Sensor: Adjustable from 2 to 200 fc; keeps lighting off when selected lighting level is present.

2.7 INDOOR OCCUPANCY SENSORS

A. Available Manufacturers:

1. Hubbell Lighting Inc.
2. Leviton Mfg. Company Inc.
3. Lithonia Lighting.
4. MYTECH Corporation.
5. Novitas, Inc.
6. RAB Electric Manufacturing, Inc.
7. Sensor Switch, Inc.
8. TORK.
9. Unenco Electronics; a Hubbell Company.
10. Watt Stopper (The).

B. General Description: Wall- or ceiling-mounting, solid-state units with a separate relay unit.

1. Operation: Unless otherwise indicated, turn lights on when covered area is occupied and off when unoccupied; with a time delay for turning lights off, adjustable over a minimum range of 1 to 15 minutes.
2. Sensor Output: Contacts rated to operate the connected relay, complying with UL 773A. Sensor shall be powered from the relay unit.
3. Relay Unit: Dry contacts rated for 20-A ballast load at 120- and 277-V ac, for 13-A tungsten at 120-V ac, and for 1 hp at 120-V ac. Power supply to sensor shall be 24-V dc, 150-mA, Class 2 power source as defined by NFPA 70.
4. Mounting:

   a. Sensor: Suitable for mounting in any position on a standard outlet box.
   b. Relay: Externally mounted though a 1/2-inch knockout in a standard electrical enclosure.
   c. Time-Delay and Sensitivity Adjustments: Recessed and concealed behind hinged door.

5. Indicator: LED, to show when motion is being detected during testing and normal operation of the sensor.
6. Bypass Switch: Override the on function in case of sensor failure.
7. Automatic Light-Level Sensor: Adjustable from 2 to 200 fc; keeps lighting off when selected lighting level is present.

C. PIR Type: Ceiling mounting; detect occupancy by sensing a combination of heat and movement in area of coverage.

1. Detector Sensitivity: Detect occurrences of 6-inchminimum movement of any portion of a human body that presents a target of at least 36 sq. in.
2. Detection Coverage (Room): Detect occupancy anywhere in a circular area of 1000 sq. ft. when mounted on a 96-inch-high ceiling.
3. Detection Coverage (Corridor): Detect occupancy within 90 feet when mounted on a 10-foot- high ceiling.

D. Ultrasonic Type: Ceiling mounting; detect occupancy by sensing a change in pattern of reflected ultrasonic energy in area of coverage.

1. Detector Sensitivity: Detect a person of average size and weight moving at least 12 inchesin either a horizontal or a vertical manner at an approximate speed of 12 inches/s.
2. Detection Coverage (Small Room): Detect occupancy anywhere within a circular area of 600 sq. ft. when mounted on a 96-inch-high ceiling.
3. Detection Coverage (Standard Room): Detect occupancy anywhere within a circular area of 1000 sq. ft. when mounted on an 8-foot-high ceiling.
4. Detection Coverage (Large Room): Detect occupancy anywhere within a circular area of 2000 sq. ft. when mounted on a 96-inch-high ceiling.
5. Detection Coverage (Corridor): Detect occupancy anywhere within 90 feet when mounted on a 10-foot- high ceiling in a corridor not wider than 14 feet.

E. Dual-Technology Type: Ceiling mounting; detect occupancy by using a combination of PIR and ultrasonic detection methods in area of coverage. Particular technology or combination of technologies that controls on and off functions shall be selectable in the field by operating controls on unit.

1. Sensitivity Adjustment: Separate for each sensing technology.

2. Detector Sensitivity: Detect occurrences of 6-inch minimum movement of any portion of a human body that presents a target of at least 36 sq. in., and detect a person of average size and weight moving at least 12 inches in either a horizontal or a vertical manner at an approximate speed of 12 inches/s.
3. Detection Coverage (Standard Room): Detect occupancy anywhere within a circular area of 1000 sq. ft. when mounted on a 96-inch- high ceiling.

2.8 MULTIPOLE CONTACTORS

A. Available Manufacturers:

1. Allen-Bradley/Rockwell Automation.
2. Cutler-Hammer; Eaton Corporation.
3. GE Industrial Systems; Total Lighting Control.
4. Square D.
5. Siemens.

B. Description: Electrically operated and electrically held, complying with NEMA ICS 2 and UL 508.

1. Current Rating for Switching: Listing or rating consistent with type of load served, including tungsten filament, inductive, and high-inrush ballast (ballast with 15 percent or less total harmonic distortion of normal load current).
2. Control-Coil Voltage: Match control power source.

2.9 CONDUCTORS AND CABLES

A. Power Wiring to Supply Side of Remote-Control Power Sources: Not smaller than No. 12 AWG, complying with Division 26 Section Low-Voltage Electrical Power Conductors and Cables.

B. Classes 2 and 3 Control Cable: Multiconductor cable with stranded copper conductors not smaller than No. **18** AWG, complying with Division 26 Section Low-Voltage Electrical Power Conductors and Cables.

C. Class 1 Control Cable: Multiconductor cable with stranded copper conductors not smaller than No. **14** AWG, complying with Division 26 Section Low-Voltage Electrical Power Conductors and Cables.

D. Install unshielded, twisted-pair cable for control and signal transmission conductors, complying with Division 27 Section Voice and Data Communication Cabling.

PART 3 - EXECUTION

3.1 SENSOR INSTALLATION

A. Install and aim sensors in locations to achieve at least 90 percent coverage of areas indicated. Do not exceed coverage limits specified in manufacturer's written instructions.

3.2 WIRING INSTALLATION

A. Wiring Method: Comply with Division 26 Section Low-Voltage Electrical Power Conductors and Cables. Minimum conduit size shall be 1/2 inch.

B. Wiring within Enclosures: Bundle, lace, and train conductors to terminal points. Separate power-limited and nonpower-limited conductors according to conductor manufacturer's written instructions.

C. Install field-mounting transient voltage suppressors for lighting control devices in Category A locations that do not have integral line-voltage surge protection.

D. Size conductors according to lighting control device manufacturer's written instructions, unless otherwise indicated.

E. Splices, Taps, and Terminations: Make connections only on numbered terminal strips in junction, pull, and outlet boxes; terminal cabinets; and equipment enclosures.

F. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.3 IDENTIFICATION

A. Identify components and power and control wiring according to Division 26 Section Identification for Electrical Systems.

B. Label time switches and contactors with a unique designation.

3.4 FIELD QUALITY CONTROL

A. Perform the following field tests and inspections and prepare test reports:

1. After installing time switches and sensors, and after electrical circuitry has been energized, adjust and test for compliance with requirements.
2. Operational Test: Verify actuation of each sensor and adjust time delays.

B. Remove and replace lighting control devices where test results indicate that they do not comply with specified requirements.

C. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.5 ADJUSTING

A. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting sensors to suit actual occupied conditions. Provide up to two visits to site outside normal occupancy hours for this purpose.

END OF SECTION

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SECTION 26 22 00

LOW-VOLTAGE TRANSFORMERS

(Edited from DeCA June 2011 Design Criteria)

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. The following types of dry-type transformers rated 600 V and less, with capacities up to 1000 kVA:

a. Distribution transformers.
b. Buck-boost transformers.
c. Control and signal transformers.

1.2 SUBMITTALS

A. Product Data Include rated nameplate data, capacities, weights, dimensions, minimum clearances, installed devices and features, and performance for each type and size of transformer indicated.

B. Shop Drawings: Wiring and connection diagrams.

C. Manufacturer Seismic Qualification Certification: Submit certification that transformer assembly and components will withstand seismic forces defined in Division 26 Section Vibration and Seismic Controls for Electrical Systems. Include the following:

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.

a. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified."

2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

D. Source quality-control test reports.

E. Output Settings Reports: Record of tap adjustments specified in Part 3.

1.3 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Comply with IEEE C 57.12.91.

C. Energy-Efficient Transformers Rated 15 kVA and Larger: Certified as meeting NEMA TP 1, Class 1 efficiency levels when tested according to NEMA TP 2.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Temporary Heating: Apply temporary heat according to manufacturer's written instructions within the enclosure of each ventilated-type unit, throughout periods during which equipment is not energized and when transformer is not in a space that is continuously under normal control of temperature and humidity.

1.5 COORDINATION

A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 03.

B. Coordinate installation of wall-mounting and structure-hanging supports.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Acme Electric Corporation; Power Distribution Products Division.
2. Challenger Electrical Equipment Corp.; a division of Eaton Corp.
3. Computer Power Inc.
4. Controlled Power Co.
5. Cutler-Hammer.
6. GE Electrical Distribution & Control.
7. Jefferson Electric, Inc.
8. Micron Industries Corp.
9. Siemens Energy & Automation, Inc.
10. Sola/Hevi-Duty Electric.
11. Square D/Groupe Schneider NA.

2.2 MATERIALS

A. Description: Factory-assembled and -tested, air-cooled units for 60-Hz service.

B. Cores: Grain-oriented, non-aging silicon steel.

C. Coils: Continuous windings without splices, except for taps.

1. Internal Coil Connections: Brazed or pressure type.

2.3 DISTRIBUTION TRANSFORMERS

A. Comply with NEMA ST 20, and list and label as complying with UL 1561.

B. Provide transformers that are internally braced to withstand seismic forces specified in Division 26 Section Vibration and Seismic Controls for Electrical Systems.

C. Cores: One leg per phase.

D. Enclosure: Ventilated, NEMA 250, Type 2. Indoor, where scheduled.

E. Enclosure: Ventilated, dripproof, NEMA 250, Type 2.Indoor, where scheduled.

F. Enclosure: Ventilated, raintight, NEMA 250, Type **3R**. Outdoor, where scheduled.

G. Enclosure: Totally enclosed, nonventilated, with lifting eyes, NEMA 250, Type **3R**. Outdoor, where scheduled.

1. Core and coil shall be encapsulated within resin compound, sealing out moisture and air.

H. Transformer Enclosure Finish: Manufacturer's standard finish, unless otherwise shown or scheduled.

I. Insulation Class: 220 deg C, (Class H), 80 deg C Rise.

J. Taps for Transformers Smaller Than 3 kVA: One 5 percent tap above normal full capacity.

K. Taps for Transformers 7.5 to 24 kVA: One 5 percent tap above and one 5 percent tap below normal full capacity.

L. Taps for Transformers 25 kVA and Larger: Two 2.5 percent taps above and four 2.5 percent taps below normal full capacity.

M. K-Factor Rating: Transformers indicated to be K-factor rated shall comply with UL 1561 requirements for nonsinusoidal load current-handling capability to the degree defined by designated K-factor.

1. Unit shall not overheat when carrying full-load current with harmonic distortion corresponding to designated K-factor.
2. Indicate value of K-factor on transformer nameplate.

N. Electrostatic Shielding: Each winding shall have an independent, single, full-width copper electrostatic shield arranged to minimize interwinding capacitance.

1. Arrange coil leads and terminal strips to minimize capacitive coupling between input and output terminals.
2. Include special terminal for grounding the shield.
3. Shield Effectiveness:

a. Capacitance between Primary and Secondary Windings: Not to exceed 33 picofarads over a frequency range of 20 Hz to 1 MHz.
b. Common-Mode Noise Attenuation: Minus 120 dBA minimum at 0.5 to 1.5 kHz; minus 65 dBA minimum at 1.5 to 100 kHz.
c. Normal-Mode Noise Attenuation: Minus 52 dBA minimum at 1.5 to 10 kHz.

O. Wall Brackets: Manufacturer's standard brackets.

P. Fungus Proofing: Permanent fungicidal treatment for coil and core.

Q. Low-Sound-Level Requirements: Minimum of 3 dBA less than NEMA ST 20 standard sound levels when factory tested according to IEEE C57.12.91.

2.4 BUCK-BOOST TRANSFORMERS

A. Description: Self-cooled, two-winding dry type, rated for continuous duty and with wiring terminals suitable for connection as autotransformer. Transformers shall comply with NEMA ST 1 and shall be listed and labeled as complying with UL 506 or UL 1561.

B. Enclosure: Ventilated, NEMA 250, Type 2.

1. Finish Color: Manufacturer’s standard finish.

2.5 CONTROL AND SIGNAL TRANSFORMERS

A. Description: Self-cooled, two-winding dry type, rated for continuous duty, complying with NEMA ST 1, and listed and labeled as complying with UL 506.

B. Ratings: Continuous duty. If rating is not indicated, provide at least 50 percent spare capacity above connected peak load.

2.6 SOURCE QUALITY CONTROL

A. Test and inspect transformers according to IEEE C57.12.91.

B. Factory Sound-Level Tests: Conduct sound-level tests on equipment for this Project.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine conditions for compliance with enclosure- and ambient-temperature requirements for each transformer.

B. Verify that field measurements are as needed to maintain working clearances required by NFPA 70 and manufacturer's written instructions.

C. Examine walls and floors for suitable mounting conditions where transformers will be installed.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install wall-mounting transformers level and plumb with wall brackets fabricated by transformer manufacturer.

1. Brace wall-mounting transformers as specified in Division 26 Section Vibration and Seismic Controls for Electrical Systems.

B. Install floor-mounting transformers level on concrete bases 2 inches high.

1. Anchor transformers to concrete bases according to manufacturer's written instructions, seismic codes at Project, and requirements in Division 26 Section Vibration and Seismic Controls for Electrical Systems.

C. Install suspended transformers on trapeze brackets suspended from the building structure as shown on the Drawings.

1. Brace suspended transformers as specified in Division 26 Section Vibration and Seismic Controls for Electrical Systems.

3.3 CONNECTIONS

A. Ground equipment according to Division 26 Section Grounding and Bonding for Electrical Systems.

B. Connect wiring according to Division 26 Section Low-Voltage Electrical Power Conductors and Cables.

C. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.4 ADJUSTING

A. Record transformer secondary voltage at each unit for at least 48 hours of typical occupancy period. Adjust transformer taps to provide optimum voltage conditions at secondary terminals. Optimum is defined as not exceeding nameplate voltage plus 10 percent and not being lower than nameplate voltage minus 5 percent. Submit recording and tap settings as test results.

B. Adjust buck-boost transformers to provide nameplate voltage of equipment being served, plus or minus 5 percent, at secondary terminals.

C. Output Settings Report: Prepare a written report recording output voltage and tap settings.

END OF SECTION

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SECTION 26 24 16

PANELBOARDS

(Edited from DeCA June 2011 Design Criteria)

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Distribution panelboards.
2. Lighting and appliance branch-circuit panelboards.
3. Transient voltage suppression panelboards.

1.2 DEFINITIONS

A. EMI: Electromagnetic interference.

B. GFCI: Ground-fault circuit interrupter.

C. RFI: Radio-frequency interference.

D. RMS: Root mean square.

E. SPDT: Single pole, double throw.

1.3 SUBMITTALS

A. Product Data: For each type of panelboard, overcurrent protective device, transient voltage suppression device, accessory, and component indicated. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.

B. Shop Drawings: For each panelboard and related equipment.

1. Dimensioned plans, elevations, sections, and details. Show tabulations of installed devices, equipment features, and ratings. Include the following:

a. Enclosure types and details for types other than NEMA 250, Type 1.
b. Bus configuration, current, and voltage ratings.
c. Short-circuit current rating of panelboards and overcurrent protective devices.
d. UL listing for series rating of installed devices, if scheduled.
e. Features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components, sufficient for selective coordination study.

2. Wiring Diagrams: Power, signal, and control wiring.

C. Manufacturer Seismic Qualification Certification: Submit certification that panelboards, overcurrent protective devices, accessories, and components will withstand seismic forces defined in Division 26 Section Vibration and Seismic Controls for Electrical Systems. Include the following:

1. Basis of Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.

   a. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified."

2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

D. Qualification Data: For testing agency.

E. Field quality-control test reports including the following:

1. Test procedures used.
2. Test results that comply with requirements.
3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.

F. Panelboard Schedules: For installation in panelboards. Submit final versions after load balancing.

G. Operation and Maintenance Data: For panelboards and components to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 01 Section Closeout Procedures, include the following:

1. Manufacturer's written instructions for testing and adjusting overcurrent protective devices.
2. Time-current curves, including selectable ranges for each type of overcurrent protective device.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain panelboards, overcurrent protective devices, components, and accessories through one source from a single manufacturer.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

C. Comply with NEMA PB 1.

D. Comply with NFPA 70.

1.5 PROJECT CONDITIONS

A. Environmental Limitations: Rate equipment for continuous operation under the following conditions, unless otherwise indicated:

1. Ambient Temperature: Not exceeding 104 deg F.
2. Altitude: Not exceeding 6600 feet.

B. Interruption of Existing Electric Service: Do not interrupt electric service to facilities occupied by Government or others unless permitted under the following conditions and then only after arranging to provide temporary electric service according to requirements indicated:

1. Notify Contracting Officer no fewer than ten days in advance of proposed interruption of electrical service.
2. Do not proceed with interruption of electrical service without Contracting Officer's written permission.

1.6 COORDINATION

A. Coordinate layout and installation of panelboards and components with other construction that penetrates walls or is supported by them, including electrical and other types of equipment, raceways, piping, and encumbrances to workspace clearance requirements.

B. Coordinate size and location of concrete bases, if free-standing panels are required. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 03.

1.7 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Keys: Six spares for each type of panelboard cabinet lock.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Panelboards, Overcurrent Protective Devices, Controllers, Contactors, and Accessories:

a. Eaton Corporation; Cutler-Hammer Products.
b. General Electric Co.; Electrical Distribution & Protection Div.
c. Siemens Energy & Automation, Inc.
d. Square D.

2. Transient Voltage Suppression Panelboards:

a. Current Technology.

b. Liebert Corporation.

2.2 MANUFACTURED UNITS

A. Fabricate and test panelboards according to IEEE 344 to withstand seismic forces defined in Division 26 Section Vibration and Seismic Controls for Electrical Systems.

B. Enclosures: Flush or Surface-mounted cabinets as scheduled. NEMA PB 1, Type 1.

1. Rated for environmental conditions at installed location.

a. Outdoor Locations: NEMA 250, Type 3R.
b. Kitchen Areas: NEMA 250, Type 4X, stainless steel.
c. Other Wet or Damp Indoor Locations: NEMA 250, Type 4.
d. Front: Secured to box with concealed trim clamps. For surface-mounted fronts, match box dimensions; for flush-mounted fronts, overlap box.

2. Finish: Manufacturer's standard enamel finish over corrosion-resistant treatment or primer coat.
3. Directory Card: With transparent protective cover, mounted in metal frame, inside panelboard door.

C. Phase and Ground Buses:

1. Material: Hard-drawn copper, 98 percent conductivity.
2. Equipment Ground Bus: Adequate for feeder and branch-circuit equipment ground conductors; bonded to box. All panelboards.
3. Isolated Equipment Ground Bus: Adequate for branch-circuit equipment ground conductors; insulated from box. Where scheduled.
4. Extra-Capacity Neutral Bus: Neutral bus rated 200 percent of phase bus and UL listed as suitable for nonlinear loads. Where scheduled.
5. Split Bus: Vertical buses divided into individual vertical sections. Where scheduled.

D. Conductor Connectors: Suitable for use with conductor material.

1. Main and Neutral Lugs: Compression type.
2. Ground Lugs and Bus Configured Terminators: Compression type.
3. Feed-Through Lugs: Where scheduled or required, Compression type suitable for use with conductor material. Locate at opposite end of bus from incoming lugs or main device.
4. Extra-Capacity Neutral Lugs: Where scheduled or required, Rated 200 percent of phase lugs mounted on extra-capacity neutral bus.

E. Service Equipment Label: UL labeled for use as service equipment for panelboards with main service disconnect switches.

F. Future Devices: Mounting brackets, bus connections, and necessary appurtenances required for future installation of devices. Provide where spaces are scheduled.

2.3 PANELBOARD SHORT-CIRCUIT RATING

A. Fully rated to interrupt symmetrical short-circuit current available at terminals.

2.4 DISTRIBUTION PANELBOARDS

A. Doors: Secured with vault-type latch with tumbler lock; keyed alike. Omit for fused-switch panelboards.

B. Main Overcurrent Protective Devices: Circuit breaker.

C. Branch Overcurrent Protective Devices:

1. For Circuit-Breaker Frame Sizes 125 A and Smaller: Bolt-on circuit breakers.
2. For Circuit-Breaker Frame Sizes Larger Than 125 A: Bolt-on circuit breakers.

2.5 LIGHTING AND APPLIANCE BRANCH-CIRCUIT PANELBOARDS

A. Branch Overcurrent Protective Devices: Bolt-on circuit breakers, replaceable without disturbing adjacent units.

B. Doors: Concealed hinges; secured with flush latch with tumbler lock; keyed alike.

2.6 LOAD CENTERS

A. Do not use.

2.7 TRANSIENT VOLTAGE SUPPRESSION PANELBOARDS

A. Doors: Secured with vault-type latch with tumbler lock; keyed alike.

B. Main Overcurrent Devices: Thermal-magnetic circuit breaker.

C. Branch Overcurrent Protective Devices: Bolt-on circuit breakers.

D. Bus: Copper phase and neutral buses; 200 percent capacity neutral bus and lugs.

E. Transient Voltage Suppression Device: IEEE C62.41, integrally mounted, plug-in-style, solid-state, parallel-connected, sine-wave tracking suppression and filtering modules.

1. Minimum Single-Impulse Current Ratings:

a. Line to Neutral: 100,000 A.
b. Line to Ground: 100,000 A.
c. Neutral to Ground: 50,000 A.

2. Protection modes shall be as follows:

a. Line to neutral.
b. Line to ground.
c. Neutral to ground.

3. EMI/RFI Noise Attenuation Using 50-ohm Insertion Loss Test: 55 dB at 100 kHz.
4. Maximum Category C Combination Wave Clamping Voltage: 600 V, line to neutral and line to ground on 120/208 V systems; 1000 V, line to neutral and line to ground on 277/480 V systems.

5. Maximum UL 1449 Clamping Levels: 400 V, line to neutral and line to ground on 120/208 V systems; 800 V, line to neutral and line to ground on 277/480 V systems.
6. Withstand Capabilities: 3000 Category C surges with less than 5 percent change in clamping voltage.
7. Accessories:

    a. Form-C contacts, one normally open and one normally closed, for remote monitoring of system operation. Contacts to reverse position on failure of any surge diversion module.
    b. Audible alarm activated on failure of any surge diversion module.
    c. Six-digit transient-counter set to total transient surges that deviate from the sine-wave envelope by more than 125 V.

2.8 OVERCURRENT PROTECTIVE DEVICES

A. Molded-Case Circuit Breaker: UL 489, with interrupting capacity to meet available fault currents. Multipole units enclosed in a single housing, all poles common trip, with a single handle to operate as a single unit.

1. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads, and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
2. Adjustable Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.
3. Electronic trip-unit circuit breakers shall have RMS sensing; field-replaceable rating plug; and with the following field-adjustable settings:

    a. Instantaneous trip.
    b. Long- and short-time pickup levels.
    c. Long- and short-time time adjustments.
    d. Ground-fault pickup level, time delay, and I^2t response.

4. GFCI Circuit Breakers: Single- and two-pole configurations with **5**-mA trip sensitivity.

B. Molded-Case Circuit-Breaker Features and Accessories: Standard frame sizes, trip ratings, and number of poles.

1. Lugs: Compression style, suitable for number, size, trip ratings, and conductor materials.
2. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HACR for heating, air-conditioning, and refrigerating equipment.
3. Ground-Fault Protection: Integrally mounted relay and trip unit with adjustable pickup and time-delay settings, push-to-test feature, and ground-fault indicator.
4. Shunt Trip: 120-V trip coil energized from separate circuit, set to trip at **55** percent of rated voltage.
5. Auxiliary Contacts: **One SPDT switch** with "a" and "b" contacts; "a" contacts mimic circuit-breaker contacts, "b" contacts operate in reverse of circuit-breaker contacts.
6. Key Interlock Kit: Externally mounted to prohibit circuit-breaker operation; key shall be removable only when circuit breaker is in off position.
7. Zone-Selective Interlocking: Integral with electronic trip unit; for interlocking ground-fault protection function.

2.9 ACCESSORY COMPONENTS AND FEATURES

A. Fungus Proofing: Permanent fungicidal treatment for panelboard interior, including overcurrent protective devices and other components.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install panelboards and accessories according to NEMA PB 1.1.

B. Comply with mounting and anchoring requirements specified in Division 26 Section Vibration and Seismic Controls for Electrical Systems.

C. Mount top of trim 74 inches above finished floor, unless otherwise indicated.

D. Mount plumb and rigid without distortion of box. Mount recessed panelboards with fronts uniformly flush with wall finish.

E. Install overcurrent protective devices and controllers.

1. Set field-adjustable switches and circuit-breaker trip ranges.

F. Install filler plates in unused spaces.

G. Stub four 1-inchempty conduits from panelboard into accessible ceiling space or space designated to be ceiling space in the future. Stub four 1-inchempty conduits into raised floor space or below slab not on grade, with caps.

H. Arrange conductors in gutters into groups and bundle and wrap with wire ties after completing load balancing.

3.2 IDENTIFICATION

A. Identify panelboards, field-installed conductors, interconnecting wiring, and components; provide warning signs as specified in Division 26 Section Identification for Electrical Systems.

B. Create a directory to indicate installed circuit loads after balancing panelboard loads. Obtain approval before installing. Use a computer or typewriter to create directory; handwritten directories are not acceptable.

3.3 CONNECTIONS

A. Ground equipment according to Division 26 Section Grounding and Bonding for Electrical Systems.

B. Connect wiring according to Division 26 Section Low-Voltage Electrical Power Conductors and Cables.

3.4 FIELD QUALITY CONTROL

A. Prepare for acceptance tests as follows:

1. Test insulation resistance for each panelboard bus, component, connecting supply, feeder, and control circuit.
2. Test continuity of each circuit.

B. Perform the following field tests and inspections and prepare test reports:

1. Perform each electrical test and visual and mechanical inspection stated in NETA ATS, Section 7.5 for switches and Section 7.6 for molded-case circuit breakers. Certify compliance with test parameters.
2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.

C. Load Balancing: After Substantial Completion, but not more than 60 days after Final Acceptance, measure load balancing and make circuit changes.

1. Measure as directed during period of normal system loading.
2. Perform load-balancing circuit changes outside normal occupancy/working schedule of the facility and at time directed. Avoid disrupting critical 24-hour services such as fax machines and on-line data processing, computing, transmitting, and receiving equipment. Use colored tape banding to revise the color code of conductors changed to a different phase, at the panel and at the load.
3. After circuit changes, recheck loads during normal load period. Record all load readings before and after changes and submit test records.
4. Tolerance: Difference exceeding 20 percent between phase loads, within a panelboard, is not acceptable. Rebalance and recheck as necessary to meet this minimum requirement.

D. Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scanning of each panelboard. Remove panel fronts so joints and connections are accessible to portable scanner. Perform remedial action for any deficiencies detected.

1. Instrument: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
2. Record of Infrared Scanning: Prepare a certified report that identifies panelboards checked and describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.5 CLEANING

A. On completion of installation, inspect interior and exterior of panelboards. Remove paint splatters and other spots. Vacuum dirt and debris; do not use compressed air to assist in cleaning. Repair exposed surfaces to match original finish.

END OF SECTION

SECTION 26 27 26

WIRING DEVICES

(Edited from DeCA June 2011 Design Criteria)

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Single and duplex receptacles, ground-fault circuit interrupters, integral surge suppression units, and isolated-ground receptacles.
2. Single- and double-pole snap switches and dimmer switches.
3. Device wall plates.
4. Pin and sleeve connectors and receptacles.
5. Floor service outlets, poke-through assemblies, service poles, and multioutlet assemblies.

1.2 DEFINITIONS

A. EMI: Electromagnetic interference.

B. GFCI: Ground-fault circuit interrupter.

C. PVC: Polyvinyl chloride.

D. RFI: Radio-frequency interference.

E. TVSS: Transient voltage surge suppressor.

F. UTP: Unshielded twisted pair.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: List of legends and description of materials and process used for premarking wall plates.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain each type of wiring device through one source from a single manufacturer.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

C. Comply with NFPA 70.

1.5 COORDINATION

A. Receptacles for Government-Furnished Equipment: Match plug configurations.

1. Cord and Plug Sets: Match equipment requirements.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Wiring Devices:

a. Bryant Electric, Inc./Hubbell Subsidiary.
b. Eagle Electric Manufacturing Co., Inc.
c. Hubbell Incorporated; Wiring Device-Kellems.
d. Leviton Mfg. Company Inc.
e. Pass & Seymour/Legrand; Wiring Devices Div.

2. Multioutlet Assemblies:

a. Hubbell Incorporated; Wiring Device-Kellems.
b. Wiremold Company (The).

3. Telephone/Power Poles:

a. Hubbell Incorporated; Wiring Device-Kellems.
b. Pass & Seymour/Legrand; Wiring Devices Div.
c. Square D/Groupe Schneider NA.
d. Thomas & Betts Corporation.
e. Wiremold Company (The).

2.2 RECEPTACLES

A. Straight-Blade-Type Receptacles: Comply with NEMA WD 1, NEMA WD 6, DSCC W-C-596G, and UL 498.

B. Straight-Blade and Locking Receptacles: Heavy -Duty grade.

C. GFCI Receptacles: Straight blade, non-feed-through type, Heavy-Duty grade, with integral NEMA WD 6, Configuration 5-20R duplex receptacle; complying with UL 498 and UL 943. Design units for installation in a 2-3/4-inch- deep outlet box without an adapter.

D. Isolated-Ground Receptacles: Straight blade, Heavy-Duty grade, duplex receptacle, with equipment grounding contacts connected only to the green grounding screw terminal of the device and with inherent electrical isolation from mounting strap.

1. Devices: Listed and labeled as isolated-ground receptacles.
2. Isolation Method: Integral to receptacle construction and not dependent on removable parts.

E. TVSS Receptacles: Straight blade, NEMA WD 6, Configuration 5-20R, with integral TVSS in line to ground, line to neutral, and neutral to ground.

1. TVSS Components: Multiple metal-oxide varistors; with a nominal clamp level rating of 500 volts and minimum single transient pulse energy dissipation of 140 J line to neutral, and 70 J line to ground and neutral to ground.
2. Active TVSS Indication: Visual only with light visible in face of device to indicate device is "active" or "no longer in service."
3. Receptacle Type: Heavy-Duty grade.
4. Identification: Distinctive marking on face of device to denote TVSS-type unit.

F. Industrial Heavy-Duty Pin and Sleeve Devices: Comply with IEC 309-1.

2.3 PENDANT CORD/CONNECTOR DEVICES

A. Description: Matching, locking-type plug and receptacle body connector, NEMA WD 6, Configurations to match equipment, Heavy-Duty grade.

1. Body: Nylon with screw-open cable-gripping jaws and provision for attaching external cable grip.
2. External Cable Grip: Woven wire-mesh type made of high-strength galvanized-steel wire strand, matched to cable diameter, and with attachment provision designed for corresponding connector.

2.4 CORD AND PLUG SETS

A. Description: Match voltage and current ratings and number of conductors to requirements of equipment being connected.

1. Cord: Rubber-insulated, stranded-copper conductors, with Type SOW-A jacket; with green-insulated grounding conductor and equipment-rating ampacity plus a minimum of 30 percent.
2. Plug: Nylon body and integral cable-clamping jaws. Match cord and receptacle type for connection.

2.5 SWITCHES

A. Single- and Double-Pole Switches: Comply with DSCC W-C-896F and UL 20.

B. Snap Switches: Heavy-Duty grade, quiet type.

C. Dimmer Switches: Modular, full-wave, solid-state units with integral, quiet on/off switches and audible frequency and EMI/RFI filters.

1. Control: Continuously adjustable slider; with single-pole or three-way switching to suit connections.

2. Incandescent Lamp Dimmers: Modular, 120 V, 60 Hz with continuously adjustable rotary knob, toggle switch, or slider; single pole with soft tap or other quiet switch; EMI/RFI filter to eliminate interference; and 5-inch wire connecting leads.
3. Fluorescent Lamp Dimmer Switches: Modular; compatible with dimmer ballasts; trim potentiometer to adjust low-end dimming; dimmer-ballast combination capable of consistent dimming with low end not greater than 20 percent of full brightness. Dimmer shall be compatible with the fluorescent luminaire ballast it is connected to.

2.6 WALL PLATES

A. Single and combination types to match corresponding wiring devices.

1. Plate-Securing Screws: Metal with head color to match plate finish.
2. Material for Finished Spaces: 0.035-inch- thick, satin-finished stainless steel.
3. Material for Unfinished Spaces: Galvanized steel.
4. Material for Wet Locations: Cast aluminum with spring-loaded lift cover, and listed and labeled for use in "wet locations."

2.7 MULTIOUTLET ASSEMBLIES

A. Components of Assemblies: Products from a single manufacturer designed for use as a complete, matching assembly of raceways and receptacles.

B. Raceway Material: Metal, with manufacturer's standard finish.

C. Wire: No. 12 AWG.

D. Receptacles: 20A 125V grounding duplex on 12 inch centers, or 20A 125V grounding single on 6 inch centers where indicated on Drawings.

2.8 SERVICE POLES

A. Description: Factory-assembled and -wired units to extend power and voice and data communication from distribution wiring concealed in ceiling to devices or outlets in pole near floor.

1. Poles: Nominal 2.5-inch- square cross section, with height adequate to extend from floor to at least 6 inches above ceiling (or other height indicated on Drawings), and with separate channels for power wiring and voice and data communication cabling.
2. Mounting: Ceiling trim flange with concealed bracing arranged for positive connection to ceiling supports; with pole foot and carpet pad attachment.
3. Finishes: Manufacturer's standard white painted finish and trim combination.
4. Wiring: Sized for scheduled power and ground conductors; scheduled 4-pair, Category 6 voice and data communication cables; and scheduled low voltage signaling conductors.
5. Power Receptacles: As scheduled on Drawings.
6. Voice and Data Communication Outlets: As scheduled on Drawings.

2.9 FINISHES

A. Color:

1. Wiring Devices Connected to Normal Power System: Gray, unless otherwise indicated or required by NFPA 70.
2. Wiring Devices Connected to Emergency Power System: Red.
3. TVSS Devices: Blue.
4. Isolated-Ground Receptacles: Orange; or as specified above, with orange triangle on face.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install devices and assemblies level, plumb, and square with building lines.

B. Install wall dimmers to achieve indicated rating after derating for ganging according to manufacturer's written instructions.

C. Install unshared neutral conductors on line and load side of dimmers according to manufacturers' written instructions.

D. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical, and with grounding terminal of receptacles on bottom. Group adjacent switches under single, multigang wall plates. Group adjacent voice or data outlets under single, multigang wall plates.

E. Remove wall plates and protect devices and assemblies during painting.

F. Adjust locations of floor service outlets and service poles to suit arrangement of partitions and furnishings.

G. Devices installed within gondola shelving are to be wired with Type MC metal-clad cable run in the protected spaces behind back panels and under the base shelf, supported above the floor by the holes in the base shelf supports. Coordinate the final exact locations with store operations personnel through the Government’s Designated Inspector. Receptacles mounted in the toe space below the base shelf are to be aligned with the long dimension horizontal.

3.2 IDENTIFICATION

A. Comply with Division 26 Section Identification for Electrical Systems.

1. Receptacles: Identify panelboard and circuit number from which served. Use engraved machine printing with black-filled lettering on face of plate, and durable wire markers or tags inside outlet boxes.

3.3 CONNECTIONS

A. Ground equipment according to Division 26 Section Grounding and Bonding for Electrical Systems.

B. Connect wiring according to Division 26 Section Low-Voltage Electrical Power Conductors and Cables.

C. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.4 FIELD QUALITY CONTROL

A. Perform the following field tests and inspections and prepare test reports:

1. After installing wiring devices and after electrical circuitry has been energized, test for proper polarity, ground continuity, and compliance with requirements.
2. Test GFCI operation with both local and remote fault simulations according to manufacturer's written instructions.

B. Remove malfunctioning units, replace with new units, and retest as specified above.

END OF SECTION

SECTION 26 28 13

FUSES

(Edited from DeCA June 2011 Design Criteria)

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Cartridge fuses rated 600 V and less for use in switches, switchboards, controllers, and motor-control centers.
2. Spare-fuse cabinets.

1.2 SUBMITTALS

A. Product Data: Include the following for each fuse type indicated:

1. Dimensions and manufacturer's technical data on features, performance, electrical characteristics, and ratings.
2. Let-through current curves for fuses with current-limiting characteristics.
3. Time-current curves, coordination charts and tables, and related data.
4. Fuse size for elevator feeders and elevator disconnect switches.

B. Ambient Temperature Adjustment Information: If ratings of fuses have been adjusted to accommodate ambient temperatures, provide list of fuses with adjusted ratings.

1. For each fuse having adjusted ratings, include location of fuse, original fuse rating, local ambient temperature, and adjusted fuse rating.
2. Provide manufacturer's technical data on which ambient temperature adjustment calculations are based.

C. Operation and Maintenance Data: For fuses to include in emergency, operation, and maintenance manuals.

1. In addition to items specified in Division 01 Section Closeout Procedures, include the following:

a. Let-through current curves for fuses with current-limiting characteristics.
b. Time-current curves, coordination charts and tables, and related data.
c. Ambient temperature adjustment information.

1.3 QUALITY ASSURANCE

A. Source Limitations: Obtain fuses from a single manufacturer.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

C. Comply with NEMA FU 1.

D. Comply with NFPA 70.

1.4 PROJECT CONDITIONS

A. Where ambient temperature to which fuses are directly exposed is less than 40 deg F or more than 100 deg F, apply manufacturer's ambient temperature adjustment factors to fuse ratings.

1.5 COORDINATION

A. Coordinate fuse ratings with utilization equipment nameplate limitations of maximum fuse size.

1.6 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Fuses: Quantity equal to ten percent of each fuse type and size, but no fewer than 3 of each type and size.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Cooper Bussman, Inc.
2. Eagle Electric Mfg. Co., Inc.; Cooper Industries, Inc.
3. Ferraz Shawmut, Inc.
4. Tracor, Inc.; Littelfuse, Inc. Subsidiary.

2.2 CARTRIDGE FUSES

A. Characteristics: NEMA FU 1, nonrenewable cartridge fuse; class and current rating indicated; voltage rating consistent with circuit voltage.

2.3 SPARE-FUSE CABINET

A. Cabinet: Wall-mounted, 0.05-inch- thick steel unit with full-length, recessed piano-hinged door and key-coded cam lock and pull.

1. Size: Adequate for storage of spare fuses specified with 15 percent spare capacity minimum.
2. Finish: Gray, baked enamel.
3. Identification: "SPARE FUSES" in 1-1/2-inch- high letters on exterior of door.
4. Fuse Pullers: For each size of fuse.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine utilization equipment nameplates and installation instructions. Install fuses of sizes and with characteristics appropriate for each piece of equipment.

B. Evaluate ambient temperatures to determine if fuse rating adjustment factors must be applied to fuse ratings.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 FUSE APPLICATIONS

A. Service Entrance: Class **L, fast acting**.

B. Feeders: Class **L, fast acting**.

C. Motor Branch Circuits: Class **RK1**, time delay.

D. Other Branch Circuits: Class **RK1, time delay**.

3.3 INSTALLATION

A. Install fuses in fusible devices. Arrange fuses so rating information is readable without removing fuse.

B. Install spare-fuse cabinet(s).

3.4 IDENTIFICATION

A. Install labels indicating fuse replacement information on inside door of each fused switch or other fusible device.

END OF SECTION

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SECTION 26 28 16

ENCLOSED SWITCHES AND CIRCUIT BREAKERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Individually mounted, enclosed switches and circuit breakers:

a. Fusible switches.
b. Nonfusible switches.
c. Molded-case switches.
d. Enclosures.

1.2 DEFINITIONS

A. GD: General duty.

B. GFCI: Ground-fault circuit interrupter.

C. HD: Heavy duty.

D. RMS: Root mean square.

E. SPDT: Single pole, double throw.

1.3 SUBMITTALS

A. Product Data: For each type of enclosed switch, circuit breaker, accessory, and component indicated. Include dimensioned elevations, sections, weights, and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.

1. Enclosure types and details for types other than NEMA 250, Type 1.
2. Current and voltage ratings.
3. Short-circuit current rating.
4. UL listing for series rating of installed devices.
5. Features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.

B. Shop Drawings: Diagram power, signal, and control wiring.

C. Manufacturer Seismic Qualification Certification: Submit certification that enclosed switches and circuit breakers, accessories, and components will withstand seismic forces defined in Division 26 Section Vibration and Seismic Controls for Electrical Systems. Include the following:

1. Basis of Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.

   a. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified."

2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

D. Qualification Data: For testing agency, if used.

E. Field quality-control test reports including the following:

1. Test procedures used.
2. Test results that comply with requirements.
3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.

F. Operation and Maintenance Data: For enclosed switches and circuit breakers to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 01 Section Closeout Procedures, include the following:

1. Manufacturer's written instructions for testing and adjusting enclosed switches and circuit breakers.
2. Time-current curves, including selectable ranges for each type of circuit breaker.

1.4 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Comply with NFPA 70.

C. Product Selection for Restricted Space: Drawings indicate maximum dimensions for enclosed switches and circuit breakers, including clearances between enclosures, and adjacent surfaces and other items. Comply with indicated maximum dimensions.

1.5 PROJECT CONDITIONS

A. Environmental Limitations: Rate equipment for continuous operation under the following conditions, unless otherwise indicated:

1. Ambient Temperature: Not less than minus 22 deg F and not exceeding 104 deg F.
2. Altitude: Not exceeding 6600 feet.

1.6 COORDINATION

A. Coordinate layout and installation of switches, circuit breakers, and components with other construction, including conduit, piping, equipment, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

1.7 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Spares: For the following:

a. Potential Transformer Fuses: One set of each size and type used.
b. Control-Power Fuses: One set of each size and type used.
c. Fuses for Fusible Switches: One set of each size and type used.
d. Fuses for Fused Power Circuit Devices: One set of each size and type used.

2. Spare Indicating Lights: **One set** of each type installed.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.

2.2 FUSIBLE AND NONFUSIBLE SWITCHES

A. Available Manufacturers:

1. Eaton Corporation; Cutler-Hammer Products.
2. General Electric Co.; Electrical Distribution & Control Division.
3. Siemens Energy & Automation, Inc.
4. Square D/Group Schneider.

B. Fusible Switch, 1200 A and Smaller: NEMA KS 1, Type HD, with clips or bolt pads to accommodate specified fuses, lockable handle with capability to accept two padlocks, and interlocked with cover in closed position.

C. Nonfusible Switch, 1200 A and Smaller: NEMA KS 1, Type HD, lockable handle with capability to accept two padlocks, and interlocked with cover in closed position.

D. Accessories:

1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.

2. Neutral Kit: Internally mounted; insulated, capable of being grounded, and bonded; and labeled for copper and aluminum neutral conductors.
3. Auxiliary Contact Kit: Auxiliary set of contacts arranged to open before switch blades open.

2.3 MOLDED-CASE CIRCUIT BREAKERS AND SWITCHES

A. Available Manufacturers:

1. Eaton Corporation; Cutler-Hammer Products.
2. General Electric Co.; Electrical Distribution & Control Division.
3. Moeller Electric Corporation.
4. Siemens Energy & Automation, Inc.
5. Square D/Group Schneider.

B. Molded-Case Circuit Breaker: NEMA AB 1, with interrupting capacity to meet available fault currents.

1. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
2. Adjustable Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.
3. Electronic Trip-Unit Circuit Breakers: RMS sensing; field-replaceable rating plug; with the following field-adjustable settings:

   a. Instantaneous trip.
   b. Long- and short-time pickup levels.
   c. Long- and short-time time adjustments.
   d. Ground-fault pickup level, time delay, and I^2t response.

4. Current-Limiting Circuit Breakers: Frame sizes 400 A and smaller and let-through ratings less than NEMA FU 1, RK-5.
5. GFCI Circuit Breakers: Single- and two-pole configurations with **5**-mA trip sensitivity.

C. Molded-Case Circuit-Breaker Features and Accessories:

1. Standard frame sizes, trip ratings, and number of poles.
2. Lugs: Mechanical style **with compression lug kits** suitable for number, size, trip ratings, and conductor material.
3. Application Listing: Type SWD for switching fluorescent lighting loads; Type HACR for heating, air-conditioning, and refrigerating equipment.
4. Ground-Fault Protection: **Integrally mounted** relay and trip unit with adjustable pickup and time-delay settings, push-to-test feature, and ground-fault indicator.
5. Shunt Trip: 120-V trip coil energized from separate circuit, set to trip at **55** percent of rated voltage.
6. Undervoltage Trip: Set to operate at 35 to 75 percent of rated voltage **with field-adjustable 0.1- to 0.6-second** time delay.
7. Auxiliary Switch: **One SPDT switch** with "a" and "b" contacts; "a" contacts mimic circuit-breaker contacts, "b" contacts operate in reverse of circuit-breaker contacts.
8. Key Interlock Kit: Externally mounted to prohibit circuit-breaker operation; key shall be removable only when circuit breaker is in off position.
9. Zone-Selective Interlocking: Integral with electronic trip unit; for interlocking ground-fault protection function.

D. Molded-Case Switches: Molded-case circuit breaker with fixed, high-set instantaneous trip only, and short-circuit withstand rating equal to equivalent breaker frame size interrupting rating.

E. Molded-Case Switch Accessories:

1. Lugs: Mechanical style **with compression lug kits** suitable for number, size, trip ratings, and material of conductors.
2. Application Listing: Type HACR for heating, air-conditioning, and refrigerating equipment.
3. Shunt Trip: 120-V trip coil energized from separate circuit, set to trip at **55** percent of rated voltage. Provide "dummy" trip unit where required for proper operation.
4. Undervoltage Trip: Set to operate at 35 to 75 percent of rated voltage **with field-adjustable 0.1- to 0.6-second** time delay. Provide "dummy" trip unit where required for proper operation.
5. Auxiliary Switch: **One SPDT switch** with "a" and "b" contacts; "a" contacts mimic circuit-breaker contacts, "b" contacts operate in reverse of circuit-breaker contacts.
6. Key Interlock Kit: Externally mounted to prohibit operation; key shall be removable only when switch is in off position.

2.4 ENCLOSURES

A. NEMA AB 1 and NEMA KS 1 to meet environmental conditions of installed location.

1. Outdoor Locations: NEMA 250, Type 3R.
2. Kitchen Areas: NEMA 250, Type 4X, stainless steel.
3. Other Wet or Damp Indoor Locations: NEMA 250, Type 4.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine elements and surfaces to receive enclosed switches and circuit breakers for compliance with installation tolerances and other conditions affecting performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 CONCRETE BASES

A. Coordinate size and location of concrete bases. Verify structural requirements with structural engineer.

B. Concrete base is specified in Division 26 Section Common Work Results for Electrical, and concrete materials and installation requirements are specified in Division 03.

3.3 INSTALLATION

A. Comply with applicable portions of NECA 1, NEMA PB 1.1, and NEMA PB 2.1 for installation of enclosed switches and circuit breakers.

B. Mount individual wall-mounting switches and circuit breakers with tops at uniform height, unless otherwise indicated. Anchor floor-mounting switches to concrete base.

C. Comply with mounting and anchoring requirements specified in Division 26 Section Vibration and Seismic Controls for Electrical Systems.

D. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.

3.4 IDENTIFICATION

A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs as specified in Division 26 Section Identification for Electrical Systems.

B. Enclosure Nameplates: Label each enclosure with engraved metal or laminated-plastic nameplate as specified in Division 26 Section Identification for Electrical Systems.

3.5 FIELD QUALITY CONTROL

A. Prepare for acceptance testing as follows:

1. Inspect mechanical and electrical connections.
2. Verify switch and relay type and labeling verification.
3. Verify rating of installed fuses.
4. Inspect proper installation of type, size, quantity, and arrangement of mounting or anchorage devices complying with manufacturer's certification.

B. Perform the following field tests and inspections and prepare test reports:

1. Test mounting and anchorage devices according to requirements in Division 26 Section Vibration and Seismic Controls for Electrical Systems.
2. Perform each electrical test and visual and mechanical inspection stated in NETA ATS, Section 7.5 for switches and Section 7.6 for molded-case circuit breakers. Certify compliance with test parameters.
3. Check all features of each installed switch and circuit breaker for proper operation.
4. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
5. Infrared Scanning:

   a. Initial Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each enclosed switch and circuit breaker. Open or remove doors or panels so connections are accessible to portable scanner.
   b. Instruments, Equipment and Reports:

      1) Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
      2) Prepare a certified report that identifies enclosed switches and circuit breakers included and describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.6 ADJUSTING

A. Set field-adjustable switches and circuit-breaker trip ranges.

3.7 CLEANING

A. On completion of installation, vacuum dirt and debris from interiors; do not use compressed air to assist in cleaning.

B. Inspect exposed surfaces and repair damaged finishes.

END OF SECTION

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SECTION 26 32 14

DIESEL-ENGINE DRIVEN GENERATOR SETS

(Edited from DeCA June 2011 Design Criteria)

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Packaged diesel-engine generator sets with the following features and accessories:

a. Battery charger.
b. Day tank.
c. Engine-generator set.
d. Muffler.
e. Exhaust piping external to set.
f. Outdoor enclosure.
g. Remote annunciator.
h. Remote stop switch.
i. Starting battery.

B. Related Sections:

1. Division 26 Section Transfer Switches for transfer switches including sensors and relays to initiate automatic-starting and -stopping signals for engine-generator sets.

1.2 DEFINITIONS

A. Operational Bandwidth: The total variation from the lowest to highest value of a parameter over the range of conditions indicated, expressed as a percentage of the nominal value of the parameter.

B. Steady-State Voltage Modulation: The uniform cyclical variation of voltage within the operational bandwidth, expressed in Hertz or cycles per second.

1.3 SUBMITTALS

A. Product Data: Include the following:

1. Data on features, components, accessories ratings, and performance.
2. Thermal damage curve for generator.
3. Time-current characteristic curves for generator protective device.

B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

1. Dimensioned outline plan and elevation drawings of engine-generator set and other components specified.
2. Design Calculations: Signed and sealed by a qualified professional engineer. Calculate requirements for selecting vibration isolators and seismic restraints and for designing vibration isolation bases.
3. Vibration Isolation Base Details: Signed and sealed by a qualified professional engineer. Detail fabrication, including anchorages and attachments to structure and to supported equipment. Include base weights.
4. Wiring Diagrams: Power, signal, and control wiring.

C. Welding certificates.

D. Manufacturer Seismic Qualification Certification: Submit certification that day tank, engine-generator set, batteries, battery racks, accessories, and components will withstand seismic forces defined in Division 26 Section Vibration and Seismic Controls for Electrical Systems. Include the following:

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.

   a. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified."
   b. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."

2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

E. Qualification Data: For Installer and testing agency.

F. Certified summary of prototype-unit test report.

G. Certified Test Reports: For components and accessories that are equivalent, but not identical, to those tested on prototype unit.

H. Certified Summary of Performance Tests: Demonstrate compliance with specified requirement to meet performance criteria for sensitive loads.

I. Test Reports:

1. Report of factory test on units to be shipped for this Project, showing evidence of compliance with specified requirements.
2. Report of sound generation.
3. Field quality-control test reports.

J. Certification of Torsional Vibration Compatibility: Comply with NFPA 110.

K. Operation and Maintenance Data: For packaged engine generators to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 01 Section Closeout Procedures, include the following:

1. List of tools and replacement items recommended to be stored at the Project for ready access. Include part and drawing numbers, current unit prices, and source of supply.

L. Warranty: Special warranty specified in this Section.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.

1. Maintenance Proximity: Not more than four hours' normal travel time from Installer's place of business to Project site.
2. Engineering Responsibility: Preparation of data for vibration isolators and seismic restraints of engine skid mounts, including Shop Drawings, based on testing and engineering analysis of manufacturer's standard units in assemblies similar to those indicated for this Project.

B. Manufacturer Qualifications: A qualified manufacturer. Maintain, within 200 miles of Project site, a service center capable of providing training, parts, and emergency maintenance repairs.

C. Source Limitations: Obtain packaged generator sets and auxiliary components through one source from a single manufacturer.

D. Product Options: Drawings indicate size, profiles, and dimensional requirements of packaged generator sets and are based on the specific system indicated.

E. Welding: Qualify procedures and personnel according to ASME Boiler and Pressure Vessel Code: Section IX for welding exhaust-system piping.

F. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

G. Comply with NFPA 37.

H. Comply with NFPA 70.

I. Comply with NFPA 110 requirements for Level **2** emergency power supply system.

J. Engine Exhaust Emissions: Comply with applicable state and local government requirements.

K. Noise Emission: Comply with Host Military Base requirements for maximum noise level at adjacent property boundaries due to sound emitted by generator set including engine, engine exhaust, engine cooling-air intake and discharge, and other components of installation.

1.5 COORDINATION

A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 03.

1.6 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of packaged engine generators and associated auxiliary components that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Five years from date of Substantial Completion.

1.7 MAINTENANCE SERVICE

A. Initial Maintenance Service: Beginning at Substantial Completion, provide 12 months' full maintenance by skilled employees of manufacturer's designated service organization. Include quarterly exercising to check for proper starting, load transfer, and running under load. Include routine preventive maintenance as recommended by manufacturer and adjusting as required for proper operation. Maintenance agreements shall include parts and supplies as used in manufacture and installation of original equipment.

1.8 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Fuses: One for every 10 of each type and rating, but not less than one of each.
2. Indicator Lamps: Two for every six of each type used, but not less than two of each.
3. Filters: One set each of lubricating oil, fuel, and combustion-air filters.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Caterpillar; Engine Div.
2. Generac Power Systems, Inc.
3. Kohler Co; Generator Division.
4. Onan Corp./Cummins Power Generation; Industrial Business Group.

2.2 ENGINE-GENERATOR SET

A. Packaged engine-generator set shall be a coordinated assembly of compatible components.

B. Power Output Ratings: Nominal ratings as indicated, with capacity as required to operate as a unit as evidenced by records of prototype testing.

C. Output Connections: Three phase, four wire.

D. Safety Standard: Comply with ASME B15.1.

E. Nameplates: Each major system component shall be equipped with a nameplate to identify manufacturer's name and address, and model and serial number of component.

F. Fabricate engine-generator-set mounting frame and attachment of components to resist generator-set movement during a seismic event when generator-set mounting frame is anchored to building structure.

G. Mounting Frame: Adequate strength and rigidity to maintain alignment of mounted components without depending on concrete foundation. Mounting frame shall be free from sharp edges and corners and shall have lifting attachments arranged for lifting with slings without damaging components.

1. Rigging Diagram: Inscribed on metal plate permanently attached to mounting frame to indicate location and lifting capacity of each lifting attachment and generator-set center of gravity.

2.3 GENERATOR-SET PERFORMANCE FOR SENSITIVE LOADS

A. Meet ISO 8528-5 G3 requirements. Oversizing generator compared with the rated power output of the engine is permissible to meet specified performance.

1. Nameplate Data for Oversized Generator: Show ratings required by the Contract Documents rather than ratings that would normally be applied to generator size installed.

B. Steady-State Voltage Operational Bandwidth: +/- 2 percent of rated output voltage from no load to full load.

C. Steady-State Voltage Modulation Frequency: Less than 1 Hz.

D. Transient Voltage Performance: Not more than 10 percent variation for 50 percent step-load increase or decrease. Voltage shall recover and remain within the steady-state operating band within 0.5 second.

E. Steady-State Frequency Operational Bandwidth: Plus or minus 0.25 percent of rated frequency from no load to full load.

F. Steady-State Frequency Stability: When system is operating at any constant load within the rated load, there shall be no random speed variations outside the steady-state operational band and no hunting or surging of speed.

G. Transient Frequency Performance: Less than 5.0 percent variation for a 50 percent step-load increase or decrease. Frequency shall recover and remain within the steady-state operating band within three seconds.

H. Output Waveform: At no load, harmonic content measured line to neutral shall not exceed 2 percent total with no slot ripple. The telephone influence factor, determined according to NEMA MG 1, shall not exceed 50 percent.

I. Sustained Short-Circuit Current: For a 3-phase, bolted short circuit at system output terminals, the system shall supply a minimum of 300 percent of rated full-load current for not less than 10 seconds and then clear the fault automatically, without damage to winding insulation or other generator system components.

J. Excitation System: Performance shall be unaffected by voltage distortion caused by nonlinear load.

K. Start Time: Comply with NFPA 110, Type 10, system requirements.

2.4 SERVICE CONDITIONS

A. Environmental Conditions: Engine-generator system shall withstand the following environmental conditions without mechanical or electrical damage or degradation of performance capability:

1. Ambient Temperature: **5 to 104 deg F.**
2. Relative Humidity: 0 to 95 percent.
3. Altitude: Sea level to **1000 feet**.

2.5 ENGINE

A. Fuel: Fuel oil, Grade DF-2.

B. Rated Engine Speed: 1800 rpm.

C. Maximum Piston Speed for Four-Cycle Engines: 2250 fpm.

D. Lubrication System: The following items are mounted on engine or skid:

1. Filter and Strainer: Rated to remove 90 percent of particles 5 micrometers and smaller while passing full flow.
2. Thermostatic Control Valve: Control flow in system to maintain optimum oil temperature. Unit shall be capable of full flow and is designed to be fail-safe.
3. Crankcase Drain: Arranged for complete gravity drainage to an easily removable container with no disassembly and without use of pumps, siphons, special tools, or appliances.

E. Engine Fuel System:

1. Main Fuel Pump: Mounted on engine. Pump ensures adequate primary fuel flow under starting and load conditions.
2. Relief-Bypass Valve: Automatically regulates pressure in fuel line and returns excess fuel to source.

F. Coolant Jacket Heater: Electric-immersion type, factory installed in coolant jacket system. Comply with NFPA 110 requirements for Level 1 equipment for heater capacity.

G. Governor: Adjustable isochronous, with speed sensing.

2.6 ENGINE COOLING SYSTEM

A. Radiator: Rated for specified coolant.

1. Radiator Core Tubes: Nonferrous-metal construction other than aluminum.
2. Size of Radiator: Adequate to contain expansion of total system coolant from cold start to 110 percent load condition.

3. Fan: Driven by multiple belts from engine shaft.

B. Coolant: Solution of 50 percent ethylene-glycol-based antifreeze and 50 percent water, with anticorrosion additives as recommended by engine manufacturer.

C. Expansion Tank: Constructed of welded steel plate and rated to withstand maximum closed-loop coolant system pressure for engine used. Equip with gage glass and petcock.

D. Temperature Control: Self-contained, thermostatic-control valve modulates coolant flow automatically to maintain optimum constant coolant temperature as recommended by engine manufacturer.

E. Coolant Hose: Flexible assembly with inside surface of nonporous rubber and outer covering of aging-, ultraviolet-, and abrasion-resistant fabric.

1. Rating: 50-psig maximum working pressure with coolant at 180 deg F, and noncollapsible under vacuum.
2. End Fittings: Flanges or steel pipe nipples with clamps to suit piping and equipment connections.

2.7 FUEL SUPPLY SYSTEM

A. Comply with NFPA 30.

B. Base-Mounted Fuel Oil Tank: Factory installed and piped, complying with UL 142 fuel oil tank. Features include the following:

1. Tank level indicator.
2. Capacity: Fuel for forty-eight hours' continuous operation at 100 percent rated power output.
3. Vandal-resistant fill cap.
4. Containment Provisions: Comply with requirements of authorities having jurisdiction.

2.8 ENGINE EXHAUST SYSTEM

A. Muffler: Industrial type, sized as recommended by engine manufacturer; sound level in the 20- to 75-Hz frequency band measured at a distance of 25 feet from exhaust discharge shall be 87 dBA or less.

B. Condensate Drain for Muffler: Schedule 40, black steel pipe connected to muffler drain outlet through a petcock.

C. Connection from Engine to Exhaust System: Flexible section of corrugated stainless-steel pipe.

D. Connection from Exhaust Pipe to Muffler: Stainless-steel expansion joint with liner.

E. Exhaust Piping External to Engine: ASTM A 53/A 53M, Schedule 40, welded, black steel, with welded joints and fittings.

2.9 COMBUSTION-AIR INTAKE

A. Description: Heavy-duty, engine-mounted air cleaner with replaceable dry-filter element and "blocked filter" indicator.

2.10 STARTING SYSTEM

A. Description: **12**-V electric, with negative ground and including the following items:

1. Components: Sized so they will not be damaged during a full engine-cranking cycle with ambient temperature at maximum specified in "Environmental Conditions" Paragraph in "Service Conditions" Article.
2. Cranking Motor: Heavy-duty unit that automatically engages and releases from engine flywheel without binding.
3. Cranking Cycle: As required by NFPA 110 for system level specified.
4. Battery: Adequate capacity within ambient temperature range specified in "Environmental Conditions" Paragraph in "Service Conditions" Article to provide specified cranking cycle at least three times without recharging.
5. Battery Cable: Size as recommended by engine manufacturer for cable length indicated. Include required interconnecting conductors and connection accessories.
6. Battery Compartment: Factory fabricated of metal with acid-resistant finish and thermal insulation. Thermostatically controlled heater shall be arranged to maintain battery above 50 deg F regardless of external ambient temperature within range specified in "Environmental Conditions" Paragraph in "Service Conditions" Article. Include accessories required to support and fasten batteries in place.
7. Battery-Charging Alternator: Factory mounted on engine with solid-state voltage regulation and 35-A minimum continuous rating.
8. Battery Charger: Current-limiting, automatic-equalizing and float-charging type. Unit shall comply with UL 1236 and include the following features:

    a. Operation: Equalizing-charging rate of 10 A shall be initiated automatically after battery has lost charge until an adjustable equalizing voltage is achieved at battery terminals. Unit shall then be automatically switched to a lower float-charging mode and shall continue to operate in that mode until battery is discharged again.
    b. Automatic Temperature Compensation: Adjust float and equalize voltages for variations in ambient temperature from minus 40 deg F to plus 140 deg F to prevent overcharging at high temperatures and undercharging at low temperatures.
    c. Automatic Voltage Regulation: Maintain constant output voltage regardless of input voltage variations up to plus or minus 10 percent.
    d. Ammeter and Voltmeter: Flush mounted in door. Meters shall indicate charging rates.
    e. Safety Functions: Sense abnormally low battery voltage and close contacts providing low battery voltage indication on control and monitoring panel. Sense high battery voltage and loss of ac input or dc output of battery charger. Either condition shall close contacts that provide a battery-charger malfunction indication at system control and monitoring panel.
    f. Enclosure and Mounting: NEMA 250, Type 1, wall-mounted cabinet.

2.11 CONTROL AND MONITORING

A. Functional Description: When mode-selector switch on the control and monitoring panel is in the automatic position, remote-control contacts in one or more separate automatic transfer

switches initiate starting and stopping of the generator set. When mode-selector switch is switched to the on position, the generator set starts. The off position of the same switch initiates generator-set shutdown. When generator set is running, specified system or equipment failures or derangements automatically shut down the generator set and initiate alarms. Operation of a remote emergency-stop switch also shuts down the generator set.

B. Configuration: Operating and safety indications, protective devices, basic system controls, and engine gages shall be grouped in a common control and monitoring panel mounted on the generator set. Mounting method shall isolate the control panel from generator-set vibration.

C. Indicating and protective devices and controls shall include those required by NFPA 110 for a Level 1 system, and the following:

1. AC voltmeter.
2. AC ammeter.
3. AC frequency meter.
4. DC voltmeter (alternator battery charging).
5. Engine-coolant temperature gage.
6. Engine lubricating-oil pressure gage.
7. Running-time meter.
8. Ammeter-voltmeter, phase-selector switch(es).
9. Generator-voltage adjusting rheostat.
10. Fuel tank derangement alarm.
11. Fuel tank high-level shutdown of fuel supply alarm.
12. Generator overload.

D. Supporting Items: Include sensors, transducers, terminals, relays, and other devices and include wiring required to support specified items. Locate sensors and other supporting items on engine or generator, unless otherwise indicated.

E. Common Remote Audible Alarm: Comply with NFPA 110 requirements for Level 1 systems. Include necessary contacts and terminals in control and monitoring panel.

1. Overcrank shutdown.
2. Coolant low-temperature alarm.
3. Control switch not in auto position.
4. Battery-charger malfunction alarm.
5. Battery low-voltage alarm.

F. Remote Alarm Annunciator: Comply with NFPA 99. Labeled LED shall identify each alarm event. Common audible signal shall sound for alarm conditions. Silencing switch in face of panel shall silence signal without altering visual indication. Connect so that after an alarm is silenced, clearing of initiating condition will reactivate alarm until silencing switch is reset. Cabinet and faceplate are surface- or flush-mounting type to suit mounting conditions indicated.

G. Remote Emergency-Stop Switch: Flush; wall mounted, unless otherwise indicated; and labeled. Push button shall be protected from accidental operation.

2.12 GENERATOR OVERCURRENT AND FAULT PROTECTION

A. Generator Circuit Breaker: Molded-case, electronic full function- type; 100 percent rated; complying with NEMA AB 1 and UL 489.

1. Tripping Characteristic: Designed specifically for generator protection.

2. Trip Rating: Matched to generator rating.
3. Shunt Trip: Connected to trip breaker when generator set is shut down by other protective devices.
4. Mounting: Adjacent to or integrated with control and monitoring panel.

2.13 GENERATOR, EXCITER, AND VOLTAGE REGULATOR

A. Comply with NEMA MG 1 and specified performance requirements.

B. Drive: Generator shaft shall be directly connected to engine shaft. Exciter shall be rotated integrally with generator rotor.

C. Electrical Insulation: Class H or Class F.

D. Stator-Winding Leads: Brought out to terminal box to permit future reconnection for other voltages if required.

E. Construction shall prevent mechanical, electrical, and thermal damage due to vibration, overspeed up to 125 percent of rating, and heat during operation at 110 percent of rated capacity.

F. Excitation shall use no slip or collector rings, or brushes, and shall be arranged to sustain generator output under short-circuit conditions as specified.

G. Enclosure: Dripproof.

H. Instrument Transformers: Mounted within generator enclosure.

I. Voltage Regulator: Solid-state type, separate from exciter, providing performance as specified.

1. Adjusting rheostat on control and monitoring panel shall provide plus or minus 5 percent adjustment of output-voltage operating band.

2. Provide automatic compensation for feeder voltage drop between the generator output terminals and the distribution panel, to maintain stable voltage at the panel.

J. Strip Heater: Thermostatically controlled unit arranged to maintain stator windings above dew point.

K. Windings: Two-thirds pitch stator winding and fully linked amortisseur winding.

L. Subtransient Reactance: 12 percent, maximum.

2.14 OUTDOOR GENERATOR-SET ENCLOSURE

A. Description: Vandal-resistant, weatherproof steel housing, wind resistant up to 100 mph. Multiple panels shall be lockable and provide adequate access to components requiring maintenance. Panels shall be removable by one person without tools. Instruments and control shall be mounted within enclosure.

2.15 FINISHES

A. Indoor and Outdoor Enclosures and Components: Manufacturer's standard enamel over corrosion-resistant pretreatment and compatible standard primer.

2.16 SOURCE QUALITY CONTROL

A. Prototype Testing: Factory test engine-generator set using same engine model, constructed of identical or equivalent components and equipped with identical or equivalent accessories.

1. Tests: Comply with NFPA 110, Level 1 energy converters in Paragraphs 3.2.1, 3.2.1.1, and 3.2.1.2.
2. Generator Tests: Comply with IEEE 115.
3. Components and Accessories: Items furnished with installed unit that are not identical to those on tested prototype shall have been factory tested to demonstrate compatibility and reliability.

B. Project-Specific Equipment Tests: Before shipment, factory test engine-generator set and other system components and accessories manufactured specifically for this Project. Perform tests at rated load and power factor. Include the following tests:

1. Full load run.
2. Maximum power.
3. Voltage regulation.
4. Transient and steady-state governing.
5. Single-step load pickup.
6. Safety shutdown.

C. Report factory test results within 10 days of completion of test.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas, equipment bases, and conditions, with Installer present, for compliance with requirements for installation and other conditions affecting packaged engine-generator performance.

B. Examine roughing-in of piping systems and electrical connections. Verify actual locations of connections before packaged engine-generator installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 CONCRETE BASES

A. Coordinate size and location of concrete bases. Verify structural requirements with structural engineer.

B. Concrete base is specified in Division 26 Section Common Work Results for Electrical, and concrete materials and installation requirements are specified in Division 03.

3.3 INSTALLATION

A. Comply with packaged engine-generator manufacturers' written installation and alignment instructions and with NFPA 110.

B. Install packaged engine generators level on concrete base.

1. Vibration Isolation: Mount packaged engine generators on **rubber pads**. Vibration isolation devices and installation requirements are specified in Division 21 Section Fire-Suppression Sprinkler Systems, Division 22 Section Vibration and Seismic Controls for Plumbing Piping and Equipment, Division 23 Section Vibration and Seismic Controls for HVAC Piping and Equipment.

C. Vibration Isolation: Mount packaged engine generators on vibration isolation equipment base as specified in Division 21 Section Fire-Suppression Sprinkler Systems, Division 22 Section Vibration and Seismic Controls for Plumbing Piping and Equipment, Division 23 Section Vibration and Seismic Controls for HVAC Piping and Equipment.

D. Install packaged engine generator to provide access, without removing connections or accessories, for periodic maintenance.

E. Install exhaust-system piping. Extend to point of termination outside structure. Size piping according to manufacturer's written instructions.

1. Install condensate drain piping for engine exhaust system. Extend drain piping from low points of exhaust system and from muffler to condensate traps and to point of disposition.
2. Support exhaust piping and muffler with pipe hangers spaced a maximum of 20 feet horizontally and at each floor vertically. Pipe hangers are specified in Division 21 Fire-Suppression Sprinkler Systems, Division 22 Section Common Work Results for Plumbing, and Division 23 Section Hangers and Supports for HVAC Piping and Equipment.
3. Restrain exhaust piping and mufflers with cable-type bracing assemblies. Cable-type bracing assemblies are specified in Division 26 Section Vibration and Seismic Controls for Electrical Systems.

F. Electrical Wiring: Install electrical devices furnished by equipment manufacturers but not specified to be factory mounted.

3.4 CONNECTIONS

A. Piping installation requirements are specified in Division 21, 22 and 23 Sections. Drawings indicate general arrangement of piping and specialties. The following are specific connection requirements:

1. Install fuel, cooling-system, and exhaust-system piping adjacent to packaged engine generator to allow service and maintenance.
2. Connect cooling-system water supply and drain piping to diesel-engine heat exchangers. Install flexible connectors at connections to engine generator and remote radiator.
3. Connect fuel piping to engines with a gate valve and union.

a. Diesel storage tanks, tank accessories, piping, valves, and specialties for fuel systems outside the building are specified in Division 23 Section Fuel Oil Distribution.

b. Diesel fuel piping, valves, and specialties inside the building are specified in Division 23 Section Fuel Oil Piping.

4. Connect exhaust-system piping to engines.

B. Ground equipment according to Division 26 Section Grounding and Bonding for Electrical Systems.

C. Connect wiring according to Division 26 Section Low-Voltage Electrical Power Conductors and Cables.

D. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.5 IDENTIFICATION

A. Identify system components according to Division 21 Section Identification for Fire-Suppression Sprinkler Systems, Division 22 Section Common Work Results for Plumbing, Division 23 Section Identification for HVAC Piping and Equipment, and Division 26 Section Identification for Electrical Systems.

3.6 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust field-assembled components and equipment installation, including connections, and to assist in field testing. Report results in writing.

B. Perform the following field tests and inspections and prepare test reports:

1. Perform each electrical test and visual and mechanical inspection stated in NETA ATS, Sections 7.15.2.1 and 7.22.1 (except for vibration baseline test). Certify compliance with test parameters.
2. Perform tests recommended by manufacturer.
3. NFPA 110 Acceptance Tests: Perform tests required by NFPA 110 that are additional to those specified here including, but not limited to, the following:

   a. Single-step full-load pickup test.

4. Battery Tests: Equalize charging of battery cells according to manufacturer's written instructions. Record individual cell voltages.

   a. Measure charging voltage and voltages between available battery terminals for full-charging and float-charging conditions. Check electrolyte level and specific gravity under both conditions.
   b. Test for contact integrity of all connectors. Perform an integrity load test and a capacity load test for the battery.
   c. Verify acceptance of charge for each element of the battery after discharge.
   d. Verify that measurements are within manufacturer's specifications.

5. Battery-Charger Tests: Verify specified rates of charge for both equalizing and float-charging conditions.

6. System Integrity Tests: Methodically verify proper installation, connection, and integrity of each element of engine-generator system before and during system operation. Check for air, exhaust, and fluid leaks.
7. Exhaust-System Back-Pressure Test: Use a manometer with a scale exceeding 40-inch wg. Connect to exhaust line close to engine exhaust manifold. Verify that back pressure at full-rated load is within manufacturer's written allowable limits for the engine.
8. Exhaust Emissions Test: Comply with applicable government test criteria.
9. Voltage and Frequency Transient Stability Tests: Use recording oscilloscope to measure voltage and frequency transients for 50 and 100 percent step-load increases and decreases, and verify that performance is as specified.
10. Harmonic-Content Tests: Measure harmonic content of output voltage under 25 percent and at 100 percent of rated linear load. Verify that harmonic content is within specified limits.
11. Noise Level Tests: Measure A-weighted level of noise emanating from generator-set installation, including engine exhaust and cooling-air intake and discharge, at four locations on the property line, and compare measured levels with required values.

C. Coordinate tests with tests for transfer switches and run them concurrently.

D. Test instruments shall have been calibrated within the last 12 months, traceable to standards of the National Institute for Standards and Technology, and adequate for making positive observation of test results. Make calibration records available for examination on request.

E. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.

F. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.

G. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

H. Remove and replace malfunctioning units and retest as specified above.

I. Retest: Correct deficiencies identified by tests and observations and retest until specified requirements are met.

J. Report results of tests and inspections in writing. Record adjustable relay settings and measured insulation resistances, time delays, and other values and observations. Attach a label or tag to each tested component indicating satisfactory completion of tests.

3.7 STARTUP SERVICE

A. Engage a factory-authorized service representative to perform startup service.

B. Inspect field-assembled components and equipment installation, including piping and electrical connections. Report results in writing.

C. Complete installation and startup checks according to manufacturer's written instructions.

3.8 DEMONSTRATION

A. Engage a factory-authorized service representative to train Government's maintenance personnel to adjust, operate, and maintain packaged engine generators. Refer to Division 01 Section Closeout Procedures.

1. Coordinate this training with that for transfer switches.

END OF SECTION

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SECTION 26 36 00

TRANSFER SWITCHES

(Edited from DeCA June 2011 Design Criteria)

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Transfer switches rated 600 V and less, including the following:

a. Automatic transfer switches.
b. Nonautomatic transfer switches.

1.2 SUBMITTALS

A. Product Data: Include rated capacities, operating characteristics, furnished specialties, and accessories.

B. Shop Drawings: Dimensioned plans, sections, and elevations showing minimum clearances, conductor entry provisions, gutter space, installed features and devices, and material lists for each switch specified.

C. Manufacturer Seismic Qualification Certification: Submit certification that transfer switches, accessories, and components will withstand seismic forces defined in Division 26 Section Vibration and Seismic Controls for Electrical Systems. Include the following:

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.

a. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified."

2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

D. Qualification Data: For manufacturer.

E. Field quality-control test reports.

F. Operation and Maintenance Data: For each type of product to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 01 Section Closeout Procedures include the following:

1. Features and operating sequences, both automatic and manual.
2. List of all factory settings of relays; provide relay-setting and calibration instructions, including software, where applicable.

1.3 QUALITY ASSURANCE

A. Manufacturer Qualifications: Maintain a service center capable of providing training, parts, and emergency maintenance repairs within a response period of less than eight hours from time of notification.

B. Source Limitations: Obtain automatic transfer switches and nonautomatic transfer switches through one source from a single manufacturer.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, for emergency service under UL 1008, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

D. Comply with NEMA ICS 1.

E. Comply with NFPA 70.

F. Comply with NFPA 110.

G. Comply with UL 1008 unless requirements of these Specifications are stricter.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Contactor Transfer Switches:

a. Caterpillar; Engine Div.
b. Emerson; ASCO Power Technologies, LP.
c. Generac Power Systems, Inc.
d. GE Zenith Controls.
e. Kohler Co.; Generator Division.
f. Onan Corp./Cummins Power Generation; Industrial Business Group.
g. Russelectric, Inc.
h. Spectrum Detroit Diesel.

2.2 GENERAL TRANSFER-SWITCH PRODUCT REQUIREMENTS

A. Indicated Current Ratings: Apply as defined in UL 1008 for continuous loading and total system transfer, including tungsten filament lamp loads not exceeding 30 percent of switch ampere rating, unless otherwise indicated.

B. Tested Fault-Current Closing and Withstand Ratings: Adequate for duty imposed by protective devices at installation locations in Project under the fault conditions indicated, based on testing according to UL 1008.

C. Solid-State Controls: Repetitive accuracy of all settings is plus or minus 2 percent or better over an operating temperature range of minus 4 to plus 158 deg F.

D. Resistance to Damage by Voltage Transients: Components shall meet or exceed voltage-surge withstand capability requirements when tested according to IEEE C62.41. Components shall meet or exceed voltage-impulse withstand test of NEMA ICS 1.

E. Neutral Terminal: Solid and fully rated, unless otherwise indicated.

F. All ATS and MTS switches shall be 4-pole.

G. Oversize Neutral: Ampacity and switch rating of neutral path through units indicated for oversize neutral shall be double the nominal rating of circuit in which switch is installed.

H. Enclosures: General-purpose NEMA 250, Type 1, 3R, or 12, as appropriate to the location, complying with NEMA ICS 6 and UL 508, unless otherwise indicated.

I. Heater: Equip switches exposed to outdoor temperatures and humidity, and other units indicated, with an internal heater. Provide thermostat within enclosure to control heater.

J. Factory Wiring: Train and bundle factory wiring and label, consistent with Shop Drawings, either by color code or by numbered or lettered wire and cable tape markers at terminations.

1. Designated Terminals: Pressure type suitable for types and sizes of field wiring indicated.
2. Power-Terminal Arrangement and Field-Wiring Space: Suitable for top, side, or bottom entrance of feeder conductors as indicated.
3. Control Wiring: Equipped with lugs suitable for connection to terminal strips.

K. Electrical Operation: Accomplish by a nonfused, momentarily energized solenoid or electric-motor-operated mechanism, mechanically and electrically interlocked in both directions.

L. Switch Characteristics: Designed for continuous-duty repetitive transfer of full-rated current between active power sources.

1. Limitation: Switches using molded-case switches or circuit breakers or insulated-case circuit-breaker components are not acceptable.
2. Switch Action: Double throw; mechanically held in both directions.
3. Contacts: Silver composition or silver alloy for load-current switching. Conventional automatic transfer-switch units, rated 225 A and higher, shall have separate arcing contacts.

2.3 AUTOMATIC TRANSFER SWITCHES

A. Comply with Level 1 equipment according to NFPA 110.

B. Switching Arrangement: Double-throw type, incapable of pauses or intermediate position stops during normal functioning, unless otherwise indicated.

C. Manual Switch Operation: Under load, with door closed and with either or both sources energized. Transfer time is same as for electrical operation. Control circuit automatically disconnects from electrical operator during manual operation.

2.4 AUTOMATIC TRANSFER-SWITCH FEATURES

A. Undervoltage Sensing for Each Phase of Normal Source: Senses low phase-to-ground voltage on each phase. Pickup voltage is adjustable from 85 to 100 percent of nominal, and dropout voltage is adjustable from 75 to 98 percent of pickup value. Factory set for pickup at 90 percent and dropout at 85 percent.

B. Time delay for override of normal-source voltage sensing delays transfer and engine start signals. Adjustable from zero to six seconds, and factory set for one second.

C. Voltage/Frequency Lockout Relay: Prevents premature transfer to generator. Pickup voltage is adjustable from 85 to 100 percent of nominal. Factory set for pickup at 90 percent. Pickup frequency is adjustable from 90 to 100 percent of nominal. Factory set for pickup at 95 percent.

D. Time Delay for Retransfer to Normal Source: Adjustable from 0 to 30 minutes, and factory set for 10 minutes. Provides automatic defeat of delay on loss of voltage or sustained undervoltage of emergency source, provided normal supply has been restored.

E. Test Switch: Simulates normal-source failure.

F. Switch-Position Pilot Lights: Indicate source to which load is connected.

G. Source-Available Indicating Lights: Supervise sources via transfer-switch normal- and emergency-source sensing circuits.

1. Normal Power Supervision: Green light with nameplate engraved "Normal Source Available."
2. Emergency Power Supervision: Red light with nameplate engraved "Emergency Source Available."

H. Unassigned Auxiliary Contacts: Two normally open, single-pole, double-throw contacts for each switch position, rated 10 A at 240-V ac.

I. Transfer Override Switch: Overrides automatic retransfer control so automatic transfer switch will remain connected to emergency power source regardless of condition of normal source. Pilot light indicates override status.

J. Engine Starting Contacts: One isolated and normally closed, and one isolated and normally open; rated 10 A at 32-V dc minimum.

K. Engine Shutdown Contacts: Time delay adjustable from zero to five minutes, and factory set for five minutes. Contacts shall initiate shutdown at remote engine-generator controls after retransfer of load to normal source.

L. Engine-Generator Exerciser: Solid-state, programmable-time switch starts engine generator and transfers load to it from normal source for a preset time, then retransfers and shuts down engine after a preset cool-down period. Initiates exercise cycle at preset intervals adjustable from 7 to 30 days. Running periods are adjustable from 10 to 30 minutes. Factory settings are for 7-day exercise cycle, 20-minute running period, and 5-minute cool-down period. Exerciser features include the following:

1. Exerciser Transfer Selector Switch: Permits selection of exercise with and without load transfer.
2. Push-button programming control with digital display of settings.
3. Integral battery operation of time switch when normal control power is not available.

2.5 NONAUTOMATIC TRANSFER SWITCHES

A. Operation: Electrically actuated by push buttons designated "Normal Source" and "Alternate Source." In addition, removable manual handle provides quick-make, quick-break manual-switching action. Switch is capable of electrically or manually transferring load in either direction with either or both sources energized. Control circuit disconnects from electrical operator during manual operation.

B. Double-Throw Switching Arrangement: Incapable of pauses or intermediate position stops during switching sequence.

2.6 NONAUTOMATIC TRANSFER-SWITCH ACCESSORIES

A. Pilot Lights: Indicate source to which load is connected.

B. Source-Available Indicating Lights: Supervise sources via transfer-switch normal- and alternate-source sensing circuits.

1. Normal Power Supervision: Green light with nameplate engraved "Normal Source Available."
2. Emergency Power Supervision: Red light with nameplate engraved "Alternate Source Available."

C. Unassigned Auxiliary Contacts: One set of normally closed contacts for each switch position, rated 10 A at 240-V ac.

2.7 FINISHES

A. Enclosures: Manufacturer's standard enamel over corrosion-resistant pretreatment and primer.

2.8 SOURCE QUALITY CONTROL

A. Factory test and inspect components, assembled switches, and associated equipment. Ensure proper operation. Check transfer time and voltage, frequency, and time-delay settings for compliance with specified requirements. Perform dielectric strength test complying with NEMA ICS 1.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with mounting and anchoring requirements specified in Division 26 Section Vibration and Seismic Controls for Electrical Systems.

B. Floor-Mounted Switch: Anchor to floor by bolting.

1. Concrete Bases: 4 inches high, reinforced, with chamfered edges. Extend base no more than 2 inches in all directions beyond the maximum dimensions of switch, unless otherwise indicated. Cast anchor-bolt inserts into bases. Comply with Division 03 Section Cast-in-Place Concrete.

C. Identify components according to Division 26 Section Identification for Electrical Systems.

3.2 CONNECTIONS

A. Ground equipment according to Division 26 Section Grounding and Bonding for Electrical Systems.

B. Connect wiring according to Division 26 Section Low-Voltage Electrical Power Conductors and Cables.

C. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.3 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect**, test, and adjust** field-assembled components and equipment installation, including connections**, and to assist in field testing**. Report results in writing.

B. Perform the following field tests and inspections and prepare test reports:

1. After installing equipment and after electrical circuitry has been energized, test for compliance with requirements.
2. Perform each electrical test and visual and mechanical inspection stated in NETA ATS, Section 7.22.3. Certify compliance with test parameters.
3. Measure insulation resistance phase-to-phase and phase-to-ground with insulation-resistance tester. Include external annunciation and control circuits. Use test voltages and procedure recommended by manufacturer. Comply with manufacturer's specified minimum resistance.

    a. Check for electrical continuity of circuits and for short circuits.
    b. Inspect for physical damage, proper installation and connection, and integrity of barriers, covers, and safety features.
    c. Verify that manual transfer warnings are properly placed.
    d. Perform manual transfer operation.

4. After energizing circuits, demonstrate interlocking sequence and operational function for each switch at least three times.

    a. Simulate power failures of normal source to automatic transfer switches and of emergency source with normal source available.
    b. Simulate loss of phase-to-ground voltage for each phase of normal source.
    c. Verify time-delay settings.
    d. Verify pickup and dropout voltages by data readout or inspection of control settings.
    e. Verify proper sequence and correct timing of automatic engine starting, transfer time delay, retransfer time delay on restoration of normal power, and engine cool-down and shutdown.

5. Ground-Fault Tests: Coordinate with testing of ground-fault protective devices for power delivery from both sources.

a. Verify grounding connections and locations and ratings of sensors.
b. Observe reaction of circuit-interrupting devices when simulated fault current is applied at sensors.

C. Coordinate tests with tests of generator and run them concurrently.

D. Report results of tests and inspections in writing. Record adjustable relay settings and measured insulation and contact resistances and time delays. Attach a label or tag to each tested component indicating satisfactory completion of tests.

E. Remove and replace malfunctioning units and retest as specified above.

3.4 DEMONSTRATION

A. Engage a factory-authorized service representative to train Government's maintenance personnel to adjust, operate, and maintain transfer switches and related equipment as specified below. Refer to Division 01 Section Closeout Procedures.

1. Coordinate this training with that for generator equipment.

END OF SECTION

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SECTION 26 43 00

TRANSIENT VOLTAGE SUPPRESSION

(Edited from DeCA June 2011 Design Criteria)

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Transient voltage surge suppressors for low-voltage power, control, and communication equipment.

B. Related Sections:

1. Division 26 Section Wiring Devices for devices with integral transient voltage surge suppressors.
2. Division 26 Section Panelboards for factory-installed transient voltage surge suppressors.
3. Division 26 Section Switchboards for factory-installed transient voltage surge suppressors.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated. Include rated capacities; shipping, installed, and operating weights; furnished specialties; and accessories.

B. Product Certificates: Signed by manufacturers of transient voltage suppression devices, certifying that products furnished comply with the following testing and labeling requirements:

1. UL 1283 certification.
2. UL 1449 listing and classification.

C. Field Test Reports: Written reports of tests specified in Part 3 of this Section. Include the following:

1. Test procedures used.
2. Test results that comply with requirements.
3. Failed test results and corrective action taken to achieve requirements.

D. Maintenance Data: For transient voltage suppression devices to include in maintenance manuals specified in Division 01.

E. Warranties: Special warranties specified in this Section.

1.3 QUALITY ASSURANCE

A. Source Limitations: Obtain suppression devices and accessories through one source from a single manufacturer providing field representation in the project area.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

C. IEEE Compliance: Comply with IEEE C62.41, "IEEE Guide for Surge Voltages in Low Voltage AC Power Circuits," and test devices according to IEEE C62.45, "IEEE Guide for Surge Suppressor Testing."

D. NEMA Compliance: Comply with NEMA LS 1, "Low Voltage Surge Protective Devices."

E. UL Compliance: Comply with UL 1283, "Electromagnetic Interference Filters," and UL 1449, "Transient Voltage Surge Suppressors."

1.4 PROJECT CONDITIONS

A. Placing into Service: Do not energize or connect data terminals to their sources until the surge protective devices are installed and connected.

B. Existing Utilities: Do not interrupt utilities serving facilities occupied by Government or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:

1. Notify Contracting Officer not less than ten days in advance of proposed utility interruptions.
2. Do not proceed with utility interruptions without Contracting Officer's written permission.

C. Service Conditions: Rate surge protective devices for continuous operation under the following conditions, unless otherwise indicated:

1. Maximum Continuous Operating Voltage: Not less than 115 percent of nominal system operating voltage.
2. Operating Temperature: 30 to 120 deg F.
3. Humidity: 0 to 85 percent, noncondensing.
4. Altitude: Less than 20,000 feet above sea level.

1.5 COORDINATION

A. Coordinate location of field-mounted surge suppressors to allow adequate clearances for maintenance.

1.6 WARRANTY

A. General Warranty: Special warranties specified in this Article shall not deprive Government of other rights Government may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

B. Special Warranty: Written warranty, executed by manufacturer agreeing to repair or replace components of surge suppressors that fail in materials or workmanship within five years from date of Substantial Completion.

C. Special Warranty for Plug-in Cord-Connected Surge Suppressors: Written warranty, executed by manufacturer agreeing to repair or replace electronic equipment connected to circuits protected by surge suppressors.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Manufacturers of a Broad Line of Suppressors:

   a. Advanced Protection Technologies, Inc.
   b. Atlantic Scientific Corp.
   c. Current Technology, Inc.
   d. Cutler-Hammer, Inc.
   e. Entrelec, Inc.
   f. Innovative Technology, Inc.
   g. Intermatic, Inc.
   h. LEA International.
   i. Leviton Manufacturing Co. Inc.
   j. Liebert Corp.
   k. Northern Technologies.
   l. Siemens Energy & Automation.
   m. Square D Co.
   n. Sutton Designs, Inc.
   o. Transtector Systems, Inc.
   p. Tycor International, Inc.
   q. United Power, Inc.
   r. Zero Surge Inc.

2. Manufacturers of Category A and Telephone/Data Line Suppressors:

   a. MCG Electronics, Inc.
   b. NTE Electronics, Inc.
   c. Telebyte Technology, Inc.

3. Manufacturers of Gas-Tube Suppressors:

   a. Sankosha U.S.A., Inc.

2.2 SERVICE ENTRANCE SUPPRESSORS

A. Surge Protective Device Description: Modular design with field-replaceable modules and the following features and accessories:

1. Fuses, rated at 200-kA interrupting capacity.
2. Fabrication using bolted compression lugs for internal wiring.
3. Integral disconnect switch.
4. Redundant suppression circuits.
5. Redundant replaceable modules.

6. Arrangement with copper busbars and for bolted connections to phase buses, neutral bus, and ground bus.
7. Arrangement with wire connections to phase buses, neutral bus, and ground bus.
8. Red and green LED indicator lights for power and protection status.
9. Audible alarm, with silencing switch, to indicate when protection has failed.
10. Surge-event operations counter.

B. Peak Single-Impulse Surge Current Rating: **320** kA per phase.

C. Connection Means: Permanently wired.

D. Protection modes and UL 1449 clamping voltage for grounded wye circuits with voltages of 480Y/277 and 208Y/120; 3-phase, 4-wire circuits, shall be as follows:

1. Line to Neutral: **800 V for 480Y/277**.
2. Line to Ground: **800 V for 480Y/277**.
3. Neutral to Ground: **800 V for 480Y/277**.

2.3 PANELBOARD SUPPRESSORS

A. Surge Protective Device Description: Modular design with field-replaceable modules and the following features and accessories:

1. Fuses, rated at 200-kA interrupting capacity.
2. Fabrication using bolted compression lugs for internal wiring.
3. Integral disconnect switch.
4. Redundant suppression circuits.
5. Redundant replaceable modules.
6. Arrangement with wire connections to phase buses, neutral bus, and ground bus.
7. Red and green LED indicator lights for power and protection status.
8. Audible alarm, with silencing switch, to indicate when protection has failed.
9. Surge-event operations counter.

B. Peak Single-Impulse Surge Current Rating: **160** kA per phase.

C. Protection modes and UL 1449 clamping voltage for grounded wye circuits with voltages of 480Y/277 and 208Y/120; 3-phase, 4-wire circuits, shall be as follows:

1. Line to Neutral: **800 V for 480Y/277**.
2. Line to Ground: **800 V for 480Y/277**.
3. Neutral to Ground: **800 V for 480Y/277**.

2.4 PLUG-IN SURGE SUPPRESSORS

A. Description: Non-modular, plug-in suppressors with at least four 15-A, 120-V ac, NEMA WD 6, Configuration 15-15R receptacles, suitable to plug into a NEMA WD 6, Configuration 15-15R receptacle; with the following features and accessories:

1. LED indicator lights for power and protection status.
2. LED indicator lights for reverse polarity and open outlet ground.
3. Circuit breaker and thermal fusing. Unit continues to supply power if protection is lost.
4. Line cord length as appropriate to application.
5. Rocker-type on-off switch, illuminated when in the on position.

6. One RJ11/12C telephone line protector, suitable for modem connection. Maximum clamping voltage 220 peak on pins No. 3 and 4.

B. Peak Single-Impulse Surge Current Rating: 26 kA per phase.

C. Protection modes and UL 1449 clamping voltage shall be as follows:

1. Line to Neutral: 475 V.
2. Line to Ground: 475 V.
3. Neutral to Ground: 475 V.

2.5 CONTROL AND DATA TERMINALS

A. Protectors for copper data, antenna, and telephone conductors entering the building from the outside shall be as recommended by the manufacturer for the type of line being protected.

2.6 ENCLOSURES

A. NEMA 250, with type matching the enclosure of panel or device being protected.

PART 3 - EXECUTION

3.1 INSTALLATION OF SURGE PROTECTIVE DEVICES

A. Install devices at service entrance on load side, with ground lead bonded to service entrance ground.

B. Install devices for panelboards with conductors between suppressor and points of attachment as short and straight as possible. Do not exceed manufacturer's recommended lead length. Do not bond neutral and ground.

1. Provide multipole, 15-A circuit breaker as a dedicated disconnect for the suppressor, unless otherwise indicated.

3.2 CONNECTIONS

A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A.

3.3 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including piping and electrical connections. Report results in writing.

1. Verify that electrical wiring installation complies with manufacturer's installation requirements.

3.4 DEMONSTRATION

A. Engage a factory-authorized service representative to train Government's maintenance personnel to adjust, operate, and maintain surge protective devices.

1. Train Government's maintenance personnel on procedures and schedules for maintaining suppressors.
2. Review data in maintenance manuals. Refer to Division 01 Section Closeout Procedures and Division 01 Section Demonstration and Training.
3. Schedule training with Government, through Contracting Officer, with at least ten days' advance notice.

END OF SECTION

SECTION 26 51 00

INTERIOR LIGHTING

(Edited from DeCA June 2011 Design Criteria)

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Interior lighting fixtures with lamps and ballasts.
2. Lighting fixtures mounted on exterior building surfaces.
3. Emergency lighting units.
4. Exit signs.

B. Related Sections:

1. Division 26 Section Wiring Devices for manual wall-box dimmers for incandescent lamps.
2. Division 26 Section Lighting Control Devices for automatic control of lighting, including time switches, photoelectric relays, occupancy sensors, and multipole lighting relays and contactors.

1.2 DEFINITIONS

A. Retain abbreviations that remain after this Section has been edited.

B. BF: Ballast factor. Ratio of light output of a given lamp(s) operated by the subject ballast to the light output of the same lamp(s) when operated on an ANSI reference circuit.

C. CRI: Color rendering index.

D. CU: Coefficient of utilization.

E. LER: Luminaire efficiency rating, which is calculated according to NEMA LE 5. This value can be estimated from photometric data using the following formula:

1. LER is equal to the product of total rated lamp lumens times BF times luminaire efficiency, divided by input watts.

F. RCR: Room cavity ratio.

1.3 SUBMITTALS

A. Product Data: For each type of lighting fixture scheduled, arranged in order of fixture designation. Include data on features, accessories, finishes, photometric performance data (including LER when scheduled), and the following:

1. Physical description of fixture, including dimensions and verification of indicated parameters.

2. Coefficient of Utilization Chart
3. Emergency lighting unit battery and charger.
4. Fluorescent and high-intensity-discharge ballasts.

   a. Fluorescent: for each specific lamp / ballast system used, provide system lumens, input watts, ballast factor, efficacy and minimum starting temperature. For dimming ballasts, provide the data at minimum and maximum of the dimming range.

5. Air and Thermal Performance Data: For air-handling fixtures. Furnish data required in "Submittals" Article in Division 23 Section Diffusers, Registers, and Grilles.
6. Sound Performance Data: For air-handling fixtures. Indicate sound power level and sound transmission class in test reports certified according to standards specified in Division 23 Section Diffusers, Registers and Grilles.
7. Lamps (Full data - Include ANSI Code, initial and mean lumens, rated life, CRI).

B. Wiring Diagrams: Power, signal, and control wiring.

C. Product Certificates: For each type of ballast for dimmer-controlled fixtures, signed by product manufacturer.

D. Field quality-control test reports.

E. Operation and Maintenance Data: For lighting equipment and fixtures to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 01 Section Closeout Procedures, include the following:

1. Catalog data for each fixture. Include the diffuser, ballast, and lamps installed in that fixture.
2. List of lamp requirements for each room (for relamping purposes), including: fixture Drawing designation(s) in which lamp is used; the full lamp description; full ordering code or manufacturer’s product number; total quantity of lamps installed.

F. Warranties: Special warranties specified in this Section.

1.4 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Comply with NFPA 70.

C. NFPA 101 Compliance: Comply with visibility and luminance requirements for exit signs.

1.5 WARRANTY

A. Special Warranty for Emergency Lighting Unit Batteries: Manufacturer's standard form in which manufacturer of battery-powered emergency lighting unit agrees to repair or replace components of rechargeable batteries that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Manufacturer's standard warranty or 1-year, whichever is longer from date of Substantial Completion. Full warranty shall apply for first year, and prorated warranty for the remaining nine years.

B. Special Warranty for Fluorescent Ballasts: Manufacturer's standard form in which ballast manufacturer agrees to repair or replace ballasts that fail in materials or workmanship within specified warranty period.

1. Warranty Period for Electronic Ballasts: Manufacturer's standard warranty or 1-year, whichever is longer from date of Substantial Completion.
2. Warranty Period for Electromagnetic Ballasts: Manufacturer's standard warranty or 1-year, whichever is longer from date of Substantial Completion.

C. Manufacturer's Special Warranty for T8 Fluorescent Lamps: Manufacturer's standard form, made out to Government and signed by lamp manufacturer agreeing to replace lamps that fail in materials or workmanship, f.o.b. the nearest shipping point to Project site, within specified warranty period indicated below.

1. Warranty Period: Manufacturer's standard warranty or 1-year, whichever is longer from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products specified.

2.2 FIXTURES AND COMPONENTS, GENERAL

A. Recessed Fixtures: Comply with NEMA LE 4 for ceiling compatibility for recessed fixtures.

B. Incandescent Fixtures: Comply with UL 1598. Where LER is specified, test according to NEMA LE 5A.

C. Fluorescent Fixtures: Comply with UL1598. Where LER is specified, test according to NEMA LE 5 and NEMA LE 5A as applicable.

D. HID Fixtures: Comply with UL1598. Where LER is specified, test according to NEMA LE 5B. Metal halide lamp fixtures shall use "O-rated" lamps suitable for open fixtures, or shall be fitted with an enclosing diffuser; if the enclosing diffuser is thermoplastic, such as acrylic, and the lamp is not "O-rated," a tempered glass shield shall be provided between the lamp and the plastic diffuser.

E. Metal Parts: Free of burrs and sharp corners and edges.

F. Sheet Metal Components: Steel, unless otherwise indicated. Form and support to prevent warping and sagging.

G. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position.

H. Reflecting surfaces shall have minimum reflectance as follows, unless otherwise indicated:

1. White Surfaces: 85 percent.
2. Specular Surfaces: 83 percent.
3. Diffusing Specular Surfaces: 75 percent.
4. Laminated Silver Metallized Film: 90 percent.

I. Plastic Diffusers, Covers, and Globes:

1. Acrylic Lighting Diffusers: 100 percent virgin acrylic plastic. High resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.

   a. Lens Thickness: At least 0.125 inch minimum unless different thickness is scheduled.
   b. UV stabilized.

2. Glass: Annealed crystal glass, unless otherwise indicated.

J. Air-Handling Fluorescent Fixtures: For use with plenum ceiling for air return and heat extraction and for attaching an air-diffuser-boot assembly specified in Division 23 Section Diffusers, Registers, and Grilles.

1. Air Supply Units: Slots in one or both side trims join with air-diffuser-boot assemblies.
2. Heat Removal Units: Air path leads through lamp cavity.
3. Combination Heat Removal and Air Supply Unit: Heat is removed through lamp cavity at both ends of the fixture door with air supply same as for air supply units.
4. Dampers: Operable from outside fixture for control of return-air volume.
5. Static Fixtures: Air supply slots are blanked off, and fixture appearance matches active units.

2.3 FLUORESCENT LAMP BALLASTS

A. Description: Include the following features, unless otherwise indicated:

1. Designed for type and quantity of lamps indicated at full light output except for emergency lamps powered by in-fixture battery-packs.
2. Externally fused with slow-blow type rated between 2.65 and 3.0 times the line current.

B. Electronic ballasts for linear lamps shall include the following features, unless otherwise indicated:

1. Comply with NEMA C82.11.
2. Ballast Type: **Programmed** start, unless otherwise indicated.
3. Programmed Start: Ballasts with two-step lamp starting to extend life of frequently started lamps.
4. Operating Temperature: Ballasts for standard T8 and T5 lamps shall be suitable for ambient temperatures from 0 deg F to 120 deg F, starting and operating lamps reliably as low as 0 deg F.

5. System Ballast Factor: Not less than 0.90 with scheduled lamps, unless scheduled otherwise.
6. Sound Rating: **A**
7. Total harmonic distortion rating of less than **20** percent according to NEMA C82.11.
8. Transient Voltage Protection: IEEE C62.41, Category A.
9. Operating Frequency: **20 kHz** or higher.
10. Power Factor: 95 percent minimum.
11. Lamp Current Crest Factor: Less than **1.7**.
12. Parallel Lamp Circuits: Multiple lamp ballasts connected to maintain full light output on surviving lamps if one or more lamps fail.
13. Quick disconnect note.

C. Electromagnetic ballasts for linear lamps shall have the following features, unless otherwise indicated:

1. Comply with NEMA C82.1.
2. Type: Energy-saving, high power factor, Class P, automatic-reset thermal protection.
3. Ballast Manufacturer Certification: Indicated by label.
4. Provide lamp end-of-life detection and shutdown circuit for T5 diameter lamps.

D. Ballasts for compact lamps in recessed fixtures shall have the following features, unless otherwise indicated:

1. Type: Electronic.
2. Power Factor: 90 percent, minimum.
3. Flicker: Less than 5 percent.
4. Lamp Current Crest Factor: Less than **1.7**.
5. Electronic Ballast Operating Frequency: **20 kHz** or higher.
6. Lamp end-of-life detection and shutdown circuit.
7. Transient Protection: Comply with IEEE C62.41 for Category A1 locations.
8. Interference: Comply with 47 CFR, Chapter 1, Part 18, Subpart C, for limitations on electromagnetic and radio-frequency interference for nonconsumer equipment.

E. Ballasts for compact lamps in nonrecessed fixtures shall include the following features, unless otherwise indicated:

1. Power Factor: 90 percent, minimum.
2. Ballast Coil Temperature: 149 deg F, maximum.
3. Transient Protection: Comply with IEEE C62.41 for Category A1 locations.
4. Interference: Comply with 47 CFR, Chapter 1, Part 18, Subpart C, for limitations on electromagnetic and radio-frequency interference for nonconsumer equipment.

F. Ballasts for dimmer-controlled fixtures shall comply with general and fixture-related requirements above for electronic ballasts and the following features:

1. Dimming Range: 100 to 20 percent percent of rated lamp lumens.
2. Ballast Input Watts: Can be reduced to **20** percent of normal.
3. Compatibility: Certified by manufacturer for use with specific dimming system indicated.
4. Ballast shall be compatible with RMCS (0-10v) control.

G. Ballasts for Low-Temperature Environments (Less than 65 deg F):

1. Temperatures 0 Deg F and Higher: Electronic type rated for 0 deg F starting temperature.

2. Temperatures -20 Deg F to 0 Deg F: Electronic type rated for -20 deg F starting temperature.

H. Ballasts for Low Electromagnetic-Interference Environments: Comply with 47 CFR, Chapter 1, Part 18, Subpart C, for limitations on electromagnetic and radio-frequency interference for consumer equipment.

2.4 EXIT SIGNS

A. General: Comply with UL 924; for sign colors and lettering size, comply with authorities having jurisdiction.

B. Internally Lighted Signs:

1. Lamps for AC Operation: Light-emitting diodes, 70,000 hours minimum of rated lamp life.

C. Self-Powered Exit Signs (Battery Type): Integral automatic charger in a self-contained power pack.

1. Battery: Sealed, maintenance-free, nickel-cadmium type with special warranty.
2. Charger: Fully automatic, solid-state type with sealed transfer relay.
3. Operation: Relay automatically energizes lamp from battery when circuit voltage drops to 80 percent of nominal voltage or below. When normal voltage is restored, relay disconnects lamps from battery, and battery is automatically recharged and floated on charger.

2.5 EMERGENCY LIGHTING UNITS

A. General: Self-contained units complying with UL 924.

1. Battery: Sealed, maintenance-free, lead-acid type with minimum 10-year nominal life and special warranty.
2. Charger: Fully automatic, solid-state type with sealed transfer relay.
3. Operation: Relay automatically turns lamp on when power supply circuit voltage drops to 80 percent of nominal voltage or below. Lamp automatically disconnects from battery when voltage approaches deep-discharge level. When normal voltage is restored, relay disconnects lamps from battery, and battery is automatically recharged and floated on charger.
4. Wire Guard: Where indicated, heavy-chrome-plated wire guard protects lamp heads or fixtures.

2.6 FLUORESCENT EMERGENCY LIGHTING FIXTURES

A. Internal Type: Self-contained, modular, battery-inverter unit factory mounted within fixture body. Comply with UL 924.

1. Emergency Connection: Operate one fluorescent lamp continuously. Connect unswitched circuit to battery-inverter unit and switched circuit to fixture ballast.
2. Night Light Connection: Operate one fluorescent lamp continuously.
3. Test Switch and Light-Emitting-Diode Indicator Light: Visible and accessible without opening fixture or entering ceiling space.

4. Battery: Sealed, maintenance-free, nickel-cadmium type with minimum seven-year nominal life.
5. Charger: Fully automatic, solid-state, constant-current type.

2.7 FLUORESCENT LAMPS

A. Low-Mercury Lamps: Comply with Federal toxic characteristic leaching procedure test, and yield less than 0.2 mg of mercury per liter, when tested according to NEMA LL 1.

B. T8 rapid-start low mercury lamps, rated 59 W maximum, nominal length 96 inches, 5900 initial lumens (minimum), CRI of 82 (minimum), color temperature of 3500K, and average rated life of 20,000 hours, unless otherwise indicated.

C. T8 rapid-start low-mercury lamps, rated 32 W maximum, nominal length 48 inches, 2800 initial lumens (minimum), CRI of 82 (minimum), color temperature of 3500K, and average rated life of 20,000 hours, unless otherwise indicated.

D. T8 rapid-start low-mercury lamps, rated 17 W maximum, nominal length of 24 inches, 1300 initial lumens (minimum), CRI of 82 (minimum), color temperature of 3500K, and average rated life of 20,000 hours, unless otherwise indicated.

E. T8 Fluorescent lamps of other lengths shall be selected from the manufacturer's same product series as the above, having the same efficacy and characteristics.

F. T5HO rapid-start low-mercury lamps, rated 54 W maximum, nominal length 48 inches, 5000 initial lumens (minimum), CRI of 82 (minimum), color temperature of 3500K, and average rated life of 20,000 hours, unless otherwise indicated.

G. T5 rapid start low-mercury lamps, rated 28W maximum, nominal length 48 inches, 2730 initial lumens (minimum), CRI of 82 (minimum), color temperature of 3500K, and average rated life of 20,000 hours, unless otherwise indicated.

H. T5 rapid start low-mercury lamps, rated 14 W maximum, nominal length of 24 inches, 1300 initial lumens (minimum), color temperature of 3500K, and average rated life of 20,000 hours, unless otherwise indicated.

I. T5 Fluorescent lamps of other lengths shall be selected from the manufacturer's same product series as the above, having the same efficacy and characteristics.

J. Compact Fluorescent Lamps: CRI 80 (minimum), color temperature 3500K, average rated life of 10,000 hours at 3 hours operation per start, unless otherwise indicated.

1. T4, Twin Tube: Rated 5 W, 250 initial lumens (minimum).
2. T4, Twin Tube: Rated 7 W, 400 initial lumens (minimum).
3. T4, Twin Tube: Rated 9 W, 600 initial lumens (minimum).
4. T4, Twin Tube: Rated 13 W, 825 initial lumens (minimum).
5. T4, Double-Twin Tube: Rated 13 W, 900 initial lumens (minimum).
6. T4, Double-Twin Tube: Rated 18 W, 1200 initial lumens (minimum).
7. T4, Double-Twin Tube: Rated 26 W, 1800 initial lumens (minimum).

K. Any of the above lamps may be specified in 3000 deg K color temperature where specifically scheduled or noted on the Drawings for special product displays.

L. Inductively Coupled Electrodeless Lamps: 100 watt Sylvania "Icetron" induction lamps, or equal; 100,000 hour rated life, -40 deg F minimum starting temperature, 8000 lumens (initial), 3500 K color temperature, 80 CRI. (For use in frozen food storage rooms environments to cold for standard fluorescent lamp-ballast combinations).

2.8 HIGH-INTENSITY-DISCHARGE LAMPS

A. Metal-Halide Lamps: ANSI C78.1372, wattage and burning position as scheduled, CRI 65 (minimum), and color temperature 3500K.

2.9 LED LIGHTING MODULES

A. Light Emitting Diode lighting modules shall be as scheduled, with the following technical characteristics, unless scheduled otherwise:

1. Rated life: 55,000 hours.
2. Efficacy: 60 lumens/watt minimum.
3. Color Temperature: 5000K to 6500K (in utility or back-room areas); 3500K in public areas.
4. CRI: 70 (minimum in utility or back-room areas); 85 in public areas.
5. Dimmable to 20 percent of maximum.

2.10 FIXTURE SUPPORT COMPONENTS

A. Comply with Division 26 Section Common Work Results for Electrical for channel- and angle-iron supports and nonmetallic channel and angle supports.

B. Single-Stem Hangers: 1/2-inch steel tubing with swivel ball fittings and ceiling canopy. Finish same as fixture.

C. Twin-Stem Hangers: Two, 1/2-inch steel tubes with single canopy designed to mount a single fixture. Finish same as fixture.

D. Wires: ASTM A 641/A 641M, Class 3, soft temper, zinc-coated, **12 gage**.

E. Wires for Humid Spaces: ASTM A 580/A 580M, Composition 302 or 304, annealed stainless steel, **12 gage**.

F. Rod Hangers: 3/16-inch- minimum diameter, cadmium-plated, threaded steel rod.

G. Hook Hangers: Integrated assembly matched to fixture and line voltage and equipped with threaded attachment, cord, and locking-type plug.

H. Aircraft Cable Support: Use cable, anchorages, and intermediate supports recommended by fixture manufacturer.

2.11 FINISHES

A. Fixtures: Manufacturers' standard, unless otherwise indicated.

1. Paint Finish: Applied over corrosion-resistant treatment or primer, free of defects.

2. Metallic Finish: Corrosion resistant.

2.12 FLUORESCENT FIXTURE RETROFIT MATERIALS

A. Comply with UL 1598 listing requirements.

1. Reflector Kit: UL 1598, Type I. Suitable for two- to four-lamp, surface-mounted or recessed lighting fixtures by improving reflectivity of fixture surfaces. No electrical parts are to be changed.
2. Ballast and Lamp Change Kit: UL 1598, Type II. Suitable for changing existing ballast, lamps, and sockets as scheduled.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Fixtures: Set level, plumb, and square with ceilings and walls. Install lamps in each fixture.

B. Support for Fixtures in or on Grid-Type Suspended Ceilings: Use grid for support.

1. Install a minimum of four ceiling support system rods or wires for each fixture. Locate not more than 6 inches from fixture corners.
2. Support Clips: Fasten to fixtures and to ceiling grid members at or near each fixture corner with clips that are UL listed for the application.
3. Fixtures of Sizes Less Than Ceiling Grid: Install as indicated on reflected ceiling plans or center in acoustical panel, and support fixtures independently with at least two 3/4-inch metal channels spanning and secured to ceiling tees.
4. Install at least one independent support rod or wire from structure to a tab on lighting fixture. Wire or rod shall have breaking strength of the weight of fixture at a safety factor of 3.

C. Suspended Fixture Support: As follows:

1. Pendants and Rods: Where longer than 48 inches, brace to limit swinging.
2. Stem-Mounted, Single-Unit Fixtures: Suspend with twin-stem hangers.
3. Continuous Rows: Use tubing or stem for wiring at one point and tubing or rod for suspension for each unit length of fixture chassis, including one at each end.
4. Continuous Rows: Suspend from cable.

D. Air-Handling Fixtures: Install with dampers closed and ready for adjustment.

E. Adjust aimable fixtures to provide required light intensities.

3.2 CONNECTIONS

A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

B. Connect dual-circuited fixtures in a common area so that the same group of lamps in each fixture are connected to the same circuit to provide a uniform appearance.

3.3 FIELD QUALITY CONTROL

A. Inspect each installed fixture for damage. Replace damaged fixtures and components.

B. Verify normal operation of each fixture after installation.

C. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify normal transfer to battery power source and retransfer to normal.

D. Prepare a written report of tests, inspections, observations, and verifications indicating and interpreting results. If adjustments are made to lighting system, retest to demonstrate compliance with standards.

E. Corroded Fixtures: During warranty period, replace fixtures that show any signs of corrosion.

END OF SECTION

SECTION 27 08 00

COMMISSIONING OF COMMUNICATION SYSTEMS

(Edited from DeCA June 2011 Design Criteria)

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Division 27 responsibilities in the commissioning process.
2. Commissioning voice and data communications cabling.
3. Commissioning voice communications systems.
4. Commissioning public address and music system.

B. Related Sections:

1. Division 01 Section General Commissioning Requirements.

1.2 DEFINITIONS

A. CA: Commissioning Agent.

B. CO: Contracting Officer.

C. GC: Contractor; General Contractor, not a Subcontractor.

D. O&M: Operations and Maintenance.

E. QC: Contractor's Quality Control Manager.

F. TI: Technical Inspector.

1.3 DESCRIPTION

A. This Section describes commissioning requirements applicable to commissioned items and systems specified in Division 27 to ensure that all systems are operating in a manner consistent with the Contract Documents.

B. Conform to commissioning requirements and the commissioning plan.

1.4 RESPONSIBILITIES

A. Construction and Acceptance Phases:

1. Include the cost of commissioning in the Contract price.
2. In each purchase order or subcontract written, include requirements for submittal data, O&M data and training.

3. Conduct a commissioning scoping meeting and other meetings necessary to facilitate the Commissioning process.
4. Provide requested documentation to the TI, developed for functional testing procedures.
5. Assist in clarifying the operation and control of commissioned equipment in areas where the specifications, control drawings or equipment documentation is not sufficient for writing detailed testing procedures.
6. Provide functional performance test procedures. Subs shall review test procedures to ensure feasibility, safety and equipment protection and provide necessary written alarm limits to be used during the tests.
7. Develop a full start-up and initial checkout plan using manufacturer's start-up procedures and the prefunctional checklists for all commissioned equipment. Submit to QC for review prior to startup. TI will verify plan for compliance. Refer to Division 01 Section General Commissioning Requirements for further details related to start-up.
8. During the startup and initial checkout process, execute and document the electrical-related portions of the prefunctional checklists provided by the CA for all commissioned equipment.
9. Perform and clearly document all completed startup and system operational checkout procedures, providing a copy to the QC and TI.
10. Address current A/E punch list items before functional testing. Fire and life safety systems shall be completed with discrepancies and problems remedied before functional testing of the respective systems.
11. Provide skilled technicians to execute starting of equipment and to execute the functional performance tests. Ensure that they are available and present during the agreed upon schedules and for sufficient duration to complete the necessary tests, adjustments and problem-solving.
12. Provide all test equipment necessary to fulfill specified testing requirements.
13. Perform functional performance testing under the direction of the CA for specified equipment. Assist the CA and TI in interpreting the monitoring data, as necessary.
14. Correct deficiencies (differences between specified and observed performance) as interpreted by the CA, TI and A/E and retest the equipment.
15. Prepare O&M manuals according to the Contract Documents, including clarifying and updating the original sequences of operation to as-built conditions.
16. During construction, maintain as-built red-line drawings for all drawings and final CAD as-builts for contractor-generated coordination drawings. Update after completion of commissioning (excluding deferred testing). Prepare red-line as-built drawings for all drawings and final as-builts for contractor-generated coordination drawings.
17. Provide training of the Government's operating personnel as specified.
18. Coordinate with equipment manufacturers to determine specific requirements to maintain the validity of the warranty.

B. Operation Manuals shall include:

1. A table of all setpoints and implications when changing them.
2. Schedules.
3. Instructions for operation of each piece of equipment for emergencies.
4. Startup and shutdown.
5. Recommendations for recommissioning frequency by equipment type.

C. Warranty Period:

1. Execute seasonal or deferred functional performance testing, witnessed by the CA, according to the specifications.
2. Correct deficiencies and make necessary adjustments to O&M manuals and as-built drawings for applicable issues identified in any seasonal testing.

1.5 SUBMITTALS

A. Provide submittal documentation relative to commissioning as required in this Section, Division 01 Section General Commissioning Requirements and other specified requirements.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 Field Testing Voice and Data cabling

A. Perform the following field tests and inspections and prepare test reports:

B. Operational Test: After installation of cables and connectors, demonstrate product capability and compliance with requirements. Test each signal path for end-to-end performance from each end of all pairs installed. Remove temporary connections when satisfactory tests have been completed.

C. Copper Cable Procedures: Inspect for physical damage and test each conductor signal path for continuity and shorts. Use Class 2, bi-directional, category 6 tester. Test for faulty connectors, splices, and terminations. Test according to ANSI/TIA/EIA 568-B.2-1, "Transmission Performance Specifications for Field Testing of Unshielded Twisted Pair Cabling Systems." Link performance for UTP cables must meet minimum criteria of TIA/EIA-568-A.

D. All balanced twisted pair field testers shall be factory calibrated each calendar year by the field test equipment manufacturer as stipulated by the manuals provided with the field test unit. The calibration certificate shall be provided for review prior to the start of the testing.

E. Autotest settings provided in the field tester for testing the installed cabling shall be set to default parameters.

F. Test settings selected from options provided in the field testers shall be compatible with the installed cable under test.

G. All Category 6 field-testing shall be performed with an approved level III balanced twisted pair field device.

H. Category 6 balanced twisted pair horizontal and backbone cables shall be 100 percent tested according to ANSI/TIA/EIA-568-B2.1. Test parameters include wire map, length, NEXT loos (pair to pair), NEXT loss (power sum), ELFEXT loss (pair to pair), ELFEXT loss (power sum), return loss, insertion loss, propagation delay, and delay skew.

I. Backbone phone cable: All balanced twisted pair backbone cables exceeding 295feet or 328 feet shall be 100 percent tested for continuity if applications assurance is not required.

J. Fiber Optic Testing: Fiber cables shall be 100 percent tested for insertion loss and length. Insertion loss shall be tester at 850 nm and 1300 nm for 62.5/125mm multimode cabling in at least one direction using the Method B (1 - jumper) test procedure as specified in ANSI/TIA/EIA 526-14A.

K. Fiber cables shall be tested with an OTDR tester.

L. Remove malfunctioning units, replace with new units and retest as specified above

M. Provide all test report in electronic format. Include in the Operations and Maintenance manuals

3.2 STARTUP

A. The Electrical Contractors shall follow the start-up and initial checkout procedures listed in the Responsibilities list in this Section and in Division 01 Section General Commissioning Requirements. Division 26 has start-up responsibility and is required to complete systems and sub-systems so they are fully functional, meeting the design objectives of the Contract Documents. The commissioning procedures and functional testing do not relieve or lessen this responsibility or shift that responsibility partially to the Commissioning Agent, Technical Inspector, or Government.

B. Functional testing is intended to begin upon completion of a system. Functional testing may proceed prior to the completion of systems, or sub-systems at the discretion of the PM and GC. Beginning system testing before full completion, does not relieve the Contractor from fully completing the system, including all prefunctional checklists as soon as possible.

3.3 OPERATIONS AND MAINTENANCE (O&M) MANUALS

A. The following O&M manual requirements do not replace O&M manual documentation requirements elsewhere in these Specifications.

B. Division 26 shall compile and prepare documentation for all commissioned systems covered in Division 26 and deliver this documentation to the GC for inclusion in the O&M manuals prior to the training of Government personnel.

3.4 TRAINING OF GOVERNMENT PERSONNEL

A. The GC shall be responsible for training coordination and scheduling and ultimately to ensure that training is completed.

B. The QC shall be responsible for reviewing the content and adequacy of the training of Government personnel for commissioned equipment or systems. TI will verify compliance.

C. Electrical Contractor: The Electrical Contractor shall have the following training responsibilities:

1. Provide the TI with a training plan four weeks before the planned training.
2. Provide designated Government personnel with comprehensive orientation and training in the understanding of the systems and the operation and maintenance of each major piece of commissioned electrical equipment or system.
3. Training shall start with classroom sessions, if necessary, followed by hands on training on each piece of equipment, which shall illustrate the various modes of operation, including startup, shutdown, fire/smoke alarm, power failure, etc.
4. During any demonstration, should the system fail to perform in accordance with the requirements of the O&M manual or sequence of operations, the system will be repaired or adjusted as necessary and the demonstration repeated.
5. The appropriate trade or manufacturer's representative shall provide the instructions on each major piece of equipment. This person may be the start-up technician for the piece of equipment, the installing contractor or manufacturer’s representative. Practical building operating expertise as well as in-depth knowledge of all modes of operation of

the specific piece of equipment are required. More than one party may be required to execute the training.

6. The training sessions shall follow the outline in the Table of Contents of the operation and maintenance manual and illustrate whenever possible the use of the O&M manuals for reference.
7. Training shall include:

    a. Use the printed installation, operation and maintenance instruction material included in the O&M manuals.
    b. A review of the written O&M instructions emphasizing safe and proper operating requirements, preventative maintenance, special tools needed and spare parts inventory suggestions. The training shall include start-up, operation in all modes possible, shut-down, seasonal changeover and any emergency procedures.
    c. Discussion of relevant health and safety issues and concerns.
    d. Discussion of warranties and guarantees.
    e. Common troubleshooting problems and solutions.
    f. Explanation of information included in the O&M manuals.
    g. Discussion of any peculiarities of equipment installation or operation.
    h. Classroom sessions shall include the use of overhead projections, slides, video and audio taped material as might be appropriate.

8. Hands-on training shall include start-up, operation in all modes possible, including manual, shut-down and any emergency procedures and maintenance of all pieces of equipment.
9. Fully explain and demonstrate the operation, function and overrides of any local packaged controls, not controlled by the central control system.
10. Training shall occur after functional testing is complete, unless approved otherwise by the Project Manager.
11. Minimum Duration of Training: The Electrical Contractor shall provide training on each piece of equipment according to the periods indicated in the individual Division 26 Sections.
12. Train Owner's maintenance personnel in cable plant management operations, including changing signal pathways for different workstations, rerouting signals in failed cables, and extending wiring to establish new workstation outlets.

END OF SECTION

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SECTION 27 15 00

COMMUNICATIONS HORIZONTAL CABLING

(Edited from DeCA June 2011 Design Criteria)

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Pathways.
2. UTP cabling.
3. Micrometer, optical fiber cabling.
4. Coaxial cable.
5. Multiuser telecommunications outlet assemblies.
6. Cable connecting hardware, patch panels, and cross-connects.
7. Telecommunications outlet/connectors.
8. Cabling system identification products.
9. Cable management system.

1.2 DEFINITIONS

A. Basket Cable Tray: A fabricated structure consisting of wire mesh bottom and side rails.

B. BICSI: Building Industry Consulting Service International.

C. Channel Cable Tray: A fabricated structure consisting of a one-piece, ventilated-bottom or solid-bottom channel.

D. Consolidation Point: A location for interconnection between horizontal cables extending from building pathways and horizontal cables extending into furniture pathways.

E. Cross-Connect: A facility enabling the termination of cable elements and their interconnection or cross-connection.

F. Ladder Cable Tray: A fabricated structure consisting of two longitudinal side rails connected by individual transverse members (rungs).

G. LAN: Local area network.

H. MUTOA: Multiuser telecommunications outlet assembly, a grouping in one location of several telecommunications outlet/connectors.

I. Outlet/Connectors: A connecting device in the work area on which horizontal cable or outlet cable terminates.

J. RCDD: Registered Communications Distribution Designer.

K. Solid-Bottom or Nonventilated Cable Tray: A fabricated structure consisting of longitudinal side rails and a bottom without ventilation openings.

L. Trough or Ventilated Cable Tray: A fabricated structure consisting of longitudinal side rails and a bottom having openings for the passage of air.

M. UTP: Unshielded twisted pair.

1.3 HORIZONTAL CABLING DESCRIPTION

A. Horizontal cable and its connecting hardware provide the means of transporting signals between the telecommunications outlet/connector and the horizontal cross-connect located in the communications equipment room. This cabling and its connecting hardware are called "permanent link," a term that is used in the testing protocols.

1. TIA/EIA-568-B.1 recommends that a minimum of two telecommunications outlet/connectors be installed for each work area.
2. Horizontal cabling shall contain no more that one transition point or consolidation point between the horizontal cross-connect and the telecommunications outlet/connector.
3. Bridged taps and splices shall not be installed in the horizontal cabling.
4. Splitters shall not be installed as part of the optical fiber cabling.

B. A work area is approximately 100 sq. ft., and includes the components that extend from the telecommunications outlet/connectors to the station equipment.

C. The maximum allowable horizontal cable length is 295 feet. This maximum allowable length does not include an allowance for the length of 16 feet to the workstation equipment. The maximum allowable length does not include an allowance for the length of 16 feet in the horizontal cross-connect.

1.4 PERFORMANCE REQUIREMENTS

A. General Performance: Horizontal cabling system shall comply with transmission standards in TIA/EIA-568-B.1, when tested according to test procedures of this standard.

1.5 SUBMITTALS

A. Product Data: For each type of product indicated.

1. For coaxial cable, include the following installation data for each type used:

a. Nominal OD.
b. Minimum bending radius.
c. Maximum pulling tension.

B. Shop Drawings:

1. System Labeling Schedules: Electronic copy of labeling schedules, in software and format selected by Government.
2. System Labeling Schedules: Electronic copy of labeling schedules that are part of the cabling and asset identification system of the software.
3. Cabling administration drawings and printouts.
4. Wiring diagrams to show typical wiring schematics, including the following:

a. Cross-connects.

b. Patch panels.
c. Patch cords.

5. Cross-connects and patch panels. Detail mounting assemblies, and show elevations and physical relationship between the installed components.
6. Cable tray layout, showing cable tray route to scale, with relationship between the tray and adjacent structural, electrical, and mechanical elements. Include the following:

a. Vertical and horizontal offsets and transitions.
b. Clearances for access above and to side of cable trays.
c. Vertical elevation of cable trays above the floor or bottom of ceiling structure.
d. Load calculations to show dead and live loads as not exceeding manufacturer's rating for tray and its support elements.

C. Samples: For workstation outlets, jacks, jack assemblies, in specified finish, one for each size and outlet configuration and faceplates for color selection and evaluation of technical features.

D. Qualification Data: For Installer, qualified layout technician, installation supervisor, and field inspector.

E. Source quality-control reports.

F. Field quality-control reports.

G. Maintenance Data: For splices and connectors to include in maintenance manuals.

H. Software and Firmware Operational Documentation:

1. Software operating and upgrade manuals.
2. Program Software Backup: On magnetic media or compact disk, complete with data files.
3. Device address list.
4. Printout of software application and graphic screens.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Cabling Installer must have personnel certified by BICSI on staff.

1. Layout Responsibility: Preparation of Shop Drawings and Cabling Administration Drawings, Cabling Administration Drawings, and field testing program development by an RCDD.
2. Installation Supervision: Installation shall be under the direct supervision of Level 2 Installer, who shall be present at all times when Work of this Section is performed at Project site.
3. Testing Supervisor: Currently certified by BICSI as an RCDD to supervise on-site testing.

B. Testing Agency Qualifications: An NRTL.

1. Testing Agency's Field Supervisor: Currently certified by BICSI as an RCDD to supervise on-site testing.

C. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

E. Telecommunications Pathways and Spaces: Comply with TIA/EIA-569-A.

F. Grounding: Comply with ANSI-J-STD-607-A.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Test cables upon receipt at Project site.

1. Test optical fiber cables to determine the continuity of the strand end to end. Use optical loss test set.
2. Test optical fiber cables while on reels. Use an optical time domain reflectometer to verify the cable length and locate cable defects, splices, and connector; including the loss value of each. Retain test data and include the record in maintenance data.
3. Test each pair of UTP cable for open and short circuits.

1.8 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install cables and connecting materials until wet work in spaces is complete and dry, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

1.9 COORDINATION

A. Coordinate layout and installation of telecommunications pathways and cabling with Owner's telecommunications and LAN equipment and service suppliers.

B. Coordinate telecommunications outlet/connector locations with location of power receptacles at each work area.

1.10 SOFTWARE SERVICE AGREEMENT

A. Technical Support: Beginning with Substantial Completion, provide software support for two years.

B. Upgrade Service: Update software to latest version at Project completion. Install and program software upgrades that become available within two years from date of Substantial Completion. Upgrading software shall include operating system. Upgrade shall include new or revised licenses for use of software.

1. Provide **30** days' notice to Government to allow scheduling and access to system and to allow Government to upgrade computer equipment if necessary.

1.11 EXTRA MATERIALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Patch-Panel Units: One of each type
2. Connecting Blocks: One of each type.
3. Outlet Assembly: **One** of each type for every 25 installed, but not less than one.

PART 2 - PRODUCTS

2.1 PATHWAYS

A. General Requirements: Comply with TIA/EIA-569-A.

B. Cable Support: NRTL labeled for support of Category 6 cabling, designed to prevent degradation of cable performance and pinch points that could damage cable.

1. Support brackets with cable tie slots for fastening cable ties to brackets.
2. Lacing bars, spools, J-hooks, and D-rings.
3. Straps and other devices.

C. Cable Trays:

1. See Division 26 Section Cable Trays for Electrical Systems.

D. Conduit and Boxes: Comply with requirements in Division 26 Section Raceway and Boxes for Electrical Systems.

1. Outlet boxes shall be no smaller than 2 inches wide, 3 inches high, and 2-1/2 inches deep.

2.2 BACKBOARDS

A. Backboards: Plywood, fire-retardant treated, 3/4 by 48 by 96 inches. Comply with requirements in Division 06 Section Rough Carpentry for plywood backing panels.

2.3 UTP CABLE

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Belden CDT Inc.; Electronics Division.
2. Berk-Tek; a Nexans company.
3. CommScope, Inc.
4. Genesis Cable Products; Honeywell International, Inc.
5. KRONE Incorporated.
6. Mohawk; a division of Belden CDT.
7. Nordex/CDT; a subsidiary of Cable Design Technologies.
8. Superior Essex Inc.
9. SYSTIMAX Solutions; a CommScope, Inc. brand.
10. Tyco Electronics/AMP Netconnect; Tyco International Ltd.

B. Description: 100-ohm, 4-pair UTP covered with a thermoplastic jacket.

1. Comply with ICEA S-90-661 for mechanical properties.

2. Comply with TIA/EIA-568-B.1 for performance specifications.
3. Comply with TIA/EIA-568-B.2, Category 6.
4. Listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with UL 444 and NFPA 70 for the following types:

   a. Communications, General Purpose: Type CM or CMG.
   b. Communications, Plenum Rated: Type CMP, complying with NFPA 262.
   c. Communications, Riser Rated: Type CMR, complying with UL 1666.
   d. Communications, Limited Purpose: Type CMX, Multipurpose: Type MP or MPG.
   e. Multipurpose, Plenum Rated: Type MPP, complying with NFPA 262.
   f. Multipurpose, Riser Rated: Type MPR, complying with UL 1666.
   g. All cable shall be clearly identified on the outside jacket as being RoHS compliant.

C. UTP CABLE Colors shall be as follows for coding purposes:

1. POS System: Blue.
2. Wireless Lan: Yellow.
3. PC LAN: Green.
4. Telephone: Gray.
5. Meat Scale System: White.

2.4 UTP CABLE HARDWARE

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Hubbell Premise Wiring.
2. Panduit Corp.
3. Siemon Co. (The).
4. Tyco Electronics/AMP Netconnect; Tyco International Ltd.

B. General Requirements for Cable Connecting Hardware: Comply with TIA/EIA-568-B.2, IDC type, with modules designed for punch-down caps or tools. Cables shall be terminated with connecting hardware of same category or higher.

C. Connecting Blocks: 110-style IDC for Category 6 Provide blocks for the number of cables terminated on the block, plus 25 percent spare. Integral with connector bodies, including plugs and jacks where indicated.

D. Cross-Connect: Modular array of connecting blocks arranged to terminate building cables and permit interconnection between cables.

1. Number of Terminals per Field: One for each conductor in assigned cables.

E. Patch Panel: Modular panels housing multiple-numbered jack units with IDC-type connectors at each jack for permanent termination of pair groups of installed cables.

1. Number of Jacks per Field: One for each four-pair UTP cable indicated plus 25 percent spare capacity.

F. Jacks and Jack Assemblies: Modular, color-coded, eight-position modular receptacle units with integral IDC-type terminals. Color codes shall be as follows:

1. POS System: Blue.

2. Wireless Lan: Yellow.
3. PC LAN: Green.
4. Telephone: Gray.
5. Meat Scale System: White.

G. Patch Cords: Factory-made, four-pair cables; terminated with eight-position modular plug at each end. Coordinate quantities and lengths with Government Designated Representative.

1. Patch cords shall have bend-relief-compliant boots and color-coded icons to ensure Category 6 performance. Patch cords shall have latch guards to protect against snagging.
2. Patch cords shall have color-coded boots for circuit identification.

2.5 OPTICAL FIBER CABLE

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Berk-Tek; a Nexans company.
2. CommScope, Inc.
3. Corning Cable Systems.
4. General Cable Technologies Corporation.
5. Mohawk; a division of Belden CDT.
6. Nordex/CDT; a subsidiary of Cable Design Technologies.
7. Optical Connectivity Solutions Division; Emerson Network Power.
8. Superior Essex Inc.
9. SYSTIMAX Solutions; a CommScope, Inc. brand.
10. 3M.
11. Tyco Electronics/AMP Netconnect; Tyco International Ltd.

B. Description: Multimode, 50/125 micrometer, 12fiber, nonconductive, tight buffer, optical fiber cable.

1. Comply with ICEA S-83-596 for mechanical properties.
2. Comply with TIA/EIA-568-B.3 for performance specifications.
3. Comply with TIA/EIA-492AAAA-A for detailed specifications.
4. Listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with UL 444, UL 1651, and NFPA 70 for the following types:

   a. General Purpose, Nonconductive: Type OFN or OFNG.
   b. Plenum Rated, Nonconductive: Type OFNP, complying with NFPA 262.
   c. Riser Rated, Nonconductive: Type OFNR, complying with UL 1666.
   d. General Purpose, Conductive: Type OFC or OFCG.
   e. Plenum Rated, Conductive: Type OFCP, complying with NFPA 262.
   f. Riser Rated, Conductive: Type OFCR complying with UL 1666.

5. Conductive cable shall be steel armored type.
6. Maximum Attenuation: 3.50 dB/km at 850 nm; 1.5 dB/km at 1300 nm.
7. Minimum Modal Bandwidth: 160 MHz-km at 850 nm; 500 MHz-km at 1300 nm.

C. Jacket:

1. Jacket Color: Orange for 50/125-micrometer cable.
2. Cable cordage jacket, fiber, unit, and group color shall be according to TIA/EIA-598-B.

3. Imprinted with fiber count, fiber type, and aggregate length at regular intervals not to exceed 40 inches.
4. All cable shall be clearly identified on the outside jacket as being RoHS compliant.

2.6 OPTICAL FIBER CABLE HARDWARE

A. Manufacturers: Subject to compliance with requirements available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. American Technology Systems Industries, Inc.
2. Berk-Tek; a Nexans company.
3. Corning Cable Systems.
4. Dynacom Corporation.
5. Hubbell Premise Wiring.
6. Molex Premise Networks; a division of Molex, Inc.
7. Nordex/CDT; a subsidiary of Cable Design Technologies.
8. Optical Connectivity Solutions Division; Emerson Network Power.
9. Siemon Co. (The).
10. Tyco.

B. Cross-Connects and Patch Panels: Modular panels housing multiple-numbered, duplex cable connectors.

1. Number of Connectors per Field: One for each fiber of cable or cables assigned to field, plus spares and blank positions adequate to suit specified expansion criteria.

C. Patch Cords: Factory-made, dual-fiber cables in 36-inch lengths.

D. Cable Connecting Hardware:

1. Comply with Optical Fiber Connector Intermateability Standards (FOCIS) specifications of TIA/EIA-604-2, TIA/EIA-604-3-A, and TIA/EIA-604-12. Comply with TIA/EIA-568-B.3.
2. Quick-connect, simplex and duplex, Type SC connectors. Insertion loss not more than 0.75 dB.
3. Type SFF connectors may be used in termination racks, panels, and equipment packages.

2.7 COAXIAL CABLE

A. Basis of Design Product for Wireless LAN Remote Antenna: Hyperlink 400 Style, 50-Ohm Coax Cable with RP-TNC connectors or equal brand.

B. For Video Surveillance Applications: Coordinate with Video Surveillance equipment manufacturer. Refer to Division 28 Section Video Surveillance.

1. RG 59/U, Plenum RG59/U, Plenum-Rated Indoor Distribution Cable: No. 20 AWG, solid, copper-covered steel conductor; foam fluorinated ethylene propylene insulation. Double shielded with 100 percent aluminum-foil shield, 65 percent aluminum braid. Copolymer jacket. NFPA 70, Type CATV and UL 910.

2.8 COAXIAL CABLE HARDWARE

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Aim Electronics; a brand of Emerson Electric Co.
2. Leviton Voice & Data Division.
3. Siemon Co. (The).

B. Coaxial-Cable Connectors: Type BNC, 75 ohms.

2.9 TELECOMMUNICATIONS OUTLET/CONNECTORS

A. Jacks: 100-ohm, balanced, twisted-pair connector; four-pair, eight-position modular. Comply with TIA/EIA-568-B.1.

B. Workstation Outlets: Four port-connector assemblies mounted in single faceplate, unless otherwise indicated.

1. Plastic Faceplate: High-impact plastic. Coordinate color with Division 26 Section Wiring Devices.
2. For use with snap-in jacks accommodating any combination of UTP, optical fiber, and coaxial work area cords.

a. Flush mounting jacks, positioning the cord at a 45-degree angle.

3. Legend: Machine printed, in the field, using adhesive-tape label.

2.10 GROUNDING

A. Comply with requirements in Division 26 Section Grounding and Bonding for Electrical Systems for grounding conductors and connectors.

B. Comply with ANSI-J-STD-607-A.

2.11 IDENTIFICATION PRODUCTS

A. Comply with TIA/EIA-606-A and UL 969 for labeling materials, including label stocks, laminating adhesives, and inks used by label printers.

B. Comply with requirements in Division 26 Section Identification for Electrical Systems.

2.12 CABLE MANAGEMENT SYSTEM

A. Manufacturers: Subject to compliance with requirements available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Basis-of-Design Product: Subject to compliance with requirements, provide or comparable product by one of the following:

1. iTRACS Corporation.

2. Telsoft Solutions.

C. Description: Computer-based cable management system, with integrated database and graphic capabilities.

D. Document physical characteristics by recording the network, TIA/EIA details, and connections between equipment and cable.

E. Information shall be presented in technical drawings.

1. AutoCAD drawing software shall be used as drawing and schematic plans software.

F. System shall interface with the following testing and recording devices:

1. Direct upload tests from circuit testing instrument into the personal computer.
2. Direct download circuit labeling into labeling printer.

2.13 SOURCE QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to evaluate cables.

B. Factory test UTP and optical fiber cables on reels according to TIA/EIA-568-B.1.

C. Factory test UTP cables according to TIA/EIA-568-B.2.

D. Factory test multimode optical fiber cables according to TIA/EIA-526-14-A and TIA/EIA-568-B.3.

E. Factory-sweep test coaxial cables at frequencies from 5 MHz to 1 GHz. Sweep test shall test the frequency response, or attenuation over frequency, of a cable by generating a voltage whose frequency is varied through the specified frequency range and graphing the results.

F. Cable will be considered defective if it does not pass tests and inspections.

G. Prepare test and inspection reports.

PART 3 - EXECUTION

3.1 ENTRANCE FACILITIES

A. Coordinate backbone cabling with the protectors and demarcation point provided by communications service provider.

3.2 WIRING METHODS

A. Wiring Method: Install cables in raceways and cable trays except within consoles, cabinets, desks, and counters. Conceal raceway and cables except in unfinished spaces.

1. Install plenum cable in environmental air spaces, including plenum ceilings.
2. Comply with requirements for raceways and boxes specified in Division 26 Section Raceway and Boxes for Electrical Systems.

B. Wiring Method: Conceal conductors and cables in accessible ceilings, walls, and floors where possible.

C. Wiring at Drops for Checkout Stands: Provide 10 feet slack by making a 5-foot loop-back in the cable tray for each cable at drops to checkout stands. Outside the cable tray, provide a coiled-up length of each cable equal to 10 feet plus the distance from the cable tray to the floor, for installation by others using a service pole provided with the checkout stand. Label each cable to identify service and cable number. Attach the coiled cables to structure or suspension members supporting the cable tray or ceiling using ty-wraps or equivalent. Perform final testing of the cables after installation and termination is complete.

D. Wiring within Enclosures: Bundle, lace, and train cables to terminal points with no excess and without exceeding manufacturer's limitations on bending radii. Provide and use lacing bars and distribution spools.

3.3 INSTALLATION OF PATHWAYS

A. Cable Trays: Comply with NEMA VE 2 and TIA/EIA-569-A-7.

B. Drawings indicate demarcation point and general arrangement of pathways, cabinets, racks, and fittings.

C. Comply with TIA/EIA-569-A for pull-box sizing and length of conduit and number of bends between pull points.

D. Comply with requirements in Division 26 Section Raceway and Boxes for Electrical Systems for installation of conduits and wireways.

E. Install manufactured conduit sweeps and long-radius elbows whenever possible.

F. Pathway Installation in Communications Equipment Rooms:

1. Position conduit ends adjacent to a corner on backboard where a single piece of plywood is installed, or in the corner of room where multiple sheets of plywood are installed around perimeter walls of room.
2. Install cable trays to route cables if conduits cannot be located in these positions.
3. Secure conduits to backboard when entering room from overhead.
4. Extend conduits 3 inches above finished floor.
5. Install metal conduits with grounding bushings and connect with grounding conductor to grounding system.

G. Backboards: Install backboards with 96-inch dimension vertical. Butt adjacent sheets tightly, and form smooth gap-free corners and joints.

3.4 INSTALLATION OF CABLES

A. Comply with NECA 1.

B. General Requirements for Cabling:

1. Comply with TIA/EIA-568-B.1.
2. Comply with BICSI ITSIM, Ch. 6, "Cable Termination Practices."
3. Install 110-style IDC termination hardware unless otherwise indicated.

4. MUTOA shall not be used as a cross-connect point.
5. Consolidation points may be used only for making a direct connection to telecommunications outlet/connectors:

    a. Do not use consolidation point as a cross-connect point, as a patch connection, or for direct connection to workstation equipment.
    b. Locate consolidation points for UTP at least 49 feet from communications equipment room.

6. Terminate conductors; no cable shall contain unterminated elements. Make terminations only at indicated outlets, terminals, cross-connects, and patch panels.
7. Cables may not be spliced. Secure and support cables at intervals not exceeding 30 inches and not more than 6 inches from cabinets, boxes, fittings, outlets, racks, frames, and terminals.
8. Install lacing bars to restrain cables, to prevent straining connections, and to prevent bending cables to smaller radii than minimums recommended by manufacturer.
9. Bundle, lace, and train conductors to terminal points without exceeding manufacturer's limitations on bending radii, but not less than radii specified in BICSI ITSIM, "Cabling Termination Practices" Chapter. Install lacing bars and distribution spools.
10. Do not install bruised, kinked, scored, deformed, or abraded cable. Do not splice cable between termination, tap, or junction points. Remove and discard cable if damaged during installation and replace it with new cable.
11. Cold-Weather Installation: Bring cable to room temperature before dereeling. Heat lamps shall not be used for heating.
12. In the communications equipment room, install a 10-foot- long service loop on each end of cable.
13. Pulling Cable: Comply with BICSI ITSIM, Ch. 4, "Pulling Cable." Monitor cable pull tensions.

C. UTP Cable Installation:

1. Comply with TIA/EIA-568-B.2.
2. Do not untwist UTP cables more than 1/2 inch from the point of termination to maintain cable geometry. Building Service Cables and Conduits.

D. Optical Fiber Cable Installation:

1. Comply with TIA/EIA-568-B.3.
2. Cable may be terminated on connecting hardware that is rack or cabinet mounted

E. Open-Cable Installation:

1. Install cabling with horizontal and vertical cable guides in telecommunications spaces with terminating hardware and interconnection equipment.
2. Suspend UTP cable not in a wireway or pathway a minimum of 8 inches above ceilings by cable supports not more than 60 inches apart.
3. Cable shall not be run through structural members or in contact with pipes, ducts, or other potentially damaging items.

F. Installation of Cable Routed Exposed under Raised Floors:

1. Install plenum-rated cable only.
2. Install cabling after the flooring system has been installed in raised floor areas.
3. Coil cable 6 feet long not less than 12 inches in diameter below each feed point.

G. Outdoor Coaxial Cable Installation:

1. Install outdoor connections in enclosures complying with NEMA 250, Type 4X. Install corrosion-resistant connectors with properly designed O-rings to keep out moisture.
2. Attach antenna lead-in cable to support structure at intervals not exceeding 36 inches.

H. Group connecting hardware for cables into separate logical fields.

I. Separation from EMI Sources:

1. Comply with BICSI TDMM 12th Edition and TIA/EIA-569-A for separating unshielded copper voice and data communication cable from potential EMI sources, including electrical power lines and equipment.
2. Separation between open communications cables or cables in nonmetallic raceways and unshielded power conductors and electrical equipment shall be as follows:

   a. Electrical Equipment Rating Less Than 2 kVA: A minimum of 5 inches.
   b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 12 inches.
   c. Electrical Equipment Rating More Than 5 kVA: A minimum of 24 inches.

3. Separation between communications cables in grounded metallic raceways and unshielded power lines or electrical equipment shall be as follows:

   a. Electrical Equipment Rating Less Than 2 kVA: A minimum of 2-1/2 inches.
   b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 6 inches.
   c. Electrical Equipment Rating More Than 5 kVA: A minimum of 12 inches.

4. Separation between communications cables in grounded metallic raceways and power lines and electrical equipment located in grounded metallic conduits or enclosures shall be as follows:

   a. Electrical Equipment Rating Less Than 2 kVA: No requirement.
   b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 3 inches.
   c. Electrical Equipment Rating More Than 5 kVA: A minimum of 6 inches.

5. Separation between Communications Cables and Electrical Motors and Transformers, 5 kVA or HP and Larger: A minimum of 48 inches.
6. Separation between Communications Cables and Fluorescent Fixtures: A minimum of 5 inches.

3.5 FIRESTOPPING

A. Comply with requirements in Division 07 Section Firestopping.

B. Comply with TIA/EIA-569-A, Annex A, "Firestopping."

C. Comply with BICSI TDMM 12th Edition, "Firestopping" Article.

3.6 GROUNDING

A. Install grounding according to BICSI TDMM 12th Edition, "Grounding, Bonding (Earthing)" Chapter.

B. Comply with ANSI-J-STD-607-A.

C. Locate grounding bus bar to minimize the length of bonding conductors. Fasten to wall allowing at least 2-inch clearance behind the grounding bus bar. Connect grounding bus bar with a minimum No. 4 AWG grounding electrode conductor from grounding bus bar to suitable electrical building ground.

D. Bond metallic equipment to the grounding bus bar, using not smaller than No. 6 AWG equipment grounding conductor.

3.7 IDENTIFICATION

A. Identify system components, wiring, and cabling complying with TIA/EIA-606-A. Comply with requirements for identification specified in Division 26 Section Identification for Electrical Systems.

B. Using cable management system software specified in Part 2, develop Cabling Administration Drawings for system identification, testing, and management. Use unique, alphanumeric designation for each cable and label cable, jacks, connectors, and terminals to which it connects with same designation. At completion, cable and asset management software shall reflect as-built conditions.

C. Comply with requirements in Division 09 Section Painting and Coatings for painting backboards. For fire-resistant plywood, do not paint over manufacturer's label.

D. Paint and label colors for equipment identification shall comply with TIA/EIA-606. Cable Schedule: Post in prominent location in each equipment room and wiring closet. List incoming and outgoing cables and their designations, origins, and destinations. Protect with rigid frame and clear plastic cover. Furnish an electronic copy of final comprehensive schedules for Project.

E. Cabling Administration Drawings: Show building floor plans with cabling administration-point labeling. Identify labeling convention and show labels for telecommunications closets, backbone pathways and cables, entrance pathways and cables, terminal hardware and positions, horizontal cables, work areas and workstation terminal positions, grounding buses and pathways, and equipment grounding conductors. Follow convention of TIA/EIA-606-A. Furnish electronic record of all drawings, in software and format selected by Government.

F. Cable and Wire Identification:

1. Label each cable within 4 inches of each termination and tap, where it is accessible in a cabinet or junction or outlet box, and elsewhere as indicated.
2. Each wire connected to building-mounted devices is not required to be numbered at device if color of wire is consistent with associated wire connected and numbered within panel or cabinet.
3. Exposed Cables and Cables in Cable Trays and Wire Troughs: Label each cable at intervals not exceeding 15 feet.
4. Label each terminal strip and screw terminal in each cabinet, rack, or panel.

   a. Individually number wiring conductors connected to terminal strips, and identify each cable or wiring group being extended from a panel or cabinet to a building-mounted device shall be identified with name and number of particular device as shown.
   b. Label each unit and field within distribution racks and frames.

5. Identification within Connector Fields in Equipment Rooms and Wiring Closets: Label each connector and each discrete unit of cable-terminating and connecting hardware. Where similar jacks and plugs are used for both voice and data communication cabling, use a different color for jacks and plugs of each service.
6. Uniquely identify and label work area cables extending from the MUTOA to the work area. These cables may not exceed the length stated on the MUTOA label.

G. Labels shall be preprinted or computer-printed type with printing area and font color that contrasts with cable jacket color but still complies with requirements in TIA/EIA-606-A.

1. Cables use flexible vinyl or polyester that flex as cables are bent.

3.8 FIELD QUALITY CONTROL

A. Perform tests and inspections with qualified personnel.

B. Tests and Inspections:

1. Visually inspect UTP and optical fiber cable jacket materials for NRTL certification markings. Inspect cabling terminations in communications equipment rooms for compliance with color-coding for pin assignments, and inspect cabling connections for compliance with TIA/EIA-568-B.1.
2. Visually confirm marking of outlets, cover plates, outlet/connectors, and patch panels.
3. Visually inspect cable placement, cable termination, grounding and bonding, equipment and patch cords, and labeling of all components.
4. Test UTP backbone copper cabling for DC loop resistance, shorts, opens, intermittent faults, and polarity between conductors. Test operation of shorting bars in connection blocks. Test cables after termination but not cross-connection.

   a. Test instruments shall meet or exceed applicable requirements in TIA/EIA-568-B.2. Perform tests with a tester that complies with performance requirements in "Test Instruments (Normative)" Annex, complying with measurement accuracy specified in "Measurement Accuracy (Informative)" Annex. Use only test cords and adapters that are qualified by test equipment manufacturer for channel or link test configuration.

5. Optical Fiber Cable Tests:

   a. Test instruments shall meet or exceed applicable requirements in TIA/EIA-568-B.1. Use only test cords and adapters that are qualified by test equipment manufacturer for channel or link test configuration.
   b. Link End-to-End Attenuation Tests:

      1) Horizontal and multimode backbone link measurements: Test at 850 or 1300 nm in 1 direction according to TIA/EIA-526-14-A, Method B, One Reference Jumper.
      2) Attenuation test results for backbone links shall be less than 2.0 dB. Attenuation test results shall be less than that calculated according to equation in TIA/EIA-568-B.1.

6. UTP Performance Tests:

   a. Test for each outlet and MUTOA. Perform the following tests according to TIA/EIA-568-B.1 and TIA/EIA-568-B.2:

1) Wire map.
2) Length (physical vs. electrical, and length requirements).
3) Insertion loss.
4) Near-end crosstalk (NEXT) loss.
5) Power sum near-end crosstalk (PSNEXT) loss.
6) Equal-level far-end crosstalk (ELFEXT).
7) Power sum equal-level far-end crosstalk (PSELFEXT).
8) Return loss.
9) Propagation delay.
10) Delay skew.

7. Optical Fiber Cable Performance Tests: Perform optical fiber end-to-end link tests according to TIA/EIA-568-B.1 and TIA/EIA-568-B.3.
8. Conduct tests according to Division 27. Final Verification Tests: Perform verification tests for UTP and optical fiber systems after the complete communications cabling and workstation outlet/connectors are installed.

   a. Voice Tests: These tests assume that dial tone service has been installed. Connect to the network interface device at the demarcation point. Go off-hook and listen and receive a dial tone. If a test number is available, make and receive a local, long distance, and digital subscription line telephone call.
   b. Data Tests: These tests assume the Information Technology Staff has a network installed and is available to assist with testing. Connect to the network interface device at the demarcation point. Log onto the network to ensure proper connection to the network.

C. Document data for each measurement. Data for submittals shall be printed in a summary report. Transferred from the instrument to the computer, saved as text files, and printed and submitted.

D. End-to-end cabling will be considered defective if it does not pass tests and inspections.

E. Prepare test and inspection reports.

END OF SECTION

SECTION 28 31 00

FIRE DETECTION AND ALARM

(Edited from DeCA June 2011 Design Criteria)

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Fire alarm systems.

B. Related Sections:

1. Division 08 Section Door Hardware for door closers and holders with associated smoke detectors, electric door locks, and release devices that interface with the fire alarm system.
2. Division 28 Section Mass Notification Systems (if provided).

1.2 DEFINITIONS

A. FACP: Fire alarm control panel.

B. LED: Light-emitting diode.

C. NICET: National Institute for Certification in Engineering Technologies.

D. Definitions in NFPA 72 apply to fire alarm terms used in this Section.

E. AHJ: Authority Having Jurisdiction is an individual responsible for review, inspection, and/or approval of a system and shall include the building official, fire marshal, engineer, Contracting Officer, or Government's insurance representative. For this project, the AHJ shall be the Ft. Lee Fire Marshall.

1.3 REFERENCES

A. All references shall be of the latest edition.

B. Factory Mutual (FM):

1. FM AG Approval Guide.

C. National Fire Protection Association (NFPA):

1. NFPA 13 Standard For The Installation of Sprinkler Systems.
2. NFPA 70 National Electrical Code.
3. NFPA 72 National Fire Alarm Code.
4. NFPA 90A Standard For The Installation of Air Conditioning And Ventilating Systems.
5. NFPA 101 Life Safety Code.

D. Underwriters' Laboratories, Inc. (UL): Appropriate UL equipment standards:

1. UL 864 Control Panels.
2. UL 268 Smoke Detectors.
3. UL 268A Smoke Detectors (HVAC).
4. UL 38 Manually Actuated Signaling Boxes.
5. UL 346 Water flow Indicators for Fire Protection Signaling.
6. UL 1971, Standard for Visual Signaling Appliances.

E. Building Codes:

1. International Building Code.
2. International Fire Code.

F. ADA, and/or State and local equivalency standards as adopted by The Authority Having Jurisdiction.

G. Military Unified Facilities Criteria:

1. UFC 3-600-1.
2. UFC 3-600-02.
3. UFC 4-021-01.

1.4 SYSTEM DESCRIPTION

A. Noncoded, analog-addressable system; automatic sensitivity control of certain smoke detectors; and multiplexed signal transmission. Signal communication within the premises shall be by hard-wired circuits.

B. All equipment furnished shall be new and the latest state of the art products of a single manufacturer, engaged in the manufacturing and sale of analog fire detection devices for over ten years.

C. The system as specified shall be reviewed, fully tested and approved by each of the Authorities Having Jurisdiction, and turned over to the Government in an operational condition.

D. In the interest of job coordination and responsibilities the installing contractor shall contract with a single supplier for fire alarm equipment, engineering, programming, inspection and testing.

E. The contractor shall provide a representative as requested for project meetings such as to assist in coordination of crafts.

1.5 PERFORMANCE REQUIREMENTS

A. Comply with NFPA 72.

B. Fire alarm signal initiation shall be by one or more of the following devices:

1. Manual stations.
2. Smoke detectors.
3. Automatic sprinkler system water flow.
4. Fire extinguishing system operation.

C. Fire alarm signal shall initiate the following actions:

1. Sound an audible alarm and display a custom screen/message defining the building/zone/room in alarm and the specific alarm point initiating the alarm.
2. Log to the system history archives all activity pertaining to the alarm condition.
3. Sound the ANSI 117-1 signal with synchronized audible alarm and visual strobe signals throughout the facility.
4. Audible signals shall be silenced from the fire alarm control panel by an alarm silence switch. Visual signals shall be programmable to flash until system reset or additional alarm silencing, as required.
5. A signal dedicated to sprinkler system water flow alarm shall not be silenced while the sprinkler system is flowing at a rate of flow equal to a single head.
6. HVAC shut down shall be accomplished by system operated duct detectors as per local requirements. Unless specifically required by the AHJ, HVAC and duct detectors shall initiate a supervisory signal and not a building evacuation.
7. Door hold-open devices shall release by floor or when specifically indicated otherwise on Drawings or local requirements.
8. Electric door locking devices shall release by floor or when specifically indicated otherwise on Drawings or local requirements.
9. Provide for an alarm condition at an approved off-site monitoring station or as indicated on Drawings.

D. Supervisory signal initiation shall be by one or more of the following devices or actions:

1. Signal from the Mass Notification Panel (if provided or existing).
2. Display the origin of the supervisory condition report at the local fire alarm control panel.
3. Activate supervisory audible and dedicated visual signal.
4. Provide a means for silencing a supervisory signal shall be permitted only if it is key-operated, located in a locked enclosure, or arranged to provide equivalent protection against unauthorized use. Such a means shall be permitted only if it transfers the supervisory indication to a lamp or other visible indicator and subsequent supervisory signals in other zones cause the supervisory notification appliance(s) to re-sound.
5. Record within system history the initiating device and time of occurrence of the event.
6. Transmit the signal to the monitoring station.

E. System trouble signal initiation shall be by one or more of the following devices or actions:

1. Signal from the Mass Notification Panel (if provided or existing).
2. Display at the local fire alarm control panel the origin of the trouble condition report.
3. Activate trouble audible and visual signals at the control panel and as indicated on the drawings.
4. Silence audible signals from the fire alarm control panel via a trouble acknowledge switch.
5. Trouble reports for primary system power failure to the master control shall be optionally delayed for a period of time not greater than 200 seconds. Trouble conditions that have been restored to normal shall be automatically removed from the trouble display queue and not require operator intervention. This feature shall be software selectable and shall not preclude the logging of trouble events to the historical file.
6. Record within system history, the occurrence of the event, the time of occurrence and the device initiating the event.
7. Transmit the signal to the monitoring station.

F. System Trouble and Supervisory Signal Actions: Ring trouble alarm and annunciate at the FACP and remote annunciators.

G. Power and Voltage Limitations:

1. Battery capacity calculations. Battery size shall be a minimum of 125 percent of the calculated requirement.
2. Power supplies shall be sized to furnish the total connected load in a worst-case condition plus 25 percent spare capacity. (i.e. 4A supply x .25 spare = 1A reserve.)
3. Voltage drop calculations for wiring runs demonstrating worst-case condition. Unless otherwise approved by the engineer, voltage drop calculations shall be performed using the Lump-Sum approach using device nominal rating voltage. Calculations must include and clearly indicate wire length out and back to panel. Calculations shall be provided for horn, strobe, and speaker circuits. Use of notification power booster panels shall be limited.
4. Device current values for voltage calculations shall be based on the lowest nameplate voltage. (i.e. current values at a voltage of 20 volts shall be used when available rather than current values for 24 volts.)
5. Notification Appliance Circuit (NAC) design shall incorporate a 25 percent spare capacity for future expansion.
6. End-of-line voltage reading will be required for each circuit and must have a 25 percent spare capacity. (i.e. 24V circuit - 21V nameplate = 3 volt drop x 0.25 spare = 0.75 volt safety factor required.)
7. In no case shall horn/strobe circuits be designed or measured to have an end-of-line voltage below 20 volts or the manufactures nameplate voltage, whichever is higher.

1.6 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Five copies of all submittals shall be submitted to the Contracting Officer for review. The contractor shall include the following information in submittals.

1. Shop Drawings shall be prepared and signed by persons with the following qualifications:

   a. Trained and certified by manufacturer in fire alarm system design.
   b. Fire alarm certified by NICET, minimum Level III.

2. System Operation Description: Detailed description for this Project, including method of operation and supervision of each type of circuit and sequence of operations for manually and automatically initiated system inputs and outputs. Manufacturer's standard descriptions for generic systems are not acceptable.
3. Device Address List: Coordinate with final system programming.
4. Control input/output Matrix.
5. System riser diagram with device addresses, conduit sizes, and cable and wire types and sizes.
6. Wiring Diagrams: Power, signal, and control wiring. Include diagrams for equipment and for system with all terminals and interconnections identified. Show wiring color code.
7. Batteries: Size calculations.
8. Duct Smoke Detectors: Performance parameters and installation details for each detector, verifying that each detector is listed for the complete range of air velocity, temperature, and humidity possible when air-handling system is operating. Coordinating the installation of duct smoke detectors and access to them. Show critical dimensions that relate to placement and support of sampling tubes, the detector housing, and remote status and alarm indicators. Locate detectors according to manufacturers written recommendations.

9. Elevation Details: Details shall be provided showing mounting of wall and ceiling devices. Where exposed or pocketed ceilings are involved, specific dimensioned details of detector and notification devices shall be provided.
10. Device Mounting Details: Details of device back-box requirements shall be provided.
11. Floor Plans: Indicate final outlet locations showing address of each addressable device. Show size and route of cable and conduits. Unless prohibited by Government, CADD files for floor plans may be obtained through General Contractor from the Architect/Engineer via the Government's Designated Representative. Unless noted otherwise, Architect/Engineer firm charges $100.00 per sheet.

C. Cut Sheets, Calculations, and Other Design Documents: Each set of shop drawings shall be accompanied with supportive submittal documentation. This documentation shall be quality bound and shall be organized and numerically tabbed into the following sections.

1. Power Supplies.
2. Detection Devices.
3. Audio/Visual Devices.
4. System Components, Modules and Relays.
5. Battery Calculations and cut sheets (summary of results shall also be on plans).
6. Voltage Calculations (summary of results shall also be on plans).
7. Compatibility Listings (matrix, table, or info showing device compatibility).
8. Operating Instructions for entire System. (This will include a copy of what will be posted adjacent to FACP.)
9. Manufacturers Inspection instructions and other maintenance criteria from NFPA 72 and UFC 3-600-02.
10. Designer and installer certificates. (Documents prepared by a PE do not require certificate, but are required to be sealed.)

D. Qualification Data: Copies of certificates for installers and documenting approved manufacture representation shall be provided.

E. Field quality control test reports.

F. Operation and Maintenance Data: For fire alarm system to include in emergency, operation, and maintenance manuals. Comply with NFPA 72, Appendix A, recommendations for Government's manual. Include abbreviated operating instructions for mounting at the FACP.

G. Submittals to Authorities Having Jurisdiction: In addition to distribution requirements for submittals specified in Division 01 Administrative Requirements, make an identical submittal to authorities having jurisdiction. To facilitate review, include copies of annotated Contract Drawings as needed to depict component locations. Resubmit if required to make clarifications or revisions to obtain approval. On receipt of comments from authorities having jurisdiction, submit them to Contracting Officer for review.

H. Documentation:

1. Approval and Acceptance: Provide the "Record of Completion" form according to NFPA 72 to Government and authorities having jurisdiction.
2. Record of Completion Documents: Provide the "Permanent Records" according to NFPA 72 to Government. Format of the written sequence of operation shall be the optional input/output matrix.

   a. Hard copies on paper to Government.

I. A copy of these fire alarm specifications shall be included with all submittal packages including those to the Government, and local AHJ's.

J. Incomplete submittals shall be returned without review, unless previously approved by the Contracting Officer.

1.7 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Qualifications:

1. The contractor shall submit copies of all required Licenses and Bonds as required in the State having jurisdiction to the Contracting Officer upon award of contract, and engineer upon request.
2. The contractor shall employ on staff a minimum of one NICET level III Fire Alarm Technician, a registered Fire Protection Engineer, a professional engineer registered in the State of the installation, or a Certified Safety Professional with proven experience in fire alarm systems. This individual shall make regular site visits as necessary to oversee the system installation. This individual will be held accountable for system oversight, code compliance, and quality of installation. This requirement shall apply to the fire alarm contractor and any other contractor installing portions of the system such as wiring and/or devices by an electrical contractor. Qualified individual shall immediately provide evidence of qualification upon request.
3. At least one NICET Level II Fire Alarm Technician shall be present and have oversight anytime fire alarm equipment and/or wiring are being installed. This requirement shall apply to the fire alarm contractor and any other contractor installing portions of the system such as wiring and/or devices by an electrical contractor. Technician shall immediately provide evidence of qualification upon request.
4. Fire alarm shop drawings shall be prepared and signed by a NICET Level III Fire Alarm Technician or a Professional Engineer with proven and documented experience/training in fire alarm system design and codes. Plans not prepared by the Professional Engineer or under the direct supervision (same employment) of the Professional Engineer shall not be approved. Design documents prepared by a Professional Engineer shall bear a seal and signature of the engineer.
5. The Contracting Officer may accept a testing or qualification body other than NICET, if submitted and approved prior to bidding the project. Evidence of qualification and means for verification shall be provided in writing to the Contracting Officer with sufficient time for evaluating such request prior to awarding of contract. However, such qualifications shall be specifically focused towards fire alarm system design, installation, and codes. Qualifications for other low voltage systems such as security, access control, telephone, etc. shall not be approved.
6. The State approved or licensed fire alarm contractor whose name appears on the system and who is responsible for system warranty and service shall have sole authority to establish installation responsibilities. Thus, if any portion is to be wired or installed by a separate contractor (such as an electrical contractor), then the fire alarm contractor will by contract select and warrant such contractor. An electrical or other contractor not licensed by the state and/or not meeting qualification requirements of this Specification shall not dictate installation conditions for this system.

1.8 REGULATORY REQUIREMENTS

A. Factory Mutual (FM).

1. FM AG Approval Guide.

1.9 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Lamps for Remote Indicating Lamp Units: Quantity equal to 10 percent of amount installed, but not less than 1 unit.
2. Lamps for Strobe Units: Quantity equal to 10 percent of amount installed, but not less than 1 unit.
3. Smoke, Fire, and Flame Detectors: Quantity equal to 10 percent of amount of each type installed, but not less than 1 unit of each type.
4. Detector Bases: Quantity equal to 2 percent of amount of each type installed, but not less than 1 unit of each type.
5. Keys and Tools: One extra set for access to locked and tamperproofed components.
6. Audible and Visual Notification Appliances: One of each type installed.
7. Fuses: Two of each type installed in the system.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Wire and Cable:

a. Comtran Corporation.
b. Helix/HiTemp Cables, Inc.; a Draka USA Company.
c. West Penn Wire/CDT; a division of Cable Design Technologies.

2. Audible and Visual Signals:

a. Match existing manufacturer and style.

2.2 FACP

A. General Description: Existing to remain.

B. Circuits:

1. Signaling Line Circuits: NFPA 72, Class A.
2. Notification-Appliance Circuits: NFPA 72, Class A.
3. Actuation of alarm notification appliances, emergency voice communications, annunciation, elevator recall, and actuation of suppression systems shall occur within 10 seconds after the activation of an initiating device.

4. Electrical monitoring for the integrity of wiring external to the FACP for mechanical equipment shutdown and magnetic door-holding circuits is not required, provided a break in the circuit will cause doors to close and mechanical equipment to shut down.

2.3 MANUAL FIRE ALARM BOXES

A. Description: UL 38 listed; finished in red with molded, raised-letter operating instructions in contrasting color. Station shall show visible indication of operation. Mounted on recessed outlet box; if indicated as surface mounted, provide manufacturer's surface back box.

1. Double-action mechanism requiring two actions to initiate an alarm, pull-lever type. With integral addressable module, arranged to communicate manual-station status (normal, alarm, or trouble) to the FACP.
2. Station Reset: Key- or wrench-operated switch.
3. Indoor Protective Shield: Factory-fabricated clear polycarbonate plastic enclosure, hinged at the top to permit lifting for access to initiate an alarm. Lifting the cover actuates an integral battery-powered audible horn intended to discourage false-alarm operation. Locate only in public areas.

2.4 SYSTEM SMOKE DETECTORS

A. General Description:

1. UL 268 listed, operating at 24-V dc, nominal.
2. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to the FACP.
3. Multipurpose type, containing the following:

   a. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to the FACP.
   b. Heat sensor, combination rate-of-rise and fixed temperature.

4. Plug-in Arrangement: Detector and associated electronic components shall be mounted in a plug-in module that connects to a fixed base. Provide terminals in the fixed base for connection of building wiring.
5. Self-Restoring: Detectors do not require resetting or readjustment after actuation to restore them to normal operation.
6. Integral Visual-Indicating Light: LED type. Indicating detector has operated and power-on status.
7. Remote Control: Unless otherwise indicated, detectors shall be analog-addressable type, individually monitored at the FACP for calibration, sensitivity, and alarm condition, and individually adjustable for sensitivity from the FACP.

   a. Rate-of-rise temperature characteristic shall be selectable at the FACP for 15 or 20 deg F per minute.
   b. Fixed-temperature sensing shall be independent of rate-of-rise sensing and shall be settable at the FACP to operate at 135 or 155 deg F.
   c. Provide multiple levels of detection sensitivity for each sensor.

B. Photoelectric Smoke Detectors:

1. Sensor: LED or infrared light source with matching silicon-cell receiver.

2. Detector Sensitivity: Between 2.5 and 3.5 percent/foot smoke obscuration when tested according to UL 268A.

C. Duct Smoke Detectors:

1. Photoelectric Smoke Detectors:

a. Sensor: LED or infrared light source with matching silicon-cell receiver.
b. Detector Sensitivity: Between 2.5 and 3.5 percent/foot smoke obscuration when tested according to UL 268A.

2. UL 268A listed, operating at 24-V dc, nominal.
3. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to the FACP.
4. Plug-in Arrangement: Detector and associated electronic components shall be mounted in a plug-in module that connects to a fixed base. The fixed base shall be designed for mounting directly to the air duct. Provide terminals in the fixed base for connection to building wiring.

a. Weatherproof Duct Housing Enclosure: UL listed for use with the supplied detector. The enclosure shall comply with NEMA 250 requirements for Type 4X.

5. Self-Restoring: Detectors shall not require resetting or readjustment after actuation to restore them to normal operation.
6. Integral Visual-Indicating Light: LED type. Indicating detector has operated and power-on status.
7. Remote Control: Unless otherwise indicated, detectors shall be analog-addressable type, individually monitored at the FACP for calibration, sensitivity, and alarm condition, and individually adjustable for sensitivity from the FACP.
8. Each sensor shall have multiple levels of detection sensitivity.
9. Sampling Tubes: Design and dimensions as recommended by manufacturer for the specific duct size, air velocity, and installation conditions where applied.
10. Relay Fan Shutdown: Rated to interrupt fan motor-control circuit.

2.5 NOTIFICATION APPLIANCES

A. Description: Match existing manufacturer and style.

2.6 SPRINKLER SYSTEM REMOTE INDICATORS

A. Remote status and alarm indicator and test stations, with LED indicating lights. Light is connected to flash when the associated device is in an alarm or trouble mode. Lamp is flush mounted in a single-gang wall plate. A red, laminated, phenolic-resin identification plate at the indicating light identifies, in engraved white letters, device initiating the signal and room where the smoke detector or valve is located. For water-flow switches, the identification plate also designates protected spaces downstream from the water-flow switch.

2.7 MAGNETIC DOOR HOLDERS

A. Description: Units are equipped for wall or floor mounting as indicated and are complete with matching door plate.

1. Electromagnet: Requires no more than 3 W to develop 25-lbf holding force.
2. Wall-Mounted Units: Flush mounted, unless otherwise indicated.
3. Rating: 120 VAC or 24 V dc.

B. Material and Finish: Match door hardware.

2.8 GUARDS FOR PHYSICAL PROTECTION

A. Description: Welded wire mesh or polycarbonate of size and shape for the manual station, smoke detector, strobe, or other device requiring protection. Any device located in Receiving/Staging area shall be protected as such.

B. Manual pull station shall have tamper proof cover equivalent to Edward Systems Stopper II with sounder.

2.9 WIRE AND CABLE

A. Wire and cable for fire alarm systems shall be UL listed and labeled as complying with NFPA 70, Article 760.

B. Signaling Line Circuits: Twisted, shielded pair, No. 14 AWG.

1. Circuit Integrity Cable: Twisted shielded pair, NFPA 70 Article 760, Classification CI, for power-limited fire alarm signal service. UL listed as Type FPL, and complying with requirements in UL 1424 and in UL 2196 for a 2-hour rating.

C. Non-Power-Limited Circuits: Solid-copper conductors with 600-V rated, 75 deg C, color-coded insulation.

1. Low-Voltage Circuits: No. 16 AWG, minimum.
2. Line-Voltage Circuits: No. 12 AWG, minimum.

2.10 AS-BUILT PLAN CABINET

A. An As-Built plan cabinet shall be installed with every new fire alarm system installation or replacement. The purpose of the cabinet is to provide a secured location for all fire alarm documentation related to the system. This will aid in future servicing and modifications to the system.

1. The plan cabinet shall be sized and contain approved plans, specifications, manuals, test reports, service reports, computer disk, and a hard copy printout of the system logic/programming.
2. The cabinet shall be keyed the same as the fire alarm panel.
3. The cabinet shall be located as shown on plans, adjacent to the main fire alarm panel, or there shall be signage on the fire alarm panel indicating where the plan cabinet is located.

B. The cabinet shall be neatly and clearly labeled "As Built Drawings" and shall be equal to the DBX As Built Cabinets manufactured by Space Age Electronics.

PART 3 - EXECUTION

3.1 EQUIPMENT INSTALLATION

A. Connecting to Existing Equipment: Verify that existing fire alarm system is operational before making changes or connections.

1. Connect new equipment to the existing monitoring equipment at the Supervising Station.

B. Smoke or Heat Detector Spacing:

1. Smooth ceiling spacing shall not exceed 30 feet.
2. Spacing of heat detectors for irregular areas, for irregular ceiling construction, and for high ceiling areas, shall be determined according to Appendix A in NFPA 72.
3. Spacing of heat detectors shall be determined based on guidelines and recommendations in NFPA 72.

C. HVAC: Locate detectors not closer than 3 feet from air-supply diffuser or return-air opening.

D. Duct Smoke Detectors: Comply with NFPA 72 and NFPA 90A. Install sampling tubes so they extend the full width of the duct.

E. Single-Station Smoke Detectors: Where more than one smoke alarm is installed within a dwelling or suite, they shall be connected so that the operation of any smoke alarm causes the alarm in all smoke alarms to sound.

F. Remote Status and Alarm Indicators: Install near each smoke detector and each sprinkler water-flow switch and valve-tamper switch that is not readily visible from normal viewing position.

G. Audible Alarm-Indicating Devices: Install not less than 80 inches to bottom of device or 6 inches below the ceiling, but not higher than 96 inches unless otherwise noted. Ceiling mounted devices at same location or in combination with Visible Indicating Devices are permitted. Install bells and horns on flush-mounted back boxes with the device-operating mechanism concealed behind a grille where finished walls are available for mounting. In large open ceiling areas where walls are not available, devices may be suspended on rigidly supported threaded conduit.

H. Visible Alarm-Indicating Devices: Install adjacent to each alarm bell or alarm horn and at least 80 inches to bottom of device or 6 inches below the ceiling, but not higher than 96 inches unless otherwise noted. Ceiling mounted devices shall be permitted with coverage per NFPA 72 tables.

I. Device Location-Indicating Lights: Locate in public space near the device they monitor.

J. No portion of a fire alarm system shall be installed prior to having plans on site that have been approved and stamped by the Contracting Officer and the local AHJ. This includes wiring. Approved stamped plans shall be on site at all times while the system is in the installation stage.

1. Smoke detectors shall not be installed until the construction cleanup of all trades is complete per NFPA 72. Any smoke detector that has been installed prior to the construction cleanup of all trades and without prior written approval of the engineer and local AHJ shall be marked in a permanent manner that will identify it from re-use and shall be replaced prior to commissioning of the system and/or turning over to the

Government. Such detectors shall be replaced at the sole expense of the installing contractor. Subject to approval of the engineer and local AHJ this may exclude services, which do not create air-born particles such as telephone/network services, and modular furniture installation.

2. Orange shipping covers, rubber gloves, tape, or other devices shall not be used to try and get around these basic requirements.

3.2 BACK BOXES

A. Any time fire alarm speakers are to be installed, a 4-square deep box with extension ring shall be installed to limit potential damage to wiring.

B. Manual pull stations shall be located on walls such that tamper resistant covers can be installed as may be indicated, or in the future. Therefore, a 3-inch clearance from other switches, window openings, door frames, etc. shall be provided on each side of a manual pull station and 4 inches clear area above and below the manual pull station.

3.3 WIRING INSTALLATION

A. Install wiring according to the following:

1. NECA 1.
2. TIA/EIA 568-A.

B. Wiring Method: Install wiring in raceway according to Division 26 Section Raceway and Boxes for Electrical Systems.

1. Fire alarm circuits and equipment control wiring associated with the fire alarm system shall be installed in a dedicated raceway system. This system shall not be used for any other wire or cable.
2. Devices need to be included on the circuits as indicated on the approved plans and calculations. Changes will need to be evaluated by the designer. Changes in wire routing may require new calculations.
3. Raceway system shall be minimum 3/4 inch EMT Type.
4. Paint all fire alarm conduit red. In exposed ceiling areas, conduit may be painted to match surroundings but provide 3/4 inch red bands every 10 feet on center.

C. Wiring within Enclosures: Separate power-limited and non-power-limited conductors as recommended by manufacturer. Install conductors parallel with or at right angles to sides and back of the enclosure. Bundle, lace, and train conductors to terminal points with no excess. Connect conductors that are terminated, spliced, or interrupted in any enclosure associated with the fire alarm system to terminal blocks. Mark each terminal according to the system's wiring diagrams. Make all connections with approved crimp-on terminal spade lugs, pressure-type terminal blocks, or plug connectors.

D. Cable Taps: Use numbered terminal strips in junction, pull, and outlet boxes, cabinets, or equipment enclosures where circuit connections are made.

E. Color-Coding: Color-code fire alarm conductors differently from the normal building power wiring. Use one color for alarm circuit wiring and a different color for supervisory circuits. Color-code audible alarm-indicating circuits differently from alarm-initiating circuits. Use different colors for visible alarm-indicating devices. Paint fire alarm system junction boxes and covers red.

3.4 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals according to Division 26 Section Identification for Electrical Systems.

B. Each conductor shall be identified as shown on the drawings at each end and at terminal points with wire markers. Attach permanent wire markers within 2 inches of the wire termination. Marker legends shall be visible.

3.5 FIELD QUALITY CONTROL

A. Contractor Pre-Testing and Record of Completion Testing:

1. This section covers contractor pre-testing and documentation by the installing contractor that shall be conducted before any commissioning inspection or AHJ testing is scheduled.
2. Wiring runs shall be tested for continuity, short circuits and grounds before any system devices are installed or energized.
3. All alarm initiating devices shall be observed and logged for correct zone and sensitivity. These devices and their bases shall be tagged with adhesive tags located in an area not visible when installed, showing the initials of the installing technician and date.
4. Computer/labeler generated labels with the address number only may be installed on the exterior of the device as long as the background is clear and installed in a quality manner. This will assist in the inspection, testing, maintenance, and trouble-shooting of the system.
5. All smoke detectors shall be commissioned using canned smoke or a method that will functionally test the smoke chamber. The use of magnets for commission testing of smoke detectors is Strictly Prohibited.
6. The installing contractor shall make instruments, tools and labor required to conduct the system tests available.

B. At minimum the following tests shall be conducted and documented:

1. Turn each sprinkler system flow valve two full turns and verify proper supervisory alarm at the FACP.
2. Verify activation of all flow switches under approved flowing conditions.
3. Open initiating device circuits and verify that the trouble signal actuates.
4. Open and short signaling line circuits and verify that the trouble signal actuates.
5. Open and short Notification Appliance Circuits and verify that trouble signal actuates.
6. Ground all circuits and verify response of trouble signals.
7. Check installation, supervision, and operation of all intelligent smoke detectors using the Walk Test feature.
8. Each notification horn circuit shall be tested under standby/battery power. End-of-line voltage readings shall be taken at the end-of-line resistor for Class "B" circuits, or at the booster panel for Class "A" circuits. Any circuit that measures less than 20 volts dc or the nameplate voltage, whichever is higher, shall be considered as failing the design. Note: Some systems incorporating synchronizing modules can impair results. If the module cannot be bypassed for voltage readings, the manufacturer should be contacted for guidance.

3.6 ACCEPTANCE TESTING

A. This section details criteria for commissioning inspections by AHJ's and the Government.

1. This stage of testing shall not be scheduled or conducted until all pre-testing has been completed and is in compliance with applicable requirements.
2. The contractor is responsible for testing all components in accordance with the manufacturers required and suggested procedures and in accordance with NFPA 72. If this Specification incorporates a detailed Acceptance Test Procedure (ATP) prepared by the engineer than it shall also be followed.
3. The commissioning inspector shall use the system record drawings and other documents specified under this Specification during the testing procedure to verify operation as programmed. In conducting the commissioning test, the inspector shall request demonstration of any or all input and output functions.
4. All smoke detectors shall be commissioned using canned smoke or a method that will functionally test the smoke chamber. The use of magnets for commission testing of smoke detectors is strictly prohibited.
5. New detectors that show to be dirty through system sensitivity testing shall be replaced.
6. The items tested shall include but not be limited to the following:

   a. System wiring shall be tested to show the following results and the systems subsequence operation:

      1) Open, Shorted or Grounded Circuits.
      2) Primary and Battery power disconnected.
      3) End-of-line voltage readings on notification circuits.

   b. System notification circuits and appliances operate as programmed. Audibility and visual levels meet required standards.
   c. A minimum of 15 dBA above ambient shall be obtained in every occupiable space (throughout) per NFPA 72. This includes storage rooms, electrical rooms, telephone rooms, and any other occupiable space.

3.7 WARRANTY AND SERVICES

A. The contractor shall warranty the new devices for electrical and mechanical failures for a period of one year. The warranty shall begin with the completion of the commissioning testing or when beneficial use to the Government is determined and so documented.

B. If a commissioning test for an AHJ has been scheduled and is cancelled without sufficient notice to modify a travel schedule without financial penalties, or the system fails to pass all requirements of this Specification resulting in a re-inspection, the AHJ reserves the right to bill the contractor for expenses incurred as a result thereof. Such expenses may include travel, transportation, lodging, meals, and daily wages. Daily wages shall not exceed $800 per day.

END OF SECTION

SECTION 33 08 00

COMMISSIONING OF UTILITIES

(Edited from DeCA June 2011 Design Criteria)

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Division 33 responsibilities in the commissioning process.
2. Commissioning of storm drainage utilities.
3. Commissioning of electric utility services.

B. Related Sections:

1. Division 01 Section General Commissioning Requirements.

1.2 DEFINITIONS

A. CA: Commissioning Agent.

B. CO: Contracting Officer.

C. GC: Contractor; General Contractor, not a Subcontractor.

D. O&M: Operations and Maintenance.

E. QC: Contractor's Quality Control Manager.

F. TI: Technical Inspector.

1.3 DESCRIPTION

A. This Section describes commissioning requirements applicable to commissioned items and systems specified in Division 33 to ensure that all systems are operating in a manner consistent with the Contract Documents.

B. Conform to commissioning requirements and the commissioning plan.

1.4 RESPONSIBILITIES

A. Construction and Acceptance Phases:

1. Include the cost of commissioning in the Contract price.
2. In each purchase order or subcontract written, include requirements for submittal data, O&M data and training.

3. Conduct a commissioning scoping meeting and other meetings necessary to facilitate the Commissioning process.
4. Provide requested documentation to the TI, developed for functional testing procedures.
5. Provide functional performance test procedures. Subcontractors shall review test procedures to ensure feasibility, safety and equipment protection and provide necessary written alarm limits to be used during the tests.
6. Develop a full start-up and initial checkout plan using manufacturer's start-up procedures and the prefunctional checklists for all commissioned equipment. Submit to QC for review prior to startup. TI will verify plan for compliance. Refer to Division 01 Section General Commissioning Requirements for further details related to start-up.
7. During the startup and initial checkout process, execute the prefunctional checklists for all commissioned equipment.
8. Perform and clearly document all completed startup and system operational checkout procedures, providing a copy to the QC and TI.
9. Correct system deficiencies before functional testing.
10. Provide skilled technicians to execute starting of equipment and to execute the functional performance tests. Ensure that they are available and present during the agreed upon schedules and for sufficient duration to complete the necessary tests, adjustments and problem-solving.
11. Provide all test equipment necessary to fulfill specified testing requirements.
12. Assist the CA and TI in interpreting the monitoring data, as necessary.
13. Correct deficiencies (differences between specified and observed performance) as interpreted by the CA, TI and A/E and retest the equipment.
14. Prepare O&M manuals according to the Contract Documents, including clarifying and updating the original sequences of operation to as-built conditions.
15. During construction, maintain as-built red-line drawings for all drawings and final CAD as-builts for contractor-generated coordination drawings. Update after completion of commissioning (excluding deferred testing).
16. Coordinate with equipment manufacturers to determine specific requirements to maintain the validity of the warranty.

B. Operation Manuals Shall Include:

1. A table of all setpoints and implications when changing them.
2. Schedules.
3. Instructions for operation of each piece of equipment for emergencies.
4. Seasonal adjustment.
5. Startup and shutdown.
6. Instructions for energy savings operations and descriptions of the energy savings strategies in the facility (from O&M Manuals).
7. Recommendations for recommissioning frequency by equipment type.
8. Energy tracking recommendations.

C. Warranty Period:

1. Execute seasonal or deferred functional performance testing, witnessed by the CA, according to the specifications.
2. Correct deficiencies and make necessary adjustments to O&M manuals and as-built drawings for applicable issues identified in any seasonal testing.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 STARTUP

A. Contractors shall follow the start-up and initial checkout procedures listed in the Responsibilities list in this Section and in Division 01 Section General Commissioning Requirements. Division 33 has start-up responsibility and is required to complete systems and sub-systems so they are fully functional, meeting the design objectives of the Contract Documents. The commissioning procedures and functional testing do not relieve or lessen this responsibility or shift that responsibility partially to the Commissioning Agent, Technical Inspector, or Government.

B. Functional testing will generally begin upon completion of a system. Functional testing may proceed prior to the completion of systems or sub-systems at the discretion of the CO. Beginning system testing before full completion does not relieve the Contractor from fully completing the system, including all prefunctional checklists.

3.2 OPERATION AND MAINTENANCE (O&M) MANUALS

A. The following O&M manual requirements are in addition to O&M manual documentation requirements elsewhere in these Specifications.

B. Division 33 shall compile and prepare documentation for all commissioned systems covered in Division 33 and deliver this documentation to the GC for inclusion in the O&M manuals prior to the training of Government personnel.

3.3 TRAINING OF GOVERNMENT PERSONNEL

A. The GC shall be responsible for training coordination and scheduling to ensure that training is completed.

B. The QC shall be responsible for reviewing the content and adequacy of the training of Government personnel for commissioned equipment or systems. TI will verify compliance.

C. The Subcontractor shall have the following training responsibilities for the commissioned systems:

1. Provide the TI with a training plan four weeks before the planned training.
2. Provide designated Government personnel with comprehensive orientation and training in the understanding of the systems and the operation and maintenance of each piece of commissioned equipment.
3. Training shall start with classroom sessions followed by hands-on training on each piece of equipment.
4. During any demonstration, should the system fail to perform in accordance with the requirements of the O&M manual or sequence of operations, the system will be repaired or adjusted as necessary and the demonstration repeated.
5. The appropriate trade or manufacturer's representative shall provide the instructions on each major piece of equipment. This person may be the start-up technician for the piece of equipment, the installing contractor or manufacturer's representative. Practical operating expertise as well as in-depth knowledge of all modes of operation of the specific piece of equipment are required. More than one party may be required to execute the training.

6. The training sessions shall follow the outline in the Table of Contents of the operation and maintenance manual and illustrate whenever possible the use of the O&M manuals for reference.
7. Training shall include:

    a. Use of the printed installation, operation and maintenance instruction material included in the O&M manuals.
    b. A review of the written O&M instructions emphasizing safe and proper operating requirements, preventative maintenance, special tools needed and spare parts inventory suggestions. The training shall include start-up, operation in all modes possible, shut-down, seasonal changeover and any emergency procedures.
    c. Discussion of relevant health and safety issues and concerns.
    d. Discussion of warranties and guarantees.
    e. Common troubleshooting problems and solutions.
    f. Explanation of information included in the O&M manuals.
    g. Discussion of any peculiarities of equipment installation or operation.
    h. Classroom sessions shall include the use of overhead projections, slides, video/audio-taped material as might be appropriate.

8. Hands-on training shall include start-up, operation in all modes possible, including manual, shut-down and any emergency procedures and preventative maintenance for all pieces of equipment.
9. Fully explain and demonstrate the operation, function and overrides of any local packaged controls, not controlled by the central control system.
10. Training shall occur after functional testing is complete, unless approved otherwise by the Project Manager.
11. Minimum Duration of Training. Subcontractor shall provide 8 hours of training.

END OF SECTION

09 MAY 2012

COMMISSARY
FORT LEE, VA

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SPECIFICATIONS
100% FINAL DESIGN
SUBMITTAL

ARCHITECTURAL AND
REFRIGERATION
UPGRADE AT THE
COMMISSARY

PROJECT # EA11M14
A/E PROJECT # 2011-052

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