1. GENERAL

1.1. Related Sections. See Division 23 Sections 23 90 00 Product Refrigeration Systems and 23 09 16 Refrigeration Monitoring and Control Systems (RMCS).

1.2. New Store Concept:

A. Ensure mechanical systems incorporated into new store compliment and encompass current marketing strategies resulting in a pleasing, efficient, and energy saving system. Identify appropriate mechanical systems early in the design to achieve both the desired appearance and energy savings. Coordinate design concept with DeCA Project Manager prior to commencing design.

B. Current marketing trend eliminates suspended ceiling in Sales Area and renders ceiling structure visible. This impact on air conditioning systems and other mechanical systems is immediate. The design Mechanical Engineer shall provide guidance to the design Architect for appropriate visual appearance of the mechanical systems. Accomplish this by incorporating spiral ductwork (insulation as required), protecting overhead exposed refrigeration lines from excessive condensation by applying appropriate insulation (or other means of catching condensate), and paralleling structural support runs with piping runs. Also, recent trends of varying lighting levels require the design to properly account for heat generated by the new schemes into the different projects. Incorporate these and other energy saving initiatives into the construction documents.

C. The sections comprising Division 23 address air conditioning of the various functional areas. The design Mechanical Engineer shall work closely with DeCA Project Manager during the development of the construction documents. Constant changes in marketing trends require flexibility in the designs of the mechanical systems. The attached air conditioning Design Standards Plates, 230500 series, provide guidance in the general layout of the air conditioning systems. Anticipate variations of these layouts as new marketing trends are incorporated into the different projects.

1.3. Remodel Concept:

A. Incorporate new store concepts during major remodeling of existing facilities. Many will not apply. The design Mechanical Engineer shall coordinate with the design Architect on those marketing concepts to include in the construction documents. The same requirements for new store projects shall apply for remodel projects to the extent feasible. For example, exposed structure will require spiral ductwork. Installation of a new suspended ceiling will allow the use of rectangular sheet metal ductwork. Other remodel or addition/alteration information is in other sections of Division 23. Ensure mechanical systems incorporated into remodeled store result in an efficient and energy saving system. Identify and provide appropriate mechanical systems calculations early in design to achieve desired energy savings.

B. Phasing of work to accomplish the desired changes will be an important consideration to incorporating the changes. Clearly discuss the effect of the work on the mechanical systems in the design analysis. Discuss any conflicts or problems with attempting to incorporate the new marketing concept application. (For example, removing the suspended ceiling will require additional insulation at the roof deck. Incorporating the new concept of exposed structure will require extensive roof work.) Clearly discuss the approach to replacing the existing mechanical systems.

1.4. Applicable Codes:

A. The International Code Council family of codes, current editions, shall govern DeCA construction. These codes include: International Building code (IBC), International Mechanical (IMC), and International Energy Conservation Code (IECC), Federal Energy Reduction Mandates including Executive Order 13514 and 13423 with Guiding Principles,

EISA 2007 (Energy Independence and Security Act of 2007), EPACT 2005 (Energy Policy Act of 2005) and 10 CFR Part 433.

B. Unified Facilities Criteria (UFC).

1.5. Design Analysis:

A. Include the following:

1. Engineering weather data showing design temperatures for the installation.
2. Investigation results of the availability of heat source.
3. Descriptions of all systems **(new and existing)**, proposed changes, and phasing work if applicable.
4. HVAC load analysis and calculations with all design submittals.
    a. Detailed psychometric analysis of each air handling system with schematic showing points and conditions with reference to psychometric chart.
    b. Design calculations for each piece of air moving equipment to verify the HVAC equipment selections.
5. Energy analysis to verify compliance with codes and federal guidelines.
    a. (**new construction**) Comply with requirements to design and build to "Energy performance standards applicable to Federal residential and commercial in 10 CFR part 435". See Division 01 Section 01 33 29 Sustainable Design Reporting and Computer Energy Analysis.
    b. Summary table of all product type selections based on Efficiency Recommendation Tables from DOE/FEMP's Buying Energy Efficient Products.
6. Air flow ductwork schematic for air handling units.

1.6. Design Review:

1. Provide comprehensive HVAC control design review to insure that the RMCS and conventional controls are properly integrated, complete, and coordinated.
2. Review to ensure that all Specification Sections and Construction Drawings clearly reflect all control requirements and specifications.
3. Review to ensure that all Specification Sections and Construction Drawings are consistent and cohesive in the control requirements that they indicate.

1.7. System Design:

A. See Section 23 05 00 for general requirements. Comply with the requirements of the Design Standard Plates as applicable. Provide building [**EDIT OUT FOR TROPICS**: heating and] cooling load calculations, [**EDIT OUT FOR TROPICS**: heating and cooling equipment, duct sizing calculations by a professional mechanical engineer licensed to practice that discipline in any one of the states or possessions of the United States, Washington D.C., or Puerto Rico.

B. Indoor Design Conditions:

1. Summer:

SPACE	TYPICAL	
Sales Area	75 deg F DB;	52 Deg F dew point

Offices, CISIC Room, Alcove, Rest Rooms, Locker Rooms and Breakrooms	15 deg F less than the1% outside dry bulb (DB) weather condition not to exceed 78 deg F DB or be less than 75 deg FDB	50% RH min +/- 10%
Delivery, dry storage, and Mechanical equipment rooms	fan forced ventilation	

2. Winter: [NOT IN TROPICS]

SPACE	**TYPICAL**
Sales Area	70 deg F DB 52 deg F dew point (maximum)
CISIC Room, Offices, Rest Rooms, Locker Rooms and Breakrooms	70 deg F DB
Delivery, Dry Storage and Mechanical Rooms	55 deg F DB
Entry/Exit, Cart Return Vestibules	55 deg F DB, unless otherwise directed

C. Outside air volumes:

a. Sales/Checkout Area: In accordance with ASHRAE Standard 62.1-2016.

7.5 CFM per occupant + 0.06 CFM per SF.

The number of people for Sales/Checkout Area calculations will be based on 125 ft^2 per person of net area.

Provide at a minimum a surplus of outside air to make-up exhaust air and keep the sales area positively pressurized with respect to the outdoors.

b. Other areas comply with ASHRAE 62.1-2016.

D. HVAC Design Considerations:

1. General for all areas:

a. Zone building to allow optimal use of setback thermostats in intermittent use areas.

b. No variable air volume systems without prior approval from DeCA CIED.

c. Refrigerant: R410A shall be used in all HVAC systems. Alternate refrigerants with lower GWP (Global Warming Potential), such as R-32 (HFC-32), shall be considered when available from the manufacturer.

d. Design heating, mechanical ventilation, and air-conditioning per the ASHRAE HVAC Applications Handbook and SMACNA standards.

e. Except for refrigeration, identify all piping by color codes and symbols.

f. Compute heating and air-conditioning load calculations per procedures of the latest ASHRAE Fundamentals Handbook.

g. Outside Design Temperatures: Use the latest version of UFC 3-400-02 Engineering Weather Data:

Summer: 1% Occurrence

Winter: 99% Occurrence

2. Sales and Checkout Area:

   a. Coordinate heating, ventilation, and air conditioning design with refrigeration design to provide an integrated, cost effective system.

   b. Cooling and Heating Load Profiles for Sales Area: Cooling and heating load profiles shall be provided for the sales area by the Architect/Engineer.

   c. Economizer Cycle: Do not use for Sales Area cooling.

   d. Design air volumes for the Sales Area:

      1) See Design Standard 230500-03 for general layout and diffuser preference.

   e. Discharge Air and Return Air: Base on following:

      1) 0.75 CFM/ft^2 (3.81 L/s/m^2) of Sales Area floor area.

   f. Credits and Losses (see refrigeration schedules):

      1) Sales Area Cooling Design:

         a) Total Open Refrigerated Display Case Load Credit: 60% sensible, 0 latent.

         b) Total Glass Door Refrigerated Display Case Load Credit: 40% sensible, 0 latent.

      2) Sales Area Heating Design:

         a) Total Open And Glass Door Refrigerated Display Case Load Penalty: 90% (sensible).

   g. Return Air Duct Layout:

      1) Do not design the return air duct system to draw air from beneath and/or behind the refrigerated cases. Exception: In an existing commissary that uses return air from beneath and/or behind the refrigerated cases, continue using this method based on the following:

      2) (See Design Standard 230500-01and 03).Return air at 75 cfm/ft (116 lps/m) unless noted otherwise. Utilize as many cases as required to provide the required return air CFM in the following order:

         a) Dairy: 1G02.

         b) Meat Multi-deck:

            (1) 1M02.

            (2) 1M04.

            (3) 1M07

         c) Deli:

            (1) 1D01.

            (2) 1D02.

         d) Ice Cream:

            (1) 1B08.

            (2) 1G12.

            (3) 1G28 – Use if available for designs with underfloor return ducts.

e) Frozen Juice: 1G13

f) Frozen Food:

(1) 1G06. 150 CFM/ft (230 L/s/m)

(2) 1G07. 150 CFM/ft (230 L/s/m)

(3) 1G10.

(4) 1G27 - Use if available for designs with underfloor return ducts.

g) Produce:

(1) 1P02.

(2) 1P03.

(3) 1P07.

h. Return air duct layout: (See Design Standard 23 05 00-03).

1) Under floor tunnels shall not be used without express direction from DeCA.

2) Conceal ductwork above the ceiling where ceiling is proposed. Where no ceiling is proposed (open to structure) coordinate type, design, and location of ductwork with design Architect.

3) Do not use the space between the roof and ceiling as supply or return air plenum. Provide ductwork.

i. Sales Area HVAC Air Distribution:

1) Do not use a variable air volume system for the sales checkout area.

2) Direct 2/3 of volume to checkout and queuing area and 1/3 to display area.

3) Do not locate diffusers over or near any open or multideck refrigerated display case area.

4) Select diffuser types and locations to direct air toward loads, particularly at front of the sales area (slotted diffusers preferred).

5) On larger stores, consider two zones (checkout/sales). However, direct 2/3 of total HVAC air distribution volume to Checkout and Queuing Areas and 1/3 to display area with common return for both zones. Indicate in Design Analysis proposed zoning of sales area (checkout/sales) at [**35**] [**50**/**100**] percent progress review.

6) Provide nozzle type destratification fans over refrigerated isles where return air is not drawn beneath and/or behind the refrigerated cases. Fans shall be controlled by a single variable speed controller with RMCS interface.

j. Air Handler(s):

1) Sales Area Air Handler: Sales Area shall be served by a dual path dehumidifiers or a combination of multiple package desiccant dehumidifiers and single zone package air handling unit. System type shall be determined utilizing life cycle cost analysis (LCCA) and evaluation of structure. Phasing will also need to be considered for any sustainment project or add alter project.

a) Dual Path Dehumidifiers

(1) When utilizing Dual Path Dehumidification units the designer shall consider using two units on larger stores. When using two units the unit

serving the Checkout Area shall deliver 2/3s of the total airflow and the unit serving the Sales Floor shall deliver 1/3 of the total airflow.

(2) Indirect gas fired heating units shall provide all of the heating.

(3) Heat reclaim coil shall be considered when parallel rack compressors systems are utilized (See heat reclaim section)

(4) Unit shall be controlled by the building RMCS system. (See RMCS section).

(5) Air distribution should be ducted with linear diffuser utilized for distribution over the Sales Area & Checkout Area.

b) Packaged Desiccant Dehumidifiers

(1) When utilizing Packaged Desiccant Dehumidifiers the designer shall located these units over the sales floor. Multiple units should be utilized and zoned to provide proper air distribution utilizing plenum distribution system with high velocity drum type diffusers.

(2) Packaged Desiccant Dehumidifiers shall provide 1/3 of the total air flow in the sales floor.

(3) The desiccant units will provide all of the ventilation air to the space and provide both temperature and humidity control to the sales floor area.

(4) Designer should avoid locating these units over the frozen food area.

(5) Indirect gas fired heating units shall provide all of the heating.

(6) Unit shall be controlled by the building RMCS system. (See RMCS section).

c) Single Zone Packaged Air Handling Unit

(1) Provide single zone package air handling unit over the checkout area.

(2) Single zone package air handling unit shall provide 2/3 of the total air flow in the checkout area.

(3) No ventilation air shall be provided with this unit. All of the ventilation is provided in the Packaged Desiccant Dehumidifiers.

(4) Air distribution should be ducted with linear diffuser utilized for distribution over the checkout area.

d) Heat Reclaim System: See Design Standard 23 84 16-01.

(1) General: Heat reclaim in commissary facilities refers to the utilization of the heat rejected by the display and perishable storage refrigeration to supplement the Sales Area, Administration Area and Warehouse heating and the heating of domestic hot water. It will not supplement the store heating and dehumidification control system as a means of meeting the overall building energy budget. Provide heat reclaim by equipping the refrigeration system with a second condenser (heat recovery coil) located in the facility AHU. Divert compressor discharge gas to heat reclaim coil as required by the space thermostat. Connect heat reclaim coil in series with remote condenser. Depending upon the geographic location, reclaimed heat can provide from 45% to 100% of heating requirements. Heat reclaim used in conjunction with air conditioning provides economical reheat for dehumidification control. Heat available

for heat reclaim is proportional to refrigeration load. In cold weather, refrigeration load can decrease and reduce heat of rejection to 50% of summer design value.

(2) Heat Reclaim Coil(s):

(a) Mount in air-handling unit or duct mount.

(b) Located as close to refrigeration compressors as practicable to minimize heat loss and refrigerant use. Allow maximum of 75'-0" from refrigeration compressors to heat recovery coil.

(3) Sizing:

(a) Do not exceed approximately 40% of design heat of rejection of each compressor system.

(4) Design Temperature Differential at Coil: 125 deg F.

(a) Divert compressor discharge gas to the heat coil as required by the RMCS. Connect the heat recovery coil in series with the remote condenser.

(b) Locate the heat reclaim coil as close to the refrigeration machinery as practicable to minimize heat loss and refrigerant use. Limit piping to a maximum of 75'-0" from refrigeration units to the heat recovery coil.

(c) Provide a DEC "Thermastore," Paul Mueller Co. "Pre-Heater" or equivalent 119 gallon storage type heat reclaim systems for heating domestic hot water on each low temperature system.

(d) Provide low condensing pressure heat reclaim lockout through the RMCS for all heat reclaim systems.

3. Other air conditioned areas (See Design Standard 23 05 00-03 thru 23 05 00-07 for additional information).

a. Cashier's Office and Cash Counting Room HVAC (See Design Standard 23 05 00-04) consider following:

1) Provide a packaged rooftop HVAC unit or, where local regulations will not permit or local conditions make outdoor heating equipment impractical, split system air conditioning equipment. Provide gas fired or heat pump heating sections as fuel cost economics or building constraints suggest.

2) Equipment heat load:

a) 1500 w. (sensible).

b) 88 Watts (300 BTUH) (latent).

c) Three (3) personnel. In large stores, two (2) in mid-size stores, and one (1) in small stores.

3) Provide adequate air circulation in Cash Counting.

b. CISC and/or Communication Room HVAC:

1) Provide a ductless split system heat pump with wall mounted or ceiling cassette evaporator section and wall mounted, hard wired 7 day programmable thermostat with diagnostic display and locking guard.

2) Equipment heat load:

a) 1-5 check stands - 3,000 w. (sensible).

b) 6+ check stands - 6,200 w.

c) Two (2) personnel.

d) Provide 30 cfm from a ventilation kit or from an adjacent system to provide for the occasional occupant.

c. Communication Closet (Sub Hub):

1) Provide a 200 cfm exhaust fan and a means of introducing makeup air from an adjacent air conditioned space. The fan shall run continuously.

d. Administrative Areas, Break rooms, and Training Rooms (See Design Standard 23 05 00-6):

1) Provide a packaged rooftop HVAC unit or, where local regulations will not permit or local conditions make outdoor heating equipment impractical, split system air conditioning equipment. Units over 6 tons shall be 2 stage. Provide gas fired or heat pump heating sections as fuel cost economics or building constraints suggest.

2) Administrative Office:

a) Account for general office equipment and occupancy as shown on the concept floor plan in the Design Analysis.

b) Do not provide VAV control units. Instead, provide VAV diffusers – heating/cooling changeover type - in private offices to modulate less than 10% of the total system cfm.

3) Break Room and Training Rooms:

a) Provide dedicated air conditioning equipment for each room except that adjacent, connected Training room with folding door to make area into one room may share an HVAC unit if an electric reheat coil and thermostat is provided for the training room.

b) Assume normal equipment (vending machines, projector) and occupancy loads in the Design Analysis.

e. Employee Break Room and Locker Area:

1) Provide a packaged rooftop HVAC unit or, where local regulations will not permit or local conditions make outdoor heating equipment impractical, split system air conditioning equipment. Units over 6 tons shall be 2 stage. Provide gas fired or heat pump heating sections as fuel cost economics or building constraints suggest.

2) Assume normal equipment (vending machines, projector) and occupancy loads in the Design Analysis.

f. Meat Manager's Office/Produce Manager's Office Staging/Receiving Manager's Office:

1) Provide a ductless split system heat pump with ceiling cassette evaporator section, ventilation kit, and wall mounted, hard wired 7 day programmable thermostat with diagnostic display and locking guard.

2) In climate zones where the winter design temperature falls below the heat pump heating capabilities, provide supplemental electrical heat. (i.e. electric baseboard heater or wall heater).

3) Where offices are located within refrigerated spaces, the ductless split system may be omitted. Provide supplemental electric heat as required. (i.e. ceiling mounted forced air electric heater or wall heater).

g. Medical Food Inspection Office:

1) Provide a ductless split system heat pump with ceiling cassette evaporator section, ventilation kit, and wall mounted, hard wired 7 day programmable thermostat with diagnostic display and locking guard.

h. Bakery/Deli Area (See Design Standard 23 05 00-05):

1) Provide a packaged rooftop HVAC unit or, where local regulations will not permit or local conditions make outdoor equipment impractical, split system air conditioning equipment. Provide gas fired or heat pump heating sections as fuel cost economics or building constraints suggest.

2) Do not provide outside make-up air.

3) Consider following internal heat loads:

a) Equipment: 15,000 to 30,000 BTU/HR.

b) Lights: 2.5 Watts/ft^2.

c) Four (4) 4 personnel.

4) Provide ceiling exhaust fan to discharge return air and aroma of baked goods from bakery work room into the sales area for full size, bake off bakeries only.

5) Provide Type 1 hoods in accord with NFPA 96 (latest edition) and the IMC. All hoods shall have fire suppression systems in accord with NFPA 96, IFC, and the IMC. Provide hoods at:

a) Rotisserie oven.

b) Kombi oven.

c) Bakery oven (this hood may be integral. Verify that fire suppression is provided.)

The Hoods shall be compensating or makeup air type when exhaust air quantity exceeds 5% of the total circulated air quantity in the Sales Area. Stainless steel splash panels, if required, shall be furnished under Division 05 Metals.

6) Provide a flue exhaust fan for the oven in accord with manufacturer's instructions.

7) Note the access requirements, construction requirements, and grease trap requirements in the IMC and NFPA 96.

E. Facility Space Heating System:

1. Design to ensure adequate heating will be available to the facility. Clearly identify operating sequence reset requirements for operation of the heating system when ambient conditions are at or below 55 deg F with full heat available at 35 deg F. Provide space heating equipment to heat all portions of the facility. In extreme climates and only at the direction of DeCA, provide a boiler to supply hot water to all HVAC equipment handling 800 cfm or more.

2. Boiler Types: [**NOTE TO SPECIFIER**: PROVIDE BOILER ONLY IN EXTREME CLIMATES WITH CONCURRENCE OF DeCA.]

1) Coordinate with the installation preference of boiler types. Only separated combustion type boilers with ducted combustion air from out of doors shall be installed in refrigeration machinery rooms.

b. Identify available fuel sources for use in area.

c. Supply design water temperature to equipment 120 deg F to 180 deg F by reset controls.

d. Provide two hot water pumps. Pumps shall be controlled in a lead/lag operation with an automatic alternator rotating the pumps which are lead and lag based on a predetermined schedule.

e. Service connection for [***SITE SPECIFIC:*** **natural gas / LPG]** service for this project shall be the Contractor's responsibility.

f. Provide adequate expansion tank.

g. Justify the use of a boiler by economic analysis and include in design calculations.

h. Provide all drawing details pertaining to the facility space heating system on the construction drawings.

i. All loads greater than 5000 Btu/hr shall be met by the boiler/Hydronic system, lesser loads shall utilize electric heat.

3. [**NOTE TO SPECIFIER:** *this paragraph not applicable to D/B RFPs – Ensure Geotechnical Report includes this info*].

4. **[NOTE TO SPECIFIER**: Provide Central or district heat only in EXTREME CLIMATES WITH CONCURRENCE OF DeCA. When heat source is from an installation central heating plant, verify with installation year-round availability and provide in the design analysis results of the investigation.]

a. Provide meters as indicated below:

1) <u>Steam Meters:</u>

a) If facility is supplied steam from central steam plant, and if a considerable amount of steam or condensate will be consumed within the facility, provide steam meters.

b) If only a relatively small amount of steam or condensate will be lost, provide condensate meters in lieu of steam meters.

c) Provide meters that have capability for local readouts and Electronic Monitoring and Control Systems (EMCS) connections.

d) Connect meters to the RMCS.

e) Do not use turbine type steam meters.

2) <u>Steam Condensate Meters:</u>

a) Steam and steam condensate meters shall conform to Unified Facilities Criteria (UFGS) Section 25 10 10 Advanced Utility Metering System for its respective duty.

b) Design meters for 120EC (250EF) condensate and flow rates from 2 to 10-gallons per minute.

c) Provide meters with a pulse switch initiator capable of operating up to speeds of 500-pulses per minute with no false pulses, and requiring no field adjustments.

d) Initiators shall provide the maximum number of pulses, but not less than 1-pulse per 10-gallons, up to 500 per minute that is obtainable from the manufacturer.

e) Connect meter to the RMCS.

3) High Temperature Water HTW Meters:

a) If facility is supplied HTW from a central plant, provide a "BTU" meter.

b) Meter shall be suitable for temperatures and pressures incurred with HTW.

c) Provide meters that have the capability for local readouts and EMCS connections.

d) Connect meter to the RMCS.

4) Areas of the building to be heated:

a) Staging/Receiving Area: When winter design temperature is below 32 deg F, provide high intensity gas fired radiant heaters at all overhead doors. Remainder of area shall be heated with separated combustion gas fired unit heaters. Design calculations shall account for infiltration through the overhead doors. Account for a minimum of 1.05 cfm/ft^2 of staging/receiving area as infiltration through overhead doors).

b) Entrance and Exit Vestibules: Where winter design temperature is 32 deg F or lower, provide supplemental heating with a gas fired rooftop or indoor packaged gas fired unit with discharge air ducted to each vestibule and return air from each vestibule, or if a large area, with a low intensity infra red hater.

c) Blind attics above freezers where outdoor air design temperature is less than 20 deg F: Heat to 50 deg F.

F. Ventilation Systems:

1. Provide a schedule of exhaust fan controls indicating which fans are controlled by the RMCS, and which by conventional controls (Division 23 Section 23 09 13 Instrumentation and Control Devices for HVAC) and which by manual (Division 26) controls.

2. Fish Market:

a. Provide an exhaust system for the work area in the fish market sized at 2 cfm per square foot. Additionally, exhaust 100 cfm per square foot with a linear register above the display case. Include this air volume in the Sales area makeup air calculation.

3. Mechanical Room for Refrigeration Compressors (Not required for Self contained Mechanical Centers):

a. Provide ventilation system consisting of a combination of exhaust fans, inlet fans, and dampers.

b. Design ventilation system such that the airflow is across the machinery.

c. Control and monitor each fan and inlet damper through the RMCS.

d. Provide fixed intake louvers unless design ambient temperature is below 20 deg F in which case motor operated louvers or dampers behind the louvers shall be required.

e. Design ventilation systems to limit the temperature rise to 10 deg F above ambient.

f. Refrigeration compressors and motors radiate a sufficient amount of heat that ventilation is required both summer and winter.

1) Provide two (2) exhaust fans and inlet dampers and locate so that air flow is across refrigeration equipment.

2) [**add/alter projects**] Stage separate thermostat and thermostat set points if no RMCS exists.

3) For compressor systems with remote condensers, provide the following:

A. For summer 1% ambient over 90 deg F, provide ventilation of 100 CFM/HP of refrigeration compressor motors.

B. For summer 1% ambient of 90 deg F or lower, provide ventilation of 75 CFM/HP of refrigeration compressor motors.

C. For condensing unit compressor systems with compressor and condenser in mechanical room, provide 1000 CFM/HP.

4) Noise Control in Mechanical Equipment Rooms. Comply with OSHA Standards. Use AMCA-300, ARI 575, and ASTM E477 for guidance.

4. Staging/Receiving and Warehouse Areas:

a. Heat and vent Staging/Receiving and Warehouse Areas. Do not cool except if evaporative coolers are warranted per subparagraph below.

b. Provide forced ventilation at the rate of 2cfm/sf. Exhaust air through rooftop ventilators.

c. Use curb mounted exhaust fans. Locate air intakes louvers with motorized dampers 10' above grade at north or west walls. Provide bars at 16" spacing in both plan directions on the exterior side of the motorized dampers in both the exhaust and intake openings. Create cross-flow ventilation pattern. Introduce make-up air through vandal-proof security grilles. Interlock motorized louver dampers with exhaust fans.

d. Provide high volume low speed fans (HVLS) in climate zones1A, 1B, 2A, 2B, and 3A.

e. Heat Staging/Receiving and Warehouse areas per Division 23 Section 23 05 50 Common Work Results for HVAC criteria.

f. In desert climates where forced ventilation alone cannot provide tolerable ambient temperature, provide evaporative cooling systems (direct or indirect option) throughout the staging/receiving and warehouse areas. As an alternative, provide a life cycle cost analysis to compare the options of using evaporative cooling systems or using a roof spray cooling system with forced ventilation.

g. Controls:

1) For exhaust fans: Monitor status and control through the RMCS.

2) For HVLS fans: Control all fans with a single control panel capable of group and individual control of fans; monitor and allow overrides of fan status, speed, and direction through the RMCS. Monitor fire alarm status and interlock fans with operation. Allow local user override with a timeout function.

3) Temperature sensor: provide at 72" AFF.

4) See Division 23 Section 23 09 13 Instrumentation and Control Devices for HVAC.

5. Suspended Slab Floor Ventilation:

a. If all or any portion of building should employ a suspended slab floor system and thus creating a void or crawl space, provide a forced ventilation system to produce air movement in the space between the suspended slab floor and the finished grade at rate of 0.10cfm/sf.

b. Place exhaust fans on one end of building and louvered grilles on opposite end.

c. Base control on separate thermostat for required number of exhaust fans and stage thermostat set points on outside temperatures.

d. Make fans operate when under slab temperature exceeds 55 deg F.

e. Provide forced ventilation system to produce air movement in the space between the suspended slab floor at a rate of 0.1 to 0.25 CFM/ft^2.

6. Freezer Floor Ventilations:

a. Provide a 250 cfm roof mounted exhaust fan connected to the ventilation piping shown in the drainage fill below the freezer floor. See details on the architectural/structural drawings.

b. The fan shall run continuously and its operation shall be monitored by the RMCS through a sail switch. The RMCS shall issue an alarm upon fan failure.

7. Kitchen Equipment Ventilation:

a. Review kitchen equipment manufacturer requirements and provide the necessary exhaust fan, ductwork and/or fire suppression kitchen hood for the following CEDs:

1) 1B12-A

2) 1B12-B

3) 1B13-A

4) 1B13-B

5) 1D09

6) 1D26

8. Other Storage Room Ventilation (Sensitive Storage, damaged merchandise room, Janitor Closet, Contractor Storage Room, Main Supply Room and Small Store Room):

a. Provide forced exhaust air ventilation at rate of 2 CFM/ft^2 of floor area.

b. Introduce make-up air through vandal proof grilles and exhaust through roof. (See Design Standard 23 05 00-13 for Sensitive Storage).

c. Controls:

1) Monitor status and control through the RMCS.

2) Temperature sensor: where more than one room is served, locate sensor in the largest room. Provide at 72" AFF.

d. See Division 23 Section 23 09 13 Instrumentation and Control Devices for HVAC

9. Restroom Exhaust (See Design Standards 23 05 00-5, 23 05 00-6 and 23 05 00-7):

a. Provide single exhaust fan to exhaust from both men's and women's restrooms at rate of 125 CFM per stall.

b. Introduce Make-up air through door grille.

c. Control exhaust fan by room occupancy sensor except where more than one room is served by a single fan. Where more than one room is served by a single exhaust fan, control fan with time-of-day schedule.

d. Monitor status and control through the RMCS.

10. Telephone Sub Hub Rooms:

a. Provide single forced exhaust air ventilation fan **(200cfm)**.

b. Introduce make-up air from air conditioned space through door grille.

c. The fan shall run continuously and its operation shall be monitored by the RMCS through a sail switch. The RMCS shall issue an alarm upon fan failure.

11. Electrical Rooms:

a. Provide single forced exhaust air ventilation fan.

b. Introduce un-conditioned make-up air though door grille from un-conditioned space or outdoor air louver.

c. Control from conventional thermostat.

G. Control of HVAC Units:

1. Utilize the RMCS for control of all HVAC equipment including package rooftop units, split systems, ductless split systems, exhaust fans and unit heaters in the Staging/Receiving Area. Refer to Division 23 Section 23 09 16 Refrigeration Monitoring and Control Systems (RMCS).

2. Emergency HVAC shut down must be incorporated with the RMCS system to enable all applicable HVAC equipment to be shut down in the event of a hazardous emergency. Refer to UFC-4-010-01, Section B-4.3.

3. Smoke detectors are a part of the fire alarm and detection system and shall not be connected to or monitored by the RMCS.

H. Wall Heaters, Vestibule Heaters, Radiant Heaters:

1. Control from wall mounted conventional thermostats.

2. Provide wiring schematic drawing detail which clearly indicates that fan is hard wired in series with wall and bonnet thermostat. (This will keep the fan "off" during the summer).

3. See Division 23 Section 23 09 13 Instrumentation and Control Devices for HVAC criteria.

1.8. Insulation:

A. Insulate all supply and return air ducts with R-6 blanket (where concealed) or rigid (where exposed in finished space or Mechanical Room) insulation with continuous vapor barrier.

B. Where dew point exceeds 72 deg F, use rigid polyisocyanurate board applied as described in the specification provided.

C. Insulate all piping in accordance with Section 435.112 of Title 10cFR, Part 435. Provide a 26 gauge aluminum jacket on outdoor insulation with longitudinal joints at the bottom of the pipe and all joints sealed watertight.

D. All materials shall have flame spread / smoke developed rating of 25/50 or less.

1.9. Penetrations:

A. Where ducts penetrate walls, floors, etc. or where pipes penetrate duct, seal airtight and to prevent access by rodents or insects.

1.10. Access:

A. Provide adequate access space, catwalks, and service platforms for all equipment.

B. Do not install cooling coils above finished ceilings.

C. Provide secondary drain pans and moisture sensors for suspended equipment.

2. PRODUCTS (NOT USED

3. EXECUTION

3.1. Environmental Compliance Responsibilities:

A. General:

1. Detail in specifications contractor's responsibility for compliance with environmental laws, rules, procedures and guidelines as they apply to construction and maintenance of commissary facility equipment.

2. Provide all relative EPA documents for compiling of environmental data by contractor to support project and assure compliance.

3. Detail in specifications the following items.

a. Service Practice Requirements: Observe EPA required service practices that minimize emissions of ozone-depleting refrigerants.

b. Equipment Certification: Compliance with certification program for recovery and recycling equipment.

c. Refrigerant Handling Records: Compliance with recording procedures addressing refrigerant releases during servicing and disposal of air-conditioning and refrigeration equipment. Include in specifications requirement for recording and submitting to the Government Authorized Technical Representative quantity and type of refrigerant added or removed from any air-conditioning or refrigeration equipment either existing or new during startup, servicing or maintenance procedures.

d. Mandatory Technician Certification: Include requirement for mandatory technician certification prior to working on systems.

e. Reclaimer Certification: Include requirement for certification if reclaimed refrigerant is being used. Require compliance with ARI 700 purity levels.

f. Safe Disposal Requirements: Include requirement for proper handling of equipment that enters waste stream with charge intact.

3.2. Refrigerant Handling:

A. General: Accomplish all work per current regulatory requirements established by the Environmental Protection Agency, including final regulations to implement the Clean Air Act Amendments.

B. Refrigerant Added to Equipment: Contractor-furnished, Contractor-installed, new non-recycled.

C. Refrigerant Log Book: Furnish and maintain for recording refrigerant transfers.

1. Log book shall itemize services performed, actions taken, and amount of refrigerant added to or removed from each and every system installed or affected by the Work.

2. Log Book shall be a three-ring loose-leaf binder and shall contain a table of contents and a separate Refrigerant Logging Form for each piece of refrigeration or HVAC equipment (see sample refrigerant log form).

D. Execution of Record Keeping for Refrigerant Transfers:

1. Duration: Establish at the start of construction and continuously maintain and keep current during construction and during the warranty period.

2. Location of Refrigerant Log Book: During the construction period, keep the log book protected at the construction site. Upon completion of construction and during the warranty period, keep the log book in the Store Manager's Office.

3. Project Closeout: Upon completion of construction, provide two updated copies of the Refrigerant Log Book to DeCA/CIEDM and turn over original to the Government Authorized Technical Representative's custody.

3.3. Contract Documents Check List:

A. Specify testing adjusting and balancing by an independent contractor.

B. AGA draft hoods shall not be used except on vented infra red heaters in the Receiving Area. In the case of heating boilers (only to be used with express agreement of DeCA) draft hoods shall only be used if the boiler is in a dedicated boiler room and positive pressure (not exhaust) is provided.

C. Pipes, pumps, compressors, and other equipment subject to freezing shall not be located near combustion air intakes. Provide supplementary heat at combustion air intakes.

D. In add / alter projects insure continuous availability of heat and air conditioning by providing a location for the new heating and cooling equipment separate from the old equipment location so that occupied areas will always be heated and cooled adequately.

E. Verify that space and structural support are adequate for replacement equipment, particularly large dual path units.

F. Show location of floor drains for all condensate producing equipment.

G. Gas fired equipment located in refrigeration equipment rooms, occupied spaces, or in equipment spaces other than properly ventilated and protected boiler rooms shall be of the separated combustion type with combustion air ducted from out of doors.

H. Verify that air intakes maintain minimum separation distance from exhaust discharges and plumbing vents as required by the current version of ASHRAE 62.1 and maintain minimum separation above ground level as required by the current ATFP standards.

I. Coordinate with structural design to provide supplementary steel at all roof curbs for exhaust fans, rooftop HVAC units, etc.

J. Specify aluminum jacket on all exterior insulation.

K. Large bakery oven - B12 and 13 - require field supplied exhaust fan. See DeCA equipment data on the DeCA website.

L. Type 1 exhaust hoods and grease ducts serving them shall be provided for all grease or smoke producing appliances including ovens (IMC 2003 2012, Para. 507.2.1.) Provide fire suppression systems for all Type 1 hoods (IMC 2003 2012, Para 509) including "built in" eyebrow hoods on large bakery ovens.

M. Mount hoods with bottom 6'-8" or more above floor. Coordinate with cooking equipment to assure that hood will clear equipment.

N. Coordinate with plumbing and electrical to assure that kitchen appliances under hoods have fuel shutoff devices (furnished under Division 23 Section 23 38 13 Commercial Kitchen Hoods) installed and that fire alarm system connections to hoods and fire extinguishers are covered.

O. Work with the Structural Engineer to determine whether seismic restraint or wind restraint is needed for items of mechanical equipment based on ASCE 7-05.

P. Locate all rooftop equipment a minimum 10' – 0" from roof edge. When serviceable equipment cannot be placed at least 10' – 0" from the roof edge, provide fall protection railing in accordance with the International Mechanical Code and OSHA.

END OF SECTION