**6. ENGINEERING SYSTEMS REQUIREMENTS**

**D30 HVAC**

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SYSTEMS REQUIREMENTS   
HVAC TEMPLATE 09/22  
  
Instructions for using this template: There are template files for each UNIFORMAT Level 2 Group Elements. This template is for Group Element D30-HVAC. Text such as this is hidden text that will not print when the hidden text box in "Print/Options" is un-checked.   
  
The Mechanical Team Member should edit this template for the requirements of the project. The SYSTEMS REQUIREMENTS are intended to define items that are required throughout the facility or on a system wide basis that is common to several rooms. Room-specific requirements are defined in the ROOM REQUIREMENTS section. Coordinate with the lead programmer for ROOM REQUIREMENTS. Editing is required where brackets [] appear. Delete all building elements that are not required for the project. If additional elements or sub-elements are required for the project that do not appear in the template, refer to the NIST UNIFORMAT II publication for additional building element numbers and descriptions. The Uniformat II Work Breakdown Structure can be found at** [**www.wbdg.org/ndbm/**](http://www.wbdg.org/ndbm/) **. Coordinate with the PERFORMANCE SPECIFICATION SECTION D30 to ensure that performance requirements are provided for all of the Building Elements listed here and that paragraph numbering matches.  
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NOTE: Consider each HVAC component relative to Part 2 UFGS Section 01 33 29, *Sustainability Requirements and Reporting* and UFC 1-200-02, *High Performance and Sustainable Building Requirements*.  
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Refer to Part 4 Section D30 for performance requirements of the building elements included in the HVAC system.

**SYSTEM DESCRIPTION**  
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NOTE: Marine Corps Headquarters has approved these BEQ DB RFP requirements for HVAC, and intends the specifications to remain as specified.   
  
Authoring/modifications by the RFP writer/designer shall be limited to such things as selections of bracketed items, inserting information to complete existing RFP paragraphs and eliminating requirements that do not apply to the project location. RFP writer/designer shall be careful that edits do not alter the intent of previously approved RFP requirements. Thus, requirements below can only be modified if a waiver of the requirement is granted by Marine Corps Headquarters.  
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NOTE: Remember to let the design build A/E design the project. Keep the requirements general wherever possible. If it is covered by the building code or Section D30, it does not need to be restated in this section.   
  
Many locations have specific mechanical design policies. Contact activity mechanical engineers for any site specific mechanical policies prior to editing this RFP.  
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Provide heating, ventilating and air conditioning (HVAC) systems for the BEQ that attains the following objectives: Occupant comfort, Indoor air quality, Acceptable noise levels, Energy efficiency, Reliable operation, and Ease of maintenance. Design and install in accordance with the International Mechanical Code (IMC), including the IMC supplemental requirements within UFC 3-410-01, UFC 3-401-01, *Mechanical Engineering* and UFC 4-721-10, *Navy and Marine Corps Bachelor Housing*. LonWorks items in UFC 3-410-02 are not applicable when identified in UFGS 23 09 00, UFGS 23 09 23.02 and UFGS 23 09 13. Refer to Building Requirements, Space Tabulations Section of the Project Program for building occupancy levels.

Any combination of equipment that attains these goals, and meets the requirements outlined below, will be acceptable.

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NOTE: Recommended Mechanical System Types for Marine Corps BEQ's for various Regions:   
  
Cherry Point/Camp Lejeune/New River, NC, and Beaufort/Parris Island/Albany, SC Marine Corps Bases: Provide a VAV System with series fan powered boxes and air-cooled water chiller. Generate heating system hot water and domestic system hot water via central steam or propane/natural gas-fired boilers. MCAS Beaufort has a central low temperature hot water system available for heating and domestic hot water generation. Provide primary/secondary pumping for hot water system with VFD's on primary/secondary hot water pumps. Provide primary/secondary pumping for chilled water system with VFD's only on secondary chilled water pumps.   
  
NAVFAC Washington Marine Corps Bases: Provide 4-pipe fan coil units with hot and chilled water coils, and an air cooled chiller. Generate heating system hot water and domestic system hot water via steam or propane/natural gas boilers. Provide outside ventilation air directly to fan coil units. Provide primary/secondary pumping for hot water system with VFD's on primary/secondary hot water pumps. Provide primary/secondary pumping for chilled water system with VFD's only on secondary chilled water pumps.  
  
29 Palms/Yuma,CA Marine Corps Bases: Provide 4-pipe fan coil units with hot and chilled water coils, and an air cooled chiller. Generate heating system hot water and domestic system hot water via steam or propane/natural gas boilers. Provide outside ventilation air directly to fan coil units. Provide primary/secondary pumping for hot water system with VFD's on primary/secondary hot water pumps. Provide primary/secondary pumping for chilled water system with VFD's only on secondary chilled water pumps.  
  
Barstow, CA Marine Corps Base: Provide 4-pipe fan coil unit with hot and chilled water coils. Provide water cooled chillers with cooling tower for chiller condenser water. Generate heating system hot water and domestic system hot water via natural gas-fired boilers. Provide dedicated outside air ventilation system. Provide primary/secondary pumping for hot water system with VFD's on primary/secondary hot water pumps. Provide primary/secondary pumping for chilled water system with VFD's only on secondary chilled water pumps.  
  
Camp Pendleton, CA Marine Corps Base: Provide 4-pipe fan coil units with hot and chilled water coils. Only connect hot water coils and make provisions for a future air-cooled chiller system. Provide a concrete pad for the future air-cooled chiller. The chilled water system must have all the necessary accessories and appurtenances required for a complete chilled water system, but must not have the air-cooled chiller as part of the contract. Generate heating system hot water and domestic system hot water via natural gas-fired boilers. Provide dedicated outside air ventilation system(s). Provide primary/secondary pumping for hot water system with VFD's on primary/secondary hot water pumps. Provide primary/secondary pumping for chilled water system with VFD's only on secondary chilled water pumps.  
  
Miramar, CA Marine Corps Base: Provide 4-pipe fan coil units with hot and chilled water coils, and air cooled chiller. Generate heating system hot water and domestic system hot water via natural gas-fired boilers. Provide dedicated outside air ventilation system. Provide primary/secondary pumping for hot water system with VFD's on primary/secondary hot water pumps. Provide primary/secondary pumping for chilled water system with VFD's only on secondary chilled water pumps.  
  
Kaneohe, HI Marine Corps Base: Provide a VAV System with series fan powered boxes and water-cooled chiller with a cooling tower. Generate heating system hot water and domestic system hot water via propane-fired boilers. Provide primary/secondary pumping for hot water system with VFD's on primary/secondary hot water pumps. Provide primary/secondary pumping for chilled water system with VFD's only on secondary chilled water pumps.  
  
NAVFAC Marianas/NAVFAC Far East Marine Corps Bases: Provide a VAV System with series fan powered boxes and air-cooled water chiller. Generate heating system hot water and domestic system hot water via steam or propane/natural gas-fired boilers. Provide primary/secondary pumping for hot water system with VFD's on primary/secondary hot water pumps. Provide primary/secondary pumping for chilled water system with VFD's only on secondary chilled water pumps.  
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NOTE: Revise the following as required to identify system choices that should not be used for this facility. Economizers are not allowed in humid areas.  
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Direct expansion multizone systems, direct expansion variable air volume systems, and thru-the-wall units are not acceptable. [Economizer cycles are not allowed.]

[VAV System Description: All conditioned spaces within the BEQ with the exception of the Mechanical room, Fire Pump room, Telecommunication/Data/NMCI room, and Electrical room must be heated and cooled by variable air volume (VAV) units. All VAV units must include hot water reheat coils, must operate independently, and be controlled by wall mounted adjustable temperature sensors. Design the hot water piping system for the reheat coils as a reverse return system. All VAV units must be accessible for maintenance. Access to VAV units located above ceilings must be through lockable and hinged ceiling access panel(s) of sufficient size to allow removal of mechanical equipment without damage or demolition of ceiling. Cooling for the VAV units must be provided by a chilled water central station VAV air handling unit(s) located in the mechanical room(s). Route all cooling coil condensate from the VAV air handling unit(s) to a floor drain in the mechanical room. Locate mechanical equipment rooms on each floor and in each wing if necessary. Attic space may be used for mechanical equipment if there is suitable access for maintenance purposes. Deliver outside ventilation air for the facility through the VAV air handling unit(s) in compliance with the latest edition of ASHRAE 62. Maintain a constant volume of outside air ventilation through the central station VAV air handling unit by using an injection fan and a constant volume terminal with a pressure independent velocity controller in order to keep the ventilation airflow constant as the VAV air handling fan modulates.

Provide series fan powered type VAV units for the Room Plan, Offices, Multi-purpose room, Public spaces, Lobbies, and Corridors. Return air back to the VAV boxes must be through return filter grilles. Provide each Room Plan closet with a minimum 7 L/s (15 CFM) of conditioned supply air.

Provide series fan powered type VAV units for the Laundry room. No conditioned air from the laundry room may be returned or transferred to other spaces. Return air back to the VAV boxes must be through return filter grilles.]

[Fan Coil Unit System Description: All conditioned spaces within the BEQ with the exception of the Mechanical room, Fire Pump room, Telecommunication/Data/NMCI room, and Electrical room, must be heated and cooled by four-pipe fan coil units. All fan coil units must be provided with chilled and hot water coils, must operate independently, and be controlled by wall mounted adjustable temperature sensors. Design chilled and hot water piping systems to the fan coil unit coils as a reverse return system. Route cooling coil condensate from the fan coil units to a condensate main, and then to the sanitary system. Provide drain pans under all chilled water fan coil units and chilled water connections mounted above ceilings. All fan coil units must be accessible for maintenance. Access to fan coil units located above ceilings must be through lockable and hinged ceiling access panel(s) of sufficient size to allow removal of mechanical equipment without damage or demolition of ceiling. Provide cooling for the fan coil units by chilled water, and provide heating by hot water.

Ventilation Systems: Outside ventilation air for the BEQ must be provided by an independent and dedicated [packaged] ventilation system(s), and comply with the latest edition of ASHRAE 62. Maintain a constant volume of outside ventilation air to each Room Plan and all other spaces. Provide each Room Plan with a minimum of 19 L/s (40 CFM) of ventilation air. Ventilation air to each space must exceed room exhaust air by a minimum of 15%. Provide an independent and dedicated [packaged] ventilation system for the Multi-purpose room. The ventilation system for the Multi-purpose room must be controlled via O2 sensor(s). The ventilation systems must preheat, cool, and reheat to neutral conditions all outside ventilation air prior to entering a space. Locate mechanical equipment rooms throughout the BEQ as necessary. Attic space may be used for mechanical equipment if there is suitable access for maintenance purposes. Route all cooling coil condensate from the dedicated ventilation system(s) to a floor drain.

Fan coil units for the Room Plans, Offices, Multi-purpose room, Public spaces, Lobbies, and Corridors must return air back to the fan coil units through filter grilles. Provide each Room Plan closet with a minimum 7 L/s (15 CFM) of conditioned supply air.

Fan coil unit(s) for the Laundry room must return air back to the fan coil unit(s) through filter grille(s). No conditioned air from the laundry room fan coil unit(s) may be returned or transferred to other spaces.]

The Telecommunication/Data/NMCI room must be [cooled only] [cooled and heated] via a ductless split [air conditioner] [heat pump]. Provide minimum base ventilation rates as defined by the latest edition of ASHRAE 62. Provide the minimum base ventilation rate for this space by an adjacent air system from another space.

Exhaust Systems: Provide continuous exhaust air for the Room Plan bathrooms, Laundry room, Janitor's room, Public Head, and Duty Office Head. The exhaust air for these spaces must be part of a central exhaust system that routes all exhaust air through an energy recovery wheel to exchange heat between the outgoing exhaust air and the incoming ventilation air. Continuous exhaust air for the Room Plan bathrooms must be 17 L/s (35 CFM). Continuous exhaust air for the Public Head, Duty Officer Head, and Janitor's room must be 24 L/s (50 CFM). Static pressures for these spaces must be negative as compared to adjacent spaces.

Energy Recovery System: Provide total energy (enthalpy) type energy recovery wheels (heat wheels) in the air handling system for recovering energy between the outgoing exhaust air and the incoming ventilation air. The total enthalpy heat wheel(s) must be located in the mechanical room or the attic space, and must be easily accessible for maintenance.

Mold and Mildew: The BEQ must have no evidence of mold or mildew due to condensate moisture on indoor surfaces after one year of service.

**GENERAL SYSTEM REQUIREMENTS**  
Provide working space around all equipment. Provide all required fittings, connections and accessories required for a complete and usable system. Install all equipment in accordance with the criteria in RFP Section D30 and the manufacturer's recommendations. Where the word "should" is used in manufacturer's instructions, substitute the word "must".

Provide air conditioning and heating for spaces as indicated and for the following Design conditions:

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NOTE: Provide outside design conditions as they apply to the new BEQ location.  
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| --- | --- | --- | --- | --- | --- |
| Outside Conditions | | | | | |
| Summer | xx.x | Degrees C dry bulb | Winter | xx.x | Degrees C |
| xx.x | Degrees F dry bulb | xx.x | Degrees F |
| xx.x | Degrees C wet bulb |  | |
| xx.x | Degrees F wet bulb |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Room Plans, Offices, Laundry Room, Multi-Purpose Room, Janitor's Room,  Corridors, and Storage Rooms Inside Conditions | | | | | |
| Summer | 24.4 | Degrees C dry bulb | Winter | 20.0 | Degrees C |
| 76.0 | Degrees F dry bulb | 68.0 | Degrees F |
| 50 | Percent RH |  | |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| NMCI/Data/Telephone Room Inside Conditions | | | | | |
| Summer | 23.9 | Degrees C dry bulb | Winter | 7.2 | Degrees C |
| 75.0 | Degrees F dry bulb | 45.0 | Degrees F |
| 50 | Percent RH |  | |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Mechanical, Electrical, and Fire Pump Room Heating & Ventilating Inside Conditions | | | | | |
| Summer | 12.2 | Degrees C dry bulb | Winter | 7.2 | Degrees C |
| 10.0 | Degrees F dry bulb | 45.0 | Degrees F |
| 10 | Air changer per hour |  | |

Provide outside air ventilation rates and systems in accordance with ASHRAE Standard 62, *Ventilation for Acceptable Indoor Air Quality*. Precondition (heat, cool, and dehumidify to room conditions) all outside air prior to admission into occupied spaces. Provide supply ventilation for the mechanical room if it contains fuel-fired equipment, and exhaust ventilation for the electrical room to limit the temperature to no more than 10 degrees F above ambient. Provide exhaust ventilation for the mechanical room if there is no fuel-fired combustion equipment present.

Provide summer ventilation rates for the mechanical and electrical room at a minimum of 10 air changes per hour.

The Mechanical room, and Fire Pump room must be heated with [hot water unit heater(s)][electric unit heater(s)] and controlled by a wall mounted thermostat.

The electrical room must be heated by electric unit heater(s) and controlled by a wall mounted thermostat.

Configure the HVAC system for the BEQ to provide each zone with the choice of heating or cooling year round unless otherwise indicated. Provide each zone with its own limited range of control, as allowed by the control system central workstation.

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NOTE: Where necessary, detail zoning requirements. Coordinate with the project architect for functional requirements of the facility spaces. Clearly indicate which zones are to be heated and ventilated only vs. heated and cooled. Also indicate which spaces can be grouped into zones.  
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Zone the HVAC system as follows:

Each Room Plan must be a separate zone.

Each Office must be a separate zone.

The Laundry Room must be a separate zone.

The Multi-Purpose Room must be a separate zone.

Corridors must be separate zones.

The Telecommunication/Data/NMCI room must be a separate zone.

The Mechanical room, Fire Pump room, and the Electrical room must each be a separate zone, heated and ventilated only.

[Provide a central mechanical building to serve the BEQ complex.]

Noise levels must comply with the requirements for Hotels/Motels in the ASHRAE Applications Handbook.

Material and Equipment Qualifications: All materials and equipment must have been in satisfactory commercial or industrial use for 2 years prior to the bid opening. The 2-year use must include applications of equipment and materials under similar circumstances and of similar size. The product must have been for sale on the commercial market through advertisements, manufacturer's catalogs, or brochures during the 2-year period.

Motors: Single-phase fractional-horsepower alternating-current motors must be high efficiency types corresponding to the applications listed in NEMA MG 11. Select polyphase motors based on high efficiency characteristics relative to the applications as listed in NEMA MG 10. Additionally, all polyphase squirrel-cage medium induction motors with continuous ratings must meet or exceed energy efficient ratings per Table 12-10 of NEMA MG 1. Provide controllers for 3-phase motors rated 0.75 kW (1 hp) and above with phase voltage monitors designed to protect motors from phase loss and over/under-voltage. Provide means to prevent automatic restart by a time adjustable restart relay. For packaged equipment, the manufacturer must provide controllers including the required monitors and timed restart. Provide reduced voltage starters for all motors 25 hp and larger.

Provide housekeeping pads and vibration isolators under all floor-mounted equipment.

[For sea coast applications, provide factory painted finishes that are designed for 3000 hour duration test for outside equipment and for equipment bringing in outside air.]

For unoccupied mode, provide the following night setback temperatures:

For winter, 10 degrees F (6 degrees C) lower than indoor heating design conditions, but no lower than 55 degrees F (12.8 degrees C).

For summer, 5 degrees F (3 degrees C) higher than indoor cooling design conditions, but no higher than 85 degrees F (29.4 degrees C).

**D3010 ENERGY SUPPLY**

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NOTE: Edit the energy supply systems in order to provide the BEQ with the most efficient and cost effective energy supply source. Provide a life cycle cost analysis or contact user activity for energy supply source.  
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**D301002 GAS SUPPLY SYSTEM**

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NOTE: Coordinate with and insert name of utility company.  
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[Obtain natural gas pressures from the local natural gas utility provider, [\_\_\_\_\_]. Provide any applications and permits and provide the complete natural gas system from the load side of the utility meter to the heating equipment. Contract with the local natural gas utility provider for installation of piping and appurtenances up to the load side of the meter. Provide gas meter on the building main and tie meter into the Building Automation System (BAS) [and the existing Advanced Metering Infrastructure (AMI) metering system.]

[Provide a complete propane storage and delivery system to the heating equipment.]

**D301003 STEAM SUPPLY SYSTEM (FROM Central Plant)**

Refer to Section G30, *Site Civil/Mechanical Utilities*.

[An existing central steam distribution system is the source of heating for the facility. Provide extension and connection to the existing Base steam system. Provide [[aboveground] [below ground] piping] [concrete trench] system including [manholes] [supports].]

**D301004 HOT WATER SUPPLY SYSTEM (FROM CENTRAL PLANT)**

Refer to Section G30, *Site Civil/Mechanical Utilities*.

[An existing central hot water distribution system is the source of heating for the facility. Provide extension and connection to the existing Base heating system. Provide [[aboveground] [below ground] piping] [concrete trench] system including [manholes] [supports].]

**D301005 SOLAR ENERGY SUPPLY SYSTEMS**

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NOTE: Per Capital Improvements Engineering & Construction Bulletin; Issue No. 2010-05; All new construction and major renovation projects requiring complete roof replacements will incorporate roof top solar thermal and/or photovoltaic systems.  
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NOTE: Solar Domestic Hot Water Systems (SDHWS) are required by the Energy Independence and Security Act (EISA 07) where Life Cycle cost effective. Evaluate the building and building site for shading, roof orientation, roof area available for solar panels, roof type, and other relevant issues to ensure that the SDHWS is compatible with the project. A Solar Domestic Hot Water Decision Tool is available on the CIME Web Page of the NAVFAC Portal for preliminary assistance in determining the solar economics.  
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[Provide a complete solar domestic hot water system including heating panels, roof supports, piping, pumps, hot water storage tanks, heat exchangers and controls. Provide a system designed to furnish a minimum of [30][100][\_\_\_] percent of the annual demand for domestic hot water.

If the solar domestic hot water system is located on the roof, provide a coordinated design of the roof elements in accordance with UFC 3-110-3 *Roofing*. Organize the roof space necessary to accomplish the functions the roof has to provide, minimize roof penetrations, and plan the roof to facilitate future reroofing of the facility. Select the roof type and detail roof mounted equipment to complement the implementation of the functions that have to take place on the roof and minimize the need for routine maintenance. Accomplish a Pre-Roof Design Conference prior to the design of the roof.]

**D3020 HEAT GENERATING SYSTEMS**

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NOTE: Check with the Base PWC to see if there has been a previous study or a maintenance preference for boiler type.  
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Provide a heating system for this facility consisting of 2 boilers, each providing 60 percent of the load.

[Provide shot type feeder for manual chemical feed for closed loop system.]

[Provide tempered make-up water with automatic chemical treatment for open loop system.]

**D302001 BOILERS**

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NOTE: Check with the Base PWD to see if there has been a previous study or a maintenance preference for boiler type. Consider packaged gas fired condensing boilers when natural gas or propane is available for the purpose of gaining maximum energy efficiency.  
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[Provide [cast iron sectional] [packaged gas fired condensing] hot water boiler(s).

**D302004 AUXILIARY EQUIPMENT**

[Provide steam to hot water converter(s) for the BEQ, using the Base central steam system to generate hot water for the HVAC system.]

[Provide [hot water][steam] to hot water heat exchanger for the BEQ.]

**D302005 EQUIPMENT THERMAL INSULATION**

Provide insulation for steam system equipment, steam to hot water converters, hot water pumps and other associated heating equipment.

**D3030 COOLING GENERATING SYSTEMS**

**D303001 CHILLED WATER SYSTEMS**

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NOTE: The following paragraphs should be used to identify the type of chilled water system.   
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NOTE: Specify the type and number of chillers to be provided. If multiple chillers are provided, require chiller manufacturer to provide a central chiller control panel. Coordinate with the PW department for preference on number of chillers or back-up required.  
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Provide a [rotary screw water-cooled] [[rotary screw] [scroll] air-cooled] chiller using a primary/secondary pumping system with variable speed secondary pumping[ and [cooling tower with automatic chemical treatment system][closed circuit cooler]]. Provide a cooling system for this facility consisting of 1 chiller providing 100 percent of the load. Locate the air-cooled chiller(s) outside on a 150 mm (6 inch) thick reinforced concrete housekeeping pad. Provide heat tape for freeze protection of chilled water piping and any other associated appurtenances.

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NOTE: 40 degrees F is typically standard, 20 degrees F, 0 degrees F, or –20 degrees F (special) are optional. Consult FEC office for guidance.  
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Chiller(s) must operate in temperatures down to [\_\_] degrees F.

Total chilled water system volume must be a minimum of 7 gallons per ton of cooling.

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NOTE: Specify corrosion protection for air-cooled water chiller coils that are exposed to the weather within 5 miles of a sea (salt) water coast.  
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Provide factory corrosion protection coating on coils.

[Provide heat recovery for [reheat] [domestic hot water].

Provide insulation and vapor barrier on all chilled water equipment.

[Provide chiller controls with BACnet communication protocol.*]*

Provide complete start-up and operational testing of chiller equipment.

[Provide factory assembled [galvanized steel with stainless steel basin] [stainless steel] [fiberglass] [cooling tower(s) with automatic chemical treatment systems(s)] [closed circuit cooler(s)] to serve the water-cooled chillers. All hardware must be stainless steel. [Provide with basin heater(s).] The load must be served by a single cooling tower.

**D303002 DIRECT EXPANSION SYSTEMS**

**\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*   
NOTE: This paragraph is intended for light commercial equipment. See paragraph D305006 for requirements for Packaged Terminal Air Conditioners (PTACs) and small split systems and coordinate.  
\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\***

Provide a direct expansion ductless split cooling only unit for cooling the Telecommunications/Data/NMCI room. The ductless split cooling only unit must cool all telecommunication/data/NMCI equipment loads within the room. Provide with a wall mounted adjustable thermostat.

**\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*   
NOTE: Water source heat pumps are one of the 3 recommended system options. Delete water source heat pumps if not used.  
\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\***

[Provide vertical [water source] [ground-coupled] heat pump units with ducted air distribution and controls to serve the heating and cooling requirements of the facility. Provide one vertical [water source] [ground-coupled] heat pump unit for each zone and locate within a mechanical closet. The mechanical closet must be lockable and allow adequate space for maintenance. Provide each [water source] [ground-coupled] heat pump with a return filter grille to ease maintenance. If space does not allow for a vertical heat pump unit, provide horizontal heat pump units in the overhead with a means for removal and maintenance of the system through lockable access panels. Install flexible stainless steel piping connections (hose kits) between [water source] [ground-coupled] heat pumps and piping. Install vibration isolators on heat pumps. [Provide heat pumps with supplemental electric heaters.] [Provide heat pumps with desuperheaters and tanks for domestic water.]]

[Provide a [air][water] cooled variable refrigerant flow (VRF) heating, cooling, ventilating and air conditioning system to serve the requirements of the facility. Design the system to provide the facility with simultaneous heating and cooling with heat recovery. Provide a complete and useable system consisting of VRF heat pump units, branch circuit controllers, VRF fan coil units, and associated controls. Incorporate zone thermostats for control of each fan coil.]

**D3040 DISTRIBUTION SYSTEMS**

**D304001 AIR DISTRIBUTION, HEATING & COOLING**

**\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*   
NOTE: Ductwork location should also be addressed in this paragraph if requirements are critical (such as must be concealed or can be exposed).  
\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\***

Provide [insulated, galvanized steel] [double wall, preinsulated] ductwork constructed, braced, reinforced, installed, supported, and sealed in accordance with the IMC and Sheet Metal and Air Conditioning Contractors' National Association (SMACNA) standards.

**\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*   
NOTE: Variable air volume systems are one of the 3 recommended system options. Delete VAV system if not used.  
\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\***

[Provide a Variable Air Volume (VAV) system using ducted returns [and sound attenuators]. Locate VAV units above ceilings and allow for maintenance and removal of units through lockable access panels.]

**\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*   
NOTE: Verify that Activity does not have a restriction on the use of Fan-powered VAV boxes due to increased maintenance of the box fans and filters.  
\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\***

[Direct expansion variable air volume systems are not acceptable.]

[Provide VAV Units.]

[Provide VAV Fan-Powered Units.]

Provide grilles, registers, and diffusers. [Provide filter grilles for return air.] [Provide linear slot diffusers including boot.]

**D304002 STEAM DISTRIBUTION SYSTEMS**

[For Exterior Buried Steam systems, see Section G30, *Site Civil/Mechanical Utilities*.]

[Provide insulated steam and condensate piping to serve the HVAC equipment throughout the facility. Steam piping and equipment must be in a self-contained dedicated steam equipment room or a wet mechanical room. Piping penetrations from this room into the facility must be tightly sealed to prevent steam from leaving the dedicated steam equipment room in the event of a steam pipe rupture. The dedicated steam equipment room must have double doors to the outside and be designed to contain steam in event of a leak.]

**D304003 HOT WATER DISTRIBUTION SYSTEMS**

**\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*   
NOTE: If the variable primary pumping system option is selected, ensure packaged gas-fired condensing boiler option is selected in paragraph D302001 of this ESR.  
\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\***

For exterior buried Hot Water Distribution Systems see Section G30, *Site Civil/Mechanical Utilities*.

Provide a [variable primary][primary/secondary][variable speed] pumping system to serve the HVAC hot water equipment throughout the facility. Provide insulated [steel][copper] hot water supply and return piping to serve the HVAC equipment throughout the facility.

Provide air control and shot type feeder for manual chemical feed for hot water piping system.

Provide an expansion tank for the hot water piping system.

Provide system flushing and start-up for the hot water piping system.

**D304006 CHILLED WATER DISTRIBUTION SYSTEMS**

[For exterior buried chilled water distribution systems, coordinate with Section G30, *Site Civil/Mechanical Utilities*.]

Provide a [variable primary] [primary/secondary] [variable speed] pumping system to serve the HVAC chilled water equipment throughout the facility.

**\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*   
NOTE: Coordinate with the PW department for preference on type of insulation required.   
\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\***

Provide [steel][ or ][copper] chilled water supply and return piping to serve the HVAC equipment throughout the facility. Insulate piping with cellular glass insulation.

Provide air control and shot type feeder for manual chemical feed for the chilled water piping system.

Provide an expansion tank for the chilled water piping system.

Provide system flushing and start-up for the chilled water piping system.

**D304007 EXHAUST SYSTEMS**

**Central Exhaust System:** Provide a ducted central exhaust ventilation system(s) and exhaust fan(s) to serve all ventilated zones of the facility. Provide in-line centrifugal exhaust fan(s) for the BEQ central exhaust system. The BEQ central exhaust system must capture all Room Plan bathroom, Laundry room, and other space exhaust air, and route it through a total energy (enthalpy) type energy recovery wheel (heat wheel) before exiting the BEQ in order to gain heat transfer between the incoming ventilation air and outgoing exhaust air. The central exhaust system ductwork may be routed through a chase adjacent to the Room Plan showers as shown on attached sketches in part three of the project program.

**Multi-Purpose Room Exhaust System:** Provide an additional inline centrifugal exhaust fan in the multi-purpose room that is interlocked with the Multi-purpose room dedicated ventilation system. The Multi-purpose room exhaust fan must discharge to the outside all ventilation air and balance system. Provide a positive pressure in the Multi-purpose room in accordance with ASHRAE recommendations.

**Stacked Dryer Exhaust System:** Exhaust air from the stacked dryers in Laundry room must be discharged outside. Provide a dryer plenum/chase area as shown on the attached sketches. Dryer exhaust ducts must route through dryer plenum/chase area to an exterior intake/exhaust louver. Dryer intake air must be drawn into the dryer plenum/chase area through the exterior intake/exhaust louver and enter the rear of the dryers. This method prevents the need for conditioning dryer makeup air.

**D304008 AIR HANDLING UNITS**

[Provide chilled water central station variable-air-volume (VAV) air handling unit(s) to serve the BEQ. The central station VAV air handling unit(s) must deliver conditioned air to the VAV units at a constant temperature of 12.8 degrees Celsius (55 degrees Fahrenheit). Provide the central station VAV air handling unit(s) with a hot water coil for pre-heating the outside ventilation air if necessary and provide with Minimum Efficiency Reporting Value (MERV) 8 filters.]

**\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*   
NOTE: Consideration should be given to the use of ultraviolet (UV) based on the activity's ability to maintain the equipment, since it enhances the equipment life and minimizes coil cleaning. Also this will help avoid indoor air quality (IAQ) problems.  
\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\***

[Provide separate and independent constant volume air handling unit(s) to serve the ventilation requirements of the BEQ. The ventilation air handling unit(s) must be [a packaged system] [provided with hot and chilled water coils], and must preheat, dehumidify, and reheat ventilation air to neutral conditions prior to delivery within the BEQ. Neutral conditioned air is defined as air that is 21 degrees Celsius (70 degrees Fahrenheit). All incoming outside ventilation air must be routed through a total enthalpy heat wheel prior to entering the air handling unit(s) in order to exchange heat between the exhaust air and ventilation air. Provide the ventilation air handling unit(s) with Minimum Efficiency Reporting Value (MERV) 8 filters.]

**D304090 OTHER DISTRIBUTION SYSTEMS**

Provide base mounted circulating pumps [with variable frequency drives].

Provide chemical treatment systems for the hot and chilled water systems.

**D3050 TERMINAL & PACKAGE UNITS**

**D305002 UNIT HEATERS**

[Provide hot water unit heater(s) to serve the heating requirements of the Mechanical and Fire Pump rooms.]

**D305003 FAN COIL UNITS**

**\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*   
NOTE: Fan coil units are one of the 3 recommended system options. Delete fan coil units if not used.  
\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\***

[[Provide 4-pipe vertical type fan coil units and controls to serve the heating and cooling requirements of the facility. Provide one vertical fan coil unit for each zone and locate within a mechanical closet. The mechanical closet must be lockable and allow adequate space for maintenance. Provide each fan coil unit with a return filter grille to ease maintenance requirements. If space does not allow for vertical fan coil units, provide horizontal fan coil units in the overhead with a means for removal and maintenance of the units through lockable access panels. Provide auxiliary drain pans below valves and appurtenances to prevent piping leaks and condensate forming on chilled water piping from damaging ceilings.]

**D305005 ELECTRIC HEATING**

Provide an electric unit heater(s) for heating the electrical room space.

**D305006 PACKAGE UNITS**

[Provide packaged 100 percent Outside Air Ventilation Unit(s) to precondition outside air prior to distributing to the BEQ.]

**D3060 CONTROLS AND INSTRUMENTATION**

**\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*   
NOTE: Where the Engineering Field Division, Engineering Field Activity, Station, or Command has an Approved Justification and Authorization (J & A) document allowing the use of a single Direct Digital Controls provider; and where all previous J & A bid experiences have indicated that bid pricing remains reasonable and competitive; then use the second bracketed sentence. In other cases, use the first bracketed sentence. For small DX systems, delete this section in its entirety and include a short write-up describing the desired control scenario.  
\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\***

**D306001 HVAC CONTROLS**

**D306001 1.1 DIRECT DIGITAL CONTROLS (DDC)**

**\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*   
NOTE: For new standalone DDC systems select the first bracketed option. For new DDC systems intended to integrate into an existing Utility Monitoring and Control System (UMCS) select the second bracketed option.**

**In situations where a device requires local control only, even if a DDC system is being provided, identify those specific devices in this Section.  
\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\***

[Provide a complete Direct Digital Control (DDC) system [to comply with UFGS 23 09 00, *Instrumentation and Control for HVAC,* UFGS 23 09 23.02, *BACnet Direct Digital Control for HVAC and Other Building Control Systems,* UFGS 23 09 13, *Instrumentation and Control Devices for HVAC*, and BACnet communication protocol][to comply with \_\_\_\_\_] for the facility.]

[Provide integration of the new Direct Digital Control (DDC) system to the existing [\_\_\_\_\_] Utility Monitoring and Control System (UMCS) in compliance with the UMCS's Risk Management Framework (RMF) Authorization to Operate (ATO) [, \_\_\_\_\_,] and UFGS 25 10 10, *Utility Monitoring and Control System (UMCS) Front End and Integration*.]

[Provide a DDC system which will communicate with the existing basewide Energy Monitoring and Control System].

[Provide a partial direct digital control (DDC) system [to comply with UFGS 23 09 00, *Instrumentation and Control for HVAC,* UFGS 23 09 23.02, *BACnet Direct Digital Control for HVAC and Other Building Control Systems,* UFGS 23 09 13, *Instrumentation and Control Devices for HVAC*][to comply with \_\_\_\_\_\_\_] for the facility. Provide integration of the new DDC to the existing operator workstation and the existing operator workstation software. The existing DDC system was manufactured by [\_\_\_\_\_\_\_].] [The DDC system& must be (make/model).]

**\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*   
NOTE: Operator workstation requirements depend on project. Always provide a notebook computer as a minimum with the manufacturer's full application software and license.  
\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\***

[Provide [operator workstation] [and] [notebook] computer[s] and complete application software with all licenses.]

Provide meters, monitored by DDC, on the following incoming utilities of the building: steam and gas. [Tie the gas meter into the existing Advanced Metering Infrastructure (AMI) metering system.] For electrical energy monitoring refer to Section D50, *Electrical*, paragraph entitled, *Service Entrance Equipment*. For potable water meter refer to Section G30, *Site Civil/Mechanical Utilities*, paragraph entitled, *Potable Water Distribution*. [Set up trend reports to record data daily and store values in the operator workstation DDC computer.] [Set up trend reports to record data daily and store values in the ASHRAE Standard 135 building controller for later retrieval by either a notebook computer or an operator workstation DDC computer.]

**\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*   
NOTE: Refer to ASHRAE 189.1-2011 Tables 7.3.3.1A and 7.3.3.1B for Energy Source and Subsystem Thresholds.  
\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\***

[Provide meters, monitored by DDC, on the following subsystems for steam, gas and water: HVAC and processes.]

**\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*   
NOTE: Refer to ASHRAE 189.1-2011 Tables 6.3.3A and 6.3.3B for Water Supply Source and Subsystem Sub-Metering Thresholds.  
\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\***

[Provide meters, monitored by DDC, on the following subsystems for potable water and reclaimed water: [cooling tower[s] makeup and blowdown] [, evaporative cooler[s]] [, steam boiler[s]] [, hot-water boiler[s]] [, processes].]

[Provide meter, monitored by DDC, on reclaimed water subsystem used for total irrigated landscape area with controller[s].]

[For meter of potable water subsystem used for total irrigated landscape area with controller[s], refer to Section G20, *Site Improvements*, paragraph entitled, *Irrigation Systems*.]

Provide ASHRAE Standard 135 building controller as the main interface for the building control system.

**\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*   
NOTE: Coordinate with Base Commanding Officer and local CIO.  
\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\***

[Provide patch panel in the mechanical equipment room for ease of connection and disconnection of equipment.]

**\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*   
NOTE: Alarm is to notify unauthorized access.  
\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\***

Provide panels with locks and alarms. The alarms ;must include [both] [a flashing light] [and] [an audible alarm] inside the mechanical room. The alarms must also be a networked alarm (e.g. switch connected to controller DI) with alarm events recorded remotely for a period not less than one year.

[Provide flow rate meters, monitored by the DDC system, for central and chilled water flow.]

[Provide air handlers and all terminal units, including VAV boxes, with discharge/supply temperature sensors.]

[Provide central air handler unit outside air CFM air flow monitoring stations.]

[Provide a DDC option for automatic operation of building circulating pumps whenever outdoor air temperature is below 35 degrees F or when there is a high potential for freeze damage.]

[Provide control to automatically start back-up pumps (or other HVAC equipment) if the primary device fails.] [Primary and back-up equipment starter circuits must be wired to prevent both pieces of equipment from operating at the same time.] [Rotate primary and back-up HVAC equipment monthly (adjustable) with a lead/lag control routine.]

**\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*  
 NOTE: Only utilize electronic controls if extending existing system with electronic controls. All new systems to utilize DDC controls.**

**Where DDC controls are provided, and there are some items desired with local control, identify those local control items in this paragraph.  
\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\***

**D306001 1.2 ELECTRONIC CONTROLS**

**\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*   
NOTE: Only utilize electronic controls if extending existing system with electronic controls. All new systems to utilize DDC controls.**

**Where DDC controls are provided, and there are some items desired with local control, identify those local control items in this paragraph.  
\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\***

[Provide electronic controls [with programmable thermostats] for the HVAC systems and equipment.]

**D3070 SYSTEMS TESTING AND BALANCING**

**\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*   
NOTE: Where the project is complex, or mission essential, or has life safety issues, or due to local construction conditions, provide additional wording as necessary  
\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\***

Provide complete Testing and Balancing (TAB) of all air and water distribution systems and HVAC equipment and performance verification testing (PVT) of all HVAC controls systems.

**D307003 HVAC COMMISSIONING**

**\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*   
NOTE: Extent of Commissioning will depend on the scope and complexity of the project.  
\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\***

Refer to RFP Part 3 - Project Program, Chapter 2 for Building Commissioning requirements. Mechanical systems to be commissioned, if provided, include HVAC systems and controls, refrigeration systems and controls, renewable energy systems, [\_\_\_\_\_\_\_,] and domestic hot water systems.

**D3090 OTHER HVAC SYSTEMS AND EQUIPMENT**

**D309001 GENERAL CONSTRUCTION ITEMS**

**\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*   
NOTE: Coordinate seismic requirements in Project Program or elsewhere in RFP.  
\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\***

[Provide seismic restraints] [and] Comply with the Force Protection Criteria.

**\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*   
NOTE: Coordinate with Architect on the mechanical equipment rooms (other than ground floors) to provide with through the wall access doors on building exterior - crane access - with removable hand rails. This requirement may have historical preservation impacts.  
\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\***

Provide access to all mechanical equipment rooms through the building exterior walls.

[Provide mechanical equipment rooms (other than ground floors) with through the wall access doors on building exterior - crane access - with removable hand rails.]

[Provide mechanical equipment rooms in basements with pit access with floor drains and stairs and through the wall access doors on building exterior - crane access - with removable hand rails.]

**D309090 OTHER SPECIAL MECHANICAL SYSTEMS**

**\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*   
NOTE: Include the following paragraphs if the need for energy recovery devices is required by ASHRAE 90.1 or other project goals. Confirm the type of energy recovery to be used with the base Public Works Department.  
\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\***

[Provide total energy (enthalpy) type energy recovery wheels (heat wheels) in the air handling system. Route outgoing exhaust air and incoming ventilation air through the enthalpy heat wheel.]

[Provide heat pipe energy recovery in the air handling system.]

-- End of Section --