Capitol Complex Construction Standards
Requirements for New Construction and Remodeling

General Requirements

- All equipment & materials shall be installed according to the manufacturer’s installation instructions.
- All equipment & materials shall be installed according to the UL or other listing standards.
- For projects involving phasing, building materials including plumbing, mechanical, electrical and life-safety must be consistent (identical manufacturer and model) throughout all phases, unless poor performance of a product is identified and Facilities Management Division (FMD) requests a change order.
- A copy or original of all permits pulled for construction and remodeling projects will be included in close out documents. Signed for completion.
- Any masonry or concrete core drilling, cutting, excavating, etc. must be preceded by x-ray or approved alternate method.
- Janitor closet/storage door sizes should be 4’ wide minimum.
- Require Draw downs and paint codes
- Zero VOC paint
- Utilize Existing Paint Standards Provided by FMD.
- Janitor closets minimum size is 110 SqFT per floor or 1 closet per 50,000 SqFT of building area, near freight elevator.
- Janitor storage of 500 SqFT – 60”x 80” clear opening
- Janitor equipment charging room required - 140 SqFT minimum - 60”x 80” clear opening – requires exhaust and outlets at 36” high every 24” around walls – adequate circuiting for loads being served plus 25% for expansion.
- Janitorial Office 100 SqFT minimum
- Janitor closet mop basins shall be floor type composite, Chicago faucet (chrome with vacuum breaker) with pail hook, wall support, and integral stops.
- 3 - Wall mounted mop hangers above sink
- Shelving – adjustable metal standards and horizontal supports with composite wood shelving – for both Janitorial and Plant Maintenance Engineer (PME) storage spaces
- Personal lockers for janitorial staff
- Janitorial spaces such as equipment storage/charging, lockers, located adjacent to loading dock
PME storage requirements should increase based on attic stock storage.

- PME bench/work area minimum 150 SqFT - in the Penthouse - Work bench and room for plan desk and horizontal drawers - Shelf for specifications and Operation/Maintenance Manuals

- PME office 100 SqFT min, with Building Management Systems connections

- Penthouse requires belt storage rack, filter storage, and storage area for attic stock.

- Room for recycling operations – baler, bins, hampers, circulation

- Panic hardware shall be Von Duprin or match existing.

- Hardware to be consistent with building standard

- Door closers shall be LCN or match existing

- Interior wood doors should be staved or stranded core material

- Railings and bike racks to be galvanized. Unless Brass/Bronze as dictated by the building. No Powder coated rails allowed.

- Exterior door frames and hardware shall be stainless steel, brass, or bronze.

- Aluminum shall be avoided on/near exterior doors and/or where salt usage may be expected.

- Screws used as fasteners on exterior doorways should be stainless steel, brass, or bronze.

- Building entrance doors shall be hung on 4 heavy duty bearing butts – reinforcing top pivot shall be engineered for entrance doors – minimum ¼” thick hinge attachment plate required.

- No continuous hinges allowed on exterior doors.

- Butt hinges required

- Wall protection required in service areas – corner guards and wall strips

- Service doors and doors serving high traffic cart usage areas shall have kick plates extending from the lock to the bottom of the door – these doors should also have wrap around metal edging on the latch and hinge edges. Frames must be 12 gauge, doors must be 14 gauge, and door skins must be welded.

- Single doors at service locations such as janitor closets should be extra wide (4’0”) to allow easy passage of carts and equipment.

- Door closers should have cast iron bodies, heavy duty arms, adjustments for closing, latch speed, and closing force – all without having to remove the device from the door.

- All hollow metal doors shall be internally ribbed with welded seams.

- No exterior hollow metal doors shall have pockets to catch or retain moisture.

- All exterior hollow metal doors and frames shall be hot dipped galvanized
• All doors must be properly beveled on the latch edge – hinge edges must be square.
• Proper clearances must be designed into doors and frames to allow non-binding operation if smoke gasket, etc. is installed.
• Recessed trash and paper towel dispensers
• Solid surface counter tops only
• Drop in china lavatories
• Solid plastic toilet partitions, deck hung and floor mounted – heaviest duty hardware available
• Coreless double roll dispensers
• Restrooms require plumbing chases with 3’0 clearance to a height of 7’0 for service.
• Dock height: one for semi height and one for mail/box van
• Exterior dock canopies should be fire sprinkled with a dry system.
• Dock levelers shall be pneumatic bladder type – Kelly is the manufacturer
• Cardboard bailer space and associated electrical/mechanical requirements
• Separate freight elevator available to service every floor in the building – minimum floor size of 6’ x 10’ with a minimum door opening of 5’
• Nonproprietary operation system for all elevators similar to Motion Control Elevator – MCE is complex standard Class C1 for Freight Elevator.
• Elevator Entrapment Phone system to dial Capitol Security direct
• Built up asphalt roof with double mopping and a different colored rock on walkways.

Electrical Requirements
• In addition to the required life safety systems, the following equipment shall be incorporated into the generator power systems: access control systems, HW pumps, building automation panels, air compressors for building systems, kitchen refrigeration equipment, mechanical/electrical room outlets and lighting, elevators, garage doors, gates, and arms of parking facilities.
• All field installed equipment shall have a local, lockable disconnect switch.
• Hands free electrical hand dryers by World Dryer
• Fixtures and equipment must be accessible by normal ladders/lifts – no special scaffold or other specialized equipment/methods for access.
• All electrical and equipment modifications requires incorporation into State of Minnesota Arc Flash Relay Coordination program.
• All abandoned cables, wiring, conduit must be removed in the project.
All motors should meet current energy efficiency standards.

All medium voltage, primary transformers shall be cast coil, copper wound type.

All conductors AWG 12 and larger shall be stranded copper.

The use of push wire connectors is not allowed.

The use of non-reversing cement anchors is not allowed.

GE, Eaton, Square D, or Siemens panels are acceptable. All electrical equipment should match existing manufacturer equipment in the building.

Panels shall be used for the voltage they are designed. The use of 480/277 volt panels on lesser voltages is not allowed unless approved by FMD.

All electrical equipment within the project scope shall be de-energized and cleaned upon completion of project.

25% future expansion for spaces and loading capabilities in panels

VFD’s by ABB or Dan Foss

ATS’s shall be open transition with a maintenance bypass switch.

Primary selector switches shall be G&W

Grounding conductors pulled into all conduits

All feeder and branch circuit conductors pulled into conduit – no NM, MC or AC cable.

Factory bends for all metal conduit shall not be used

480/277 volt wiring will be in separate raceway from 208/120 volt wiring

No multi wire branch circuits.

Generator – 48 hour full load fuel tank minimum, Caterpillar or Cummins, 25% future expansion capacity for loading

No floor set electrical outlets in hard surface floors

No exterior wet niche lighting.

Electrical rooms stacked and of single purpose – no other systems or storage allowed.

All perimeter, dock, and entrance heating system equipment shall be on generator power.

Any masonry core drilling must be preceded by x-ray of the core drilling area.

All wire and devices installed in ceiling plenums must be plenum rated.

All wire must be self-supporting and not tied off to other conduits or devices.

All installations of equipment must be done in a workman like manor and per existing codes.

All lighting controls shall be Crestron. See Automation section for control requirements.
Arc Flash and Relay Coordination Updates

- Update of arc flash and relay coordination studies and one-line riser drawings shall be completed on any electrical revision work on the three phase systems with nominal voltage levels of 120/208 and higher.

Exemptions from this requirement:

- Single phase circuits
- Individual Branch Circuits from 120/208Y VAC panel boards
- Motor Control Circuits downstream of their respective motor starters and over current protection
- Arc Flash Hazard Analysis on equipment below 240 Vac unless it involves at least one 125KVA or larger low impedance transformer in its immediate power supply.
- Arc Flash Hazard analysis on panel boards 240 VAC or less where the available bolted short circuit current is less than 10kA
- Individual motors less than 50 HP
- Updated/new electrical riser drawings for the building in AutoCAD .dwg format
- Plotted copies of the above drawings
- Short circuit study results, including:
  - All input and output data Equipment comparison tables, which compare the calculated short circuit values to the equipment ratings.
  - Analysis and recommendations analysis will be performed for all possible power source feeds.
  - All updates will be completed using SKM Power Tools electrical engineering software. Data will be formatted, arranged and merged into the existing original documents in order to keep the study as accurate and user friendly as possible.
  - Any deficiencies discovered will be identified in the completed study.

Coordination study results including:

- Time Current Coordination (TCC) curves
- Recommended protective device settings table

Arc Flash Study results, including:

- Arc flash exposure values and flash protection boundary in table format
- Personal Protective Equipment (PPE) requirements
Arc Flash and Shock Hazard labels provided and installed on equipment:

- UL 969 compliant
- ANSI Z535.4 compliant
- Label includes shock protection per NFPA 70E in addition to arc flash hazard data

**Updated panel board and Motor Control Center (MCC) schedules**

### Mechanical Requirements

- Royal manually operated flush valves on all toilets, urinals, and lavatories Sloan
- Faucets to be double handled (paddle type or blade type) Chicago or single handed Delta
- Fixture manufacturer to be consistent throughout project
- Wall hung, code compliant Kohler, Crane, or American Standard required
- Tailpieces to be 1 ½” minimum size with grid strainer
- Caulk all fixtures to floor and/or wall with mildew resistant silicone caulk
- Hose bibb required at loading dock
- Tempered water for safety showers and eye wash stations per OSHA recommendations
- Dampers for exhaust, return, outdoor = Tamco Series 9000 with highest quality linkage and shafts. Cooling tower basin should be all welded stainless steel only.
- AHU’s will be equipped with provisions to safely and efficiently replace all major components including motors, fans, and shafts.
- All domestic water piping to be flushed and sanitized prior to use
- All gas piping to be tested with nitrogen under pressure and purged to safe location outside after testing.
- Frost proof wall hydrants installed at a minimum of every 100 feet on perimeter of building
- No instant hot water heaters – use centrally heated domestic hot water or small tank type heaters for remote sites.
- Re-circulate hot water from extremities in building
- Valve manufacturer to be consistent throughout entire project
- Bell and Gossett Pumps required
- All waste drain piping to be 2” minimum
- No interior insulation allowed in duct work or air handlers.
- Chilled Water Piping insulation shall be Knauf Permawick or Techlite.
Ball valve isolation valves for domestic and heating water at each floor level and at each fixture group.

Adjustable hand-wheel type isolation valves at each fixture

Isolation valves to be full port, ball type on all piping 4” or less

Stand-alone wall hung water cooling fountains and bottle fillers – Elkay required

Boilers – Scotch marine type by Burnham, Superior, Iron Fireman, Cleaver Brooks or (Columbia in certain applications)

Tube Sheets Shall be ¾” Steel

Boiler burners by, Weishaupt, Reillo, Webster or Coen

Air atomizer on each oil burning option

Steam humidification DI water systems shall be welded stainless steel

Humidification wands must be installed inside the AHU before the supply fan, not in the ductwork downstream of the AHU.

Cold water DI feeds can be polypropylene continuously supported in tray system.

Linear diffusers shall be fully adjustable, both directional and flow limiting – Anemestat required

AHU’s must be constructed to provide adequate space for air mix and minimizing stratification.

Contractor must consult with Facilities Management Division to determine if dampers used are opposed or linear orientation.

AHU’s must include sloped stainless steel cooling drain pans piped with a minimum one and one quarter inch drain piping, Pans Must extend under entire coil Including Elbows and Supply Lines.

Pre filters must be 24”x24”x2” pleated

Primary filters shall be bag style 85% efficiency

Cooling towers shall be BAC – Stainless Steel

Condenser water treatment system components to be compatible with current FMD chemical contract supplier.

Trane chillers required

All abandoned mechanical equipment, wiring, controls and piping to be removed.

Project documents are best provided electronically

Pipe chases which require access to reach isolation valves or other plumbing devices must be a full three feet wide inside and afford a clear walking path to a height of six feet.

Proper identification and/or labeling of piping and valves is required
Facilities Management Construction Standards

- Minimum trap size on lavatories must be no smaller than one and one-half inch
- Minimum waste piping size for kitchen sink drains (especially employee lounges) must be no smaller than 2”.
- All pipe penetrations must be properly sealed to meet fire rating.
- All copper piping and fittings must be connected with soldered joints.
- New domestic water piping must be chlorinated and flushed before use.
- All roof drains must be piped independently of sanitary drains.
- Isolation valves are very important and must be provided for all domestic water branch lines at the main (to isolate each toilet room group) and at each fixture. These valves must be readily accessible and clearly labeled.
- Full-port ball valves (up to four-inch in size) must be used on all projects.
- Valve labeling and a valve schedule must be provided at project end.
- Manual faucets and flushometers are preferred to sensor-type due to cost of maintenance
- Kohler urinals are not acceptable due to dimensions-American Standard or others with equivalent dimensions are acceptable.
- Pop-up wastes on lavatories are not acceptable, use grid strainers
- Minimum trap size on lavatories must be one and one-half inch
- High spouts on lavatory faucets are not preferred due to potential splashing.
- Minimum-flow (0.5 gpm) aerators are recommended for lavatory faucets.
- Water closet carriers must be self-supporting and independent of the finished wall.
- Water closet rough-in plates must be used on new installations to permit proper tile installation and eliminate open wall penetrations.
- Water closets must be set within an eighth of an inch to the wall.
- Tile base in toilet rooms must be set flush with (as opposed to over-lapping) the wall surface or base must be cut out to allow proper water closet installation.
- Neoprene gaskets must be used on wall-set water closets and urinals.
- Water resistant wall finish materials must be used from floor to height of faucets around janitorial sinks or basins.
- Centralized soap systems for hand washing are not allowed.
- Isolation valves are required for isolation of heating/cooling systems for each floor of a building and at each heating or cooling appurtenance.
- Heating and cooling equipment and piping must be approved for use with District Energy heating and cooling systems guidelines.
Facilities Management Construction Standards

- Heating and cooling control valves must be installed with isolation valves and unions for future replacement.
- Heating and cooling control valves must be installed within 45 degrees of a straight upright position.
- Control valves used for heating and cooling must be “Controlled Velocity Ball Valves”. Acceptable brands would be Honeywell, Belimo or Bray.
- Do not install ‘first-generation’ Honeywell heating control valves. These valves are prone to o-ring failure on the stems.
- Heating/Cooling coil installations must incorporate two-inch winterization piping with proper valving tied to the air-stream of the air handling units.
- Heating/Cooling coils must be constructed of .025 inch Copper.
- Heating/Cooling coils must be independently supported (to allow removal).
- Newly installed systems must be installed in accordance with all governing codes.
- The issue of fire suppression in closets/elevator shafts must be reviewed and approved by both building inspector and fire code official.
- Exterior fire sprinkler piping in ramps must be schedule 40 galvanized pipe.
- Fire sprinkler heads and trim must be of current manufacture (Less than one year old)
- Fire pumps must be installed without a ‘timer’ feature (to meet local code)
- Proper chemical agent fire extinguishers must be provided with chemical agent.
- Josam Carriers
- Chilled water coils shall be designed for 14’F Delta T.

Lav Faucets-Chicago 895-317GN2FCCP
- Four-inch Deck-Mounted Sink Faucet
- Rigid/Swing Plain End Gooseneck Spout
- Laminar Flow Control Device in Spout
- 317-Wrist Blade Handle
- Quaturn Operating Cartridge

Service Sink Faucet-Chicago 305VB
- Short spout with vacuum breaker
- 3/4” hose thread outlet
- Pail hook
- H supply arms
- Adjustable from 4” to 8-3/8” centers
- 369 handles

**Urinal Flushometer-Sloan Royal (Manual) Model 186-1**
- Low Consumption (1.0 gpf/3.8Lpf)

**Urinal-American Standard Washbrook 1.0**
- Top Spud 6501.010
- Stainless Steel Strainer

**Water Closet Flushometer-Sloan Royal (Manual) Model 111**
- Low Consumption (1.6 gpf/6.0 Lpf)

**Water Closet-American Standard Afwall EL 1.6**
- Elongated flush valve water closet
- Top Spud 2257.103

### Security and Access Controls/Equipment Preferences and Requirements

#### Control Panels
- Security/Card Reader Main Control Panels shall be manufactured by PCSC and be of the following models depending upon requirements:
  - IQ-400 – Up to 4 readers
  - IQ-1200 – Up to 12 readers
- Security Panels shall be ordered with Memory Expansion (20,000 cardholder capacity).
- Security Panels shall be installed in accordance with specifications set in the PCSC IQ-400 Installation Manual 33-10057-001 Rev B (or most recent edition), **no exceptions**.

#### Power Supplies
- Two separate Power Supplies shall be provided for each Security Panel installation. The first Power Supply shall be rated 12VDC and will supply power to Security Panel and Card Readers only. The second Power Supply should be rated 24VDC and will supply power to the Electrified Locking Hardware. Altronix ALTV1224-DC
Card Readers
- Card Readers shall be manufactured by HID and shall be of the following models depending upon requirements:
  - Wall mounted: Thinline II Proximity Card Reader
  - Mullion mounted: Mini Prox Card Reader

Door Position Switches
- All Card Reader Doors shall have a door position switch installed and should be of the following models depending upon requirements:
  - Concealed: Sentrol 1078 Series
  - Surface Mounted: Sentrol 2500 Series
  - Overhead Door: Sentrol 2200 Series

Request to Exit Devices (REX)
- All Card Reader Doors shall have an infrared motion sensor installed for detecting authorized exits. REX motion sensors shall be wired to the REX input of the Security Control Panel.
- For doors equipped with Electromagnetic Locks, activation of the REX shall release the lock and shunt the intrusion alarm input. For doors equipped with an electric door strike that are free exiting (IE, the door hardware allows for exit at all times) the REX shall only shunt the intrusion alarm input and shall not unlock the door.
- REX motion sensor shall be manufactured by Detection Systems, Model DS150 Series.

Electrified Locking Hardware
- Electrified Locking Hardware should be rated at 24VDC continuous duty. All hardware should provide failed-secure operation unless failed-safe operation is required by local fire codes.
- Hardware should be selected based on the following order of preference:
  - Electric Door Strike, Failed-Secure 24VDC continuous duty (Fail-safe if required)
  - Electromagnetic Door Lock (mag lock) w/one-touch request to exit in addition to the infrared motion detection request to exit. (Not to be use for fail-secure applications)
- It is requested that the following hardware **not** be used unless absolutely necessary. If the following hardware is necessary, in-door wiring must use Von Duprin EPT-10 SP28 (or equivalent) Power Transfers **not** Electrified Door Hinge Transfers:
  - Electric Latch Retractors (Panic Bars)
  - Electrified Mortise Lock (Lever Hardware)
o All Electrified Locking Hardware shall have Noise Suppression Devices installed. Noise Suppression Devices shall consist of a Metal-Oxide-Resistor (MOV), Siemens S10K30 or equivalent and Diode (1N4004-1N4007) wired in parallel with the load (IE, the door strike). If this Noise Suppression is not installed, damage to the Control Panel can occur.

Duress Alarms – Desk Mount

o All desk mounted duress alarm hardware shall be Ademco model 269, no exceptions.

o All duress alarms shall be pre-approved by Capitol Security.

Temperature Control and Instrumentation

o The Department of Administration, Facilities Management Division owns and operates the Building Systems and Controls (BSAC), which provides central monitoring, control and integration of HVAC systems, security systems, fire and life safety systems, lighting control and other building operation systems associated with the Capitol Complex. All building related additions, renovations and alterations shall be incorporated into and become an extension of the existing system. Exception: Tenant owned and operated equipment shall not be connected to or monitored by the Capitol Complex BSAC.

o The BSAC utilizes a Honeywell EBI (Enterprise Building Integrator, R430) designed to provide a graphic user interface to HVAC, fire, SCADA, access control, security and lighting operational functions.

o BSAC System Manufacturer: Honeywell

o Acceptable Bidders: The temperature control contractor shall be factory-owned branch office of the above manufacturer and have at least 10 years of experience installing manufacturer’s product and have fully staffed project managers, system application engineers, application engineers and technicians. Branch office must have a separate fully staffed service department.

o Installation Requirements: The temperature control contractor must provide complete services to include but not limited to:
  - System Engineering
  - Programming in CARE 10 (or newer), EBI Quickbuilder and Display Builder
  - Graphic Interface Development and Implementation
  - System Checkout and Commissioning
  - Direct access to Honeywell TAC (Technical Assistance Center)
  - Provide minimum 2 years system warranty

o All proposed Building Automation Controls sequences are to be reviewed and approved by State of Minnesota Facilities Management Automation Staff prior to issuance of bid documents.
Any proposed third-party controllers and/or devices connected to the BSAC, must be pre-approved by State of Minnesota Facilities Management Division. Approved third-party controllers and/or devices must include all software, databases and training required for Automation Staff to fully maintain and program. Third-party equipment shall be connected to the BSAC using BACnet MSTP. Third-party equipment manufacturer shall provide onsite assistance to Honeywell to establish communication to Honeywell EBI system.

Video Management System

The Department of Public Safety, Capitol Security operates the Video Management System (VMS), which provides security camera monitoring, control and recording the Capitol Complex. All security camera additions, renovations and alterations shall be incorporated into and become an extension of the existing system.

The VMS system utilizes a Bosch Video Management System (BVMS)

System Manufacturer: Bosch

Acceptable Bidders: The security camera integrator shall be a local Bosch BVMS factory certified installer/integrator. Integrator shall provide proof of certification from Bosch to install BVMS systems

Installation Requirements: The security camera integrator must provide complete services to include but not limited to:

- System Engineering
- Programming in BVMS Version 8 or higher
- Provide all BVMS licensing requirements for integration into system
- System Checkout and Commissioning
- Direct access to Bosch technical support center
- Provide minimum 1 year system parts and labor warranty

All equipment connected to the BVMS shall be manufactured by Bosch. This equipment includes, but should not be limed to, cameras, encoders, decoders, storage, and control devices. This ensures 100% compatibility with the BVMS. This equipment shall be IP based and follow manufactures installation requirements.

Any proposed third-party equipment connected to the BVMS, must be pre-approved by the State of Minnesota Facilities Management Division. Proposed third-party devices shall be ONVIF compatible and reviewed and approved by Bosch to ensure compatibility with BVMS. Approved third-party controllers and/or devices must include all software, databases and training required for Automation Staff to fully maintain and program.

Integrator shall provide sufficient Network Video Recording (NVR) storage for 30 days 24/7 retention for all new cameras at the highest resolution, frame rates to be determined during project design.
Facilities Management Construction Standards

- Equipment programming and proposed locations shall be reviewed and approved by the State of Minnesota, Capitol Security, and Facilities Management Division prior to installation.

**Lighting Control System**

- The Department of Administration, Facilities Management Division owns and operates the Lighting Control System (LCS), which provides lighting control and integration of the Capitol Complex. In buildings where a LCS exists, all lighting additions, deletions, renovations and alterations shall be incorporated into and become an extension of the existing system. All existing custom graphic interfaces shall be modified accordingly.

- All new LCS shall utilize a Crestron Lighting System

- **System Manufacturer: Crestron**

- **Acceptable Bidders:** The lighting control contractor shall be factory authorized integrator of the above manufacturer and have fully staffed project managers, system application engineers, application engineers and technicians.

- **Installation Requirements:** The lighting control contractor must provide complete services to include but not limited to:
  - System Engineering
  - Programming
  - Graphic Interface Development and Implementation
  - System Checkout and Commissioning
  - Direct access to Crestron technical assistance
  - Provide minimum 1 year system warranty and 6 year parts warranty

- The Crestron System shall be installed as an independent IP based system, it shall not be connected to the existing Automation Network. New Building system installations shall include a Crestron Fusion server which will be connected to the existing Automation Network.

- All proposed lighting control sequences and narratives are to be reviewed and approved by State of Minnesota Facilities Management Automation Staff prior to issuance of bid documents.

- Lighting control sequence, databases and other programming software is the property of the State of Minnesota and must be turned over at project completion. If warranty work by the LCS contractor is done and the database changes, the new database must be turned over to the State if Minnesota.

- The LCS is also interfaced with the Capitol Complex Honeywell EBI (Enterprise Building Integrator) Building Systems And Controls (BSAC). This interface shall include:
  - Fieldserver interface programmed by Crestron
Utility Metering System

- The Department of Administration, Facilities Management Division owns and operates utility metering system which provides utility meter monitoring for the Capitol Complex. All utility meter additions, deletions, renovations and alterations shall be incorporated into and become an extension of the existing system.
- The utility metering system utilizes a Schneider Electric Power Monitoring Expert (PME) System.
- System Manufacturer: Schneider Electric
- Acceptable bidders: The PME shall be programmed by a factory certified integrator of the above manufacturer.
- Installation Requirements:
  - Meters shall be certified to operate with PME
  - Programming in PME Version 8.0 or higher.
  - Provide all licensing requirements for integration into system
  - System Checkout and Commissioning
  - Direct access to Schneider Electric technical support center
  - Provide minimum 1 year system parts and labor warranty
- Any proposed third-party equipment connected to the PME, must be pre-approved by the State of Minnesota Facilities Management Division. Approved third-party controllers and/or devices must include all software, databases and training required for Automation Staff to fully maintain and program.
- Metering devices shall communicate to PME via IP based MODBUS.

Irrigation

- The contractor shall be warranty all parts for a minimum of two years from the date of substantial completion and acceptance. (Unless manufacturer is longer).
- The contractor shall be responsible for the first fall “blow-down” and spring “start-up” of the system. These activities are to be coordinated with the owner.
- Coordinate with the facility the location of all lawn irrigation sprinkler heads.
- Specify testing of all mains, laterals, risers and fittings, heads, drain valves, and controls. Coordinate with Facility Management Division or facility maintenance staff.
- The design is to ensure “head-to-head” coverage and is to exclude coverage of hard surface areas under normal wind conditions.
o Design and specify to locate spray heads so as to avoid spraying, walls, monuments and other features that could be damaged from frequent watering.

o Design and specify sprinkler heads to be perpendicular to finished grades unless otherwise noted. Install sprinkler heads adjacent to walls, curbs and other paved areas at grade and install heads in lawn area where turf is not yet established at finished grade.

o Specify that contractor shall verify finished grades with architect/engineer prior to installation.

o Specify that heads with a 1” or greater inlet shall be installed using PVC “swing-joints”. And heads with inlets smaller than 1” shall be made with poly tee fittings (no saddles fitted directly to piping).

o Specify separate metering of lawn irrigation system to avoid sewer fees.

o Specify shut-off valves, back-flow prevention and air stem valves. Install exterior main line shut off valve.

o The irrigation system shall be designed & installed for seasonal drainage.

o When the work is for an expansion of an existing system, specify components that are compatible with the existing system also with owners’ attic stock and repair parts (should be approved at pre-bid with owner.) If different 15% attic stock should be approved. During work, the existing system shall continue to work or accommodations will be made to water affected area until work is complete.

o Designer shall review subsurface irrigation piping also interior and exterior space with owner’s facility staff.

o For subsurface or drip irrigation systems, specify a removable filtering system that is installed between the main line and the irrigated zone. Provide pressure-reducing valves. Both the filtering and pressure reducing components shall be enclosed in a valve box and coupled by PVC unions. (There are exceptions for some manufacturers such as Netafim).

o For subsurface or drip irrigation systems, specify that irrigation lines shall be plugged at the end with a removable plug to allow flushing of the system. Plugs shall be installed in small valve boxes for easy access.

o System controllers are to be electronic; Hunter: Pro-C or I-Core Series or demonstrated approved equal capable of full automatic or manual operation and housed in a heavy-duty metal waterproof, lockable cabinet. All controllers shall come equipped with a remote control system. All controllers and parts shall be compatible with owners’ attic stock and repair parts. (Should be approved at pre-bid with owner). If different 15% attic stock should be approved. Verify base spec manufacturers with facility staff maintenance.

o Specify all control wiring/cable will be a minimum #14 gauge, single strand solid copper wire and UL approved for direct underground burial.

o Specify to provide tracer wiring to be installed along all main and lateral lines and will be a minimum #14 gauge single strand copper and direct buried.
o Specify that there shall be no wire splices between the controller and valve. Connections to valves must be enclosed in a valve box and wire ends attached by wire nuts, all enclosed in a direct-bury splice kit. All wires between the controller and the point of direct burial must be enclosed in approved conduit.

o Specify that all valve boxes shall not be installed closer than 18” to any sidewalk, drive or hard surface. And, treated wood or bricks shall support boxes.

o Specify that the fill to support valve boxes shall be a porous fill such as ½” river rock, a minimum of 4” in depth from the base and extending 4” from each side to allow for drainage away from box.

o Specify the top of the valve box to match finish grade.

o Specify a maximum of two valves shall be installed in one valve box.

o Valve boxes and covers shall be 12” minimum heavy duty plastic. Valve boxes and covers shall be compatible with owners’ attic stock and repair parts. (This should be approved at pre-bid with owner) If different 15% attic stock should be approved.

o Electric valves shall be globe/angle configuration with female pipe thread inlet and outlet. Valves shall have a manual flow control. Typically provide 24 volt, 60 cycle solenoid-actuated. Typically, valves 2 inches and smaller may be plastic and if larger than 2”, provide brass. All valves and repair parts shall be compatible with owner’s attic stock. (This should be approved at pre-bid with owner.) If different 15% attic stock should be approved.

o Specify quick-coupling valves with optional horizontal stabilization.

o Specify all zone valves shall be tagged using a plastic or brass tag that identifies it with the zone number that corresponds to the same number on the controller.

o Specify that all valves shall be installed using PVC unions on both sides to allow for easy replacement.

o PVC Pipes: Specify all 1-1/2” and larger piping shall be virgin, high impact, schedule 40 PVC pipe. All PVC pipe shall be continuously and permanently marked with manufacturer’s name, material size and schedule type. All free of defects.

o In accordance with manufacturers’ recommendations, specify a two-step glue process for PVC piping and fittings.

o PVC fittings: Specify PVC pipe fittings shall be made of schedule 40 PVC and be free of any defects.

o Polyethylene Pipe: Specify that all 1-1/4” and smaller piping shall be flexible, non-toxic, new polyethylene pipe. All polyethylene pipe sizes shall have a minimum 100psi working pressure rating. All polyethylene pipes shall be continuously and permanently marked with manufacturer’s name, material size and schedule type. All free of defects.

o Poly fittings: Specify PVC or nylon insert fittings shall be used.

o Specify that all installations shall provide for expansion and contraction; sloped for drainage.
o Prior to backfilling of trenches, specify that the contractor shall notify designer and/or staff facility for inspection.

o Specify all backfill material shall be free of rocks and debris that is larger than 1 ½”.

o Specify contractors to install system with a minimum of 12” cover; based on finished grade.

o Where piping and wiring crosses below hard surfaces, penetrates soil walls or similar surfaces greater than 3 feet; specify piping and wiring shall be enclosed in 4” PVC sleeves or a minimum of 2” greater than the largest diameter pipe. An additional or spare sleeve shall be installed.

o Specify contractor to provide double-sleeved protection for piping that is installed below hard surfaces. (Sidewalks, drives, plazas, etc.)

o Specify joint connections from steel water mains to plastic shall be made using threaded flanged fittings.

o Specify all main line poly connections shall be double clamped using stainless steel type clamps.

o Specify joints shall set for 24 hours prior to pressurizing the system.

o Specify that contractor shall test system after completion of each section to hold 100-psi air pressure for one hour. Contractor shall be responsible for repairs and adjustments. Contractor shall notify facility staff to be present when system is pressure tested.

o As a sustainable design measure, zone the lawn irrigation system for timed watering in the early morning and/or late afternoon to avoid excessive water evaporation. Coordinate with Facility Management Division or facility maintenance staff.

o As a sustainable design measure, provide rain sensors (with a by-pass switch) for irrigation systems to prevent unnecessary watering.

o Avoid different (multiple manufacturers) head/nozzle types for lawn head/nozzle types for lawn irrigation systems. All heads shall be compatible with owner’s attic stock and repair parts. (They should be approved at pre-bid with owner.) If different a 15% attic stock should be approved. Rotors are to be Hunter I-40’s, I-20’s or pop-ups. No sprays or rotors are to be on the same zone. Nor Aqua-pore or Netapheme or demonstrated approved equal.

o All major irrigation system components are to be installed in protected, vandal proof locations, and easily accessible for maintenance and operation.

o When installation includes buried tanks, the designer shall have soil testing performed for backfill and compaction.

**Landscape**

o Coordinate with the facility the location of all security, lighting, utilities to include tunnels and irrigation.
- Specify that all new plant material shall be maintained and warranted for a complete cycle of the seasons (no less than one year). Also to include two spring seasons. All turf to be established (usually 6 weeks minimum) and to include all mowing and watering prior to acceptance.

- Specify that all defective planting material shall be replaced and the new material shall be warranted for an additional complete cycle of the seasons (no less than one year). Also to include two spring seasons.

- Coordinate with the facility the watering requirements for lawn areas and landscaped areas. It is the contractors’ responsibility to maintain until subsequently complete or written acceptance from the owner.

- When raised planters are being proposed, review with the user facility. Typically raised planters are considered high maintenance and not encouraged.

- Propose hardy and/or indigenous plant materials that require minimal maintenance.

- Provide plants that are available from local nurseries. Do not propose plants from suppliers outside the State's region. Plants from outside the region were not raised in the same soils and climate and are difficult to replace. All plants should be pre-approved by owner.

- Avoid plants that require meticulous care in soil preparation, fertilizing and spraying.

- Evaluate the role and use (positive and negative) of landscaping materials to achieve sustainable design efforts. (i.e. shading during the summer; windbreaks during the winter, security, etc.)