MSU WEST REGIONAL CHILLED WATER PLANT
Concept Design Narrative -Study Phase
PBA# 2023.0183
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Mechanical Systems

1. Utilities: Campus steam and condensate, water, sanitary, storm.
2. Natural gas service shall be provided to support the generator.
3. Chilled water and condenser water systems:
    a. Chiller types and capacities as indicated for each Phase and Option as per the Options Summary matrix. Refer to cut sheets provided for each chiller type and capacity.
    b. Electric centrifugal chillers are to be provided with VFDs; for 2800 ton chillers they are to be floor mounted, accepting 13.2 kV input and 4160 V output to chiller; for the 1000 ton chiller the VFD is to be unit-mounted with 480V input.
    c. Steam turbine drive centrifugal chillers are to accept campus steam at 90 psig. Provide each with one duplex, electric condensate return unit - refer to cut sheet.
    d. For each chiller:
        i. Provide one primary chilled water pump, one condenser water pump with full size basket strainer, and one multi-cell cooling tower. Refer to cut sheets provided for each pump type and cooling tower. Provide each pump and cooling tower fan with VFD, concrete inertia base and spring isolators.
        ii. Provide multi-cell cooling tower with sump sweeper piping and associated centrifugal separator, spring isolators for tower, OSHA ladders, top deck guard rails, 480V electric basin heaters and chemical treatment system. All cooling tower piping located outdoors shall insulated, jacketed and provided with electric heat trace.
    e. Provide refrigerant monitoring system.
    f. Provide steel access/service platform around all sides of each multi-cell cooling tower.
    g. In Phase 1, provide two line-size air/dirt separators as indicated on the campus chiller water return mains. Provide bladder type expansion tanks.
    h. In Phase 1, provide two plate and frame heat exchangers, 3,000 GPM each, each connected to a chiller's chilled water pump and a chiller's condenser water pump.
    i. In Phase 1, provide chemical bulk storage tanks as indicated.
4. Steam and condensate:
    a. Connect 90 psig steam to each steam turbine chiller.

b. Provide steam pressure reducing station and extend steam and low pressure condensate piping to building heating devices as described below. Provide a separate, duplex condensate return unit for the building heating system.

c. Connect pumped condensate return from all condensate return unit discharges to the campus condensate system.

5. Building HVAC:

a. Provide dedicated outside unit, with supply and exhaust fans and energy recovery device, to provide ventilation air and exhaust air for offices and toilet/locker rooms. Provide duct mounted, low pressure steam coil in the supply air duct.

b. Provide VRF fan coil to serve each office and toilet/locker room, and provide VRF condensing unit on roof.

c. Provide steam unit heaters connected to low pressure steam and condensate piping for heating of chiller and electrical rooms.

d. Provide supply and exhaust ventilation systems for chiller and electrical rooms.

e. Provide exhaust fan (EF) for generator room.

6. Water:

a. Provide domestic water meter and building-sized water softener.

b. Provide freeze proof wall hydrants around exterior perimeter of building, provide hose bibb near each chiller, and provide freeze-proof roof hydrant near each cooling tower.

c. Provide two parallel, fully redundant, reduced pressure back flow preventers to serve cooling tower makeup. Provide one reduced pressure back flow preventer to serve building domestic water system.

d. Provide electric domestic water heater for toilet and locker rooms.

7. Sanitary:

a. Provide complete sanitary drainage system including floor drains at all equipment and trench drain water building water softener.

b. Provide sanitary receptors above roof to accept indirect waste from cooling towers.

c. Provide two duplex sanitary sump/pump packages, one in the pit at the steam/water service entrance and the second in the pit at the campus chilled water piping entrance. Connect inlets of each sump to floor drains in each pit.

8. Storm:

a. Provide separate primary and secondary roof drainage systems. Extend primary roof drains to storm sewer and extend secondary roof drains to spill on grade.

b. Provide two duplex storm sump/pump packages, one in the pit at the steam/water service entrance and the second in the pit at the campus chilled water piping entrance. Connect inlets of each sump to drain tile around perimeter of pit.

9. Fire Protection: Provide wet pipe sprinkler system for the entire building.

Electrical Systems

1. Utilities: Primary electrical power and fiber optic service. Both service from MSU campus systems.
2. Telecommunication Systems:
    a. Provide new ductbank from nearest COMM manhole.
    b. Provide campus fiber optic lines to support new building.
    c. Provide pathways and boxes as required to support data and phone systems throughout the facility.
    d. Provide wall mounted MDF box for termination of fiber optic lines, patch panels, and MSU provide network devices.
    e. Provide Cat6E lines from MDF box to all data drops, MSU provided WAP devices, and phone outlets.
3. Primary Power (15kV):
    a. Provide new primary circuits, duct banks, and manholes as required to support power for each phase.
        i. Duct banks and manholes by contractor.
        ii. Primary circuits from source to building by MSU. Coordinate pricing with MSU Electrical engineer.
    b. Provide 15kV electrical gear. Gear should be 15kV relay/circuit breaker based and designed to support (2) double ended substation and also any combination of primary voltage electric and steam turbine chillers. Provide 15kV breakers as required to support each phase with provisions for future breakers to support full build out of all primary voltage electric chiller option.
        i. Primary distribution equipment furnished by MSU and installed by contractor. Coordinate pricing with MSU Electrical engineer.
4. Building Power (480V and 208V):
    a. Provide double ended 480/277V substations and associated electrical distribution equipment as required to support each design phase.
    b. Provide distribution panelboards as required to power up equipment for each design phase.
    c. Provide feeders to all new equipment. Provide motor controllers (including VFCs), and safety switches as required for each phase.
    d. Receptacles and small equipment power:
        i. Provide 480V – to 208/120V dry type transformer.
        ii. Provide 208/120V panelboards and branch circuits

iii. Provide receptacles throughout facility, inside and outside.

iv. Provide all branch circuits as required.

5. Generator:

   a. Provide 32kW natural gas generator with 480/277V output. Generator shall be located on the 2nd level of the building and exhausting up the roof. Muffler and exhaust system shall be attenuated to meet critical sound levels

   b. Provide (2) 30A, 4P automatic transfer switches. One for Emergency (lighting and FACP) and one for Optional Standby (OSB) loads.

   c. Provide structural support below 2nd floor generator room. Provide walls, door, louvers and roof penetrations required for generator.

6. Fire Alarm:

   a. Provide FACP panel.

   b. Provide smoke detectors as required to cover building that is fully sprinkled. Minimum one device above FACP.

   c. Provide audio/visual notification devices to cover entire facility.

   d. Provide interface devices for tamper and flow devices on fire suppression system.

7. Lighting:

   a. Provide lighting panelboard and branch circuits as required.

   b. Provide LED light fixtures and associated controls throughout facility and on exterior perimeter of facility.

   c. Provide site lighting to support sidewalks, drives, and parking areas. Provide provisions to control via campus BMS system.

   d. Provide EXIT signs and emergency circuits to load transfer devices and light fixtures to provide emergency lighting along paths of egress and for exterior mounted lights on exterior of building above all egress doors.