MEP ENGINEERING INC.

Mechanical, Plumbing, and Electrical Systems Schematic Design Narrative
Encana Corporation
Garfield County Field Office Facility

Project Description:

The project location is in Parachute, CO in Garfield County at an elevation of approximately 5,090 feet above sea level. The project shall include construction of a new 3 story, 50,000 sq. ft. office building on a three to five acre site. The building is to be constructed under two "phases" as a core and shell development and tenant improvement build out by the Encana Corporation.

Mechanical Systems

GOVERNING CODE SECTIONS:

The codes governing the mechanical systems are the latest additions of the following codes:
International Mechanical Code – 2003 (IMC)
NFPA - 2009
International Energy Conservation Code - 2003 (IECC)
International Fire Code - 2009 (IFC)
International Fuel and Gas Code – 2003 (IFGC)

All local codes and amendments will be incorporated into the design as well. These codes will be followed through the design and construction phases of the project.

Division 23 – HVAC Core and Shell Systems

AIR HANDLING SYSTEMS (OPTION 1A):

Heating, ventilation, and air conditioning shall be provided to the building by two (2) variable air volume (VAV) rooftop air conditioning units, both 70 tons nominal in cooling capacity. This equates to approximately 380 sq. ft./ton based on an approximate 50,000 sq. ft. building. These units will be located on the roof and shall consist of a supply fan, exhaust fan, an economizer section with filter/mixing box (with 35% filter media), fully modulating gas fired heat exchanger, direct expansion cooling coil, and integral unit mounted air cooled condensing units. Variable speed controls shall be provided for the supply and return fans to vary air quantity delivered to the building based on actual load and to maintain positive pressure inside the building with respect to the outside. Rooftop unit will need to be able to accommodate architectural metal wall panel cladding in lieu of an architectural wall screening. Refer to preliminary unit specifications provided below.

Outdoor air to the building will be calculated per the 2003 International Mechanical Code (IMC) based on architectural occupancy requirements. Most spaces will require 20 CFM/Person. Preliminary calculations will require the units be balanced to approximately 36% outdoor air at a minimum with the ability to provide up to 100% outdoor air during economizer mode (free cooling). Demand control ventilation shall be utilized as a control strategy to provide the

minimum required ventilation based on real time occupancy levels. Carbon dioxide sensors mounted on each floor's return air duct openings provide a real time occupancy level based on $C0_2$ levels from the occupants and therefore modulating the outside air intake to achieve required ventilation rates.

AIR HANDLING SYSTEM (OPTION 1B):
As an alternative pricing option, the air handling systems are to be equipped with direct evaporative cooled condensing unit sections. With this option, the main air handler's energy efficiency will increase and provide a greater energy savings compared to air-cooled condensing units. Two (2) nominal 70 ton VAV roof top units will still be required to meet the cooling load of the building. Please note that evaporative cooled condensing units typically require more maintenance, more often to maintain proper working order and efficiencies when compared to a standard air cooled condensing unit. Rooftop unit will need to be able to accommodate architectural metal wall panel cladding in lieu of an architectural wall screening. Refer to preliminary unit specifications provided below.

Outdoor air to the building will be calculated per the 2003 International Mechanical Code (IMC) based on architectural occupancy requirements. Most spaces will require 20 CFM/Person. Preliminary calculations will require the units be balanced to approximately 36% outdoor air at a minimum with the ability to provide up to 100% outdoor air during economizer mode (free cooling). Demand control ventilation shall be utilized as a control strategy to provide the minimum required ventilation based on real time occupancy levels. Carbon dioxide sensors mounted on each floor's return air duct openings provide a real time occupancy level based on $C0_2$ levels from the occupants and therefore modulating the outside air intake to achieve required ventilation rates.

AIR HANDLING SYSTEM (OPTION 2):
As an additional alternative pricing option, the air handling systems are to be equipped with a heating water coil section. All cooling options shall be identical to option 1A above. Rooftop unit will need to be able to accommodate architectural metal wall panel cladding in lieu of an architectural wall screening. Refer to preliminary unit specifications provided below.

Hot water heating system will include the following necessary equipment: boilers, pumps, air separator, and an expansion tank to serve the roof top unit pre-heating coils in addition to the future tenant's fan powered boxes (FPB)/VAV terminal re-heat coils. Two (2) high efficiency condensing boilers each at approximately 1,200.0 MBH heating input at sea level, 960.0 MBH output at altitude (5,090 feet). Each boiler would be sized to handle 60% of the entire building load for additional redundancy in the event of a single boiler failure. Based on a 960.0 MBH (each) output of heating capacity, two (2) lead-lag heating water pumps with 7-1/2 HP VFD motors would need to be sized for approximately of 155 GPM at 90 feet of head for a 25°F heating water temperature difference, this arrangement would allow for 100% capacity redundancy in the event of a single pump failure.

A boiler mechanical room would be required for all necessary hot water heating elements and would be approximately 3% of the floor plate area approximately 500 sq. ft. Location of the boiler mechanical room would need to be strategically located on the roof for boiler flue and combustion air requirements.

Outdoor air to the building will be calculated per the 2003 International Mechanical Code (IMC) based on architectural occupancy requirements. Most spaces will require 20 CFM/Person. Preliminary calculations will require the units be balanced to approximately 36% outdoor air at a minimum with the ability to provide up to 100% outdoor air during economizer mode (free cooling). Demand control ventilation shall be utilized as a control strategy to provide the minimum required ventilation based on real time occupancy levels. Carbon dioxide sensors mounted on each floor's return air duct openings provide a real time occupancy level based on $C0_2$ levels from the occupants and therefore modulating the outside air intake to achieve required ventilation rates.

PRELIMINARY VAV ROOFTOP UNIT DATA AND SPECIFICATION (OPTION 1A):

Johnson Controls model YPAL070MVE46 with Direct Expansion (DX) cooling and fully modulating gas heating. Unit shall be configured for down-flow supply and return connections. Casing shall be galvanized steel, fully insulated with access doors and service panels to be hinged and unit shall be equipped with hail guards. Compressors shall be scroll type with crankcase heaters, charged with R-410A refrigerant. Evaporator and condenser coils shall be copper tubes mechanically bonded to aluminum plate fins. Stainless steel gas heating section shall be for use with natural gas. Outdoor air fans shall be direct drive. Indoor fans shall be double inlet, belt drive, and mounted on vibration isolation. Exhaust fan shall be fully modulating and provided with factory mounted controls. The unit supply and exhaust fans shall be provided with variable frequency drives (VFD) for variable air volume operation. The supply fan shall modulate to maintain duct static pressure and the exhaust fan shall modulate to maintain building pressurization. The roof top unit shall be provided as a single point electrical connection. The roof curb shall be approximately 16" tall. The unit shall be equipped with a fully modulating dry bulb economizer. The unit shall be equipped with low ambient operation to 0°F.
Capacities as follows for each roof top unit: 28,000 CFM supply @ 1.5 inches W.C. external static pressure, 24,000 CFM exhaust at 0.50 inches W.C. external static pressure, 10,080 CFM outside air (minimum), 850.0 MBH heating input at sea level, 540 MBH output at altitude (5,090 feet), 840 MBH total cooling (nominal), 30 HP supply fans, (6) nominal compressors for staging cooling load as required by internal unit controls, 460V/3phase. Approximate unit dimensions (including curb height) 38 feet long, 8 feet wide, 8 feet tall. Approximate unit weight is 16,500 lbs.

PRELIMINARY VAV ROOFTOP UNIT DATA AND SPECIFICATION (OPTION 1B):

Trane model SFHP734P with DX cooling and fully modulating gas heating. Unit shall be equipped with a direct evaporative condensing unit section. Unit shall be configured for down-flow supply and return connections. Casing shall be galvanized steel, fully insulated with access doors and service panels to be hinged and unit shall be equipped with hail guards. Compressors shall be scroll type with crankcase heaters, charged with R-410A refrigerant. Evaporator and condenser coils shall be copper tubes mechanically bonded to aluminum plate fins. Stainless steel gas heating section shall be for use with natural gas. Outdoor air fans shall be direct drive. Indoor fans shall be double inlet, belt drive, and mounted on vibration isolation. Exhaust fan shall be fully modulating and provided with factory mounted controls. The unit supply and exhaust fans shall be provided with variable frequency drives (VFD) for variable air volume operation. The supply fan shall modulate to maintain duct static pressure and the exhaust fan shall modulate to maintain building pressurization. The roof top unit shall be provided as a single point electrical connection. The roof curb shall be approximately 16" tall. The unit shall be equipped with a fully modulating dry bulb economizer. The unit shall be equipped with low ambient operation to 0°F.

Capacities as follows for each roof top unit: 28,000 CFM supply @ 1.5 inches W.C. external static pressure, 24,000 CFM exhaust at 0.50 inches W.C. external static pressure, 10,080 CFM outside air (minimum), 850.0 MBH heating input at sea level, 540 MBH output at altitude (5,090 feet), 840 MBH total cooling (nominal), 30 HP supply fans, (4) nominal compressors for staging cooling load as required by internal unit controls, 460V/3phase. Approximate unit dimensions (including curb height) 33 feet long, 10 feet wide, 9 feet tall. Approximate unit weight is 15,000 lbs.

PRELIMINARY VAV ROOFTOP UNIT DATA AND SPECIFICATION (OPTION 2):

Johnson Controls model YPAL070HVE46 with DX cooling with a hot water heating coil section. Unit shall be configured for down-flow supply and return connections. Casing shall be galvanized steel, fully insulated with access doors and service panels to be hinged and unit shall be equipped with hail guards. Compressors shall be scroll type with crankcase heaters, charged with R-410A refrigerant. Evaporator and condenser coils shall be copper tubes mechanically bonded to aluminum plate fins. Hot water heating coil shall be of copper tube, staggered in direction of airflow. A structural galvanized steel casing shall protect the coil. Outdoor air fans shall be direct drive. Indoor fans shall be double inlet, belt drive, and mounted on vibration isolation. Exhaust fan shall be fully modulating and provided with factory mounted controls. The unit supply and exhaust fans shall be provided with variable frequency drives (VFD) for variable air volume operation. The supply fan shall modulate to maintain duct static pressure and the exhaust fan shall modulate to maintain building pressurization. The roof top unit shall be provided as a single point electrical connection. The roof curb shall be approximately 16" tall. The unit shall be equipped with a fully modulating dry bulb economizer. The unit shall be equipped with low ambient operation to 0°F.

Capacities as follows for each roof top unit: 28,000 CFM supply @ 1.5 inches W.C. external static pressure, 24,000 CFM exhaust at 0.50 inches W.C. external static pressure, 10,080 CFM outside air (minimum), 540 MBH heating output (additional heating output by boiler system would provide heat for reheat coils and unit heaters), 840 MBH total cooling (nominal), 30 HP supply fans, (6) nominal compressors for staging cooling load as required by internal unit controls, 460V/3phase. Approximate unit dimensions (including curb height) 38 feet long, 8 feet wide, 8 feet tall. Approximate unit weight is 17,000 lbs.

AIR DISTRIBUTION SYSTEMS (ALL OPTIONS):

Tempered air shall be distributed to the occupied space by means of a combination of medium pressure and low pressure insulated sheet metal duct system. Air from the occupied areas of the building will be returned to the units by means of an above ceiling plenum space, a return air plenum. Each unit's supply air ducts shall be ducted to provide a medium pressure supply air loop per floor with two (2) medium pressure supply air ductwork mains/risers, and one (1) common return air ductwork main/riser. Medium pressure ductwork from the rooftop unit opening to the VAV terminals shall be galvanized steel, insulated with external fiberglass duct wrap. Architectural chases will need to be provided to accommodated the following main duct risers (clear inside dimension of chase): 90"x30" main medium supply air chase, typical of two (2) on far ends of the center core area; 84"x58" main common return air chase, typical of one (1) in center of the core area; 20"x20" exhaust air chase for restrooms, typical of one (1), see exhaust systems below for more information.

EXHAUST SYSTEMS (ALL OPTIONS):

An exhaust system shall be provided to serve the core Toilet Rooms and Janitor's Closets to maintain air quality and provide negative pressure relationships with surrounding spaces.

Exhaust will be removed at the rate of 75 CFM per restroom fixture for Toilet Rooms and Janitor's Closets (approximately 525 CFM per floor). An exhaust fan shall be roof mounted centrifugal type fan with gravity back draft damper. Exhaust fan shall operate continuously during occupied hours and be de-activated during unoccupied hours. Additional provisions in the building will need to be accommodated to provide an exhaust chase.

MISCELLANEOUS HEATING SYSTEMS (OPTION 1A & 1B):
Ceiling cabinet unit heaters with electric heating coils shall be installed at each building entry doors and vestibules that can be open to the outside. Electric unit heaters will be installed in unfinished spaces where heating is required (i.e. Fire/water entry room).

MISCELLANEOUS HEATING SYSTEMS (OPTION 2):
Ceiling cabinet unit heaters with heating water coils shall be installed at each building entry doors and vestibules that can be open to the outside. Heating water unit heaters will be installed in unfinished spaces where heating is required (i.e. Fire/water entry room).

MISCELLANEOUS COOLING SYSTEMS (ALL OPTIONS):
An outdoor equipment platform for a remote outdoor type condensing unit and refrigerant line floor sleeves at each floor shall be accommodated under the core and shell construction for the anticipated tenant's IT cooling requirements.

It is anticipated that the building will have three (3) electrical rooms, each room will have a 112.5kVA transformer that will require 24/7 cooling. Each electrical room will be conditioned with a transfer fan in the electrical rooms from adjacent spaces to the return plenum.. Each fan shall be controlled with a reverse acting thermostat to maintain a room temperature of 80°F (adjustable).

CONTROL SYSTEMS (OPTION 1A & 1B):
The temperature control system shall be a stand alone controls system provided by the roof top unit manufacturer. Control devices required but not provided with the equipment shall be furnished and installed by the mechanical/controls contractor. Installation labor, field wiring, and supplemental control components required for operation of the factory installed control systems shall also be provided by the mechanical/controls contractor.

CONTROL SYSTEMS (OPTION 2):
The temperature control system required for a complete and operational mechanical system shall be a stand alone electronic direct digital control (DDC) system compatible for interface to the roof top unit manufacturer's control panel provided by the roof top unit manufacturer, boiler manufacturer's controls, and all heating water system controls in addition to all airside controls. Installation labor, field wiring, and supplemental control components required for operation of the factory installed control systems shall also be provided by the mechanical/controls contractor.

Division 23 – HVAC Tenant Improvement Systems

AIR DISTRIBUTION SYSTEMS (ALL OPTIONS):
Medium pressure ductwork from each floor's looped supply duct to the FPB/VAV terminals shall be galvanized steel, insulated with external fiberglass duct wrap. Low pressure ductwork from the outlet of the FPB/VAV terminal to the ceiling mounted air devices shall be provided by

round or rectangular galvanized ductwork, insulated with 1" fiberglass acoustic duct linear. Air devices in perimeter zones shall be linear slot diffusers as close to the perimeter wall as possible. Air devices in interior zones shall be 24"x24" square ceiling diffusers. All air devices shall be selected to match architectural ceiling type.

Air from the occupied areas of the building will be returned to the units by means of an above ceiling plenum space, a return air plenum. All return air grilles shall be selected to match the ceiling type. Where walls are constructed full height to address privacy concerns, openings in the walls above the ceiling shall be provided to allow air to return to the units. Lined transfer ducts with at least two changes in direction can be provided in areas that require sound transfer mitigation.

VAV Terminal Device Specification (OPTION TI-A COMPATIBLE WITH OPTIONS 1A & 1B)*:*

Parallel fan powered variable air volume terminal units with electric reheat coils shall serve perimeter rooms with outside walls and windows. Interior zones shall be served primarily with pinchdown cooling only type variable volume terminal units. Some interior conference room zones will also require electric reheat coils. All FPB/VAV terminals on the third floor will require re-heat coils to provide supplemental heating to offset roof heat loss. Pinchdown type variable air volume terminal units shall be sized based on 800 - 1,200 sq.ft./box and parallel fan powered type variable air terminal units shall be based on 500 – 750 sq. ft./box. This equates to approximately 27 pinchdown type variable air volume terminal units and 36 parallel fan powered type variable air volume terminal units for the entire three-story building. Some boxes may be bigger/smaller depending on architectural layout and occupancy requirements.

VAV Terminal Device Specification (OPTION TI-B COMPATIBLE WITH OPTION 2)*:*

Parallel fan powered variable air volume terminal units with hot water reheat coils shall serve perimeter rooms with outside walls and windows. Interior zones shall be served primarily with pinchdown cooling only type variable volume terminal units. Some interior conference room zones will also require hot water reheat coils. Pinchdown type variable air volume terminal units shall be sized based on 800-1,200 sq.ft./box and parallel fan powered type variable air terminal units shall be based on 500 – 750 sq. ft./box. This equates to approximately 27 pinchdown type variable air volume terminal units and 36 parallel fan powered type variable air volume terminal units for the entire three-story building. Some boxes may be bigger/smaller depending on architectural layout and occupancy requirements.

VAV Terminal Device Specification (OPTION TI-C COMPATIBLE WITH OPTION 2)*:*

Pinchdown cooling only variable air volume terminal units shall serve both perimeter rooms with outside walls and windows and interior zones. Some interior conference room zones will also require hot water reheat coils. Variable air volume terminal units shall be sized based on 800 - 1,200 sq.ft./box. This equates to approximately 57 variable air volume terminal units for the entire three-story building. Some boxes may be bigger/smaller depending on architectural layout and occupancy requirements. Continuous hydronic baseboard heating elements shall be installed along all outside walls and beneath windows to provide necessary heating to the space. The hot water baseboard heating shall be installed under the core and shell building construction. There is approximately 1,650 linear feet of exterior wall for the entire building that would require exterior hot water baseboard heating.

EXHAUST SYSTEMS (ALL OPTIONS):
Exhaust shall also be provided where maintaining pressure relationships is required or maintaining odors is required such as in break rooms and/or additional small single fixture restrooms.

MISCELLANEOUS COOLING SYSTEMS (ALL OPTIONS):
It is anticipated that the building will have IT rooms requiring 24/7 cooling. The preliminary size of equipment is estimated to be 3-tons. The indoor unit shall be ceiling mounted with the outdoor unit mounted on the roof.

CONTROL SYSTEMS (ALL OPTIONS):
The electric controls and electronic components as required for a complete and operational mechanical system shall be compatible for interface to the building's control system, refer to building's core and shell control options. To the extent possible, control equipment shall be factory installed and tested by the equipment manufacturer for rooftop units and variable air volume terminal boxes, etc. Control devices required but not provided with the equipment shall be furnished and installed by the mechanical/controls contractor. Installation labor, field wiring, and supplemental control components required for operation of the factory installed control systems shall also be provided by the mechanical/controls contractor.

Division 22 – Plumbing Core and Shell Systems

GOVERNING CODES:
The codes governing the plumbing systems are the latest additions of the following codes:
International Plumbing Code – 2003 (IPC)
NFPA - 2009
International Energy Conservation Code - 2003 (IECC)
International Fire Code - 2009 (IFC)
International Fuel and Gas Code – 2003 (IFGC)
All local codes and amendments will be incorporated into the design as well. These codes will be followed through the design and construction phases of the project.

WATER, FIRE, SEWER AND STORM SEWER SYSTEMS:
The domestic water service to the building is currently estimated to be a 1-1/2" diameter domestic water tap and meter, entering the building at the fire/domestic water service room located on the main level of the building. The water meter shall be located in a meter pit exterior to the building. Domestic water meter sizing will become finalized once more information is available about the water pressure at the selected site and plumbing requirements in the building are finalized. Within the building, the 1-1/2" service will be provided with a reduced pressure zone backflow preventer located in the fire/water entry room. The 1-1/2" service shall increase to 2" after the backflow preventer and be distributed to the restroom cores and to anticipated tenant improvement systems of the following: break rooms, and coffee bar areas above accessible ceilings. Distribution piping risers shall be provided at each end of the building with capped and valved stub-outs for future fixture connections.

Domestic water piping throughout the building shall be type L, hard drawn, copper tubing. All domestic piping shall be insulated per Plumbing and Energy code requirements.

The sanitary sewer leaving the building shall be a minimum of 4" and be at a depth of no less than 5'-0" below exterior grade. Cleanouts shall be provided within and outside of the building to facilitate maintenance.

Sanitary sewer piping within the building shall be no-hub cast iron piping. Sanitary vent piping shall be either copper or cast iron.

4" Sanitary waste risers shall be provided at 2 locations to serve future fixture needs on all levels of the building.

3" Vent stacks shall be provided at 2 locations selected to serve future fixture requirements and coordinated with mechanical equipment layouts.

The building shall have internal roof drainage through the use of primary roof drains located at the perimeter of the building, connecting to underground storm sewer laterals. Overflow drainage shall be provide via architectural roof scuppers.

Roof drain piping within the building shall be no-hub cast iron piping. Horizontal runs shall be minimized and all piping shall be insulated.

The building shall be provided with a 6" fire service and associated backflow preventer. The fire service and backflow preventer shall be located in the fire/water entry room on the main level of the building. Distribution of the fire protection sprinkler piping shall be designed by the fire protection contractor.

Fire sprinkler piping shall be schedule 40 black steel.

PLUMBING FIXTURES:
Low-consumption plumbing fixtures shall be provided throughout the building. The following is the anticipated plumbing fixtures in the building and fixture specifications:

A. Water Closets (Main Toilet Rooms): Wall mounted, vitreous china, 1.6/1.1 GPF manually operated dual flush trip lever, 4" waste rough-in, 1/2" domestic water rough-in, 2" vent rough-in. Provide ADA height fixture where required.
Acceptable Manufacturer's (water closet): Zurn, Am. Standard, Kohler, Crane.

B. Lavatory-1 (Main Toilet Rooms): 20"x17 counter mounted, self rimming, vitreous china, single handle, 4" center-set chrome plated brass faucet, 0.5 GPM, 1/2" hot and cold water supplies, temperature mixing valve, 2" waste and vent rough-in.
Acceptable Manufacturer's (lavatory): Zurn, American Standard, Kohler, Crane
Acceptable Manufacturer's (faucet): Zurn, American Standard, Delta, Kohler

C. Urinal: Wall mounted, vitreous china, 0.13 GPF manually operated top spud 3/4" flush valve. 3/4" domestic water rough-in, 2" waste and vent rough-in.
Acceptable Manufacturer's (water closet): Zurn, Am. Standard, Kohler, Crane.
Acceptable Manufacturer's (flush valve): Zurn, Sloan

D. Mop Service Basin: Floor mounted, 24x24 size, 6" drop front, SMC construction, 10" spout faucet with pail hook, vacuum breaker, and 3/4" male hose-end outlet.3" waste rough-in, 2" vent rough-in, 3/4" hot and cold water rough-in.
Acceptable Manufacturers: Fiat, Florestone, Williams

E. Floor drains: 6" round top with trap primer connection flashing collar and adjustable head, secured grate. Zurn model FD2322 or equivalent. Provide floor drains with 2" waste and vent rough-ins in every restroom.

F. Floor sink: 10x10 square basin, half grate, cast iron body, flashing collar, porcelain enameled interior, dome strainer. Zurn model 1926 or equivalent. Provide floor sink with 6" waste and 2" vent rough-ins at water entry location.

G. Drinking Fountains: Elkay EZSD or equivalent wall mounted drinking fountain, flexiguard bubbler, front and side push bars. An electrical connection (120V) is required for this fixture. Provide at ADA height where indicated on Architectural plans.

DOMESTIC HOT WATER:
The restroom cores shall be served by an electric domestic hot water heater with a circulation pump and piping. The water heater shall be a 40 gallon, storage type unit (A.O. Smith DEL-40 with (2) two 4500 W elements or equivalent). Water heaters shall be located in a mechanical space adjacent to the first floor restroom core, and shall be provided with drain piping routed to a 3" floor drain.

GAS SERVICE:
The preliminary gas service size required for a 45,000 square foot, 2-story building is 2,500,000 BTU/h. A new gas meter and distribution shall be provided. Gas piping shall be routed inside the building to mechanical equipment locations. Gas piping shall be schedule 40 Black Steel.

ELEVATOR:
The elevator shaft shall be provided with a sump basin and pump with control panel and "Oil Minder" sensor. The pump shall discharge to an air-break, and connect to the sanitary sewer system. The control panel shall be installed in a conspicuous location within the janitor's closet for monitoring of system.

Division 22 – Plumbing Tenant Improvement Systems

PLUMBING FIXTURES:
The following is the anticipated plumbing fixtures in the building and fixture specifications for the tenant improvement systems:

A. Break Room Sink: 22x19 single compartment, self rimming, stainless steel sink with sound deadening coating and 3" outlet. Provide with single handle, 10" spout, chrome plated brass faucet. 2" waste and vent rough-in, 1/2" cold water roughin, 3/4" hot water rough-in (with 1/2" separately valved branch to dishwasher).
Acceptable Manufacturer's (sink): Elkay, Just, Standyne
Acceptable Manufactuer's (faucet): Kohler, Just, Elkay, Delta

B. Lavatory-2 (Satellite Toilet Rooms): 20”x18” Wall hung, Vitreous China lavatory with concealed floor mounted carrier, 4” center-set chrome plated brass faucet, 0.5 GPM, 1/2” hot and cold water supplies, temperature mixing valve, 2” waste and vent rough-in. Acceptable Manufacturer’s (lavatory): Zurn, American Standard, Kohler, Crane Acceptable Manufacturer’s (faucet): Zurn, American Standard, Delta, Kohler

Division 26 – Electrical Core and Shell Systems

GOVERNING CODE SECTIONS

The codes governing the electrical systems are the latest additions of the National Electric Code, NFPA 70, the National Fire Alarm Code, NFPA 72, and the Life Safety Code, NFPA 101 and local codes and amendments. These codes will be followed through the design and construction phases of the project.

PRIMARY SERVICE AND DISTRIBUTION

277/480V, three-phase power shall be provided to the site via the local electrical utility company, Xcel Energy. The exact location of the service entrance and pad mounted transformer shall be coordinated with the utility company. The secondary service entrance conductors from the utility transformer to the electrical main service disconnecting means shall consist of (5) parallel runs of 4-400 kCMIL in 3” PVC conduits. We anticipate a maximum feeder run from the transformer to the main switchgear to be approximately 50 feet. The secondary will be routed to the Main Distribution Panel (MDP) located in the main electrical room. We anticipate the electrical service and size of MDP will be 1,600 amps 277/408-volt, three-phase, four-wire switchboard having an estimated 1,100 amp demand load with a fault current rating of 65,000 Amps.

The main switchboard will contain an incoming metering section, a 1600 Amp main circuit breaker with ground fault protection section, and a distribution section. We anticipate the required size of the main electrical room will be 8 feet wide and 15 feet long. This room will require a door at each end of the room. The doors will be required to open outward from the room and will require panic hardware.

Several options are being studied for a mechanical HVAC system. The electrical service size will be impacted based on this decision. The electrical service size and distribution indicated in this narrative is worst case scenario utilizing electric re-heat in the VAV boxes and air cooled condensing units for the main rooftop VAV air handlers. The electrical service size and distribution is anticipated to be reduced if hot water re-heat and/or evaporative condensing options are chosen.

A transient voltage surge suppressor (TVSS) will be provided with the MDP to protect the system from surges from incoming utility power. The service will be grounded at the main distribution panel via a concrete encased electrode, ground rod and building cold water pipe.

Electrical power to the elevator will be provided via a 200 Amp 480 volt 3-phase circuit breaker. A shunt trip disconnect will be located within the elevator machine room as required by code.

Electrical power to each rooftop VAV air handlers is anticipated to be 300 Amps 480 volt, 3-phase.

Electrical power for lighting, receptacles and mechanical equipment will be distributed to each floor via a 400 Amp circuit breaker. A single electrical room located on each floor will be required. We anticipate this room to be approximately 8 ft x 8ft and will require the door to open outward.

One 84-curcuit, 400A 277/480-volt, three-phase panelboard will be located on each floor to provide electrical power to the lighting, and mechanical equipment. One 112.5kVA transformer will be located on each floor to feed (2) 84-Circuit, 400 Amp, 120/208v sub-panels for receptacle loads. The transformer will be fed from the 400 Amp panel, located on the same floor, via a 175 Amp circuit breaker.

Circuit breakers will be bolt-on type with a minimum 20 amp rating. All circuits will be routed in conduit raceways with junction boxes placed above the ceiling at each vertical drop into walls to accommodate future tenant interior configurations. All raceways penetrating fire separation walls will be fire stopped to ensure fire ratings. The conductors for all feeders and branch circuit will be THHN with the minimum conductor size for all branch circuits will be #12 AWG. All circuit conductors shall be identified at each panelboard, junction box and receptacle, etc.

There will be (2) 4" conduits provided for the future building as well as the future fuel filling station.

WIRING DEVICES

General use receptacles will be provided throughout the facility, and special purpose receptacles will be provided for special equipment. Ground fault circuit interrupter (GFCI) receptacles will be provided at those locations requiring receptacles to be located within 3 feet of a wall or floor mounted sink or hose bib and receptacles located above countertops containing sinks. Weatherproof GFCI receptacles with while-in-use covers shall be provided on the exterior of the facility near each exit door.

All general use duplex receptacles throughout the facility will be mounted 18 inches above the floor per ADA guidelines.

LIGHTING SYSTEMS

Energy efficient, commercial grade fluorescent and LED lighting fixtures will be used throughout the building. The lighting levels for each area will meet the requirements as published in the latest edition of the Illuminating Engineering Society of North America, IESNA and International Energy Conservation Code, IECC.

The types of lamps used in the fixtures will be standardized to reduce the types required to be stored and purchased for replacement. Energy efficient ballasts, lamps and other types of energy savings methods will be utilized.

Occupancy sensors will be used to switch the lights on and off as occupants enter and leave private and open area offices, meeting rooms, restrooms, storage and utility areas. Daylighting with stepped control will be utilized for optimize energy savings. Programmable lighting control panels will be installed in conference rooms that utilize teleconferencing to allow for multiple settings or scenes.

The location of the fixtures, conduit routing and placement of junction boxes will be as flexible as possible to allow for future changes to the interior configuration of the facility.

Lighting systems that will not be necessary during unoccupied periods will be controlled through the building's automated control system to turn the lights off during those unoccupied periods and turn them on during occupied periods.

Emergency lighting will be provided throughout the building as an integral part of the normal fixtures though the use of 90 minute battery ballasts. These fixtures shall also serve as night lighting to provide security during unoccupied hours. Exit discharge lighting will be provided at all exit locations as well as security lighting illuminating the entrances to the facility and parking areas.

The exterior lighting will consist of metal halide, full cut off and dark sky compliant fixtures as well as decorative wall sconces at the main entrances. The fixtures will be pole mounted and controlled from the building's automation control system that will allow manual or photocell control of the lights. The exterior will have a minimum 0.5 and maximum 10 footcandles on the parking and walking areas. As an add alternate LED light fixtures will be investigated. LED parking lot lighting will add more than double the number of poles to maintain the same footcandle levels. Discussion regarding reduced light levels with the tenant may be warranted before pursuing an LED option.

TELECOMMUNICATIONS SYSTEMS

The local telecommunication service will be routed underground to the building's shared electrical/telecommunication room. (2) 4" and (1) 2" conduits will also be installed with pull strings. Space requirements will be coordinated with the serving telephone company. We also anticipate each floor will require a shared electrical/telecommunications room.

FIRE ALARM SYSTEMS

The building will be supplied with an addressable Fire Alarm system with a Main Fire Alarm Control Panel (FACP) and remote Fire Alarm Annunciating Panel. The Annunciating Panel will be located at the main entrance of the facility. The system will utilize intelligent and addressable fire detection devices consisting of pull stations, smoke and heat detectors, duct mounted smoke detectors sprinkler flow monitor and tamper switch monitors. Output devices will include combination visual and audible alarm indicators as well as visual only alarm indicators. An alarm signal will be transmitted locally and through the telephone lines to the local Fire Department.

Division 26 – Electrical Tenant Improvement Systems

WIRING DEVICES

General use receptacles will be provided throughout the tenant spaces, and special purpose receptacles will be provided for special equipment. Ground fault circuit interrupter (GFCI) receptacles will be provided at those locations requiring receptacles to be located within 3 feet of a wall or floor mounted sink or hose bib and receptacles located above countertops containing sinks.

All general use duplex receptacles throughout the facility will be mounted 18 inches above the floor per ADA guidelines.

LIGHTING SYSTEMS

Energy efficient, commercial grade fluorescent and LED lighting fixtures will be used throughout the tenant spaces. The lighting levels for each area will meet the requirements as published in the latest edition of the Illuminating Engineering Society of North America, IESNA and International Energy Conservation Code, IECC.

The types of lamps used in the fixtures will be standardized to reduce the types required to be stored and purchased for replacement. Energy efficient ballasts, lamps and other types of energy savings methods will be utilized.

Occupancy sensors will be used to switch the lights on and off as occupants enter and leave private and open area offices, meeting rooms, restrooms, storage and utility areas. Programmable lighting control panels will be installed in conference rooms that utilize teleconferencing to allow for multiple settings or scenes. Perimeter offices and spaces able to utilize day-lighting measures will incorporate day-lighting sensors with stepped dimming as a baseline and continuous dimming as an add alternate solution.

The location of the fixtures, conduit routing and placement of junction boxes will be as flexible as possible to allow for future changes to the interior configuration of the facility.

Lighting systems that will not be necessary during unoccupied periods will be controlled through the building's automated control system to turn the lights off during those unoccupied periods and turn them on during occupied periods.

Emergency lighting will be provided throughout the building as an integral part of the normal fixtures though the use of 90 minute battery ballasts. These fixtures shall also serve as night lighting to provide security during unoccupied hours. Exit discharge lighting will be provided at all exit locations as well as security lighting illuminating the entrances to the facility and parking areas.

STANDBY POWER GENERATION

A standby power generation system will be installed to provide electrical power in the event of normal power interruption. This system shall consist of a natural gas powered generator, automatic transfer switch, control panel and electrical distribution panels. In the event of normal power outage only the systems designated by the tenant shall be placed on the generator.

The estimated size of the standby generator is 150kW, 208-volt, 3-phase, 4-wire, and shall be located next to the utility transformer near the main electrical room.

Separate panels will be used to segregate stand-by power from normal power on each level as dictated by tenant requirements.

TELECOMMUNICATIONS SYSTEMS

Data and telephone jacks will be located per the tenant's requirements. Both the data and telephone cabling will be Category 6 and routed in walls via ¾" EMT.