10260 Westheimer Road #250
Houston, Texas 77042
713.429.4949

WEST LAW GROUP 100% SCHEMATIC DESIGN NARRATIVE

07/18/2018

HEATING, VENTILATING, AND AIR CONDITIONING

GENERAL

Mechanical systems will be designed in accordance with all applicable Codes, Standards and Authorities having jurisdiction and in accordance with current engineering practices.

Applicable codes for Houston, Texas include but are not limited to:

- Building Code – 2012 IBC
- Mechanical Code – 2012 UMC
- Electrical Code – 2017 NEC
- Plumbing Code – 2012 UPC
- Fire Code – 2015 IFC
- IECC 2015
- ASHRAE 62.1-2016
- ASHRAE 90.1-2016
- SMACNA Duct Construction Standards

DESIGN CRITERIA

- Outdoor Design Conditions for Houston, TX.
  Summer: 97°F dry bulb/76 F Wet Bulb, (ASHRAE 0.4%).
  Winter: 30°F dry bulb, (ASHRAE 99.6%).

INDOOR DESIGN CONDITIONS

- Office and Teaching:
  Summer: 75°F (± 2°F)
  Winter: 72°F (± 2°F)

LIGHTING (COOLING LOAD BASIS)

- Office: 1.0 watts/square foot, 80% assigned to Space Loads
- Classroom: 1.0 watts/square foot, 80% assigned to Space Loads
- Restrooms: 0.9 watts/square foot, 80% assigned to Space Loads
- Stairs: 0.6 watts/square foot, 80% assigned to Space Loads
- Lobby: 1.1 watts/square foot, 80% assigned to Space Loads
- Conference/Meeting: 1.3 watts/square foot, 80% assigned to Space Loads

SMALL POWER / RECEPTACLES (COOLING LOAD BASIS)

- Office: 2.0 watts/square foot
- Classroom: 2.0 watts/square foot
- Meeting: 1.0 watts/square foot
- Lobby: 0.5 watts/square foot

OCCUPANCY

- Office: 5 people/1000 square foot
- Classroom: 35 people/1000 square foot
- Conference/Meeting: 50 people/1000 square foot
- Lobby: 10 people/1000 square foot

OUTSIDE AIR (VENTILATION)

Based on ASHRAE 62.1–20016: per CFM per person listed below + .06 CFM/SF or a dictated by office building requirements (ASHRAE 170).

- Office: 5 CFM/person
- Classroom: 10 CFM/person
- Conference/Meeting: 5 CFM/person
- Lobby: 5 CFM/person

HVAC SYSTEMS

The office building will be heated and cooled by one (1) 75 ton, 22,000 CFM, Rooftop Unit (RTU) with VAV controls and with enthalpy-controlled air-side economizer. The RTU will be equipped with a pre-filter, final filter, cooling coil, plenum fan wall, 2" casing and VFD. The units will supply 55° F air to the terminal units through medium pressure ductwork built to +4.0" WC pressure classification and shall be designed for not more than 2,000 fpm velocity, maximum 0.30 inches per 100 feet pressure drop. The air will be ducted down a vertical shaft to serve each floor. The air will be returned to the RTU through a return air shaft sized not exceed 1200 FPM. The air will be distributed to the space through series fan powered terminal units on the perimeter and through pinch down VAV terminal units in the interiors. The fan powered terminal units will be equipped with electrical SCR heaters to accommodate reheat and heating the building. The air will be distributed to the space from the terminal units via low pressure ductwork sized at 0.08" per 100' of ductwork with a maximum of 1200 fpm velocity.

Series-style, Fan Powered terminal units serving the perimeter area will be equipped with electric heat and a wall mounted temperature sensor. Internal VAV zones will also be equipped with wall mounted temperature sensors. All conference and training rooms will be equipped with its own VAV terminal unit. Current design layout utilizes 15 fan powered terminal unit with electric heating and 12 VAV terminal units.

The roof business area will be served by a separate 5 ton RTU with electric heat. Unit will be equipped with an enthalpy air-side economizer.

Ductwork within 25 feet of all RTUs will be equipped with 1" acoustical lining.

General Exhaust/ Restroom Exhaust

The building restrooms will be exhausted via a power roof ventilator located on the roof. The

ductwork will be sized at 0.08" per 100' of ductwork with a maximum of 1200 fpm velocity. The fan will be operated and controlled by a time clock.

Electrical Support Spaces

All IT/server rooms will be served by a DX Mini-split fan coil unit and roof mounted condensing unit.

Elevator Machine Rooms

Elevator machine rooms will be served by a DX Mini-split fan coil unit and roof mounted heat pump.

CONTROL SYSTEM

The control system for both buildings will be a fully integrated DDC control system that is BACNET compatible. The system shall be fully addressable through the internet with all access as required by the client.

PLUMBING

GENERAL

Plumbing systems will be designed in accordance with all applicable Codes, Standards and Authorities having jurisdiction and in accordance with current engineering practices.

Applicable codes include but are not limited to:

- 2012 Unified Plumbing Code
- 2015 International Building Code
- 2015 International Fire Code
- National Fire Protection Association (NFPA)

DOMESTIC WATER SYSTEMS

The building shall be served through a 2-1/2" domestic water main with a 2" meter connection for 70 GPM. The water will flow through a 2-1/2" reduced pressure backflow preventer (RPBP). The domestic water to the facility shall be independently metered at the water service entry into the building. The water to the building will be pumped by a duplex booster pump system with variable speed motors.

A minimum of 35 PSIG is required at the most remote fixture with the system reducing pressures as required to not exceed 80 PSIG at any fixture.

The domestic hot and cold water piping distribution system shall be sized to limit the velocity in the pipe to a maximum of 7 fps and the pressure loss in the system to maximum of 3 ft of friction per 100 ft of pipe.

Water hammer arrestors will be provided at all fast-acting plumbing fixtures and ends of branch lines. Placement and sizing of devices in the piping system will be in accordance with piping standards and per manufactures recommendations.

Local backflow preventers will be provided at mechanical and plumbing equipment connections, selected based on code requirements and USC/AWWA practice for the type of hazard.

Aboveground domestic water piping shall be Type L copper tubing (ASTM B88), with wrought-copper solder-joint fittings.

Under slab domestic water piping shall be schedule 40 steel or Type K copper tubing (ASTM B88), with no joints below floor. Insulation shall be required on all domestic water piping – hot and cold. Provide dielectric fittings where dissimilar metals are joined. Install shut-off valves at each branch line to groups of fixtures, at risers, ate each piece of equipment, and on each water supply to fixtures that do not have supply stops.

DOMESTIC HOT WATER SYSTEMS

The domestic hot water shall be supplied by electrical, storage-type, ASME-rated, hot water heaters. Each floor will be served by its own electric water heater and will be a 20 Gallon, 10 KW water heater. Water will be produced and stored at 125°F. Point of use mixing valves will be provided at each public lavatory per code. All components shall be UL listed.

Hot water recircuiting pumps shall be provided on each hot water system to ensure the timely delivery of hot water to each fixture.

SANITARY WASTE AND VENT SYSTEMS

The building's sanitary system shall be a 4" connection and will be coordinated with the Civil Engineer. The piping shall be sloped as required to meet the civil invert elevation.

Floor drains will also be required in all toilet rooms with more than one water closet. Each of these drains will require a trap guard if permitted by AHJ, otherwise provide under-lavatory type trap primers.

All drain piping (storm and sanitary systems) receiving cold condensate or waste shall be insulated from the point the cold waste enters the system for 20'. Sanitary vents will connect to building services for vent-through-roof.

Under slab sanitary waste and vent piping shall be Schedule 40 PVC with standard weight fittings.

Aboveground sanitary waste and vent piping shall be Hubless cast-iron ASTM A888 or CISPI 301 pipe with heavy-duty, shielded, stainless steel couplings.

FIRE PROTECTION SYSTEMS

GENERAL

Plumbing systems will be designed in accordance with all applicable Codes, Standards and Authorities having jurisdiction and in accordance with current engineering practices.

Applicable codes include but are not limited to:

- International Fire Code
- International Building Code
- National Fire Protection Association (NFPA)

FIRE PROTECTION SYSTEM DESCRIPTION

The building will be supplied by a 6" fire line connected to the site fire system. The fire line will be equipped with a reduced pressure backflow preventer with OS&Y gate valves with tamper switches. Floor control valves will be located to feed the sprinkler systems based on smoke compartments. System test drain(s) for the floor control valve assemblies will discharge at the exterior of the building or to floor drains provided.

A fire stand pipe will be required for the building and will be fed from a 750 GPM fire pump. 100 PSIG will be required at the top of the riser.

Once a flow test is completed the final fire pump selection will be made based on street main pressure. The fire pump will be supplied through a water storage tank.

Sprinkler zone valves shall be installed on each floor with zones not exceeding 50,000 SF.

All sprinkler systems shall be hydraulically calculated and designed by a qualified fire sprinkler contractor. Areas shall be designated as Light Hazard, Ordinary Hazard, Group 1 or Ordinary Hazard, Group 2 as noted by the architect. The pipe sizing for the systems will be as required to satisfy the hydraulic demand, except the velocity in any portion of the system will not exceed 20 fps. 100 psig will be required to be delivered at the most hydraulically remote fire hose valve in the system.

The water supply for the fire protection system shall come from the exterior water lines to be routed per the civil drawings

Quick response sprinkler heads are required throughout the entire facility as required by NFPA.

Underground, buried piping shall be ductile-iron with mechanical-joint ductile-iron fittings or ductile-iron rolled grooved piping and fittings. Underground metallic piping shall be encased with a protective film.

Piping requirements are for 2" and smaller shall be threaded-end, Schedule 40, black or galvanized steel pipe; cast or malleable-iron threaded fittings; and threaded joints. Piping 2-1/2" and larger shall be grooved-end, Schedule 40, black or galvanized steel pipe; grooved-end fittings; grooved-end pipe couplings; and grooved joints.

The fire water to the facility shall be independently metered at the water service entry into the building. At this time, fire water pumps are not required to meet the pressure requirements of

the system. It is assumed the site water supply is adequate to meet the pressure and flow requirements of the sprinkler systems.

ELECTRICAL

GENERAL

Electrical systems will be designed in accordance with all applicable Codes, Standards and Authorities having jurisdiction, the Underwriter's Laboratory and in accordance with current engineering practices. Applicable codes for Sugarland, Texas include but are not limited to:

- Building Code – 2012 IBC
- Electrical Code – 2017 NEC
- Fire Code – 2012 IFC
- Energy Code – 2015 IECC

DESIGN CRITERIA

Design Voltages:

- Building Service 208V, 3-phase, 4-wire plus ground
- Motors Larger than 1 HP 208V, 3-phase, 3-wire plus ground
- Site Lighting 208V, 2-wire plus ground
- Lighting 120V, 2-wire plus ground
- Receptacles 120V, 2-wire plus ground

Branch Circuit Load Calculations:

- LightingActual Installed VA
- Receptacles (duplex or simplex) 180 VA per strap (duplex or
- Special Outlets Actual Installed VA of Equipment Served
- Motors 100% of Motor

Continuous Load/Demand Factors:

- Lighting (continuous load) 125% of installed VA
- Receptacles (duplex or simplex) 100% of first 10 kVA installed plus 50% of balance
- Motors 125% of VA of largest motor, plus 100% of all other motors
- Special Outlets 100% of Total VA and fixed equipment installed

ELECTRICAL SERVICE

Service and distribution equipment sizes will be based on estimated maximum demand. Estimated maximum demand calculations will utilize appropriate code demand factors, diversity factors and historical data.

The anticipated total demand load of the building is 213 kVA at 208Y/120V, 3-phase 4-wire. Centerpoint pole mounted transformer will be located adjacent to the building at the property line and will be fed via existing electrical lines along Highway 59 frontage road. New pole with transformers is expected to be set. From the pole power will feed underground to a distribution panel in the building.

ELECTRICAL POWER DISTRIBUTION SYSTEMS

Power distribution equipment will be located in an electrical room on each of the three floors. The first floor will contain an 800A distribution panel that will subfeed panels in each electrical room. Panel will also serve the buildings HVAC loads, elevator, and other large equipment.

Electrical rooms will have a (2) 208Y/120v panelboards to serve receptacles, lighting, and other tenant loads. Only level 3 will be built out at the time of core and shell.

LIGHTING SYSTEMS

A complete lighting system for all indoor and outdoor illumination will be provided. The lighting system will be designed to meet the lighting power density requirements of IECC 2015. The indoor lighting system design will be practical, energy efficient, easy to maintain and appropriate for the intended functions of each space.

In general, indoor lighting control of office will consist of vacancy sensors in combination with low-voltage switches. Public areas will be controlled by timeclock with time schedule matching business hours. Daylight harvesting strategies will also be used on exterior rooms where required by energy code.

Emergency/night lighting will be provided by unswitched branch circuits with battery backup.

Lighting of interior areas will primarily utilize LED fixtures. Outdoor area illumination will be provided by LED luminaires.

ELECTRICAL EQUIPMENT

PANELBOARDS

- Distribution panelboards will be UL 891 listed, dead front, totally enclosed in NEMA 1 enclosures. Plated copper bussing will be provided for all distribution panelboards. Feeder circuit breakers will be group mounted front accessible bolt-on insulated or thermal-magnetic molded case type. Minimum interrupting capacity will be 10,000 AIC for 208Y/120V and for most cases 42,000 AIC for 480V.
- Lighting and appliance panelboards will have 42 poles. Minimum interrupting capacity will be 10,000 AIC for 208Y/120V and for most cases 35,000 AIC for 480V. Copper bussing will be provided in all panelboards. Circuit breakers will be bolt-on type. Phase, neutral and ground bus material will be plated copper.
- located between the core/coil assembly and the transformer case.

CONDUIT, RACEWAYS AND BOXES

- Conduit will be run concealed, unless installed in mechanical, electrical, elevator rooms, and other similar spaces. Minimum conduit size for power circuits will be ¾". Conduit for whips to light fixtures, door controls and switch legs will be ½". Conduits will be independently supported.
- For physical protection of circuits, rigid galvanized steel conduit (RGS) or intermediate metal conduit (IMC) will be provided if installed exposed. Surface mounted conduits below switch height will be rigid galvanized steel with threaded fittings and boxes will be cast steel. Electrical metallic tubing (EMT) conduit will be used for low voltage feeders and branch circuit wiring where installed above 6'-6" AFF. EMT fittings will be compression type with steel body. MC conduit will be allowed inside wall cavities.
- For ease of maintenance, junction boxes will be installed a minimum of 1'-0" and a maximum of 3'-0" above ceilings. Installation outside of this zone will not be allowed. Special permission may be obtained to run ceiling conduits outside of this zone providing that pull and junction boxes are unobstructed and accessible from floor using a standard 8 foot ladder.

CONDUCTORS

- Wiring will be 98% conductivity copper. Feeders above 150A will be allowed to be aluminum. Minimum wire size will be #12 AWG for all areas. Each circuit will be provided with a dedicated neutral conductor and equipment grounding conductor.
- Feeder conductors will be terminated using compression lugs. Branch circuit conductors will typically be terminated using mechanical lugs.

GROUNDING SYSTEM

- A The grounding electrode system will include the main water service line, structural steel and/or rebar, ground loop around building and Ufer ground. The equipment grounding system will extend from the building service entrance equipment to the branch circuit. Grounding system connections to the electrode system will be made using exothermic welds.
- Bonding jumpers will be provided as required across pipe connections to water meters, dielectric couplings in a metallic cold water system, and across expansion/deflection couplings in conduit and piping systems.
- All feeders and branch circuits will be provided with an equipment ground conductor. A separate, insulated equipment grounding conductor, sized per National Electrical Code, will be provided within each raceway with each end terminated on a suitable lug, bus, enclosure, or bushing.

FIRE ALARM SYSTEM

The building will have a fully addressable fire alarm system. The fire alarm system will be comprised of a fire alarm control panel, system smoke detectors, heat detectors, duct detectors, manual pull stations, sprinkler system tamper switch monitoring, sprinkler system water flow switch monitoring, sprinkler system water flow alarm bell, and monitoring of interface with systems such as BAS. The panel will be located in a public area of the first floor.