Mechanical, Electrical, Plumbing, and Fire Protection Basis of Design (BOD)

For
Example Office Building

Date

Optional Engineers Stamp

Document Contents:

General               Pages 2 through 5
Heating Ventilating and Air Conditioning Systems   Pages 5 through 8
Electrical                        Pages 8 through 16
Plumbing                        Pages 16 through 18
Fire Protection                   Pages 19 through 20
Attachment A – MEP Specifications
Attachment B – MEP Sketches
Attachment C – HVAC Load Calculations

Integrated Engineering
GENERAL

Project Description

- The Project: Example Office Building - Core and Shell
- Owner/Developer: XXXXXXX Development
- Project Architect: XXXXXXX Architecture & Interior Design
- Project Construction Manager: XXXXXXX Corporation
- Project Street Address:
- State & Zip Code:
- County location: County
- Project Type: Commercial Office Building
- Project Description Including Areas: Core and Shell Office Building
- Support Documentation Available: Architectural Drawings, Attachment A, B, and C

Purpose of This Document

This Document is intended as a basis of design (BOD) for Mechanical, Electrical, Plumbing, and Fire Protection (MEP) systems, for The Project. The BOD shall be used to complete the design of MEP systems and may be used for budget pricing or design and build pricing as requested by the owner or owner’s representative. Any proposal pricing shall include all equipment, materials, and labor for complete and operable code compliant MEP systems. Any proposal shall clearly identify any deviations from this BOD including all attachments.

Loftus Engineers Inc. has completed the preliminary calculations and BOD, and has prepared this document. Design work required to submit a Design and Build Proposal, obtain permit, and perform construction, will be the responsibility of the proposing contractor. This includes final calculations, design coordination with the architect and other consultants and contractors, and preparation of documentation required for construction and permits. Calculations may include, but not limited to, technical calculations, ComCheck submission, calculations required for permits, etc. All documents shall be prepared and stamped by a professional engineer, registered in the jurisdiction of the project. The cost of design documentation shall be included in any proposal.

The final design documents shall be submitted to the Architect to conduct a review for compliance with the Basis of Design documentation.

Each Contractor shall also deliver CAD files and pdfs of As-built drawings.

Regulatory requirements

All systems and work shall comply with all applicable codes including codes and standards listed below as adopted by the local government. Nothing in this BOD or contract documents shall be construed to conflict with any laws, ordinances, standards, requirements, or regulations of authorities having jurisdiction over the contract work, and all requirements shall be completed without additional cost to the owner.
**Codes and Standards**

- All local codes and adopted amendments to referenced codes.
- Americans with Disabilities Act - ADA
- Architectural Barriers Act Accessibility Standards (ABAAS, 36 CFR Part 1 191) - 2004
- ANSI/ASHRAE Standard 62.1 2010 - Ventilation for Acceptable Indoor Air Quality
- ASHRAE Handbook of Fundamentals - 2013
- ASHRAE Handbook of Refrigeration - 2010
- ASHRAE Handbook of Applications - 2011
- ASHRAE Handbook of Systems and Equipment – 2012
- Pennsylvania Uniform Construction Code -International Building Code (IBC), 2009 (base code) and any amendments by the City of Pittsburgh. PA. UCC – Chapter 401 - Code Training and Certification, Chapter 403 – Administration and Chapter 405 - Elevators and Other Lifting Devices, most current amended documents.
- 2012 International Building Code - Chapter 11 and Appendix E only.
- ANSI - A117.1, 2009
- International Energy Conservation Code (IECC) - 2009
- International Fuel Gas Code (IFGC) - 2009
- International Mechanical Code (IMC) - 2009
- ASME Code for Pressure Piping - 2004
- ASPE Data Book, Volume 2: Plumbing Systems - 2004
- ASPE Data Book, Volume 3: Special Plumbing Systems - 2004
- National Standard Plumbing Code (NSPC) - 2006
- NFPA 72, National Fire Alarm Code, 2007
- All Remaining NFPA National Fire Codes with the exception of NFPA 5000 and NFPA 900 Current as published in May 2009
- BICSI Telecommunication Standards
- Occupational Safety & Health Administration (OSHA) Standards – 2004
- National Electrical Contractors Association (NECA) Standard of Installation.
- Underwriters Laboratories, Inc. (UL).
- EPAct 1992 (Energy calculations)
- Manual of Steel Construction, Load and Resistance Factor Design
- American Society of Civil Engineers: Minimum Design Loads for Buildings and Other Structures, ASCE-7
- American Concrete Institute: Building Code Requirements for Structural Concrete, ACI 318-08

**USGBC LEED Requirements**

This project shall be USGBC LEED for Core and Shell Certification. Design services shall include coordinating all MEP LEED credits with the owner and architect. This includes energy modeling required for EA Credit 1 and providing information to LEED on line. Estimated preliminary energy cost savings are 16% that gives 3 LEED points. Services do not include commissioning. Minimum credit compliance requirements shall be:

- **WE Prerequisite 1**
  - Provide 20% less water use with low flow plumbing fixtures than the baseline water use
- **WE Credit 3 - 2 points**
  - Provide 30% water use reduction compare to the baseline water use calculated for the building
- **EA Prerequisite 2**
  - Provide at least 10% energy costs improvement in the proposed building over the baseline design. Comply with all mandatory provisions in Standard 90.1-2007
- **EA Prerequisite 3**
  - Zero use of (CFC)-based refrigerants.
- **EA Credit 1 - 5 points, Energy Conservation Methods include:**
  - Supply Air Temperature Reset based on humidity and outdoor area temperature
  - Roof Top Unit with Enthalpy Economizer
  - Reduced Fan Power over ASHRAE Baseline Design
  - High Efficient Lighting Systems and Lighting Controls
  - Occupancy sensors will be installed in common areas for energy savings.
  - Reduced Domestic Hot Water Demand with low flow plumbing fixtures
- **EA Credit 4 - 2 points**
  - Minimize the emission of compounds selecting equipment with the least amount of refrigerants
- **IEQ Prerequisite 1:**
  - Meet the minimum requirements of Sections 4 through 7 of ASHRAE Standard 62.1-2007 or local code, whichever is more stringent
- **IEQ Prerequisite 2**
- **IEQ Credit 1 - 1 point**
  - Provide a direct outdoor airflow measurement device with an accuracy of plus or minus 15% of the design minimum outdoor air rate. Install CO2 sensors within all densely occupied spaces.
- **IEQ Credit 5 - 1 point**
  - Install MERV 13 filters in all ventilations systems for supply air filtration
  - Provide sufficient exhaust for all spaces with hazardous gases or chemicals
- **IEQ Credit 6 - 1 point**
  - Provide individual lighting controls for at least 90% of the building occupants.
  - Provide lighting systems controls for all shared multi-occupant spaces
- **IEQ Credit 7 - 1 point**
Related Documents

The architectural drawings, the owner's general conditions, the supplementary general conditions and owner's general requirements form a part of the BOD and shall govern the work performed under each section of the specification.

MEP Contractor Submissions

MEP contractors are to coordinate final design documents, which will be reviewed and approved by the architect, the owner, or the owner’s representative.

MEP systems include HVAC, plumbing, fire protection systems, as well as electrical systems including normal and emergency power, building and site lighting, and conduit and wiring for security, access systems, CCTV, and data/telecom systems. Documents shall include final calculations, detailed plans, riser diagrams, equipment schedules, details, and specifications that describe the work completely. All design work shall be coordinated with the architect, the owner, and all other consultants and contractors. All work requiring construction by other trades shall be carefully coordinated. All exposed work shall be carefully coordinated and approved.

Work done prior to the approval of the documents is at the contractor’s risk. MEP contractors are also to provide shop drawings for all major systems and equipment and materials as required by each individual section.

Site Visit

MEP Contractors estimating this work shall visit the site and fully inform themselves of the nature of the work and conditions, and obtain all necessary information to estimate and execute the work. Failure to do so will in no way obligate the owner for any omissions or errors resulting from such negligence.

General Procedures and Coordination

MEP contractors shall coordinate during the design portion of the project. This includes the mechanical and plumbing equipment power requirements submitted to the electrical contractor.

Pipe lines, ductwork, conduits, etc., will be under installation throughout the building site and each contractor shall consult with all other trades to coordinate the assembly and installation of all trades to avoid conflict and need for rearrangement, as no additional compensation shall be granted due to lack of coordination.

The contractor shall schedule his work at the convenience of the owner to minimize interference with building operations.

MEP equipment shall be installed in a manner to permit ease of service and the MEP contractors shall inform other trades of access requirement to prevent interference with same. Install all
equipment in strict accordance with the manufacturer’s instructions which shall be available at
the job site.

**Cutting and Patching**

Cutting where necessary for MEP work shall be done by the MEP contractor in a neat and
careful manner to prevent damage or weakening of walls, roof or floors and shall meet the
approval of the architect. Patching caused by the MEP contractor shall be done by the MEP
contractor.

**Permits and Approvals**

The MEP contractors shall secure and pay for all necessary permits and approvals required for
their work.

**HEATING, VENTILATION AND AIR CONDITIONING SYSTEMS**

**Energy Summary and MEP Load Calculation Criteria/Design Conditions**

Both outdoor and indoor design conditions are listed in this mechanical HVAC Design narrative
and are used in the design process. The Values of 88.4°F DB / 71.8°F were used for the cooling
design condition and 0°F is used for the heating design condition. The site is located in Climate
Zone 5A.

Heating gain and loss calculations are performed with the Carrier Hourly Analysis Program (HAP)
Load Calculation program which utilizes calculation methodologies approved by ASHRAE, with
calculations performed on a room-by-room basis.

**Summer Indoor Design Conditions:**

- **Occupied Spaces:**
  - Design Temperature Office: 75 degrees F.
  - Operational Temperature: 75 +/- 2 degrees F.
- **Unoccupied Spaces:**
  - 85 degrees F or as required for equipment.
  - Interior Relative Humidity: 50 percent.

**Winter Indoor Design Conditions:**

- **Occupied Spaces:**
  - Design Temperature: 68 degrees F.
  - Operational Temperature: 68 +/- 2 degrees F.
- **Unoccupied Spaces:**
  - 65 degrees F.

**Occupancy Schedule:**

- Office Spaces
  - Monday - Sunday: 8 am - 5 pm

**Occupancy Loads:**
The sensible and latent loads and minimum ventilation for the occupied office spaces will comply with the ASHRAE 62.1-2010 occupant density requirements and furniture count in a space. The total occupancy for cooling and heating loads will be established using 120-SF per person, which is greater than the minimum default occupancy set by IMC Table 403. In Administration / Office spaces, a 180 watt allowance is included for each workstation. Telecom Rooms include 20 W/sf allowance.

Building Envelope:

The new building envelope is designed to meet the minimum requirements of ASHRAE 90.1-2007.

- Roof with insulation entirely above deck: U-0.046 R-20 ci
- Metal Panel Walls: U-0.047 R-13.0 + R-7.5 (ci)
- Brick Face Walls: U-0.043 R-13.0 + R-7.5 (ci)
- Fixed metal framing windows: U-0.45 SHGC - 0.46
- Exposed Floor: R-10 continuous insulation

Systems

The project shall be a consolidated package for a full building inclusive of the tenant fit-out for single tenant. Specification requirements are included in Attachment A of this document. Generally the building HVAC system will be variable volume with perimeter series fan-powered mixing boxes with electric heating coils and interior VAV units with electric reheat where required, supplied by one rooftop HVAC unit with DX cooling and gas heating.

The HVAC equipment is sized, for bidding purposes, based on test-fit plans received on 11-10-2015 for the proposed tenant fit-out configuration but must be re-evaluated and sized by the design/build contractor.

Provide one roof mounted HVAC unit and curb. Roof Top Unit shall be vertical discharge and meet the parameters listed in the Roof Top Unit schedule in the attachments. Roof Top Unit shall be equipped with supply and return fans; economizers; VFD’s, vibration isolation curb and MERV 8 filters.

HVAC supply and return ductwork shall be extended from the rooftop HVAC unit, down the duct shaft and be distributed on each floor as needed for the tenant. A combination fire/smoke damper shall be provided at all fire rated shaft duct penetrations.

Provide medium pressure supply and low pressure return main branch air distribution system for each floor. Provide ducted fan powered boxes with thermostatic control according to the following schedule:

- One per each corner office
- One per every four-exterior offices (maximum)
- One per every two Executive Offices on 4th floor.
- One per each conference room
• One per each 1,000 sf open workstation area
• One per each half of Training Room

Provide ducted VAV boxes with reheat with thermostatic control, to the following schedule:

• One per every usage zone or 1,000 SF including corridors.
• One per lunch room
• One for each locker room
• One for the fitness center

All supply and return ducts shall be insulated.

Provide a Toilet & Locker Room exhaust system that includes a rooftop exhaust fan, exhaust ductwork, and exhaust grilles. Exhaust system shall serve the Men’s toilet rooms (150 CFM minimum each room), Women’s toilet rooms (150 CFM minimum each room), Men’s Locker room (640-cfm), Women’s Locker room (640-cfm) and Janitor Closets (50 CFM each room).

Provide Electric cabinet heaters to heat the stairwells and main entrance vestibule. The core stairwells shall have one minimum 3 KW cabinet unit heater at the base level. The 1st Floor vestibules shall each have one minimum 4 KW cabinet heater. All Cabinet heaters with 2 kW or greater shall be 460/3/60 power.

Provide elevator/hoistway smoke ventilation system. System shall consist of a gravity roof hood with motorized damper and aluminum insect screen. Damper shall open upon activation of smoke detector (located in hoist way), power failure or manual override. Gravity roof hood shall provide a minimum of 6-square feet of free open area (Greenheck FGR 20x48 or equal).

Provide a nominal six ton VRF system to serve the Main IT/Data Room and small data rooms located on each floor. Indoor units shall provide a minimum of 24 MBH cooling capacity for the Main IT/Data Room and a minimum of Five MBH cooling to each small data room. Provide remaining electrical rooms with ventilation to maintain required temperatures.

Provide a web-based DDC control system capable of controlling all shell and core equipment and to control all tenant fit-out equipment.
HVAC Scope of Work

HVAC Scope of work:

- Furnish and install all central HVAC equipment and required supports.
- Furnish and install all Ductwork, insulation and supports.
- Furnish and install all Fan Powered Boxes and VAV boxes complete with thermostatic control.
- Furnish and install VRF system complete with equipment and required supports, refrigerant piping including piping insulation, condensate removal system and controls.
- Furnish and install all grilles, registers and diffusers.
- Furnish and install roof mounted exhaust fans.
- Furnish and install elevator shaft ventilation system.
- Furnish and install DDC control system.
- Test, Start, Balance, and commission all systems.

HVAC Equipment

HVAC equipment shall comply with Attachment “A” MEP Specifications.

HVAC Materials

HVAC materials shall comply with Attachment “A” MEP Specifications.

ELECTRICAL

Electrical Systems Descriptions

Electrical Service and Distribution Scope of Work

- The proposed primary electric service shall be derived from a Duquesne Light Company manhole located south of Wagner Road. Two Trade Size 5 Schedule 80 PVC conduits shall be routed from the existing manhole to a new manhole located at the northeast side of the new parking lot, then to a new pad mounted transformer located at the southwest end of the building adjacent to the parking lot. All bends shall be PVC coated rigid metal type fittings.
- The service entrance conductors will be routed from the secondary side of the transformer underground to the main switchboard “MSB” located on the Lower Level Main Electric Room.
- The service entrance conductors shall consist of (8) sets of Trade Size 4, Schedule 80 PVC Conduits with 4 -600 kcmil (Aluminum alloy) conductors in each.
- The main service Panelboard will be rated 1,200 Ampere, 480Y/277 volt, 65 KAIC, having a 1,200 ampere, main circuit breaker with long term, short term, instantaneous and ground fault protection and 60KA per mode/120KA per phase SPD protection. This Panelboard will serve the following loads:
  o Elevators.
  o Domestic waterpumps.
- Step-down transformer to 208Y/120V Distribution Board.
- Interior and exterior lighting and receptacle panelboards.
- Rooftop HVAC loads.
- HVAC power panelboards
  - Provide a 350A, 480Y/277V, 3-PH, 4-W feeder from a 350A feeder circuit breaker in the main switchboard to Roof-top Unit, approx. 105 Ton unit.
  - Provide a 400A, 480Y/277V, 3-PH, 4-W feeder from a 400A feeder circuit breaker in the main panelboard for each floor level: Basement, 1st, 2nd, 3rd, and 4th floors to a 400A, 42-pole, 480Y/277V, 3-PH, 4-W M.L.O. distribution panel. Panels to serve electric reheat, 277V lighting, and step-down transformers for receptacle loads.
  - Provide a 200A, 3-pole sub-feed breaker in each panel on Basement, 1st, 2nd, 3rd floors to feed 75KVA, 480V-208Y/120V step-down transformer to a feed a 300A, 208Y/120V, 3-PH, 4-W receptacle panelboard and 225A sub-feed to 42-pole receptacle sub-panelboards as required.
  - Provide a 110A, 3-pole sub-feed breaker in panel on 4th floor to feed 45KVA, 480V-208Y/120V step-down transformer to a feed a 200A, 208Y/120V, 3-PH, 4-W receptacle panelboard and 100A sub-feed to 42-pole receptacle sub-panelboards as required.
  - All feeders will be in conduit. Feeders greater than 100Amps may be Aluminum, all other wiring shall be copper conductors. Branch Circuits may be run using MC Cable.
  - The following is a preliminary load analysis for the new facility based on 50,000 sq. ft. Office on four floors plus Basement:
    - Power Requirements for the referenced facility include:

<table>
<thead>
<tr>
<th>LOAD DESCRIPTION</th>
<th>WATTS/SQ. FT</th>
<th>KW</th>
</tr>
</thead>
<tbody>
<tr>
<td>DESIGN LOAD (CONNECTED)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lighting (50,000 sq.ft.)</td>
<td>1.0</td>
<td>50</td>
</tr>
<tr>
<td>Convenience receptacles (Office 50,000 sq.ft.)</td>
<td>4.0</td>
<td>200</td>
</tr>
<tr>
<td>RTU-1</td>
<td>N/A</td>
<td>285</td>
</tr>
<tr>
<td>Electric Reheat</td>
<td>N/A</td>
<td>260</td>
</tr>
<tr>
<td>Cabinet Unit Heaters</td>
<td>N/A</td>
<td>20</td>
</tr>
<tr>
<td>Telecom/HVAC Loads</td>
<td>N/A</td>
<td>20</td>
</tr>
<tr>
<td>Exterior Lighting</td>
<td>N/A</td>
<td>10</td>
</tr>
<tr>
<td>(2) Passenger Elevators</td>
<td>N/A</td>
<td>43</td>
</tr>
<tr>
<td>Water heating</td>
<td>N/A</td>
<td>18</td>
</tr>
<tr>
<td>TOTAL CONNECTED LOAD</td>
<td></td>
<td>1006 KW</td>
</tr>
</tbody>
</table>

- Assuming demand factor is equal to 0.8 at power factor .95 total approximate demand load will be as follows:

\[(1006\text{KW} / 0.95) \times 0.8 = 847\text{KVA}\]
Provide the following receptacles:

- Tamper resistant ground fault circuit interrupter type duplex convenience receptacles with “while-in-use” type exterior covers at HVAC equipment, and on 25’ centers around the building exterior perimeter.
- Standard tamper resistant duplex convenience receptacles shall be installed in the building core.
  - Minimum one receptacle per wall in all finished spaces
- Ground fault circuit interrupter type duplex convenience receptacles at electric water coolers, elevator machine room and pit, in toilet rooms and in any other locations where water hazards may exist.
- Any other areas as required by code.

Provide power to Conference rooms, break rooms, Offices, work-out equipment, kitchenettes, and office modular furniture as required by the Lincoln Learning fit-out program.

Provide floor mounted poke-thru devices with furniture feed fittings to serve modular furniture locations. Coordinate power configuration of modular furniture systems with the Owner. Provide appropriate 5-Wire or 8-Wire configuration and multi-pole circuit breakers in associated branch circuit panelboards to properly serve group workstations as required by code.

Provide wiring methods as required by the latest edition of the NEC.

All loads must be confirmed and adjusted as necessary to conform to the final Mechanical, Plumbing, and Elevator system designs.

Emergency Power System

- Emergency lighting and exit signs shall consist of battery packs and battery ballast fixtures throughout the facility. Emergency illumination shall be provided for a period of 90 minutes in the event of failure of normal lighting. Emergency lighting shall be arranged to provide initial illumination that is not less than an average of 1 footcandle and a minimum at any point of 0.1 footcandle measured along the path of egress at floor level.
- Elevator(s) shall be equipped with battery lowering system. The unit will not be able to operate during a power outage, but will only lower to lowest level and open its doors.
- In addition, the following loads will be supplied with independent battery back-up systems:
  - Em. Egress Lighting as required by code
  - Communication system.
  - Fire alarm.
  - Elevator power (Battery lowering) and controls.
Lighting Systems

- Illumination Levels (minimum horizontal maintained)

<table>
<thead>
<tr>
<th>AREA</th>
<th>FC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lobby</td>
<td>10</td>
</tr>
<tr>
<td>Bathrooms</td>
<td>10</td>
</tr>
<tr>
<td>Corridors and stairways</td>
<td>10</td>
</tr>
<tr>
<td>Elec./Mech./Tele/Data rooms</td>
<td>30</td>
</tr>
<tr>
<td>General Office Area</td>
<td>50</td>
</tr>
<tr>
<td>Elevator (at door sill)</td>
<td>10</td>
</tr>
<tr>
<td>Elevator Equipment Room or controller area</td>
<td>19</td>
</tr>
<tr>
<td>Elevator Pit (at floor level)</td>
<td>10</td>
</tr>
</tbody>
</table>


- Reception Area (L-1) Fixtures shall be Edge Cirrus Channel Suspension Wall Wash Lens 24VDC LED System, 9'-0"W, Antique Bronze, 7WDC, 7.5 Watts per foot.
- Elevator Lobby Lighting (L-2 and L-2A) Light Fixtures shall be Ede Cirrus Channel Suspension D1, Direct 1" Lens 24VDC LED System, 5WDC, 5 Watts per foot, 7'-0" W for Waiting (L-2) and 6'-0"W for Upper/Lower Floor Elev Lobby (L-2A).
- Toilet Room Vanity Lighting (L-3) shall be Edge Light Channel Trim 1.6, 24VDC LED, 5WDC, 5 Watts per foot, 4'-0" W.
- Lobby, Vestibule and Toilet Room fixtures (L-4) shall be Focal Point id 4.5" x 4.5" LED downlights.
- Standard Office Light Fixtures shall be recessed 2’x2’ Volumetric type troffers using LED type light sources, Finelite HPR-A-2X2-DCO-LED-SO-3500K-277V-SC. The Base Bid shall be all LED type fixtures.
- Provide an Alternate Price to use equivalent Fluorescent Fixtures for the main 2’x2’ troffers in lieu of LED, Finelite HPR-F-2x2-DCO-XX-277 with lamping as required to meet lighting levels required. All other lighting shall remain LED.
- Electrical/Mechanical/Elevator Equip spaces will be provided with lensed LED lighting fixtures.
Example Office Building  
Mechanical, Electrical, Plumbing, and Fire Protection Basis of Design  
Date

- Provide a linear, lensed, wet location LED fixture installed above the regulated flood elevation in the elevator pit with a minimum of two fixtures placed opposite of each other in a location where there are no obstructions in the elevator shaft.
- Refer to Site Lighting Photometric Plan for LED site lighting fixtures, Cooper McGraw-Edison Gleon LED and associated poles. Provide all trenching, conduit, wiring, backfil, concrete bases, poles, fixtures and controls as required to support site lighting fixture layout.
- Full building lighting controls shall be provided to meet current International Energy Conservation Code - 2009, minimum energy efficiency requirements. Controls shall include; automatic shutoff, space controls and controls for specialized lighting and applications. Lighting control devices shall be provided to accommodate light levels and functionality of lighting per energy code requirements. A lighting control system shall be provided on each floor level networked together for access from either the HVAC control system (BACNet) or through stand-alone software over the internet. A scheduled and occupancy sensor control scheme in open office spaces will provide greater flexibility to achieve energy savings.

Fire Alarm System

- A fully addressable fire alarm system with internal battery back-up shall be provided.
- Initiation devices shall be manual pull stations, sprinkler system flow and tamper switches, smoke detectors where required, and duct smoke detectors. All devices shall be located according to the IBC, NFPA 72, and the Americans with Disabilities Act (ADA).
- The Fire Alarm Control Panel (FACP) shall be located in the main Telecom room in the Lower Level.
- A fire alarm annunciator panel will be located at the main entrance to the building or at a location designated by the fire department.
- The system shall include, but not be limited to the following features, functions and/or elements:
  - Master system CPU including all fire detection control modules.
  - Circuit interface panels including all modules.
  - Power supplies, batteries and battery charger.
  - Surge protectors.
  - Equipment enclosures.
  - Intelligent addressable devices including, but not limited to, manual pull stations, heat detectors, smoke detectors, alarm monitoring modules, and supervised control modules.
  - Audible and visual notification appliances.
  - Wiring and raceway.
  - Installation, testing, system certification and personnel training.
  - All software and firmware required in providing a complete and fully operational system.
- Initiation of any of the devices above shall cause the following operations to occur:
  - Initiate the required audible and visual alarms.
  - Automatically notifies the local fire municipality.
  - Display the individual device, which was initiated.
  - Shut down HVAC systems and operates dampers as scheduled.
Activate the Elevator Recall System.

Grounding System

- Provide a complete grounding system in accordance with NEC Article 250 and all authorities having jurisdiction. Provide an electrode grounding conductor to the service entrance side of the metal main water line. Provide a #3/0 AWG copper (CU) electrode grounding conductor and associated bonding jumper at the main entrance location. Provide a driven tri-poise ground rod system spaced minimum of 6 feet apart. Bond to the structural steel. Bond all electrode grounding conductors in the main electrical room for one continuous system. The tri-poise ground rod system shall have (3) ¾” X 8’-0” copper clad driven ground rods and 1-#3/0 AWG (CU) grounding electrode conductor.
- Provide a copper grounding system consisting of a Telecommunication Main Grounding Bar (TMGB) and Telecommunication Grounding Bars (TGB). Ground the TMGB to building steel and at the Main Electrical Switchboard using #2/0AWG bare copper grounding electrode. Ground the TMGB to TGB in each Telecom Room on floors 1,2,3, and 4 using #2/0AWG bare copper grounding electrode.
- Bond all Telecom racks and cable trays to ground bars using #6AWG bonding jumpers.

Lightning Protection System

- The Lightning Risk Assessment Calculation according to NFPA No. 780 indicates a lightning protection system is recommended for the building. This system is not a requirement of the NFPA, however, insurance companies may require or provide discounts for installing the system. Provide an alternate price for a lightning protection system on the roof of the building for consideration by the Owner. Down conductors shall be connected to driven ground rods. Blunt tip type air terminals on the appropriate break away bases shall be provided. The lightning protection system shall be a UL Master Label system. Aluminum cables shall be used on the roof top and copper conductors in the earth with a bi-metal connector connecting each type of conductor. Coordinate the type of adhesive for the bases and fasteners with the roofing contractor so they are compatible with the roofing material. Cables shall be secured every 3 feet. The down cables shall be concealed in the new construction as far as possible.

Telecom Raceway System

- The Building will require a Demarcation Service Entrance backboard located in the Main Electric/Telecom Room on the First Floor to terminate all incoming Telecom service cables (voice/data/television/internet) and allow extension of services throughout the building. Two (2) trade Size 4, Schedule 40 PVC conduits will be provided from the main Elec/Telecom Room to a new Telecom manhole located across the Parking lot at the main entry drive then out along the parking lot perimeter and connect into existing manhole system on the south side of Wagner Road to provide pathways for the Telephone, Cable Television, and Data Services Service Providers to the Service Entrance Demarcation Backboard. Fill one of the 4” conduit with 4” 3-cell Maxcell-innerduct.
Provide (4) T.S. 4 conduit sleeves between stacked Telecom Rooms on 2nd floor through the 4th floor and to the Basement level with fire stop plugs.

Provide Basket-type cable tray systems configured to support 75% of horizontal data cable runs from Telecommunication room to outlet locations. Provide 2” deep x 8” wide or 2” deep x 12” wide basket trays above accessible ceilings on each floor for distribution of cabling as required to support the required capacity at 40% fill ratio.

Provide an engineered j-hook system to support all voice/data cabling where not installed in cable trays at a maximum support distance of 5 feet apart.

Provide 18” wide ladder rack in each Telecom room above equipment racks for support of data and voice cabling within Telecom rooms.

Provide floor poke-thru devices with furniture feed fittings to distribute voice/data cabling into modular furniture locations. Conference room and Office walls shall be provided with back boxes and conduits stubbed into accessible ceilings.

**Structured Cabling System**

Telecom closets shall be vertically stacked on each floor of each building to serve telephone/data connections within a 300 foot zone. Provide 3/4” thick fire treated plywood on one wall of each Telecom Room for mounting of miscellaneous security and fire alarm panels.

Structured Cabling for voice/data/CATV shall be provided and terminated in Telecom Closets. The Main Telecom/Server Room in the Basement shall be provided with (4) 19” Equipment relay racks bolted to the floor. Each Telecom Room on floors 1, 2, 3 and 4 shall be provided with (1) 19” equipment rack. Provide 6” vertical wire management channel, horizontal wire managers, and 48-port Category 6 patch panels in quantities required to terminate all horizontal cable runs served plus 25% spare capacity. Provide 18” Ladder rack above all equipment racks for cable management within the Main Telecom Room.

Each workstation and Offices shall be provided with (2) Category 6, RJ45 data jacks. Category 6 plenum rated cable shall be used for data/telephone connections, RG-6U plenum rated cable for CATV connections.

Wireless LAN: Provide (2) Cat. 6 data outlets terminated above accessible ceilings within a 75’ circumference throughout the building for WLAN coverage. Provide in-ceiling bracket and plenum rated surface mounted box, Leviton #49223-CBC and #41089-2P or equals.

Backbone Cabling: Provide 12-strand, 50/125 micron, Riser rated fiber optic cable from Main Communications closet in Basement dedicated to each Telecom closet stacked on each floors 1,2,3, and 4 of the building in a star configuration. Terminate and test all strands utilizing duplex SC style connectors and fiber optic patch panels.

The Main Telecom/Server Room shall be equipped with (8) dedicated 20Amp circuits each serving 20A,120V twist-lock receptacles, (2) at each rack. Each of the Telecommunications Rooms shall be equipped with two 20 amp dedicated circuits serving 20A twist-lock receptacles for the rack. In addition, the Main and each Telecom Room will be provided with two separate 120V, dedicated 20A circuit each serving two (2) quadraplex receptacles on each of (2) walls.

All Network Electronics and Rack-mounted UPS units shall be provided by the Owner.

Provide dedicated cooling systems for the Basement Main Telecom/Server Room and Telecom Rooms on floors 1 thru 4. The estimated heat gain for the Main Telecom Room is
19,736 BTU/Hr. The estimated heat gain for Telecom Rooms on floors 1 thru 4 is 4,934 BTU/Hr.

- Provide analog telephone service connections required for fire alarm, elevators, and other building related services. Category 6 cable for data/telephone connection for house needs shall be terminated at the Basement floor Telecom Room.
- CATV will enter main Telecom Room and be extended to each floor serving Telecom Room. Provide RG-11 trunk cable as backbone cabling and RG-6 CATV outlets with F-type connectors on a faceplate to all Television locations identified by Owner.

Security System

- Electric door strikes, door contacts, motion sensors, glass break, PTZ or fixed IP type cameras and card readers shall be strategically installed to provide a basic level of security for the general areas and Lobbies. Empty conduit with pull wires and junction boxes shall be provided for the security system.
- The Owner uses Simplex/Grinnell for these services. A meeting will need to be scheduled with Simplex and Lincoln Learning in order to further develop the security scope of work and coordinate the installation.
- All necessary interface modules, devices and wiring for fire alarm system interface shall be provided.
- The access control, intrusion detection and CCTV camera system shall be integrated through one software package over the local area network with access to the internet to allow for on-site or off-site monitoring of these systems.
- The IP type CCTV system shall use software and computer hardware to record video images to a video recording server either on site or at a remote location.
- Low voltage cabling shall be provided at locations for CCTV cameras as directed by the owner. All cables shall be plenum rated unless installed in conduit.

Emergency Two-way Communication Systems

- A two-way communications system shall be provided at each elevator landing on accessible floors that are one or more stories above or below the story of exit discharge to comply with IBC section 1007.8.
- The system shall be audible and visual and shall have signage with instructions on the operation of the system.
- The master station shall be installed at the same location as the fire alarm system annunciator panel where first responders will answer calls to the building.
- If the location of the master station does not have an attendant 24 hours per day, the system shall be capable of dialing out to a monitoring agency or 911.

Electrical Requirements for Mechanical Systems

- Provide all necessary labor, equipment, materials, accessories and services required for the complete and installation of all systems as indicated in the mechanical specifications and
required by the mechanical contractors design. The work shall basically include but is not necessarily limited to:

- Provide all conduit, wiring and connections for mechanical boiler system including boiler controls and hot water pumps.
- Provide all conduit, wiring and connections for mechanical rooftop units.
- Provide all conduit, wiring and connections for mechanical unit heaters or cabinet heaters as required.
- Provide all conduit, wiring and connections for mechanical exhaust systems as required.
- Provide power source and termination for mechanical control panels.
- Provide power source, terminations and fire alarm system elements for all smoke dampers, variable air volume boxes with electric reheat, fan-powered boxes with electric reheat and related devices. See the HVAC Systems portion of this BOD for the quantity of terminal unit requirements.
- Provide wire and place into service duct type photoelectric smoke detectors in mechanical systems ductwork. Provide all wiring, terminations and interfaces between the duct detector and motor controller. Turn detector over to mechanical contractor for installation. Furnish, wire and place into service duct type detectors for all interfloor locations required by NFPA. Where smoke dampers are provided by the mechanical contractor, furnish, wire and place into service duct type detectors for each damper, and provide power and control wiring for the damper.

Electrical Requirements for Plumbing Systems

- Provide all necessary labor, equipment, materials, accessories and services required for the complete and installation of all systems as indicated in the plumbing and fire protection specifications. The work shall basically include but is not necessarily limited to:
  - Provide all conduit, wiring and connections for electric water heaters and associated pumps.
  - Provide all conduit, wiring and connections for electric water coolers.
  - Provide all conduit, wiring and connections for duplex package sewage pumps in Lower Level.
  - Provide all conduit, wiring and connections for fire pump (if required).
  - Provide power source, terminations and fire alarm system elements to monitor all tamper and flow switches from sprinkler system.

**Electrical Materials**

Electrical materials shall comply with Attachment “A” MEP Specifications.
PLUMBING

Systems

Sanitary Sewer:

- Sanitary sewer, waste, and vent piping will be provided for all building fixtures. The main building 6” sanitary sewer is to be routed with a clean out and fresh air inlet and connected to the municipal sewer main in Wagner Road, connection to this sewer must be verified and comply with all local municipal requirements.
- The lower level floor sanitary must be collected with a 4” sanitary line and routed to a duplex packaged sewage pump that will connect to the 6” sanitary main exiting the building.
- The core of the building will require men and women’s toilet rooms, electric water coolers and janitor’s closet on each floor. A 4” sanitary and vent stack will serve the men and women’s room fixtures.
- Sanitary sewer, waste, and vent piping will be provided for all tenant building fixtures.
- The pantry’s, break rooms and lunchrooms located on the 1st, 2nd, 3rd and 4th floors will connect to sanitary waste and vent stacks, as required.
- Elevator sump pumps and control system capable of water while containing oil shall be provided. The system shall function automatically and shall provide for an alarm and separate led lights in the event of the presence of oil in the sump, high water alarm, high amps or a locked rotor condition. In addition, led lights shall be provided for power and pump run functions. An alarm that sounds only in the event of a high liquid condition or does not separately identify the above five functions shall not be acceptable. The system shall include the following:
  - Submersible effluent pump
  - Check valve
  - Oil-minder control system
  - Oil-minder sensor probe
  - Junction box
  - Oil-minder cable, power cable, probe cable, high liquid alarm cable, and pump on float cable.
  - High liquid float
  - Pump on float

Roof Drainage:

- A complete primary storm water drainage system for all roof areas will be provided.
- There will be (8) 4” roof drains on the main roofs. Rainwater leaders are to be collected and a 10” storm pipe with a clean out, connected to the municipal main in Wagner Road, connection to this sewer must be verified and comply with all local municipal requirements.
- A complete secondary storm water overflow system of drains and piping terminating within the building low around the perimeter will be provided to meet the code requirements.
Approximately (2) 3" roof terrace drains will be required; rainwater leaders will be collected and connected to the 10" main exiting the building.

Water Supply System:

- The building domestic water system will consist of a 2" service and connect to the municipal supply main in Wagner Road, connection to this main must be verified and comply with all municipal requirements. Appropriate backflow prevention, pressure regulators and metering shall be provided as per the local water authorities requirements.
- The building will be supplied with non-freeze wall hydrants on each of the (4) faces of the building as required, near entrances, etc.
- The building’s rooftop will be supplied with a roof hydrant for maintaining the rooftop equipment.
- The core of the building will require men and women’s toilet rooms, electric water coolers and janitor’s closet on each floor. A 2" cold water riser will serve the core fixtures.
- The pantry’s, break rooms and lunchrooms located on the 1st, 2nd, 3rd and 4th floors will connect to cold water risers and the water heaters for hot water on each floor, as required.
- Domestic hot water for the core and tenant fixtures will be supplied by (4) electric water heaters located in each floor janitor’s closet on each floor to serve the core toilet rooms and janitor’s closets.
- Trap primer valves with appropriate distribution units shall be provided. Primer valve shall be machined of corrosive resistant brass with no springs or diaphragms. The trap primer shall operate on a pressure drop of as little as 5 psi. Connect primer valve to cold water piping, and extend trap priming tubing to all floor drains.

Natural Gas System:

- Gas meter and pressure regulator, as required, will be located outside the building wall.
- 3" Natural gas piping will be routed to serve HVAC equipment on the roof.
- Shut-off valves, dirt legs, and unions will be provided on piping to isolate equipment for maintenance and service.

Plumbing Scope of Work

- Furnish and install all equipment, materials and labor required for complete and operable systems including but not limited to:
- Furnish and install all equipment and fixtures as well as required equipment and fixture hangers and supports.
- Furnish and install all domestic cold water, domestic hot water, sanitary and vent piping from utilities to fixtures.
- Furnish and install all primary and secondary roof drainage, rain water conductors, and storm piping to provide proper drainage from all areas.
- Furnish and install gas piping from the utility to the roof for connection by the HVAC equipment.
- Furnish and install all piping insulation.
- Test, start, balance and commission systems.
Comply with all codes and standards.

**Plumbing Equipment and Fixtures**

Plumbing equipment shall meet minimum capacities listed and shall comply with Attachment “A” MEP Specifications

**Plumbing Materials**

Plumbing materials shall comply with Attachment “A” MEP Specifications.

**FIRE PROTECTION**

**Systems**

Automatic Sprinkler System:

- The building shall be equipped with a complete 100 percent automatic sprinkler system. The system shall consist of manual wet standpipes with hose valves, fire department connection and sprinkler heads throughout the building. The piping shall be hydraulically designed and the entire system shall meet all requirements of NFPA 13, and 14.

Sprinkler Heads:

- Sprinklers will be quick response, UL listed type. Sprinklers shall be concealed, upright pendant or sidewall design to fit appropriate ceiling areas.
- Install concealed pendant type sprinkler heads in elevator lobbies, corridors, and core toilet rooms.
- Install concealed pendant type sprinkler heads to provide appropriate coverage for the tenant fit out wall and ceiling layout as required.
- Install upright pendant type sprinkler heads in areas where no ceilings are being installed.

Fire Water Supply System:

- 6” water supply will be fed from the municipal main in Wagner Street. Connection to this main must be verified and comply with all municipal requirements. A UL listed, AWWA approved double-check backflow preventer will be installed to isolate the fire protection systems from the plumbing systems.
- Water pressure on Wagner Road was tested on November 23, 2015 at 9:15am
  - Static Pressure 109 psi
  - 1,130 GPM flow observed at hydrant 305
  - Residual pressure 104 psi at hydrant 304
- The building canopy will require a dry pipe valve with all associated piping, valves and appurtenances.
The fire protection system will be monitored by the building fire alarm system. Monitor points will include trouble and alarm conditions for water flow switches and valve monitor switches.

**Fire Protection Scope of Work**

Furnish and install all equipment, materials, and labor required for complete and operable systems including but not limited to:

- Provide a complete hydraulically calculated wet pipe sprinkler system throughout the space to meet the requirements of NFPA-13, &14.
- Furnish and install a manual wet standpipe system.
- Furnish and install a wet-pipe sprinkler system.
- Furnish and install automatic sprinkler heads throughout the spaces.
- Furnish and install backflow preventers, valves and alarms as required.
- Furnish and install a dry-pipe sprinkler system to serve the canopy.
- Test and commission systems.
- Comply with all codes and standards.

**Fire Protection Equipment & Materials**

Fire Protection materials shall comply with Attachment “A” MEP Specifications.
## SPECIFICATIONS GROUP

### Facility Construction Subgroup

**DIVISION 07 - THERMAL AND MOISTURE PROTECTION**

<table>
<thead>
<tr>
<th>Code</th>
<th>Section Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>078400</td>
<td>FIRESTOPPING</td>
</tr>
</tbody>
</table>

### Facility Services Subgroup

**DIVISION 21 - FIRE SUPPRESSION**

<table>
<thead>
<tr>
<th>Code</th>
<th>Section Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>210500</td>
<td>COMMON WORK RESULTS FOR FIRE SUPPRESSION</td>
</tr>
<tr>
<td>210553</td>
<td>IDENTIFICATION FOR FIRE SUPPRESSION PIPING AND EQUIPMENT</td>
</tr>
<tr>
<td>211300</td>
<td>FIRE SUPPRESSION SPRINKLERS</td>
</tr>
</tbody>
</table>

**DIVISION 22 - PLUMBING**

<table>
<thead>
<tr>
<th>Code</th>
<th>Section Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>220519</td>
<td>METERS AND GAGES FOR PLUMBING PIPING</td>
</tr>
<tr>
<td>220553</td>
<td>IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT</td>
</tr>
<tr>
<td>220719</td>
<td>PLUMBING PIPING INSULATION</td>
</tr>
<tr>
<td>221005</td>
<td>PLUMBING PIPING</td>
</tr>
<tr>
<td>221006</td>
<td>PLUMBING PIPING SPECIALTIES</td>
</tr>
<tr>
<td>223000</td>
<td>PLUMBING EQUIPMENT</td>
</tr>
<tr>
<td>224000</td>
<td>PLUMBING FIXTURES</td>
</tr>
</tbody>
</table>

**DIVISION 23 - HEATING, VENTILATING, AND AIR CONDITIONING (HVAC)**

<table>
<thead>
<tr>
<th>Code</th>
<th>Section Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>230010</td>
<td>HVAC GENERAL REQUIREMENTS</td>
</tr>
<tr>
<td>230513</td>
<td>COMMON MOTOR REQUIREMENTS FOR HVAC EQUIPMENT</td>
</tr>
<tr>
<td>230515</td>
<td>VARIABLE-FREQUENCY MOTOR CONTROLLERS</td>
</tr>
<tr>
<td>230548</td>
<td>VIBRATION AND SEISMIC CONTROLS FOR HVAC PIPING AND EQUIPMENT</td>
</tr>
<tr>
<td>230553</td>
<td>IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT</td>
</tr>
<tr>
<td>230593</td>
<td>TESTING, ADJUSTING, AND BALANCING FOR HVAC</td>
</tr>
<tr>
<td>230713</td>
<td>DUCT INSULATION</td>
</tr>
<tr>
<td>233100</td>
<td>HVAC DUCTS AND CASINGS</td>
</tr>
<tr>
<td>233300</td>
<td>AIR DUCT ACCESSORIES</td>
</tr>
<tr>
<td>233423</td>
<td>POWER VENTILATORS</td>
</tr>
<tr>
<td>233600</td>
<td>AIR TERMINAL UNITS</td>
</tr>
<tr>
<td>233700</td>
<td>AIR OUTLETS AND INLETS</td>
</tr>
<tr>
<td>237413</td>
<td>PACKAGED OUTDOOR CENTRAL-STATION AIR-HANDLING UNITS</td>
</tr>
<tr>
<td>238101</td>
<td>TERMINAL HEAT TRANSFER UNITS</td>
</tr>
<tr>
<td>238129</td>
<td>VARIABLE REFRIGERANT FLOW (VRF) HVAC SYSTEM</td>
</tr>
</tbody>
</table>
**DIVISION 26 - ELECTRICAL**
260001  ELECTRICAL GENERAL PROVISIONS
260519  LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES
260526  GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS
260529  HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS
260534  CONDUIT
260537  BOXES
260553  IDENTIFICATION FOR ELECTRICAL SYSTEMS
260923  DISTRIBUTED DIGITAL LIGHTING CONTROL SYSTEM
262200  LOW VOLTAGE TRANSFORMERS
262416  PANELBOARDS
262726  WIRING DEVICES
262813  FUSES
262817  ENCLOSED CIRCUIT BREAKERS
262818  ENCLOSED SWITCHES
264300  SURGE PROTECTIVE DEVICES
265100  INTERIOR LIGHTING
265600  EXTERIOR LIGHTING

**DIVISION 27 - COMMUNICATIONS**
275129  EMERGENCY COMMUNICATIONS SYSTEM

**DIVISION 28 - ELECTRONIC SAFETY AND SECURITY**
283111  DIGITAL, ADDRESSABLE FIRE-ALARM SYSTEM

END OF TABLE OF CONTENTS
PART 1 - GENERAL

1.01 SECTION INCLUDES
A. These basic Mechanical Requirements are specifically applicable to all Mechanical Division Sections, in the General Conditions and the Supplementary General Conditions which also apply to this division.
B. This Section includes instructions on general project objectives, alternates, allowances, as-built drawings, submittals, regulatory requirements, demolition instructions, and installation instructions.
C. HVAC systems include all mechanical work.

1.02 DEFINITIONS
A. Any reference in this Division to "this Contractor", "Contractor" or reference to furnish or install or to supply any work with no reference to the Contractor responsible shall be furnished and installed under this division.
B. "Provide" - Furnish and install.
C. "Furnish" - Obtain and deliver to the job for installation by other trades.
D. "Install" - Set and connect an equipment item furnished by others. Place item in full operating condition.
E. Mechanical and HVAC words are used interchangeably and have the same meaning.

1.03 SITE VISIT
A. The Trades estimating this work shall visit the site before submitting bids and fully inform themselves of the nature of the work and of the existing conditions, and obtain all necessary information to estimate and execute the work. Failure to do so shall in no way obligate the Owner for any omissions or errors resulting from such negligence.
B. Any costs involved in relocating any items, including those of other trades, in order to install the work shown shall be included in the bid price.

1.04 INTENT OF DRAWINGS
A. Separate drawings have been prepared for the General, HVAC, Plumbing, Fire Protection and Electrical Trades. Their work is generally shown under the proper heading however all drawings listed are part of each contract insofar as they are applicable.
B. The drawings are diagrammatic and additional transitions, offsets, fittings, drains, vents and drips shall be provided as may be required to install the systems, even if not shown, at no additional cost to the Owner.
C. The drawings take precedence over the specifications where there is conflicting information.
D. The systems shall be complete, ready for operation with all components required, including items which may not be fully shown or specified. Items not shown fully detailed or specified but required for a complete system shall be provided at no extra cost and shall conform to accepted trade practices.

1.05 AS-BUILT DRAWINGS
A. During construction, the Contractor shall maintain a separate reproducible set of Xerox Mechanical drawings on which he shall record the exact location of all concealed piping and ductwork which is not installed as shown. These "as built" drawings shall be delivered to the Architect at the end of the job.

1.06 SUBMITTALS AND SUBSTITUTIONS
A. Submit under provisions of the General Requirements all products in this division.
B. Submit Substitutions under provisions of the General Requirements and Conditions and the instructions given in this section of the specifications.

C. Basis of Design: Where drawings and specifications call for materials of certain manufacturers, the contract shall be based on materials specified. If the Contractor wishes to offer substitutions for consideration he must request approval 10 days prior to bid opening. Any substitutions made after the bid is received will not be accepted.

D. Full Drawings: Submit field checked and coordinated equipment room piping and ductwork layouts at 1/4" = 1'-0" scale.

E. Submit shop drawings and product data grouped to include complete submittals of related systems, products, and accessories in a single submittal. Highlight equipment data. General Catalog data will be returned unless custom highlighted.

F. Mark dimensions and values in units to match those specified. List any differences between the product submitted and the product specified and shown on the drawings.

G. All materials and equipment shall be new and shall of good quality and equal in all respects to the products of well recognized and reputable United States' manufacturers.

H. It shall be the responsibility of the Contractor to determine if the dimensions, mechanical and electrical characteristics of equipment are suitable. If revisions in the work of other trades are required due to use of any equipment other than shown on the drawings, the additional cost shall be included in the Bid Price.

I. Within 15 days after the award of a contract, the Contractor shall submit a complete list of materials and sub-contractors he proposes to use for approval.

J. Manufacturer's installation diagrams shall be provided for all equipment requiring shop drawings. Shop drawings shall be submitted in a timely manner for examination and comment.

K. Approval shall be considered as general only and as aid to the Contractor. Any item missed in review and/or is counter to the drawings or does not relieve the Contractor from the necessity of furnishing the materials and performing all work as required by the plans and specifications. Review of shop drawing does not constitute the engineer takes responsibility the shop drawings are correct or complete and is only a convenience to the contractor to correct any errors made by the contractor or vendor.

1.07 REGULATORY REQUIREMENTS

A. Conform to the following codes:

B. Nothing in the Contract Documents shall be construed to conflict with any laws, ordinances or regulations of authorities having jurisdiction over the contract work and all requirements shall be complied with throughout, without additional cost to the Owner.

C. Obtain permits, pay any fees and request inspections from authority having jurisdiction.

D. All mechanical equipment shall bear the label of an approved agency.

1.08 PROJECT/SITE CONDITIONS

A. Install Work in locations shown on Drawings, unless prevented by Project conditions.

B. Prepare drawings showing proposed rearrangement of Work to meet Project conditions, including changes to Work specified in other sections. Obtain permission of Owner/Engineer before proceeding.

C. The Contractor is solely and completely responsible for conditions of the job site, including safety of all persons and property during performance of the work. This requirement shall apply continuously and shall not be limited to normal working hours. The duty of the Engineer to
visit the site is not intended to include review of the adequacy of the Contractor's safety in, on, or near the construction site.

1.09 CHASES, CUTTING AND PATCHING
   A. This trade shall cooperate with the General trade, advising him of the sizes, number and locations of all openings, recesses, access doors and panels, and pipe sleeves required to properly install his pipe lines, ducts etc. Unless otherwise shown or noted all piping, ducts etc., in finished rooms shall be completely concealed in partitions or furred spaces. The Mechanical trade shall install all required sleeves which shall be built into place as the general construction proceeds.
   B. Cutting where necessary for Mechanical work shall be done by the Mechanical Trade in a neat and careful manner to prevent damage or weakening of walls, roof or floors and shall meet the approval of the Owner/Engineer. Patching caused by the Mechanical Trade shall be done by the Mechanical Trade for holes up to 12"x 12" (one square foot). Patching material shall match adjacent surfaces. Larger holes shall be cut and patched by the General Trade at the expense of the Mechanical Trade.

PART 2 - PRODUCTS

2.01 FIRE BARRIER MATERIALS
   A. Approved fill material for fire barriers shall be packed mineral wool, T & B Flame-Safe, 3M Fire Barrier caulk or Dow Corning RTV foam. Approved protective devices shall be UL listed fire dampers for ductwork and UL listed "link-seals" for piping. Large shaft and wall openings around ducts and piping and shaft floors where fire ratings must be maintained shall be infilled with 3M Inc. fire barrier wall sheets.

2.02 ACCESS DOORS
   A. Manufacturers:
      B. Milcor Inc.
      C. Approved Equal.
   D. Access doors shall be of metal with mounting frame and screw driver operated CAM lock latches flush with panel face. Provide 2 hour fire rated and 3 hour fire rated doors where required for shaft walls and fire rated floors and ceilings. See architectural drawings for locations of fire rated walls. Doors shall have continuous hinges.

PART 3 - EXECUTION

3.01 INSTALLATION
   A. Install equipment in accordance with the instructions in these specifications and as shown on the drawings. In lieu of a where a specific item is not detailed, install in accordance with manufacturer and industry standards.
   B. All equipment shall be installed in accordance with the instructions which shall be available at the job site. If the installation instructions are contrary to the work shown or specified, the contractor shall consult the engineer before proceeding with the installation.

3.02 PROCEDURE AND COORDINATION
   A. Pipe lines, conduits, and work other than Mechanical contract work will be under installation throughout the building site. Contractor shall consult with all other trades to coordinate the assembly and installation of all trades to avoid conflict and need for rearrangement, as no extras shall be granted due to lack of coordination. This applies particularly to locations of ducts, heating and plumbing pipes, electric conduits, recessed lights fixtures, etc., which occur in close quarters such as furred walls, columns & ceilings, pipe and duct shafts etc., and where minimum head clearances shall be maintained.
B. Do not install piping or ductwork in transformer rooms, electric equipment rooms, electric closets or generator rooms unless they serve these spaces. Do not install piping adjacent to electric devices. Provide drip pan protection if piping must be installed above or adjacent to electric panels or devices.

C. Mechanical equipment shall be installed in a manner to permit ease of service and the Mechanical Contractor shall inform other trades of access requirement to prevent interference.

D. All new piping, ductwork, equipment, etc. shall be installed so that it does not interfere with access to existing valves, access doors, equipment, etc.

E. Protect all unfinished work from damage. Seal off all portions of the duct systems or piping not being worked on to permit continued service and to prevent the entry of dirt. Install temporary filters over all exhaust/return air openings in the work area. Repair or replace any damage caused by the installation of the Mechanical systems.

F. Where alterations of new work affect the use of present buildings or facilities, the Contractor shall schedule his work and activities so that interference is kept to a minimum. When shutdown of existing systems or equipment is required, the work shall be executed at the convenience of the Owner under the direction of the Architect/Engineer.

3.03 PROTECTION OF BUILDING FIRE/SMOKE BARRIERS

A. Passages of pipes and air ducts through fire barriers and/or smoke barriers shall be protected as follows:
1. The space between the penetrating item and the fire barrier and/or smoke barrier shall be filled with a material capable of maintaining the fire/smoke resistance of the barrier or be protected by an approved device design for the specific purpose.

B. Where the penetrating item uses a sleeve to penetrate the fire and/or smoke barrier the sleeve shall be solidly set in the fire/smoke barrier and the space between the item and the sleeve shall be filled as described below.
1. All piping or duct insulation shall stop at each side of a fire barrier and the void space between the item and the rated barrier shall be protected. Void space between fire barriers and piping and ductwork subject to surface condensation shall be filled with caulk or foam material capable of preventing vapor transmission. Sufficient room shall be maintained for expansion.

C. Fire barriers shall include 1-hour, 2-hour, 3-hour and 4-hour UL rated floors and walls. Refer to architectural plans for location of fire barriers and smoke barriers and provide protection required to maintain ratings in accordance with all codes the applicable codes.

D. Approved fill material for fire barriers shall be packed mineral wool, T & B Flame-Safe, 3M Fire Barrier caulk or Dow Corning RTV foam. Approved protective devices shall be UL listed fire dampers for ductwork and UL listed "link-seals" for piping. Large shaft and wall openings around ducts and piping and shaft floors where fire ratings must be maintained shall be infilled with 3M Inc. fire barrier wall sheets.

3.04 ACCESS DOORS

A. Install access doors where shown on the drawings and where required to service equipment concealed behind walls, ceilings, or floors. Accessible ceilings do not require access doors. Minimum size of an access door is 12"x6".

3.05 PAINTING

A. In finished spaces, painting of all Mechanical equipment, apparatus and piping shall be done by the Painting Trade under the General Trade Specification, except where specified to be done by the Mechanical Trade.

B. All uncoated ferrous surfaces located outdoors, including ferrous metal piping covered by insulation, shall be painted at the job site with one coat of rust inhibited metal primer and one coat of exterior grade, enamel paint applied by the HVAC Trade. If heated surfaces are
involved, heat resistant paint shall be used. Do not paint galvanized metal, aluminum, copper or factory painted surfaces.

3.06 ELECTRICAL REQUIREMENTS
   A. Furnish to the electrical trade for installation all disconnect switches, combination motor starters, variable frequency drives and electrical devices for all HVAC equipment.
   B. Electrical trade shall provide power wiring to HVAC equipment.
   C. Electrical Trade shall provide power wiring to HVAC control panels.
   D. HVAC Trade shall provide control wiring to HVAC systems.
   E. HVAC Trade shall furnish to electrical trade disconnect means for all HVAC devices

3.07 CLEANUP
   A. All tools, benches and other workmen's materials and appliances shall be removed from the premises after formal and final approval of completion is given. The premises shall be cleaned of all remaining debris. During start-up of duct cleaning of air systems, protect all occupied areas from dirt from protective filters over air outlets and where needed, air tight covers over computers and other sensitive equipment. Clean lose dust from the area.

3.08 INSTRUCTIONS AND OPERATION AND MAINTENANCE MANUALS
   A. Upon final acceptance and turning over of the project to the Owner, make available qualified persons fully familiar with the installation and capable of instructing the Owner's staff in the operation, care and manipulation of the various systems.
   B. Provide to owner three copies of: final submittals, all shop drawings, equipment and ductwork layouts, valve tagging charts, testing and balancing data, operation and maintenance data on equipment furnished, list of suppliers and service organizations for each piece of equipment, spare parts list, warranty information, as-built drawings and all other information requested in Execution section of the mechanical sections of these specifications. Assemble into loose leaf binders indexed by tabs per each item with table of contents.

3.09 MECHANICAL WARRANTY
   A. Refer to Division 01 for general warranty requirements. Review all Division 23 sections for additional installation and equipment warranties.
   B. The mechanical contractor shall guarantee that all apparatus is of best grade and quality and that all work has been done in strict accord with the specifications and drawings. Correct defects in workmanship, materials and equipment that develop within one year from date of acceptance by repair or replacement.
   C. Provide an additional one year of warranty beyond the first year's warranty for the control system to include (2) two additional visits in the second year, one during the heating season and on during the cooling season. During these visits check the systems for proper operation and make adjustments necessary, including software re-programming, to insure the control system operates as intended.

END OF SECTION 230010