SECTION 261000 - BASIC ELECTRICAL REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Alternates: Refer to Division 01 to determine extent of, if any, work of this section that will be affected by any alternates if accepted.

B. Furnish all materials, equipment, labor, and supplies and perform all operations necessary to complete the electrical work in accordance with the intent of the drawings and these specifications.

C. Temporary Power and Lighting: Provide separate meter and service for construction area.

1. Power Distribution: Provide weatherproof, grounded circuits with ground-fault interruption features, with proper power characteristics and either permanently wired or plug-in connections as appropriate for intended use. Provide overload-protected disconnect switch for each circuit at distribution panel. Space 4-gang convenience outlets (20 amp circuit) so that every portion of work can be reached with 100' extension cord.

2. Temporary Lighting: Provide lighting of intensity and quality sufficient for proper and safe performance of the work and for access thereto and security thereof. (Consult OSHA requirements.)

1.3 QUALITY ASSURANCE

A. All wiring shall be in accordance with the latest issue of the National Electrical Code.

B. The service equipment shall be grounded at the service entrance switch enclosure. This shall also be the grounding point for the service conduit, boxes, fittings and metal enclosed equipment used in the building wiring system. Any grounding methods allowed under Article 250 of the National Electrical Code may be used provided the ground resistance is less than 25 ohms. This resistance shall be tested.

C. Ground Resistance Testing:

1. Measure ground resistance with bridge type meter designed for testing grounds.
2. Record readings, conditions of soil, model of meter, date, and name of tester.
3. Conduct test in presence of Owner or his Representative. The test shall be made no less than 48 hours after a rain.

D. The Contractor shall show evidence, upon request, of having successfully completed at least five similar projects. Installation of each system shall be under the supervision of a factory-authorized organization.

E. The Contractor shall show evidence, upon request, that he maintains a fully equipped service organization capable of furnishing adequate inspection and service to the system. The Contractor must have a service contract program for the maintenance of the system after the guarantee period.

F. All electrical equipment shall be listed by Underwriters Laboratories, Inc. Each system shall be products of a single manufacturer of established reputation and experience. The Contractor shall have supplied similar apparatus to comparable installations rendering satisfactory service for at least three years.

G. For each system, the manufacturer shall furnish "gratis" to the Owner a one-year contract effective from the date of installation for maintenance and inspection services of the manufacturer's equipment with a minimum of two inspections during the contract year.

H. Prior to submission for review of any item of equipment, determine whether or not it will fit in the space provided. Any changes in the size or location of the material or equipment supplied, which may be necessary in order to meet field conditions or in order to avoid conflicts between trades, shall be brought to the immediate attention of the Architect/Engineer and approval received before such alterations are made.

1.4 EFFICIENCY MAINE

A. This project intends to pursue Efficient Maine prescriptive and/or custom incentives. The contractor shall be an Efficiency Maine Qualified Partner and shall participate in the activities associated with Efficiency Maine incentive pre-approval and approval process including but not limited to; preparation and submission of required incentive application(s) and the tracking and submission of measure specific invoices to Efficiency Maine within 60 days of the completion of the work.

B. The contractor shall also:

1. Become familiar with the Efficiency Maine Business Program including available incentives and the application and review process.
2. Review plans and specifications for compliance with Efficiency Maine standards for applicable systems and technologies.
3. Review plans and specifications for any and all incentive opportunities, prescriptive and custom.

C. The project schedule shall reflect and accommodate the time required to achieve application preapproval from EM. No equipment shall be purchased until preapproval is received from EM.

D. All invoices shall be forwarded to EM within 60 days of the completion of work. This deliverable shall be shown on the project schedule as a milestone date and coordinated with all contractors to assure compliance with this requirement.

E. Efficiency Maine is available to assist in the application process and can be reached at 866-376-2463.

1.5 FIRE ALARM SYSTEM

A. Provide an automatic, addressable electrically supervised, low-voltage fire alarm system, to be wired, connected and left in first-class operating condition. Fire alarm systems shall generally comply with requirements of NFPA 72 for local building systems except as modified and supplemented by this specification. All units of equipment shall be listed by Underwriters Laboratories and shall consist of a battery-backed fire alarm control station, with audio/visual and visual alarm indicating devices, heat detectors, smoke detectors, and pull stations. All equipment shall be located as shown on the plans and wired in accordance with the manufacturer's instructions to form a complete and workable emergency evacuation life safety system as hereinafter described.

1.6 SUBMITTALS

A. In accordance with Division 01, furnish the following:

1. Manufacturer's descriptive literature: For each type of product indicated.
2. Submit shop drawings which include engineering drawings of the system with specification sheets covering all component parts of the system and interconnection diagrams.
3. Submit fire alarm battery calculations.
4. Certification:
   a. Prior to final inspection, deliver to the Owner's Representative certification that the material is in accordance with the drawings and specifications and has been properly installed.
   b. Submit certification of system operating test.
5. Manuals: Submit copies of complete set of operating instructions including circuit diagrams and other information of system components.

1.7 PROJECT CONDITIONS

A. Regulatory Requirements:

1. Conform to the requirements of all laws and regulations applicable to the work.
2. Cooperate with all authorities having jurisdiction.
3. Compliance with laws and regulations governing the work on this project does not relieve the Contractor from compliance with more restrictive requirements contained in these specifications.
4. If the Contract Documents are found to be at variance with any law or regulation, the Contractor shall notify the Architect/Engineer promptly in writing. The Contractor shall assume full responsibility for any work contrary to law or regulation, and shall bear all costs for the corrections thereof.
5. Minimum Requirements: The National Electrical Code (NEC), Underwriters Laboratories, Inc. (UL), the National Fire Codes, and National Fire Protection Association (NFPA) are a minimum requirement for work under this section. Design drawings and other specification sections shall govern in those instances where requirements are greater than those required by code.

B. Permits, Fees, and Inspections:

1. Secure and pay for all permits, fees, licenses, inspections, etc., required for the work under Division 26.
2. Schedule and pay for all legally required inspections and cooperate with inspecting officers.
3. Provide Certificates of Inspection and Approval from all regulatory authorities having jurisdiction over the work in Division 26.

C. Drawings:

1. Do not scale the drawings. The general location of the apparatus and the details of the work are shown on the drawings, which form a part of this specification. Exact locations are to be determined at the building as the work progresses, and shall be subject to the Architect/Engineer's approval. Actual field conditions shall govern all dimensions.
2. Anything shown on the drawings and not mentioned in the specifications or vice versa shall be provided as if it were both shown and specified.
3. It is not intended that the drawings shall show every wire, device, fitting, conduit or appliance, but it shall be a requirement to furnish without additional expense, all material and labor necessary to complete the systems in accordance with applicable codes and the best practice of the trade.

1.8 WARRANTY

A. The Contractor shall guarantee all equipment and wiring free from inherent mechanical or electrical defects for one year from date of acceptance.

1.9 RELATED WORK

A. Division 23 - Mechanical

PART 2 - PRODUCTS

2.1 MATERIALS

A. Switches

1. Toggle Switches: 20A, 277V, 1-pole, ivory specification grade, mount 4'-0" above finished floor at door entrance.
2. Push-Button Switches: Modular, momentary-contact, low-voltage type connected to lighting control panels. Use for all permanently installed luminaires unless otherwise noted. Mount 4'-0" above finished floor at door entrance.

B. Switchbox type occupancy sensors: Adaptive-technology type, 120/277 V, adjustable time delay up to 20 minutes, 180-degree field of view, with a minimum coverage area of 900 sq. ft. Configure for manual-on/automatic-off operation.

C. Indoor Occupancy Sensors

1. General Description: Wall- or ceiling-mounting, solid-state units with a separate relay unit.
   a. Operation: Unless otherwise indicated, turn lights on when covered area is occupied and off when unoccupied; with a time delay for turning lights off, adjustable over a minimum range of 1 to 15 minutes.
   b. Sensor Output: Contacts rated to operate the connected relay, complying with UL 773A. Sensor shall be powered from the relay unit.
   c. Relay Unit: Dry contacts rated for 20-A ballast load at 120- and 277-V ac, for 13-A tungsten at 120-V ac, and for 1 hp at 120-V ac. Power supply to sensor shall be 24-V dc, 150-mA, Class 2 power source as defined by NFPA 70.
   d. Mounting:
      1) Sensor: Suitable for mounting in any position on a standard outlet box.
      2) Relay: Externally mounted through a 1/2-inch (13-mm) knockout in a standard electrical enclosure.
      3) Time-Delay and Sensitivity Adjustments: Recessed and concealed behind hinged door.
   e. Indicator: LED, to show when motion is being detected during testing and normal operation of the sensor.
   f. Bypass Switch: Override the on function in case of sensor failure.
   g. Automatic Light-Level Sensor: Adjustable from 2 to 200 fc (21.5 to 2152 lx); keep lighting off when selected lighting level is present.
2. Dual-Technology Type: Ceiling mounting; detect occupancy by using a combination of PIR and ultrasonic detection methods in area of coverage. Particular technology or combination of technologies that controls on-off functions shall be selectable in the field by operating controls on unit.
   a. Sensitivity Adjustment: Separate for each sensing technology.
   b. Detector Sensitivity: Detect occurrences of 6-inch- (150-mm-) minimum movement of any portion of a human body that presents a target of not less than 36 sq. in. (232 sq. cm), and detect a person of average size and weight moving not less than 12 inches (305 mm) in either a horizontal or a vertical manner at an approximate speed of 12 inches/s (305 mm/s).
   c. Detection Coverage (Standard Room): Detect occupancy anywhere within a circular area of 1000 sq. ft. (93 sq. m) when mounted on a 96-inch-(2440-mm-) high ceiling.

D. Receptacles shall be specification grade, mounted 18" above finished floor unless otherwise noted.

E. Duplex Receptacles With Ground_Fault Interrupter shall be an integral unit suitable for mounting in a standard outlet box.

1. Ground_Fault Interrupter shall consist of a differential current transformer, solid state sensing circuitry and a circuit interrupter switch. It shall be rated for operation on a 60 Hz, 120-volt, 20-ampere branch circuit. Device shall have nominal sensitivity to ground leakage current of five milliamperes and shall function to interrupt the current supply for any value of ground leakage current above five milliamperes on the load side of the device. Device shall have a minimum nominal tripping time of 1/30th of a second.
2. Receptacle shall be rated 20 amperes, 125 volts for indoor use and shall be the standard duplex, three-wire, grounding type.

F. Weatherproof Receptacles shall consist of a duplex GFI receptacle, as specified, mounted in a weatherproof box with a gasketed, weatherproof, cast metal cover plate. The weatherproof integrity shall not be affected when heavy duty specification or hospital grade attachment plug caps are inserted. Cover plates on outlet boxes mounted flush in the wall shall be gasketed to the wall in a watertight manner.

G. Plates shall be 302 stainless steel.

H. Boxes shall be steel minimum 2-1/2" deep.

I. Light Fixtures: The light fixtures shall be as described on the drawings or approved equal.

J. Disconnect Switches shall be heavy-duty type, horsepower rated.

K. Motor Starters:

1. Manual motor starters shall be toggle-switch type with melting alloy thermal overload relay. Thermal units shall be one-piece construction and interchangeable. Starter shall be inoperative with thermal unit removed. Contacts shall be double break, silver alloy. Starters in finished areas shall be flush mounted over the light switch at 60" above finished floor. Starters shall be mounted behind stainless steel device plate and shall have adjacent pilot lights. Square D Class 2510 Type FS-1P-FL1 or approved equal. Starters in unfinished areas shall be surface mounted 60" above finished floor. Square D Class 2510 Type FG-5P or approved equal.
2. Magnetic motor starters shall be combination circuit breaker or fused disconnect switch type, mounted in a common enclosure. Starters shall be three-pole with three melting alloy overload relays. Overload heaters shall be coordinated with Division 23. Thermal units shall be of one-piece construction and interchangeable. Starter shall be inoperative with any thermal unit removed. The disconnect operating handle shall be position indicating.
   a. Provide a control device and pilot light on the cover of each combination starter. Control devices for motors with remote manual or automatic control shall be "hand-off-auto" switches. Control devices for locally controlled motors shall be "start-stop" pushbuttons.
   b. 120-volt magnetic motor starters may consist of a circuit breaker or fused disconnect switch and a magnetic starter in separate enclosures mounted next to each other.
   c. Control circuits shall operate at a maximum of 120 volts. Provide control transformers as required.
3. Starters shall be mounted within NEMA-1 enclosures unless specified otherwise.
4. All starters shall be lockable in the "off" position.
5. Overload heaters shall be sized for the motor nameplate full-load amperes per the manufacturer's recommendations.

L. Wiring Materials:

1. Wiring shall be enclosed in electrical rigid galvanized steel, intermediate metal conduit, or electrical metallic tubing sized in accordance with code requirements for the conductors. Type MC cable may be used where concealed in walls or ceilings and allowed by code.
   a. Conduit fittings shall be steel compression type.
   b. Terminations for all conduit shall have insulated bushings or insulated throat connectors in accordance with code requirements.
   c. All conduits shall be substantially supported with approved clips or hangers spaced not to exceed ten feet on center. Minimum conduit size shall be 1/2".
2. Surface Metal Raceway: UL 5 listed.
   a. Boxes and fittings for surface metal raceways shall be as recommended by the manufacturer.
   b. Support clips for surface metal raceways shall be the concealed type, with attachment screws concealed behind the raceway.
3. Flexible Metal Conduit shall be used for all connections to motors and vibrating equipment and shall comply with Fed. Spec. WW-C-566.
4. Liquid_Tight Flexible Metal Conduit shall consist of flexible steel conduit with a liquid_tight PVC jacket over the conduit.
   a. Fittings shall incorporate a threaded grounding cone, a steel or plastic compression ring, and a gland for tightening.
   b. Liquid-tight flexible metal conduit shall be used in damp or wet locations when flexible metal conduit would otherwise be used.
   c. Liquid-tight flexible metal conduit shall not penetrate the roof or exterior walls, and shall not be installed in lengths exceeding 72" except where necessary for flexibility.
5. Nonmetallic Conduit: Fed. Spec. W_C_1094, Type II or Type III shall apply. Conduit shall be Schedule 40 heavy wall PVC or high density PE. Conduit shall be UL listed for use above ground and direct burial underground and be sunlight resistant.
6. All Wiring shall be type THW, XHHW, or THWN, UL labeled, copper conductors with 600-volt insulation, except as otherwise noted. Minimum size wire shall be No. 12 AWG.
7. Type MC Cable shall have minimum No. 12 AWG type THWN or XHHW insulated copper conductors with an internal bare or insulated copper ground wire.

M. Fire_Stop Material:

1. Fire_stopping material shall maintain its dimension and integrity while preventing the passage of flame, smoke, and gases under conditions of installation and use when exposed to the ASTM E 119 time_temperature curve for a time period equivalent to the rating of the assembly penetrated. Cotton waste shall not ignite when placed in contact with the non, fire side during the test. Fire_stopping material shall be noncombustible as defined by ASTM E 136; and in addition for insulation materials, melt point shall be a minimum of 17000F for one-hour protection and 1850oF for two-hour protection.
2. Seals for floor, exterior wall, and roof shall also be watertight.

N. Panelboards:

1. Provide standard manufacturer products. All components of panelboards shall be the product and assembly of the same manufacturer. All similar units of all panelboards shall be of the same manufacturer.
2. All panels shall be dead front safety type.
3. All panelboards shall be completely factory assembled with molded case circuit breakers.
4. Panels shall have main breaker or main lugs, bus size, voltage, phase, and flush or surface mounting all as scheduled on the drawings. Panelboards to be used as service equipment shall be listed for such use.
5. Panelboards shall have the following features:
   a. Non-reduced size copper or aluminum bus bars and connection straps bolted together and rigidly supported on molded insulators. Bus bar taps shall be arranged for sequence phasing of branch circuit devices.
   b. Full size neutral bar mounted on insulated supports.
   c. Ground bar with sufficient terminals for all grounding wires. The ground bar shall be insulated and isolated where called for on the drawings.
   d. Buses braced for the available short-circuit current, but not less than scheduled and never less than 10,000 amperes symmetrical. All panelboards shall be fully rated. Series rated assemblies are not acceptable.
   e. All breakers arranged so that it will be possible to substitute a two-pole breaker for two single pole breakers or a three-pole breaker for three single pole breakers when frame size is 100 amperes or less.
   f. Design interior so that protective devices can be replaced without removing adjacent units, main bus connectors and without drilling or tapping.
   g. Where designated, on panel schedule as "space", include all necessary bussing, device supports and connections. Provide blank cover for each space.
   h. Provide galvanized steel cabinets to house panelboards. Cabinets for panelboards may be factory primed and suitably treated with a corrosion-resisting paint finish meeting UL standard for outdoor applications.
   i. Back and sides shall be of one-piece formed steel. Cabinets for panelboards may be of formed sheet steel with end and side panels welded, riveted or bolted as required.
   j. Provide minimum of four interior mounted studs and necessary hardware for in and out adjustment of panel interior.
   k. Fabricate trim of sheet steel consisting of frame with door attached by concealed hinges. Provide flush or surface trim as shown on the drawings.
   l. Surface trim shall have the same width and height as the box.
   m. Provide doors with flush type latch and manufacturer's standard lock.
   n. In making switching devices accessible, doors shall not uncover any live parts.
   o. Provide concealed butt hinges welded to the doors and trims.
   p. Provide keyed alike system for all panelboards.
   q. Provide a directory card, metal holder, and transparent cover. Permanently mount holders on inside of doors.
   r. Circuit breakers in panelboards shall be bolt on type on phase bus bar or branch circuit bar. Molded case circuit breakers shall have automatic, trip free, non-adjustable, inverse time, and instantaneous magnetic trips.

O. Circuit Breakers: Circuit breakers to be added to existing panelboards shall match existing circuit breakers.

P. Grounding Conductors:

1. Grounding conductors shall be soft-drawn bare copper.
2. Insulated grounding wires shall be UL and NEC approved types, copper, with THWN or XHHW insulation color identified green, except where otherwise shown on the drawings or specified.
3. Wire shall not be less than shown on the drawings and not less than required by the NEC.

Q. Ground Rods:

1. Ground rods shall be copperweld steel, 5/8" diameter by ten feet long. Each rod shall be die-stamped near the top with the name or trademark of the manufacturer and the length of the rod.
2. Ground rods shall have hard, clean, smooth, continuous copper jacket surface throughout the length of the rod.

R. Ground Clamps:

1. Ground clamps shall be cast bronze or cast copper and shall be UL listed for grounding connections.
2. Ground clamps shall be sized for the specific conductor and electrode to be clamped.

S. Grounding Connections: Connections shall be of the exothermic type welding process as manufacturer by Caldweld or approved equal.

T. Equipment Grounding Connections: Connections shall be of the compression type solderless connectors.

U. Fire Alarm System Components:

1. Modify and add to the existing fire alarm system to provide a complete and code compliant system including but not limited to: new smoke detectors, heat detectors and notification appliances in all areas required. The existing Simplex 4006 series conventional zoned fire alarm control panel shall remain and be expanded as necessary.
2. Components shall be listed for use with the existing fire alarm control panel.
3. Horns: Electric-vibrating-polarized type, 24-V dc; with provision for housing the operating mechanism behind a grille. Horns shall produce a sound-pressure level of 90 dBA, measured 10 feet (3 m) from the horn.
4. Strobe lights shall meet the requirements of the ADA, UL Standard 1971 and shall meet the following criteria:
   a. Strobes shall be multi-candela rated and intensity shall be field selectable.
   b. The maximum pulse duration shall be 2/10 of one second. Clear Lexan lens in housing.
   c. Strobe intensity shall meet the requirements of UL 1971.
   d. The flash rate shall meet the requirements of UL 1971.
   e. Strobes in the same area shall be synchronized.
   f. Outdoor units shall be weatherproof as well as any indicated on plans to be weatherproof that are inside the building.
5. Audible/Visual Combination Devices:
   a. Shall meet the audibility requirements specified herein for horns.
   b. Shall meet the visibility requirements specified for strobes.
6. Manual Pull Stations:
   a. Shall use a key operated test_reset lock, and shall be designed so that after actual emergency operation, they cannot be restored to normal use except by the use of a key. Units shall be supplied with plastic tamper covers that produce an audible alarm when lifted.
   b. All operated stations shall have a positive, visual indication of operation.
   c. Manual stations shall be constructed of metal with clearly visible operating instructions provided on the cover. The word FIRE shall appear on the front of the stations in raised letters.
7. Photoelectric Smoke Detector:
   a. The detectors shall use the photoelectric (light_scattering) principal to measure smoke density.
8. Thermal Detectors:
   a. Rated at 135 degrees Fahrenheit (except as otherwise indicated) and have a rate_of_rise element rated at 15 degrees F (9.4 degrees C) per minute. It shall connect via two wires to the fire alarm control panel signaling line circuit.
9. Duct Smoke Detector:
   a. The duct smoke detector housing shall accommodate a detector that provides continuous monitoring from the panel.
   b. When sufficient smoke is sensed, an alarm signal is initiated at the FACP, and appropriate action taken to change over air handling systems to help prevent the rapid distribution of toxic smoke and fire gases throughout the areas served by the duct system.
   c. Provide sampling tubes as required by the ductwork.
   d. Provide remote test/indicator stations where indicated. Provide engraved nameplate with HVAC unit designation for each station.
   e. The detector shall use the photoelectric principal to sense products-of-combustion and report the measured level of such products to the control panel.
10. Sprinkler and Standpipe Valve Supervisory Switches:
   a. Valve supervisory switches shall be furnished and installed under Div. 21 and wired and connected under this section.
11. Knox Rapid Entry System:
   a. Provide Knox Box as specified by the local fire department. Coordinate all required keying, options, etc., with the local fire department.
12. Conduit and Wire:
   a. Wiring shall be in accordance with NEC Article 760, as shown on the drawings, and as recommended by the manufacturer of the fire alarm system. All wires shall be color-coded. Exposed wiring in unfinished areas shall be installed in metal conduit. Conduit fill shall not exceed 40 percent of interior cross sectional area. Number and size of conductors shall be as recommended by the fire alarm system manufacturer. Conduit shall be 1/2" minimum. Type MC fire alarm cable shall be permitted where concealed and acceptable to the Authority Having Jurisdiction.
   b. Wires in junction boxes and cabinets shall be permanently tagged and identified with tags.
13. Terminal Boxes, Junction Boxes and Cabinets:
   a. Shall be galvanized steel in accordance with UL.
   b. Paint red and identify with white markings as "Fire".
14. Junction boxes shall have a volume 40 percent greater than required by the NEC. Minimum sized wire shall be considered as 14 AWG for calculation purposes.

V. Dry Type Transformers:

1. Transformers shall have 150, 185 and 2200 C insulation and be designed not to exceed 80, 115 and 1500 C rise above 400 C ambient under full load conditions. Insulation systems shall be UL listed. Cores shall be manufactured from high-grade, non-aging, silicon steel with high magnetic permeabilities, low hysteresis and eddy current losses, and shall be clamped with structural angles and bolted to the enclosure to prevent damage during shipment or rough handling (remove clamping after installation). Coils shall be vacuum impregnated with non-hydroscopic thermosetting varnish and shall have a final wrap of electrical insulating material designed to prevent injury to the magnet wire. Transformers having coils with magnet wire visible will not be acceptable. Transformer shall have two 2-1/2% taps above and below normal voltage. Provide lugs to receive primary and secondary conductors.
2. Ratings shall be as indicated on the drawings.

W. Lighting Controls - Refer to Lighting Control Panel Schedules on drawings for further information.

1. Lighting Control Panels: Hubbell LX series switching system or approved equal. Provide network clock/programmer in each lighting control panel.
2. Relays shall generally be configured for manual-on/time-off control with manual override for a programmable length of time. Where luminaires are controlled by dimmers, relays shall be configured for time-on/time-off control; dimmers shall be connected to the load sides of the control panel relays.
3. Programming Consultation & Training
   a. A factory-authorized service representative shall attend two, four-hour meetings at the project site with the Architect and Owner's Representative to determine final time schedules and programming. Meetings shall be scheduled with Owner's Representative through the Architect prior to system start-up.
   b. Provide the services of a factory-authorized service representative to train the Owner's personnel in the operation and maintenance of the system. Provide eight hours of on-site training time. Training shall include but not be limited to a review of the installed system program, demonstration of programming steps needed to alter the time schedule and switch/relay grouping, system capabilities, and warranty and replacement parts information. Training time shall be divided into a maximum of three presentations to accommodate personnel from up to three shifts. Provide video recording of training in DVD format for inclusion in operation and maintenance manuals.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General:

1. All work shall be in accordance with the National Electrical Code's requirements as amended to date, with the local electric utility company's rules, the Fire Underwriter's requirements, and all local, state and federal laws and regulations.
2. In general, all wiring in finished areas shall be concealed in walls or above ceilings. Where wiring cannot be concealed due to existing construction, exposed wiring shall be installed in conduit or surface metal raceway as indicated on the drawings. Exposed wiring shall not be installed in finished areas without prior written authorization from the Engineer.
3. Conduits shall be of sizes required by the National Electrical Code. Exposed conduits shall be installed with runs parallel or perpendicular to walls and ceiling, with right-angle turns consisting of bends, fittings, or outlet boxes. No wire shall be installed until work that might cause damage to wires or conduits has been completed. Conduits shall be thoroughly cleaned of water or other foreign matter before wire is installed.
4. Where conduits, wireways and other electrical raceways pass through fire partitions, fire walls, or floor, install a fire_stop that provides an effective barrier against the spread of fire, smoke and gases. Fire_stop material shall be packed tight and completely fill clearances between raceways and openings. Floor, exterior wall, and roof seals shall also be made watertight.
5. Where raceways puncture roof, coordinate with Division 07.
6. Surface metal raceways shall be sized as required by the National Electrical code and as recommended by the manufacturer. Surface metal raceways shall be installed with runs parallel or perpendicular to walls and ceiling. Changes in direction shall only be made at device box locations or with fittings designed for the particular application. Installation shall be as visually unobtrusive as possible:
   a. Surface metal raceways shall be painted to match wall finishes.
7. All splices shall be mechanically and electrically perfect, using crimp type wire connectors.
8. Provide all disconnect switches required by the N.E.C.
9. Locate motor starters as shown on drawings.
10. Mount disconnect switches and starters at a height of 60" above finished floor unless otherwise noted.
11. Provide all necessary hardware for mounting motor starters.
12. Locate panelboards so that the present and future conduits can be conveniently connected.
13. A typewritten schedule of circuits, approved by the Owner's Representative shall be on the panel directory cards. Type the room numbers and items served on the cards. Three-complete separate copies of all directories, neatly bound, shall be delivered to the Owner's Representative.
14. Revise existing panelboard directories. Furnish new cards as needed. Directories shall be typewritten or printed using a computer.
15. Mount the panelboard so that maximum height of circuit breakers above finished floor shall not exceed 78".
16. Circuit numbers indicated on the drawings are the actual numbers assigned to the circuit in the panelboard and shall not be varied without the consent of the Architect/Engineer.
17. Provide all necessary hardware for mounting panelboards.
18. Underground wiring may be installed in rigid nonmetallic conduit. In locations where nonmetallic conduits are used, change to heavy wall metallic conduit of the same internal diameter before rising out of ground. Provide metallic conduit elbows.
   a. Pitch conduits a minimum slope of 1:300 down toward manholes and handholes and away from buildings and equipment. Slope ducts from a high point in runs between two manholes to drain in both directions.
   b. Provide a means for drainage, such a hole drilled in the bottom of the conduit, at low point of underground conduits. Coordinate drainage with Divisions 31 and 33.
19. Feeder circuit wiring shall be in conduit or EMT.
20. All wiring in outside walls shall be in conduit or EMT.
21. All wiring in masonry walls shall be in conduit or EMT.
22. In general, conductors shall be the same size from the last protective device to the load and shall have an ampacity the same as or greater than the ampacity of the protective device where the wire size is not shown on the drawings. Use the 60oC ampacity rating for wire sizes No. 12 through No. 1. For 120V circuits, home runs longer than 100 feet shall be minimum No. 10 AWG, longer than 200 feet shall be minimum No. 8 AWG.

B. Grounding:

1. The entire electrical system shall be permanently and effectively grounded in accordance with Code requirements.
2. The top of the ground rods shall be a minimum of 6" below finished grade.
3. Connections to ground rods, building steel, reinforcing rods, etc., shall be exothermic weld connections, Cadweld or approved equal.
4. Connections to junction boxes, equipment frames, etc., shall be bolted.
5. Conduit Systems:
   a. Ground all metallic conduit systems.
   b. Conduit systems shall contain a grounding conductor sized per NEC Table 250-122 or as shown on the drawings. Increase conduit size where necessary to accommodate the grounding conductor.
6. Feeders and Branch Circuits: Install green grounding conductors with all feeders and branch circuits.
7. Bare copper ground conductors shall be a minimum of 30" below finished grade.
8. Lighting Fixtures: Conduits shall not be used for grounding fixtures. Green equipment grounding conductor must be bonded to all fixtures.

C. Alterations:

1. The Contractor shall study all drawings and specifications, visit the site, and acquaint himself with the existing conditions and the requirements of the plans and specifications. No claim will be recognized for extra compensation due to the failure of the Contractor to familiarize himself with the conditions and extent of the proposed work.
2. The Contractor shall execute all alterations, additions, removals, relocations or new work, etc., as indicated or required to provide a complete installation in accordance with the intent of the drawing and specifications.
3. Reconnect existing circuits to remain. Remove existing equipment to be discontinued.
4. Any existing work disturbed or damaged by the alterations or new work shall be repaired or replaced to the Engineer's satisfaction.
5. Equipment relocated or removed and reinstalled shall be cleaned and repaired to a first-class condition before reinstallation.

D. Fire Alarm System Installation:

1. Installation shall be in accordance with the NEC Article 760, and the Americans with Disabilities Act and as shown on the drawings.
2. Installation shall be as shown on the drawings and on the manufacturer's wiring diagrams, and shall be performed under the supervision of a factory-trained representative.
3. All wiring shall be one wire per terminal to insure supervision. Crimp-on connectors shall not be used.
4. All wiring shall be color-coded and tagged and shall be checked for continuity, short circuiting, and resistance to ground.
5. All fire alarm wiring shall be installed in raceways.
6. A factory-trained technician shall be present during testing and final inspection and shall instruct the Owner in system operation.
7. Splices and taps: Use numbered terminal strips in junction, pull, and outlet boxes; cabinets; or equipment enclosures where circuit connections are made.
8. Mounting Heights:
   a. Manual Stations: 48" AFF
   b. Visual Units: 80" above the highest floor level within the space or 6 in (152 mm) below the ceiling, whichever is lower.
9. Tests:
   a. Provide the service of a competent, factory_trained engineer or technician authorized by the manufacturer of the fire alarm equipment to technically supervise and participate during all of the adjustments and tests for the system. Make all adjustments and tests in the presence of the Owner's Representative.
   b. When the systems have been completed and prior to the final inspection, furnish testing equipment and perform the following tests in the presence of the Owner's Representative.
      1) Before energizing the cables and wires, check for correct connections and test for short circuits, ground faults, continuity, and insulation.
      2) Test the insulation on all installed cable and wiring by standard methods as recommended by the equipment manufacturer.
      3) Open fire alarm detector circuits to see if trouble signal actuates.
      4) Check installation, supervision, operation and sensitivity of smoke detectors as recommended by the manufacturer to ascertain that they will avoid false alarm signals and will function as specified.
      5) Perform any other tests recommended by the equipment manufacturer.
10. Final Inspection: At the final inspection a factory-trained representative of the manufacturer of the existing equipment shall demonstrate that the systems function properly in every respect. The demonstration shall be made in the presence of the Architect/Engineer.

E. Continuity of Services: Arrange to execute work at such times and in such locations to provide uninterrupted service to the building or any of its sections. If necessary, temporary power shall be installed to provide for this condition. Authorization for interrupting service shall be obtained in writing from the Owner. Any interruption of normal supply shall be performed during an overtime period to be scheduled with the Owner. Cost for overtime work shall be included in the bid.

F. Identification:

1. Provide tags on each end of all pulled wires giving location of other end.
2. Provide phenolic nameplates for all panelboards, motor starters, disconnect switches (except switches located at motors), and duct smoke detector remote test/alarm-indicating stations.
3. Label each receptacle faceplate using machine-printed thermal adhesive labels to indicate source panel and branch circuit. For receptacles connected to normal power, labels shall be white with black letters.

G. Record Drawings: The Contractor shall keep on the job a set of prints showing any changes to the installation. These shall be given to the Engineer at the completion of the work.

H. Testing and Adjusting:

1. The entire installation shall be free from short-circuits and improper grounds. Tests shall be made in the presence of the Engineer or his representatives.
2. Each individual lighting circuit shall be tested at the panel; and in testing for insulation resistance to ground, the lighting equipment shall be connected for proper operation. In no case shall the insulation resistance be less than that required by the National Electrical Code. Failures shall be corrected in a manner satisfactory to the Architect/Engineer.
3. Each system shall be completely tested and shall be adjusted for proper operation as required by the Engineer.

I. Instruction: Furnish the services of a competent instructor for not less than four hours on site for instructing personnel in the operation and maintenance of the fire alarm system.

END OF SECTION 261000

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BASIC ELECTRICAL REQUIREMENTS 261000 - 18

NORTHEAST AIR
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90% PRICING SET – 14 DECEMBER 2015 – NOT FOR CONSTRUCTION

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