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DIVISION 26 – ELECTRICAL

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

A. Definitions

1. "Electrical Contractor", "This contractor" – The party or parties have been duly awarded the contract for and are thereby made responsible for the electrical work as described herein.
2. "This Contract", "The Contract" – The agreement covering the work to be performed by "this Contractor".
3. "Approved", "Equal", "Satisfactory", "Accepted", "Acceptable", "Equivalent" – Acceptable for use on the project, as determined by the engineer based on documents presented for such determination.
4. "These Specifications", "this section, part, division" (of the specification) – The document specifying the work to be performed by "this contractor".
5. "The Electrical Work", "This Work" – All labor materials equipment, apparatus, controls, accessories, and other items required for a proper and complete installation by the Electrical Contractor.
6. "Architect", "Engineer", "Owner's Representative" – The party or parties responsible for interpreting, accepting and otherwise ruling on the performance under this contract.
7. "Furnish" – Purchase and deliver to the project site complete with every necessary appurtenance and support, all as part of the electrical work.
8. "Install" – Unload at the delivery point at the site and perform every operation necessary to establish secure mounting installation and correct operation at the proper location in the project, all as part of the electrical work.
9. "Provide" - "Furnish" and "Install".
10. "New" – Manufactured within the past two years and never used before.
11. "Relocate" – Move existing equipment/devices/fixture and all accessories as required, including the extension of existing or providing new circuit/conductors/wiring as required.
12. “Concealed”: Areas where equipment or systems are located in chases, shafts, walls or ceilings, whether hard or lay-in type.
13. “Exposed”: Equipment or systems not considered concealed.

B. Codes, Standards, and Guidelines:

1. All work shall comply with the requirements of all applicable state and local codes including the National Electrical Code (NEC) and all authorities having jurisdiction in the city of Worcester, MA building code, industry standards and utility company regulations.
2. All materials and equipment shall be Underwriters’ Laboratories Inc. (UL) listed or labeled, where available.
3. The contractor shall inform the Engineer, Architect, Owner, and Building Management of any existing work or materials which violate any of the above laws and regulations.
4. This contractor shall be responsible for prompt replacement or repair and expenses incurred for any workmanship, equipment or material in which violates any of the above references.

C. Site Verification

1. Before submitting bid, this contactor shall visit and examine the project site and become familiar with all field conditions as related to the electrical work. Any discrepancies which may affect this work shall be reported in writing prior to the bid, and if not resolved to satisfaction, shall be included as a written qualification of the bid.
2. Submission of a bid shall be evidence site verification has been performed as described above.

3. No allowance will be made for difficulties encountered due to any field condition which existed up to the time of bid.

D. Contract Documents:

1. Prior to submission of a formal bid, this contractor shall review all drawings of the entire project including general construction, demolition, architectural, mechanical, plumbing and sprinkler and he shall notify the construction manager of work required in the bid which is indicated or implied in other sections of the work.
2. Drawings are diagrammatic and indicate general arrangement of work and approximate location of equipment. Refer to architectural drawings for all dimensions and coordinate final locations of switches light fixtures, receptacles etc. Work shall be coordinated with other trades to avoid conflicts.
3. If a conflict occurs in the specifications and/or on the drawings that has not been addressed before the bid, or the documents are unclear, the more stringent situation shall apply.
4. Any equipment, supports, parts, materials, accessories, or labor that is necessary for proper performance of the electrical work, although not specifically mentioned herein or shown on the drawings, shall be furnished and installed as if called for in detail without additional cost.
5. Provide all ceiling mounted equipment in strict accordance with architectural reflected ceiling plans.

E. Prepare Requests for Interpretation (RFI's) in accordance with industry standards and project requirements.

1. RFIs shall originate with the General Contractor. RFIs submitted directly by sub-contractors will be returned with no response. RFIs sent directly to Engineer will be returned with no response. Incomplete RFIs will not be reviewed and will be returned for additional information.
2. Provide email notification to ftconadmin@f-t.com with RFI file(s) attached in industry standard ".pdf" file format. If the RFI file(s) are too large for email transfer, provide hyperlink to files allowing both download and upload of files over internet connection without requiring use of usernames or passwords. When requested, resubmit promptly incorporating design team comments.
3. Submit RFIs in format specified and in addition include:
    a. Specification Division number and title and related paragraphs, as appropriate.
    b. Drawing number, room name, structural grid coordinates and detail references, as appropriate.
    c. Field dimensions and conditions, as appropriate.
    d. Contractor's suggested solution(s). If Contractor's solution(s) impact the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
    e. Attachments: Include 8 ½" x 11" copies of construction documents highlighting areas requiring interpretation. Include drawings, descriptions, measurements, photos, Product Data, Shop Drawings, and other information necessary to fully describe items needing interpretation and suggested solution(s).
        1) Supplementary drawings prepared by Contractor shall be to scale and shall include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments.

F. This Contractor shall be responsible for Temporary Services in accordance with industry standards and project requirements.

1. Provide temporary power to facilitate construction as required.

G. This contractor shall be responsible for applying for, obtaining and paying for all permits, inspections, and fees required, and complying with all prerequisites for and post-issuance requirements of such permits and inspection documentation.

H. Guarantee

1. All equipment, materials, and workmanship shall be guaranteed for a period of one year from date of final acceptance of this work. Final acceptance shall be defined as the time at which the electrical work is taken over and accepted by the owner, and is under care, custody, and control of the owner. Extensions to standard equipment warranty periods shall be arranged by this Contractor such that the guarantee period commences upon beneficial usage by the Owner.
2. Engage the services of various manufacturers supplying the equipment for the proper startup and operation of all systems installed. Instruct the owner's personnel in the proper operation and servicing of the equipment.
3. The contractor shall provide as a requirement of the bid submission a guarantee for prompt replacement or repair and assume responsibility for all expenses incurred for any workmanship and equipment in which defects develop within the guarantee period. This work shall be done as directed by the owner. This guarantee shall also provide that where defects occur, the contractor will assume responsibility and pay for all expenses incurred in repairing and replacing work of other trades affected by defects, repairs or replacements in equipment supplied by this contractor.
4. This contractor is responsible for the maintenance and operation of all systems until the final acceptance of the work.

I. Provide, at the appropriate time and / or as directed by Architect, the services of a manufacturer’s representative to inspect, adjust, troubleshoot and place in proper operating condition any and all applicable manufacturer’s equipment and provide site visit and start-up report documentation.

J. This contractor is responsible for demonstration of the proper operation of all major equipment, to the Owner and the Engineer, at the completion of installation.

1.2 SCOPE OF WORK:

A. Provide all labor, materials, equipment, and contractor's services necessary for complete, safe installation of all electrical work as indicated in the contract documents.

B. The electrical work shall include but not be limited to the following:

1. Demolition as indicated on the plans.
2. Core drilling, cutting and channeling for holes five (5) inches and less in diameter.
3. Installation of all Equipment and Systems indicated in the contract documents, including, but not limited to:
    a. Raceway and conductors for power.
    b. Addition or modification of existing electrical distribution equipment including panelboards, distribution panelboards, switchboards, switchgear, MCC(s), etc.
    c. Installation of mechanical power wiring and final connections to mechanical equipment.
    d. Installation of conduit, junction boxes, pull boxes, etc.
    e. Grounding of all equipment as required by code and as specified.
    f. Maintenance and proper operation of existing base building systems within the contract area in accordance with the requirements of the Owner and building management.
4. Cutting, channeling and chasing required to accommodate the electrical installation and rough patching.
5. Fire stopping.
6. Temporary light and power during construction.
7. Testing of electrical systems and equipment in accordance with NFPA 110 and manufacturer recommendations.
8. As-Built drawings.

C. Install all new work in a neat workmanlike manner readily accessible for operation, maintenance and repair.

D. Contractor Coordination

1. Mechanical Contractor shall mount duct smoke detectors furnished and wired by the Electrical Contractor.
2. Refer to drawings for VFD's, motor starters / controllers, and disconnects provided by Mechanical Contractor to be installed by the Electrical Contractor.

1.3 COORDINATION WITH OWNER

A. This contractor is responsible for the maintenance and proper operation of existing base building systems within the contract area in accordance with the requirements of the Owner and Building Management.

B. For the purpose of the contractor's bid assume any noisy work (e.g. chopping, core drilling etc.) and base building system interruptions performed outside normal business hours. The contractor is responsible for determining the requirements and extent of premium time and phasing work.

C. This contractor is responsible for adhering to the building owner's rules and regulations. Any discrepancies between the contract documents and the building rules and regulations shall be submitted to the Architect/Engineer for review, with bid submission.

D. Coordinate any service interruption of existing systems with building manager with a minimum of two (2) days prior to any work.

1.4 SUBMITTALS AND SHOP DRAWINGS:

A. Provide email notification to ftconadmin@f-t.com with submittal file(s) attached in industry standard ".pdf" file format. If the submittal file(s) are too large for email transfer, provide hyperlink to files allowing both download and upload of files over internet connection without requiring use of usernames or passwords. When requested, resubmit promptly incorporating design team comments.

B. The Electrical Contractor is responsible for thorough review of all submittals and shop drawings for compliance with the contract requirements and coordination with all other trades. This contractor shall submit to the general contractor for compliance with the project requirements.

C. Include the following information, as applicable:

1. Name and address of project.
2. Name and address of supplier.
3. Name of manufacturer.
4. Reference specification section number, article number and article name.
5. Intended use and location and scheduled designation tag.
6. Identification of whether submittal is a resubmittal of previously reviewed equipment.
7. Review comments distribution list.
8. Product Submittal Data:
    a. Notation on each submittal for which products and options are applicable.
    b. Manufacturer's catalog information.
    c. Manufacturer's product and material specifications and compliance with referenced standards.
    d. Manufacturer's installation instructions and recommendations.
    e. Notation of coordination requirements.
    f. Certified performance ratings with system operating conditions indicated.
    g. Wiring diagrams showing field-installed wiring, including power, signal, and control wiring
    h. Dimensions, required clearances, operating weights and structural loading points.
    i. Compliance with referenced standards.
    j. Standard product operation and maintenance manuals.
    k. Manufacturer-included specialties, options and accessories.
9. Shop Drawings (where differing from the submittal requirements above):
    a. Project-specific information, drawn accurately to scale.
    b. Rough-in information.
    c. Design calculations.

D. Required submittals to Engineer for Review:

1. Collect information into a single submittal for each element of construction and type of product or equipment. Submittals and shop drawings submitted shall include the following:
   a. All Electrical equipment as scheduled on the drawings.
   b. Distribution Panelboards.
   c. As-built drawings (refer to applicable Section, this Part).
   d. Operation and maintenance (O&M) manuals (refer to applicable Section, this Part).
2. A product submittal or shop drawing is required if the contractor is proposing use of an item not specified herein as acceptable or basis of design.
3. Keep one (1) set of reviewed Submittals on site at all times.

E. Submittals not requiring engineering review:

1. Shop drawings and product submittals are not required for products and equipment unless listed above in paragraph D, provided that the product or equipment being furnished is not deviating from the basis of design, performance requirements or approved manufacturers listed on the drawings or specified herein.

1.5 PERMITTING AND UTILITY COMPANY CHARGES

A. Apply for, obtain and pay for all permits, inspections and fees required.

B. Be fully acquainted with and obey all Federal, State, and Municipal laws, by-laws, codes and regulations, and all authorities having jurisdiction.

C. Before starting any work, submit the required specifications and Drawings to the Governing Authorities for their approval. Comply with any requested changes as part of the Contract, and give any notification immediately of such changes.

D. Where the Specifications, Instructions, or the Governing Authorities require any work to be tested, inspected or approved, give sufficient notice of its readiness for inspection, and, if the inspection is by a Governing Authority, of the date and time set for such inspection.

E. Inspection will be made promptly. If any work is covered up without consent, it shall, if required, be uncovered for examination and the required corrections made at no extra cost to the Owner.

F. Furnish any certificates necessary as evidence that the work conforms to the requirements of all authorities having jurisdiction.

G. Make changes, if required, to make the work conform to all laws, bylaws, codes, and regulations, as part of DIVISION 26 work.

H. Electrical Contractor shall give all necessary notices, file and obtain all permits, pay all governmental taxes and fees. Contractor shall also obtain all required Certificates of Inspection for his respective work and deliver same to Architect or Owner’s Representative before request for acceptance of his portion of work is made and before final payment.

I. Electrical Contractor shall assist the owner in applications for and to the local utility company energy rebate programs, including pricing information. The application and pricing information shall be submitted prior to the lighting fixture, lamp and ballast shop drawing submittal.

1.6 SEISMIC DESIGN

A. Provide seismic-restraint devices having load testing and analysis performed according to the Office of Statewide Health Planning & Development for the State of California (OSHPD) and bearing anchorage preapproval "R" number, from OSHPD or another agency acceptable to authorities having jurisdiction, showing maximum seismic-restraint ratings.

B. Submit Shop Drawings and Product Data signed and sealed by a qualified professional engineer, including design calculations, riser supports, vibration isolation base details, seismic restraint details, and snubber load deflection.

C. Where applicable and for high rise buildings, the seismic restraint design and construction requirements for equipment and piping incorporated as part of Life Safety Systems shall be such that these systems will remain in place and be functional following a major earthquake, and that the design shall consider lateral drifts between stories as specified by code.

1.7 RECORD DOCUMENTS

A. This Contractor shall maintain a complete set of Electrical drawing prints at the project site and record, at time of occurrence, deviations from the contract documents due to addenda, bulletins, field coordination or any other instruction by the Architect or Engineer. Accurate location, depth, size and type of all concealed items, inverts of services at key points and buried locations shall be shown, referenced with building grid lines.

B. Contractor shall revise shop drawings to conform to record drawings and submit as-built condition (devices, equipment, circuitry, etc.) drawings upon completion of the project. Final submission of as-built drawings are to be signed and certified by installing contractor that this is the as-built condition of the work.

C. At project completion, as-built information shall be transferred to CAD (.dwg 2004) and printed to PDF. Electronic files shall be included with the O&M manuals at project closeout.

1.8 OPERATION AND MAINTENANCE (O&M) DATA

A. Assemble three copies of indexed hard cover manuals entitled “Operating and Maintenance Instructions for Electrical Systems”.

B. Documentation shall include the following:

1. O&M information for all systems and major components, including panelboards, distribution panelboards.
2. All accepted equipment submittals and shop drawings, including lighting drawings and sequences.
3. All accepted testing reports, including generator load test performed in accordance with NFPA 110 requirements and acceptance test.
4. CAD and PDF electronic format drawings, refer to RECORD DRAWINGS, this Section.

1.9 STANDARD REPORTING REQUIREMENTS

A. All reports shall be submitted in electronic “.pdf” file format.

B. Reports shall include project general information, at a minimum, including location, date, and personnel.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS

A. Equipment and systems scheduled on the drawings may not be intended to be additionally specified herein. In these cases, provide as scheduled, using the indicated manufacturer’s specifications to inform any substitution request / submittal.

2.2 DISCONNECT SWITCHES

A. Unless otherwise noted, disconnect switches shall be “quick-make, quick-break” heavy duty type in NEMA 1 enclosures fused or unfused as indicated on the drawings. Provide all fuses as required provide weatherproof NEMA 3R rated disconnect switches where installed outdoors or as indicated on drawings.

B. Acceptable Manufacturers: Square “D”, GE, Cutler-Hammer, Siemens.

2.3 CIRCUIT BREAKERS

A. For panelboard applications, circuit breakers shall be bolted to the panelboard bus bars. Where circuit breakers are installed in existing panelboard breakers shall be of the same manufacturer and be compatible with existing panelboard. For stand-alone applications, circuit breakers shall be in a NEMA 1 enclosure.

B. Circuit breakers shall be "thermal magnetic" type, quick-make, quick-break with non-welding contacts compensated for ambient temperatures and shall have a minimum short circuit rating of 10,000 amperes symmetrical for 208/120V panelboards and 14,000 amperes symmetrical for 480/277V panelboards or higher where noted. Breakers feeding mechanical equipment shall be HACR rated.

C. Any circuit breakers made available due to demolition shall be designated as spare on panelboard directories.

D. Acceptable Manufacturers: Match existing distribution equipment they are to be installed. Square “D”, GE, Cutler-Hammer, Siemens for individually mounted circuit breakers.

2.4 RACEWAYS

A. All wires shall be run in conduit as specified hereinafter, and each length of conduit shall bear the maker's trademark or stamp. The plans indicate the general location of outlet boxes and circuiting. The conduit runs for these circuits may be modified at the time of installation to adapt same to building construction.

B. For all sizes of conduit larger than 1 1/2", use standard elbow; in smaller sizes, field bends will be permitted instead of using manufactured elbows, but care must be taken not to damage the conduit. The radius of the inner curve of any bend shall not be any less than that permitted by code.

C. Conduit shall be securely fastened in place and hangers, supports or fastenings shall be provided at each elbow and at each end of each straight run terminated at a box or cabinet. Where riser conduits pierce floor slabs, they shall rest on each floor with approved beam clamps, pipe straps or heavy iron ties wired to the structural members supporting equipment. Size and type of anchor shall be based on the combined weights of conduit, hanger and cables. All hangers and rods shall be painted with one coat of enamel.

D. Install conduit expansion fittings in each conduit run wherever it crosses an expansion joint and wherever the conduit length exceeds 200 feet.

E. Lay out and install all conduit runs to avoid proximity to steam and hot water pipes. Do not run conduit within three inches of such pipes except where crossings are unavoidable, then the conduit shall be kept at least 1 inch from the covering of the pipe crossing.

F. Unless otherwise indicated or specified, all wiring shall be installed concealed in ceilings, walls, slabs, pipe chases, and furred spaces whenever possible.

G. Feeders and branch circuitry above hung ceiling and in partitions shall be run in electrical metallic tubing (EMT) unless otherwise noted. Final connections to motors, light fixtures, etc. May be done with flexible metallic conduit (no longer than six feet).

H. All conduit in mechanical rooms, electrical closets shall be EMT and where concealed in concrete shall be rigid threaded regardless of size.

I. Electric metallic tubing shall be industry standard thin wall conduit, EMT shall be hot dipped galvanized steel only. It shall not be less than 3/4" trade size unless otherwise noted. It shall be used for trade size up to 4" unless otherwise noted.

J. Flexible metallic conduit shall be of the grounding type. It shall consist of galvanized steel tape formed into an industry standard interlocking coil. It shall not be less than 3/4" trade size unless otherwise noted.

K. Rigid metal conduit shall be industry standard steel conduit. It shall not be less than 3/4" trade size unless otherwise noted. Rigid metal conduit shall be hot dipped galvanized. It shall not be used for trade size greater than 4" unless otherwise noted.

L. Threaded fittings shall be used with rigid conduit. Compression fittings shall be used with EMT up to 1 1/2" and set screw 2" and larger.

M. Empty conduit for new communication and data outlets in partitions shall be 1" thin wall run concealed in walls, terminated and bushed 6" into accessible hung ceiling and directed towards particular communication / data room or closet. Electrified furniture shall receive 1 1/4" conduit. Provide pull string in each conduit.

N. All metal conduit terminating in a metal enclosure shall have an insulated bushing. Provide "grounding" type bushing where required.

O. Acceptable Manufacturers: Wheatland, Triangle, Republic.

2.5 WIRE AND CABLE

A. Metal clad (type MC) for concealed branch circuitry may be used when written approval is given to the contractor from the building owner. It shall only be installed where permitted by code and accepted by the AHJ.

B. All conductors shall be soft 98% minimum conductivity properly refined copper, type THHN/THWN insulated. All conductors shall have 600 volt rated insulation unless otherwise noted.

C. The minimum wire size for branch circuits shall be no. 12 AWG. Refer to drawing notes for additional requirements.

D. Recessed lighting fixtures for hung ceiling applications shall be supplied with type THHN insulated wire in flexible metallic conduit, in length not to exceed 6 feet from adjacent junction boxes.

E. Connection to recessed ceiling fixtures supplied with pigtails shall be arranged so that up to four such fixtures may be connected into a single outlet box. No fixture shall be supplied from an outlet in another room.

F. Unless specified otherwise, all wires #10 AWG and smaller shall be solid, conductors #8 AWG and larger shall be stranded.

G. Color coding shall be building standard. Where no building standard exists, factory color coding shall be as follows:

1. 208/120 Volt system: Phase 'A' - black, Phase 'B' - red, Phase 'C' - blue, Neutral - grey, Equipment Ground - green.
2. 480/277 Volt system: Phase 'A' - brown, Phase 'B' - orange, Phase 'C' - yellow, Neutral - white, Equipment Ground - green.

H. Install and connect up complete conductors for all circuits and wiring systems

I. No conductors shall be pulled into any conduit run before all conduit joints are made up tightly, and the entire run is secured in place. When required to ease the pulling of wires into conduit, use powdered soapstone, Minerallac #100 or approved equal by Thomas & Betts.

J. Tag all feeders in all pull boxes, gutter spaces, and wireways through which they pass.

K. Terminate stranded conductors #6 AWG and larger at switchboards, transformers, ups systems with compression type connectors. At panelboards terminate with mechanical lugs.

L. Join or tap stranded conductors (#6 AWG and larger) with pressure indent type connectors - Burndy.

M. Acceptable Manufacturers: Southwire, Okonite. (AFC for Metal Clad)

2.6 WIRING DEVICES

A. Wiring devices shall be specification grade unless otherwise noted. All devices shall be flush mounted unless otherwise noted. Refer to symbol list.

B. Single pole switches shall be 120/277 Volt, rated at 20 amperes, quiet operation type. Finish of toggle and device plate as directed by Architect.

C. Three-way switches shall be 120/277 Volt, 20 Amp.

D. Standard receptacles shall be 120 Volt, 20 Amp, 2 pole grounding type. Mount with ground or neutral pin oriented up.

E. Switch and receptacle plates shall be plumb and shall fit flat against the wall.

F. Multiple devices at a common location shall be installed in a common multi-gang box with a common faceplate.

G. Acceptable Manufacturers for Light Switches: Hubbell, Lutron, Pass & Seymour, Cooper Wiring Devices.

H. Acceptable Manufacturers for Receptacles: Hubbell, Lutron, Pass & Seymour, Cooper Wiring Devices.

2.7 PULLBOXES, JUNCTION BOXES, AND OUTLET BOXES

A. Pullboxes, junction boxes and outlet boxes shall be manufactured from galvanized industry standard gauge sheet steel.

B. Provide pull boxes and junction boxes in long straight runs of raceway to assure that cables are not damaged when they are pulled, to fulfill requirements as to the number of bends permitted in raceway between cable access points, the accessibility of cable joints and splices, and the application of cable supports.

C. Pullboxes and junction boxes shall be sized so that the minimum bending radius criteria specified for the wires and cable are maintained.

D. Switch receptacle and wall outlet boxes shall be a nominal 4-inch square, 1 1/2 inch or 2 1/8-inch-deep as required by code with a raised cover, unless otherwise indicated on the drawing. Provide 3/8-inch fixture stud as required. Ganged outlet boxes shall be sufficient length to suit conditions.

E. Lighting fixture boxes shall be 4-inch octagon with 3/8-inch fixture stud. For suspended ceiling work, provide a 4-inch octagon box with removable backplate where required.

F. Include all required junction/pull boxes and outlet boxes regardless of indications on the drawings (which due to symbolic methods of notation, may not show all that are actually required).

G. Where boxes have any single horizontal dimension larger than 36", they shall be fitted with cable support racks consisting of 3/4" diameter steel pipes with flanged ends bolted to the sides or frame of the pull boxes. Each pipe support shall be fitted with a continuous fiber insulating sleeve. The pipe supports shall be arranged in tiers corresponding to the cables entering and leaving the box. Sufficient pipe support racks will be included with the pull box so that no cable shall remain unsupported for a horizontal distance greater than 36". In no case shall cable support pipe racks be mounted so that they interfere with the removal of screw covers.

H. Pull/junction box barriers shall be provided for systems as follows:

1. Between normal and emergency wiring.
2. Between 480 / 277V wiring connected to different services.

I. Barriers in junction and pull boxes shall be of conductive material of adequate thickness for mechanical strength but in no case less than 1/8". Each barrier shall have an angle iron framing support all around.

J. All equipment, device boxes, junction boxes, pullboxes and outlet boxes shall be installed so as to allow access to the box. If necessary and approved by Architect, provide access door or coverplates in areas where unobstructed access is not possible.

K. Acceptable Manufacturers for Junction Boxes: Appleton Electric, Course Hinds, O.Z./Gedney.

L. Acceptable Manufacturers for Fire Stop Material: Hilti, 3M (Electrical Contractor shall confirm material used is acceptable by local AHJ).

M. Acceptable Manufacturers for Fittings, Couplings, Bushings, and Connectors: O.Z./Gedney, Burndy, NEPCO, Thomas & Betts.

2.8 SUPPORTS AND FASTENINGS

A. All supports and fastenings necessary for the support of electrical equipment shall be in accordance with the best industry practice and as specified herein.

B. Furnish and install all steel supporting members, hangers, brackets or other special details required and necessary for the proper installation of electric equipment.

C. Support less than 2-inch trade size, vertically run conduit at intervals no greater than 8 feet. Support such conduits 2-inch trade size or larger, at intervals no greater than the story height, or 15 ft. Whichever is smaller.

D. Where they are not embedded in concrete, support less than 1" trade size, horizontally run conduits at intervals no greater than 7 ft. Support such conduits, 1" trade size or larger, at intervals no greater than 10 ft.

E. Include supporting frames or racks extending from slab to slab for work indicated as being supported from walls where the walls are incapable of supporting the weight.

F. Include supporting frames or racks for equipment, intended for vertical surface mounting, which is required in a free-standing position.

G. Except for branch circuitry install all conduit in hung ceiling space on acceptable hangers and inserts. Conduit or metal clad cable for branch circuitry shall be supported by clamps or pipe straps secured to the ceiling support system (black iron), from structural members or from the deck. Support from ceiling tees, cross tees or support wires is prohibited.

2.9 GROUNDING

A. Provide a green ground conductor in all circuits.

B. Provide supplementary ground bonding where metallic conduits terminate at metal clad equipment (or at the metal pull box of equipment) for which a ground bus is specified. Accomplish this by equipping the conduits with a bushing of the grounding type connected individually to ground bus.

C. All ground wires shall be suitably protected from mechanical injury.

D. Acceptable Manufacturers: Erico, Burndy, Thomas & Betts.

PART 3 - EXECUTION

3.1 GENERAL

A. All control wiring associated with mechanical equipment is the responsibility of the mechanical contractor.

B. All data/voice/communication wiring and devices shall be installed by other contractors and is not included in this contract.

C. Openings around electrical penetrations through fire resistance rated walls, partitions, floors, or ceilings shall be fire stopped using approved methods.

D. Provide danger labeling at all equipment and junction/pull boxes per code.

E. All panelboard covers shall be replaced at the completion of each day's work.

F. Provide a typewritten panelboard schedule that clearly indicates all loads supplied by each branch circuit installed on the new and existing panelboard schedule. This includes providing an updated panelboard schedule for existing panelboards when branch circuits are modified or added as part of the scope of work. The list shall be mounted in a steel frame under a plastic cover window. Each panelboard shall be externally tagged with permanent plate indicating panelboard identification, voltage, and the distribution equipment feeding the panelboard.

G. Maintain ground continuity throughout all systems.

H. The contractor shall remove and/or relocate any existing electrical work which interferes with the new installation. All exposed abandoned conduit and wiring shall be removed. The contractor shall cut back all abandoned conduit and wiring to floor, or demising wall of the space. This work may not be represented on the drawings but should be taken into account by the contractor in their proposal.

I. Electrical contractor shall maintain continuity of circuitry for existing equipment and devices that are to remain. Where outlets are removed and are not at the circuit dead end, extend circuitry as required to maintain integrity of original circuit. Where a wiring device is to be removed and that wall is to remain the electrical contractor shall remove branch circuitry from its source and fill-in outlet box. Blank plates will not be permitted.

J. Prior to any chasing, chopping, or core drilling being performed, the contractor shall field investigate conditions and coordinate with all appropriate trades to ensure that work will be in harmony with other work and not affect any existing building systems. This work must be approved by Building Management prior to proceeding.

K. At the completion of the life safety system installation the contractor shall test all emergency lighting devices and submit a report to the Engineer verifying that the systems are fully operational.

L. Furnish and install wiring for adequate light and small tools power for the project. This shall include stringers, outlets, breakers, and fusing, as is necessary.

M. Mounting heights: Disconnect switches or enclosed CB's: 6'-6" to handle. Panelboards: 6'-6" to MCB or top circuit breaker (if no MCB) transformers: (where hung) - as close as possible to slab above but no less than manufacturers clearance requirements.

N. Where panelboards, switches, circuit breakers, transformers, etc. Are existing to be reused the contractor shall clean and refurbish the equipment. This shall include tightening all connections, replacing defective mechanisms, exercising mechanisms and providing any miscellaneous components so the equipment is in first class working order.

O. Provide seismic restraints for all equipment, including all structural steel members, inserts, anchors, wires and the required assembly thereof. All seismic restraints shall be designed and constructed in accordance with all local codes and ordinances having jurisdiction.

P. Provide labeling at each outlet, disconnect switch, and hardwired equipment indicating panelboard number and circuit number. Use "Brother P-Touch" or similar.