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LOGIN: Jacques, Christopher

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SECTION 16000 ELECTRICAL WORK

1. GENERAL:

- A. All applicable codes, laws and regulations governing or relating to any portion of this work are hereby incorporated into and made a part of these Specifications, and their provisions shall be carried out by the Contractor who shall inform the Owner, prior to submitting a Proposal, of any work or material which violates any of the above laws and regulations. Any work done by the Contractor causing such violation shall be corrected by the Contractor.
- B. Investigate each space through which equipment must be moved. Where necessary, equipment shall be shipped from manufacturer in sections of size suitable for moving through available restrictive spaces. Ascertain from building Owner and Tenant at what times of day equipment may be moved through all areas.
- C. Drawings are diagrammatic and indicate general arrangement of systems and work. Conduit routing is shown diagrammatically and does not show all offsets, drops and rises of runs. The Contractor shall allow in his price for routing of conduit to avoid obstructions. Coordination with existing services, including those of other trades, is required. Maintain headroom and space conditions.
- D. Install work to be readily accessible for operation, maintenance and repair. Minor deviations from drawings may be made to accomplish this, but changes that involve extra cost shall not be made without approval.
- E. Removal and relocation of certain existing work may be necessary for the performance of the general work. Not all existing conditions can be completely detailed on the drawings. The Contractor shall survey the site and include all changes and charges in making up the work Proposal.
- F. Connections to existing work: Install new work and connect to existing work with minimum interference to existing facilities. Temporary shutdowns of existing services shall be performed at no additional charges, at times not to interfere with normal operation of existing facilities and only with written consent of Owner. Alarm and emergency systems shall not be interrupted. Maintain continuous operation of existing facilities as required with necessary temporary connections between new and existing work. Connect new work to existing work in neat and acceptable manner. Restore existing disturbed work to original condition, including maintenance of wiring continuity as required.
- G. Disconnect, remove and/or relocate existing material, equipment and other work as noted or required for proper installation of new work.
- H. The Contractor shall keep all equipment and materials, and all parts of the building, exterior spaces and adjacent streets, sidewalks and pavements, free from material and debris resulting from the execution of this work. Excess materials will not be permitted to accumulate either on the interior or on the exterior.
- I. Seal openings through partitions, walls and floors with mineral wool or other noncombustible material. All penetrations through new and existing rated fire and smoke partitions and/or floors shall be completely sealed using materials and methods described in subsequent "Fire Stopping" Specifications Sections.
- J. Provide all necessary flashing and counterflashing to maintain the waterproofing integrity of the building as required by the installation or removal of conduit and equipment.
- K. All existing material, equipment and construction debris to be removed under this contract shall become the property of the Contractor with the exception of specific equipment and apparatus requested by the building representative, Architect or as noted to be relocated on the drawings. Removed equipment shall be properly disposed of by this Contractor.
- L. The Contractor's Proposal for all work shall be predicated on the performance of the work during regular working hours. When so directed, however, the Contractor shall install work during overtime hours and the additional cost to be charged therefore shall be only the "premium" portion of the wages paid.
- M. Unless otherwise specifically noted or specified, include all cutting and patching of existing floors, walls, partitions and other materials in the existing building. The Contractor shall restore these areas to original condition.
- N. All material and equipment shall be new unless otherwise noted and shall be in accordance with building standards.
- O. Submission of a Proposal shall be construed as evidence that a careful examination of the portions of the existing building, equipment, etc., which affect this work, and the access to such spaces, has been made and that the Contractor is familiar with existing conditions and difficulties that will affect the execution of the work. The Contractor is responsible to indicate any discrepancies between the contract drawings and actual field conditions prior to submittal of bid. Submission of a Proposal shall be construed as evidence that such an examination has been made. Later claims shall not be made for labor, equipment or materials required because of difficulties encountered which could have been foreseen during such an examination. The on-site inspection shall verify existing conduit (sizes, clearances, etc) and conditions.
- P. All work shall be done when and as directed by the Client and in a manner satisfactory to the Building Owner. Work shall be performed so as to cause the least possible inconvenience and disturbance to other building occupants.
- Q. The final acceptance shall be made after the Contractor has adjusted his equipment, tested the various systems, demonstrated that it fulfills the requirements of the drawings and specifications and has furnished all the required certificates of inspection and approval.

2. SCOPE OF WORK:

- A. Scope of Work shall consist of providing labor, materials, equipment, services and fees necessary for complete and safe installation in conformity with the Massachusetts Electrical Code and all other applicable industry, national and local codes and authorities having jurisdiction, as indicated on drawings and herein specified.
- B. All drawings, plans, details, specifications and specification addenda are made part of this Contract and shall apply to all work under the Contract unless otherwise amended, supplemented or specified herein.
- C. The Contractor shall furnish a written guarantee to replace or repair promptly and assume responsibility for all expenses incurred, for any workmanship and equipment in which defects develop within one year from the date of final certificate for payment and/or from date of actual use of equipment or occupancy of spaces by Owner, included under the various parts of the work, whichever date is earlier. This work shall be done as directed by the Owner. This guarantee shall also provide that where defects occur, the Contractor will assume responsibility for all expenses incurred in repairing and replacing work of other trades affected by defects, repairs or replacements in equipment supplied by the Contractor.

- D. The Contractor shall give necessary notice, file drawings and specifications with all departments having jurisdiction, obtain permits or licenses necessary to carry out this work and pay all fees therefor. The Contractor shall arrange for inspection and tests of any or all parts of the work if so required by authorities and pay all charges for the same. The Contractor shall pay all costs for, and furnish to the Owner before final billing, all certificates necessary as evidence that the work installed conforms with all regulations where they apply to this work.

3. SHOP DRAWINGS

- A. Prior to the installation of any work and procurement of equipment, Contractor shall provide complete sets of coordinated shop drawings of all new and existing equipment, indicating capacity, dimensions and sequence of operation for written approval by the Architect and Engineer.
- B. Indicate on each shop drawings submitted:
 - 1) Project name and location
 - 2) Name of Architect and Engineer
 - 3) Item identification
 - 4) Approval stamp of prime contractor
- C. Submissions:
 - 1) Submissions 11 in. x 17 in. or smaller: If the submission is a catalog cut, then the Contractor shall submit one original and two copies. Otherwise, he shall submit three copies. The Architect will forward the original and one copy (two copies when no original is received) to the Engineer. All catalog cuts shall be complete.
 - 2) Submissions larger than 11 in. x 17 in.: Submit two prints and one paper sepia to the Architect. The Architect will forward one print and the paper sepia to the Engineer.
- D. Submit shop drawings for the following:
 - 1) Switches
 - 2) Fuses
 - 3) Circuit breakers
 - 4) Raceways
 - 5) Wire and cable
 - 6) Wall switches, dimmers and occupancy sensors
 - 7) Insertion receptacles
 - 8) Surface metal raceway
 - 9) Lighting fixtures and exit signs
 - 10) Fire alarm devices

4. AS-BUILT DRAWINGS AND EQUIPMENT OPERATIONAL INSTRUCTIONS

- A. Upon completion and acceptance of work, Contractor shall furnish written instructions and equipment manuals and demonstrate to the Owner the proper operation and maintenance of all equipment and apparatus furnished under this contract.
- B. These instructions shall be typed on 8-1/2 in. x 11 in. paper and bound in three ring binders with clear acetate covers. The Contractor shall give three copies of the instructions to the Owner and one copy to the Engineer.
- C. The instruction booklet shall bear the name, address and telephone number of the project, Architect and Engineer.
- D. Reproducible "As-Built" drawings shall be provided indicating the as installed conditions of the work. "As-Built" drawings shall be provided to the Architect after completion of the installation.

5. GENERAL PROVISIONS FOR ELECTRICAL WORK:

- A. Specifications are of simplified form and include incomplete sentences. Words or phrases such as "the Contractor shall," "shall be," "furnish," "provide," "a," "the," and "all" have been omitted for brevity.
- B. Temporary light and power: Provide temporary light and power systems at earliest possible date within the construction areas for the requirements of all trades as herein described. Extend systems to new construction as soon as physically possible. Maintain system during working hours of all trades. Cost of energy will be paid for by Owner. Provide all required maintenance, including lamps and sockets.
- C. Quality assurance
 - 1) Quality and gauge of materials: New, best of their respective kinds, free from defects and listed by Underwriters Laboratories, Inc., or other nationally approved testing agency and bearing their label. Materials and equipment of similar application shall be of some manufacturer, except as noted.
 - 2) Heights of outlets: Contractor shall be responsible for coordinating and confirming all mounting heights with Architect and Architectural drawings.
- D. Materials
 - 1) Nameplates: Provide black lamiconic sheet with 3/4 in. white lettering, fastened with epoxy cement for each disconnect switch, circuit breaker, panel, cabinet, transformer, enclosure, motor controller and the like. Nameplates shall describe the name and number of each component.
 - 2) Cable tags: Tag each conductor passing through splice or pullbox with a white linen tag, indicating point of origin and termination of the circuit.
- E. Paint shall be the best grade for its purpose. Deliver in original sealed containers and apply in accordance with manufacturer's instructions. Colors shall be as selected by Architect or Engineer. Utilize galvanized iron primer on panel and pull boxes, after fabrication. Utilize hot dipped galvanized or dipped in zinc based primer for: outlet boxes, junction boxes, conduit hangers, rods, inserts and supports. Zinc based primer with finish to match surroundings shall be used for marred surfaces of steel equipment and raceways. A field-applied zinc based prime coat shall be utilized for steel or ironwork.

- F. Brush and clean work prior to concealing, painting and acceptance. Painted exposed work soiled or damaged; clean and repair to match adjoining work before final acceptance. Remove debris from inside and outside of material and equipment.
- G. Final locations and mounting orientations of all switches, receptacles and light fixtures shall be verified with Architect.
- H. Provide access doors when concealed electrical equipment requires access. All access door locations shall be reviewed by Architect prior to installation.

6. DEMOLITION

- A. "Selective Demolition": Is hereby defined to include but is not necessarily limited to the removal of the following existing materials, items and equipment.
 - 1) Refer to electrical demolition plan and related notes for extent of demolition.
 - 2) Refer to existing drawings and site conditions for all removal of work necessary for completion of new work as shown. Each bidder shall carefully examine the premises and documents during the bidding period and ascertain the extent of removal of existing work. If additional work is noted by the Contractor, call it to the attention of the Architect prior to submitting bid. By submitting a bid, the Contractor will have deemed to have made such examination, to accept such conditions, and to have made allowances in preparing his bid.
 - 3) Items of salvage shall be carefully removed without damage; nails and other fasteners removed that are not integral to their construction; and stored and protected at locations directed by the Owner. Identify and tag all salvage materials regarding location in existing building and relationship of parts.
 - 4) Care must be taken not to disturb existing wiring, which is not affected by demolition. Restore all circuits and equipment disrupted or disturbed by the removal of only parts of existing systems. Maintain continuous operation of existing facilities as required with necessary temporary connections between new and existing work. Alarm and emergency systems shall not be interrupted.
 - 5) Connect new work to existing in a neat and approved manner. Restore existing work disturbed while installing new work to acceptable condition as determined by building Owner.
 - 6) All raceways to be abandoned shall be reworked as defined within the demolition notes. Where it is impractical to remove raceway back to source, disconnect wiring at load (equipment) and at line side, cut and cap, flush to surface. Remove conductors from existing raceways to be rewired. Clean raceway as required prior to rewiring.

7. CUTTING AND PATCHING

- A. The Contractor shall be responsible for all cutting and patching of the existing and new construction work, which may be required for the proper installation of the electrical work. All patching shall be of the same materials, workmanship, and finish, and shall accurately match all surrounding work.
- B. Core boring of concrete floors and/or walls if required, shall be provided by the Electrical Contractor. Coordinate all coring with tenant on floor below. Remove existing ceilings and provide water protection as required. Schedule coring with owner.

8. COORDINATION

- A. The Contractor shall verify locations of all equipment with architectural drawings. In centering outlets and locating boxes and outlets, allow for overhead pipes, ducts, and mechanical equipment, variations in fire proofing and plastering, window and door trim, paneling, hung ceilings, and the like, and correct any inaccuracy resulting from failure to do so without expenses to the Owner

9. EQUIPMENT FURNISHED BY OTHERS

- A. The Contractor shall furnish and install wiring for equipment furnished by others, as shown on drawings. Coordinate with all other trades or details for installation. The term "wiring" as used here-in, includes, but is not limited to, furnishing and installing conduit, wire, junction boxes, disconnects and making connections. Contractor shall check architectural, mechanical, and plumbing. Drawings and specifications for equipment to be installed by others. Contractor shall be responsible for proper wiring and necessary electrical adjustments to equipment to conform to specified requirements of the equipment.

10. RACEWAYS:

- A. Provide raceways complete with boxes, fittings and accessories. Conduit or tubing sizes referred to in specifications and on drawings are nominal diameters. Minimum diameter shall be 3/4 in. Raceways shall run concealed, except as noted.
- B. Materials
 - 1) Raceways:
 - a) Rigid steel conduit: full-weight pipe, galvanized, threaded.
 - b) Electrical Metallic Tubing (EMT): thin wall pipe, galvanized, threadless.
 - c) Flexible Metal Conduit: continuous single strip, galvanized.
 - d) Wireways: Wire shall be as noted, minimum No. 16 gauge steel with ground continuity. Finish shall be baked enamel. Covers shall be screw-on.
 - 2) Fittings and accessories:
 - a) Rigid steel: Nonspit, threaded, steel or malleable iron. Zinc die cast not permitted.
 - b) Electrical Metallic Tubing: Compression type or double setscrews. Galvanized rigid steel elbows, 2 in. or larger.
 - c) Flexible metal conduit: Angle wedge type with insulated throat.

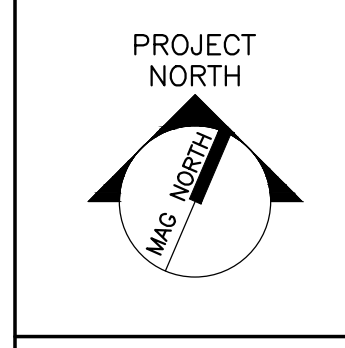
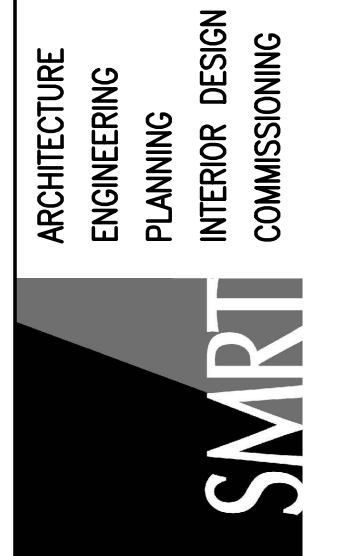
3) Boxes:

- a) Outlet boxes: Except as otherwise required by construction, devices or wiring, boxes shall be stamped steel, 4 in. square or octagon for fixtures. Boxes above ceiling shall be 1-1/2 in. deep. Boxes in ceiling or slab shall be 3 in. deep. Boxes in wall for fixtures shall be 2-3/4 in. deep. Boxes in wall for receptacles and switches shall be 1-1/2 in. deep. Furnish with raised covers and fixture studs where required. Without fixture or device: furnish blank cover. Offset back-to-back outlets with minimum 6 in. separation.
- b) Junction and pull boxes: Galvanized sheet steel with screw-on covers, except as noted. Furnish with insulated supports for cables. Locations shall be as noted or required and accessible. Provide barriers in new and renovated boxes between 120/208 volt and 265/460 volt wiring and between emergency and normal wiring.
- 4) Provide raceway support utilizing ceiling trapeze, strapangers, or wall brackets. Provide U-bolts at each floor level of riser raceways and connected to acceptable supports. Provide riser clamps at each floor level of riser raceways resting on slab. Spacing of supports shall be a minimum of 10 ft on center for metallic raceway and as required for nonmetallic raceway. Spacing shall be 5 ft on center for wireways and per code and as noted for others. Mount supports to structure masonry with toggle bolts on hollow masonry, expansion shields or inserts in concrete and brick, machine screws on metal, beam clamps on framework, wood screws on wood, and pan through straps in metal deck. Nails, rawl plugs or wood plugs shall not be permitted. Where required by structure, flush through bolts and fishplates.
 - a) Exposed raceways shall be run parallel with or at right angles to walls. Provide clearance with water, steam or other piping (minimum 3 in. separation from steam and hot water pipes, except 1 in. from pipe cover at crossings and 18 in. for parallel runs). For hung ceiling outlets, run in hung ceiling and connect to ceiling support channels. In masonry and poured concrete, run vertically only.
 - b) Maintain grounding continuity of interrupted metallic raceways with ground conductor, and in flexible conduit for feeders and motor terminal connections.
 - c) Empty raceways over 10 ft long: Provide fish or pull wire, galvanized or nylon rope.
 - d) Rigid steel conduit shall be permitted for feeders and branch circuits. Paint male threads of field-threaded conduit with graphite-base pipe compound and butt conduit ends. Touch up marred surfaces and field-cut threads, CRC-cold galvanized.
 - e) EMT shall be permitted for feeders and branch circuits, in dry locations, dry walls, hung ceilings, hollow block walls and furred spaces.
 - f) Cut conduit ends square. Ream smooth. Paint male threads of field threaded raceways with graphite base pipe compound. Draw up tight with raceway coupling.
- Erect wall and switch outlets in advance of furring and fireproofing. Outlet boxes shall be set square and true with building finish. Secure to building structure by adjustable strap iron or grout in with masonry. Verify outlet locations in finished spaces with architectural drawings of interior details and finishes. Provide barriers between switches connected to different phases for voltages exceeding 150 volts to ground.
- Panel, junction and pull boxes shall be located clear of other trades. Conceal junction and pull boxes in finished spaces. Where necessary, reroute raceways or make other arrangements for concealment. Boxes shall be accessible. Provide access doors as required for accessibility. Support boxes from building structure, independent of conduit. Provide floor-to-ceiling channels for mounting on drywall and lightweight construction. Outlet boxes for fixtures recessed in hung ceilings shall be accessible through opening created by removal of fixture. Secure to black iron support. Motor terminal boxes: coordinate with motor branch circuit conduit and wiring; add box volume where required.
- Fire sealants: Provide for raceways and wire passing through floor slots, sleeves or openings in fire-partitions.

11. WIRE AND CABLE:

- A. Provide wire and cable complete with accessories. Size reference shall be AWG except as noted.
- B. Conductors shall be copper, ASTM standard solid (No. 10 and smaller) or stranded (No. 8 and larger). General use cabling shall be No. 12 minimum. At 120 volts and over 100 ft circuit length, provide No. 10 minimum. At 265 volts and over 200 ft circuit length, provide No. 10 minimum.
- C. Control and alarm cabling, except as noted, shall be No. 14 minimum. At 120 volts and over 200 ft circuit length, provide No. 12 minimum.
- D. Other voltages and phases: adjust cable sizing as required to maintain code acceptable voltage drop. Increase raceway sizes for larger wire as required.
- E. Insulation shall be rubber and thermoplastic meeting ASTM and ICEA standards. Type THHN/THWN shall be utilized for feeders and branch circuits except as noted. SFF-2 shall be used for branch circuits located in wiring channels of continuous fluorescent fixtures and in ambient temperatures over 90 Deg. C. Underground service entrance cabling shall be USE. Provide cross-linked polyethylene insulation (Type XHHW) in exterior locations including underground non-service cables.
- F. Metal-clad cable (MC) with ground wires shall be utilized for branch circuits in dry hollow locations, hung ceilings, and block walls. When used in lieu of wiring in conduit, state in proposal that price is based upon the use of MC cable. BX cable shall not be used.
- G. Color coding shall be as follows:
 - 1) 120/208 volt system:
 - Black for A phase
 - Red for B phase
 - Blue for C phase
 - 2) 265/460 volt system:
 - Brown for A phase
 - Orange for B phase
 - Yellow for C phase
 - 3) Neutral wire shall utilize white outer covering throughout. Equipment ground wire shall utilize green outer covering throughout.

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MAINE MEDICAL CENTER IR READING ROOM AND U/S RENOVATION PORTLAND, MAINE

NO.	DATE	DESCRIPTION	REV
03-31-17		ISSUED FOR PERMITTING	

GRAPHIC SCALE: 0" 1"

SCALE: NTS
 PROJECT MANAGER:
 JC/DRAWN BY:
 A/E OF RECORD:
 CAD FILE:
 PROJECT NO: B160305-000
 DATE: 03-31-17
 SHEET TITLE:
ELECTRICAL SPECIFICATIONS
 SHEET No. **E-500**

