

SECTION 26 00 00

GENERAL REQUIREMENTS FOR ELECTRICAL WORK

PART ONE: GENERAL

1.1 General Requirements

1.1.1 Definition of Work

Conditions of the Contract, Specifications, Change Orders, Addenda and Drawings apply to work of this section.

1.1.2 Provisions

As used in this section, "provide" means "furnish and install", "furnish" means "to purchase and deliver to the project site complete with every necessary appurtenance and support and to store in a secure area in accordance with manufacturers instructions", and "install" means "to unload at the delivery point at the site or retrieve from storage, move to point of installation and perform every operation necessary to establish secure mounting and correct operation at the proper location in the project".

1.1.3 Existing Site Conditions – Responsibilities Prior to Bid

Before submitting a bid, the Electrical Subcontractor shall visit and carefully examine site to identify existing conditions and difficulties that may affect the work of this Section. No extra payment will be allowed for additional work caused by unfamiliarity with site conditions.

1.1.4 Existing Site Conditions – Responsibilities Prior to Starting Work

Before starting work in a particular area of the project, the Electrical Subcontractor shall examine the conditions under which work must be performed including preparatory work performed under other Sections of the Contract, or by the Owner and report conditions which might adversely affect the work in writing to the Engineer. Do not proceed with work until defects have been corrected and conditions are satisfactory. Commencement of work shall be construed as complete acceptance of existing conditions and preparatory work.

1.2 Applicable Codes and Standards

1.2.1 Work

All work shall be in accordance with the laws, rules, codes, and regulations set forth by Local, State, and Federal authorities having jurisdiction. All products and materials shall be manufactured, installed and tested as specified, but not limited to the latest accepted edition of the following codes, standards and regulations:

NFPA	National Fire Protection Association
OSHA	Occupational Safety and Health Act
NEC	National Electrical Code (NFPA 70)
UL	Underwriters Laboratory
NESC	National Electrical Safety Code

FM	Factory Mutual Association
MUBEC	Maine Uniform Building and Energy Code
Local AHJ	Local and State building, electrical, fire and health department and public safety codes agencies.

1.2.2 Code Conflicts

When requirements cited in this Paragraph conflict with each other or with Contract Documents, the most stringent requirements shall govern conduct of work. The Engineer may relax this requirement when such relaxation does not violate the ruling of authorities that have jurisdiction. Approval for such relaxation shall be obtained in writing. Should the Electrical Subcontractor perform any work that does not comply with the requirements of the applicable building codes, state laws, and industry standards, he shall bear all costs arising in correcting these deficiencies.

1.3 Contract Documents

1.3.1 Work to be Provided

Work to be provided under this division is shown on the electrical drawings listed in Division 1, General Requirements and in these Contract Specifications.

1.3.2 Coordination of Work

The listing of electrical drawings does not limit the responsibility of determining the full extent of work that is required by these contract documents. The Electrical Subcontractor shall refer to the drawings and other specification sections included in the complete Contract Package, that indicate types of construction with which work of this section must be coordinated. The General Contractor shall coordinate the work of all trades including that of the electrical contractor, with all other subcontractors to determine whether there will be any interference with the electrical work. If the Electrical Subcontractor fails to check with the General Contractor and the electrical work is later found to interfere with the work of other subcontractors, then he shall make necessary changes, without additional cost to the Owner, to eliminate such interference.

1.3.3 Intent of Design

Drawings are diagrammatic and indicate the general arrangement of systems and work to be included in the Contract. Information and components shown on riser diagrams or called for in the specifications but not shown on plans, and vice versa, shall apply and shall be provided as though required expressly by both. The contract documents are not intended to indicate and specify each component required, but do require that the components and materials be provided for a complete and operational installation.

1.3.4 Discrepancies in Documents

Each bidder shall be responsible for examining the drawings and specifications carefully before submitting his bid, with particular attention to errors, omissions, conflicts with provisions of laws and codes imposed by authorities having jurisdiction, conflicts between portions of drawings, or between drawings and specifications, and ambiguous definition of the extent of coverage in the contract. Any such discrepancy discovered shall be brought to the immediate attention of the Engineer for correction. Should any of the aforementioned errors, omissions, conflicts or ambiguities exist in either or both the drawings and specifications, the Electrical Subcontractor shall have the same explained and adjusted in writing before signing the contract or proceeding with work. Failure to notify the Engineer in writing of such irregularities prior to signing the Contract will cause the Engineer's interpretation of the Con-

tract Documents to be final. No additional compensation will be approved because of discrepancies thus resolved.

#### 1.3.5 Conflicts with Codes and Regulations

The drawings and these specifications are intended to comply with all the above mentioned Codes, Rules and Regulations. If discrepancies occur, the Electrical Subcontractor shall immediately notify the Engineer in writing of said discrepancies and apply for an interpretation and, unless and interpretation is offered in writing by the Engineer prior to the execution of the contract, the applicable rules and regulations shall be complied with as a part of the contract.

## PART TWO: SCOPE OF WORK

### 2.1 General Requirements

#### 2.1.1 General Scope

The work to be accomplished under these specifications includes providing all labor, materials, equipment, consumable items, supervision, administrative tasks, tests and documentation required to install complete and fully operational electrical systems as described herein and shown on the Drawings.

#### 2.1.2 Administrative Responsibilities

The Electrical Subcontractor shall file plans, obtain permits and licenses, pay fees and obtain necessary inspections and approvals from authorities that have jurisdiction, as required to perform work in accordance with all legal requirements.

#### 2.1.3 Coordination with Local Utility Companies

The Electrical Subcontractor shall coordinate with the local Power, Telephone, and Cable System Utilities if required. The Electrical Subcontractor shall be responsible for paying any Utility charges and excess costs incurred. The Electrical Subcontractor shall perform all work in accordance with utility company requirements.

### 2.2 Work to be Provided Under this Division

#### 2.2.1 General Scope

The Work shall be complete from point of service to each outlet or device with all accessory construction and materials required to make each item of equipment or system complete and ready for operation. The work shall include but not be limited to the following. The Electrical Subcontractor shall provide:

- A. **Service Entrance:** The intent is to use the existing service to the building.
- B. **Grounding System:** Provide all equipment and wiring to connect new feeders, equipment and other systems as required by the National Electrical Code to the existing building grounding system.
- C. **Temporary Power:** All charges for temporary service provided (if required), and all equipment, wiring and lighting as required and defined later in this specification section.

- D. **Power Distribution Systems:** Intent is to provide additional equipment to the existing power distribution panelboards including but not limited to overcurrent devices, raceway, cable and wire.
- E. **Feeder and Branch Circuit Wiring:** Provide feeder and branch circuits and devices for power to equipment and convenience receptacles. This includes branch wiring to system control panels furnished under other sections.
- F. **Motor Circuit Wiring:** Provide all motor wiring, safety disconnects, and motor starters unless integral with equipment.
- G. **Interior Lighting Systems:** Provide complete interior lighting system including normal and emergency fixtures, exit signs, lamps, controls, trim and accessories.
- H. **Telephone and Data Systems:** Provide complete voice/data system conduits, Cat 5E wiring back to the school patch panel.
- I. **Security Systems:** Furnish conduits and power for security equipment as shown on the plans.
- J. **Cable Television Systems:** Provide empty conduit for CATV outlets.
- K. **Control Wiring:** Provide control wiring not provided by Division 15000.
- L. **Supports and Fittings:** Provide all support material and hardware for raceway, cable tray and electrical equipment.
- M. **Terminations:** Provide terminations of all cable and wire unless otherwise noted.
- N. **Penetrations:** Provide all building wall, floor and roof penetrations for raceway and cable tray where not provided by the General Contractor.
- O. **Other Items Furnished By Others:** Install the following equipment furnished by others:
  - 1. Motors
  - 2. Control Panels
  - 3. Wiring to magnetic door holders.

### 2.3 Work not Included Under this Division

#### 2.3.1 Related Work Included in Other Sections

The following work is not included in this Section and shall be performed under other sections:

- A. Excavation and backfill.
- B. Concrete work, including concrete housekeeping pads and other pads and blocks for vibrating and rotating equipment.

- C. Cutting and patching of masonry, concrete, tile, and other parts of structure, with the exception of drilling for hangers and providing holes and openings in metal decks. The Electrical Subcontractor shall identify locations of penetrations, excavations, structural supports, etc. required for the completion of the Work of this Section to the General Contractor in a timely manner.
- D. Installation of access panels in ceilings and wall construction.
- E. Painting, except as specified herein.
- F. Temporary water, heat, gas and sanitary facilities for use during construction and testing.
- G. Outdoor air intake or exhaust louvers.
- H. Cathodic anti-corrosion protection for buried piping and tanks.
- I. Control wiring specifically indicated as part of Division 15.

## 2.4 General Equipment and Materials Requirements

### 2.4.1 General Requirements

All equipment and materials shall be new and of the quality specified. All materials shall be free from defects at the time of installation. Materials or equipment damaged in shipment or otherwise damaged during construction shall not be repaired at the jobsite, but shall be replaced with new materials.

### 2.4.2 Representation of Equipment

All equipment installed on this project shall have local representation, local factory authorized service and a local stock of repair parts.

### 2.4.3 Warranties

No equipment or material shall be installed in such a manner as to void a manufacturer's warranty. The Electrical Subcontractor shall notify the Engineer of any discrepancies between the Contract Documents and manufacturer's recommendations prior to execution of the work. Refer to Division 1, General Requirements for Warranty Requirements.

## 2.5 Shop Drawings

### 2.5.1 General Requirements

After the Contract is awarded, but prior to proceeding with the Work, the Electrical Subcontractor shall obtain complete shop drawings, product data and samples from manufacturers, suppliers, vendors, and Subcontractors for all materials and equipment specified herein, and submit data and details of such materials and equipment for review by the Engineer. Submission of such items shall follow the guidelines set in the General Section of the Specification Document. Prior to submission of the shop drawings, product data and samples to the Engineer, the Electrical Subcontractor shall review and certify that the shop drawings, product data and samples are in compliance with the Contract Documents. Further, the Electrical Subcontractor shall check all materials and equipment after their arrival on the jobsite and verify their compliance with the Contract Documents. A minimum period of ten working days, exclusive of transmittal time will be required in the Engineer's office each time shop

drawings, product data and/or samples are submitted or resubmitted for review. This time period shall be considered by the Electrical Subcontractor when scheduling his Work.

#### 2.5.2 Information to be included in Submittal

The shop drawing submittal shall include all data necessary for interpretation as well as manufacturer's name and catalog number. Sizes, capacities, colors, etc., specified on the drawings shall be specifically noted or marked on the shop drawings.

#### 2.5.3 Information Not to be included in Submittal

Submittals shall contain only information specific to systems, equipment and materials required by Contract Documents for this Project. Do not submit catalogs that describe products, models, options or accessories, other than those required, unless irrelevant information is marked out or unless relevant information is highlighted clearly. Marks on submittals, whether by Contractor, Subcontractor, manufacturer, etc., shall not be made in red ink. Red is reserved for review process.

#### 2.5.4 Responsibility of Submitted Equipment

The Engineer's review of such drawings shall not relieve the Subcontractor of responsibility for deviations from the Contract, Drawings or Specifications, unless he has in writing called the attention of the Engineer to such deviations at the time of the submission. The Engineer's review shall not relieve the Electrical Subcontractor from responsibility for errors or omissions in such drawings.

#### 2.5.5 Proposal of Other Equipment

If the Electrical Subcontractor proposes an item of equipment other than that specified or detailed on the drawings which requires any redesign of the wiring or any other part of the mechanical, electrical or architectural layout, the required changes shall be made at the expense of the trade furnishing the changed equipment at no cost to the Owner.

#### 2.5.6 Substitution of Equipment of Equal Quality

Manufacturer's names are listed herein and on the drawings to establish a standard for quality and design. Where one manufacturer's name is mentioned, products of other manufacturers will be acceptable if, in the opinion of the Engineer the substitute material is of quality equal to or better than that of the material specified. Where two or more manufacturer's names are specified, material shall be by one of the named manufacturers only.

### 2.6 Equipment Manuals

#### 2.6.1 General Requirements

The Electrical Subcontractor shall provide three copies of operations and maintenance manuals for all items. These manuals shall be packaged with additional information including equipment cur sheets and as-built wiring diagrams. Manuals shall contain names and addresses of manufacturers and local representatives who stock or furnish repair parts for items or equipment.

#### 2.6.2 Schedule

Deliver manuals no less than 30 days prior to acceptance of equipment to permit Owner's personnel to become familiar with equipment and operation prior to acceptance.

### 2.6.3 Instruction of Owner's Operating Personnel

Upon completion of installation or when Owner accepts portions of building and equipment for operational use, instruct the Owner's operating personnel in any and all parts of various systems. Such instructions shall cover period of control such as will take mechanical equipment through complete cycle. Make adjustments under actual operating conditions.

## 2.7 Record Drawings

### 2.7.1 General Requirements

As work progresses, and for duration of the Contract, the Electrical Subcontractor shall maintain a complete and separate set of prints of Contract Drawings at job site at all times and record work completed and all changes from original Contract. Drawings shall clearly and accurately include work installed as a modification or added to the original design. At completion of work and prior to final request for payment, the Electrical Subcontractor shall submit a complete set of reproducible record drawings showing all systems as actually installed.

## 2.8 Equipment Specifications

### 2.8.1 Panelboards

The intent is to reuse all existing panelboards, supplementing with new circuit breakers as shown on the drawings. Circuit Breakers shall be trip-free molded case, bolt-on, thermal magnetic circuit breakers, rated for use in the existing panel board. KAIC ratings shall match that of other breakers in the existing panelboard.

### 2.8.2 Grounding System:

A green equipment grounding conductor shall be run with each branch circuit. Grounding conductors shall be soft drawn bare copper.

### 2.8.3 Feeder and Branch Circuit Wiring:

- A. Provide feeder and branch circuits and devices for power to equipment and convenience receptacles. This includes branch wiring to system control panels furnished under other sections.
- B. All circuits feeding panels, circuit feeders and circuit wiring shall be copper, minimum size #12 AWG. Conductors shall be 600V rated with THHN/THWN insulation.
- D. All exposed wiring shall be in EMT conduit. Wiring above acoustic ceiling tiles may be in conduit or as part of an MC cable assembly.
- E. EMT Conduit fittings shall be steel set-screw type in dry locations and compression type for wet or damp locations. Terminations for all EMT conduits shall use insulated bushings or insulated throat connectors in accordance with NEC requirements. All conduits shall be properly supported with hangers or clips at a spacing not to exceed 10 feet. Minimum conduit size is  $\frac{3}{4}$ ".

- F. Flexible metal conduit shall be used for connections to vibrating equipment.
- G. Liquid-Tight flexible metal conduit shall be used for connections to vibrating equipment in wet or damp locations. Liquid tight shall not penetrate the roof or exterior walls and shall not be used in lengths exceeding 36”.
- H. All conduits or penetrations in fire rated walls shall be furnished with fire stopping material to maintain the integrity of the rating.
- I. All conduits penetrating the roof or exterior walls shall be furnished with watertight seals.

2.8.4 Motor Circuit Wiring: Provide all motor wiring, safety disconnects, and motor starters unless integral with equipment.

- A. Safety Switches: Shall be fused or non-fused as required by code. Construction shall be heavy-duty horsepower rated type. Enclosure shall be NEMA 1 where installed indoors and Nema 3R where installed outdoors.
- B. Manual motor starters: Shall be Single phase fractional HP manual motor starters shall be toggle operated, enclosed, one or two pole switches as required by the installation. The enclosure shall be NEMA 1 for indoor locations and NEMA 4 for outdoor, wet and damp locations. A handle guard shall be provided to allow the toggle operator to be padlocked in the OFF position. Starters shall be provided with trip free melting alloy thermal overloads.

2.8.5 Lighting Systems:

- A. Light fixtures shall be provided with housings, trims, ballasts, lamps, lamp holders, sockets, reflectors, wiring and other components required, as a factory-assembled unit for a complete installation. Provide electrical wiring within light fixtures suitable for connecting to branch circuit wiring in accordance with N.E.C. Article 410, Paragraph 25. Provide fluorescent fixtures of sizes, types and ratings indicated and specified in the Lighting Fixture Schedule on the Contract Drawings.
- B. Contractor shall communicate with and provide all rebate worksheets and corresponding equipment cut sheets to Efficiency Maine for approval prior to ordering the fixtures to ensure that the Owner can receive the full value of the rebate for providing high efficiency fixtures and approved lamp/ballast combinations.
- C. Occupancy Sensors: Occupancy sensors of the type and model specified on the drawings shall be provided, installed and wired into the local lighting circuit in the area that the sensors are installed. The engineer will consider equipment of another equal manufacturer, where suitable coverage can be documented.
  - Passive Infrared Wall-Mount Fixtures: Wall mounted occupancy sensors shall be suitable for dual circuit operation as specified on the contract drawings.
  - Ultrasonic/Infrared Ceiling-Mounted Sensors: Ceiling mounted occupancy sensors shall be self-calibrating type as specified on the contract drawings.
  - Power Packs: Power packs shall be provided as required for each room provided with occupancy sensors as needed.



- **Slave Relay Packs:** Slave relay packs shall be provided in rooms with more than one lighting circuit controlled by the occupancy sensor.
- **Installation Requirements:** Provide all miscellaneous equipment and wiring for a complete installation.

## PART THREE: EXECUTION

### 3.1 Wiring Methods

#### 3.1.1 Requirements

Unless otherwise noted all wiring shall be installed in raceway as follows:

- A. **Power Distribution Indoors:** Unless otherwise noted, all other power distribution wiring including feeders and branch circuits shall be installed in electrical metallic tubing (EMT) when exposed and MC Cable when concealed.
- B. **Telephone & Data:** Shall be installed in EMT from the device box to an accessible area above the hung ceiling. Cables installed above the hung ceiling shall be properly installed in a neat and orderly manner on j-hooks.
- C. **Cable Television (CATV):** Shall be installed in EMT from the device box to an accessible area above the hung ceiling. Cables installed above the hung ceiling shall be properly installed in a neat and orderly manner on j-hooks.
- D. **Security Systems Wiring:** Shall be installed in EMT from the device box to an accessible area above the hung ceiling. Cables installed above the hung ceiling shall be properly installed in a neat and orderly manner on j-hooks.

### 3.2 Equipment Arrangement and Access

#### 3.2.1 Location of Equipment

Locate all equipment which must be serviced, operated or maintained in fully accessible positions. Minor deviations from the drawings may be made to allow for better accessibility at no additional cost to the Owner, but changes shall not be made without review by the Engineer. Minimum clearances in front of or around equipment shall conform to the latest applicable code requirements.

#### 3.2.1 Arrangement of Equipment

The size of equipment shown on the drawings is based on the dimensions of a particular manufacturer. Where other manufacturers are acceptable, it is the responsibility of the Electrical Subcontractor to determine if the equipment he proposed to furnish will fit the space available. Layout drawings shall be prepared by the Subcontractor when required by the Engineer or Owner to indicate a suitable arrangement.

### 3.3 Equipment Labeling

#### 3.3.1 Panelboards

All panelboards, indoor transformers, cabinets and other specified equipment shall be labeled with engraved laminated plastic plates, minimum 3/4" high with 3/8" engraved letters. Punch tapes with mastic backings are not acceptable.

#### 3.3.2 Starters and Disconnect Switches

All starters, disconnect switches and other specified equipment shall be marked with engraved laminated plastic plates, minimum 1/2" high with 1/4" engraved letters. Where individual switches or circuit breakers in power or distribution panelboards do not have cardholders, they shall be marked with 1/2" high labels.

#### 3.3.3 Empty Conduits

All empty conduits shall have labels tied to the pull string at each end of each empty conduit, marked as to identification of each end. Junction boxes with circuits provided for future use shall be labeled with appropriate circuit designation.

#### 3.4.4 Panelboard Directories

Cardholders for panelboards shall be filled out with typewritten identification of each circuit, except that the word "spare" shall be written in soft pencil to identify all circuit breakers installed that are not used.

### 3.4 Temporary Light and Power

#### 3.4.1 Requirements

The Electrical Subcontractor shall provide a temporary service to the space in the building as required to provide electric light and power while the space is under construction and until the permanent feeders have been installed, tested and accepted by the Owner. The Electrical Subcontractor shall furnish, install and remove the temporary electrical power and lighting systems and pay for all labor, materials, and equipment required therefore. All such temporary electrical work shall meet the requirements of the National Electrical Code, the local utility company, and OSHA. The Electrical Subcontractor shall furnish all lamps, both initial and replacement, used for the temporary lighting system.

#### 3.4.2 Equipment Provided by Others

The General Contractor and all subcontractors, individually, shall furnish all extension cords, portable lights and lamps therefore, sockets, motors, and accessories as required for their work.

#### 3.4.3 Reimbursable Items

The General Contractor and all subcontractors shall reimburse the Electrical Subcontractor for the following:

- A. Any temporary wiring of a special nature, other than that specified above, required for their work.
- B. Any temporary wiring of construction offices and buildings used by them, other than the office of the General Contractor and the Clerk of the Works.

3.4.4 Removal of Equipment and Wiring

All temporary wiring, service equipment, and accessories thereto shall be removed by the Electrical Subcontractor when directed by the General Contractor.

END OF SECTION 26 00 00