

GENERAL SPECIFICATIONS

DIVISION 16 - ELECTRICAL STANDARDS

SECTION 16010 - GENERAL PROVISIONS

- 1.1 These Standards include guidelines and specifications that establish a level of quality, as well as standard industry accepted practices for the design of respective electrical systems.
- 1.2 The Standards shall be the basis for the electrical equipment and material selection, and system design and layout - but only as applicable to this specific building project. Existing building electrical equipment and systems shall be thoroughly reviewed.
- 1.3 Building management and operations personnel shall be contacted to document the existing equipment and system conditions, as well as Owner standard requirements. Larger offices will have custom power and grounding requirements based on the equipment to be installed. Owner will provide this information during the project. Equipment and system specifications and guidelines that are not applicable to this project shall be disregarded.
- 1.4 Under no circumstances shall any electrical equipment (panel boards, transformers, disconnects, etc.) be located within the Tenant's designated Telecommunication Room unless required by code. The building's common electrical room(s), a separate electrical closet within the Tenant's lease space, or other location such as work room, admin room or break room within the Tenant's lease space are options for the location of such equipment, listed in order of preference. Telecommunication Rooms cannot be located near sources of high Electromagnetic Interference such as elevator systems, electric motors/generators or transformers.

- 1.5 All electrical work shall be performed in compliance with the latest version of the following codes and standards: ANSI, UL, NEC, OSHA, ADA, NFPA 101, IBC, UFC and local codes, amendments and ordinances.

SECTION 16020 - DEMOLITION

- 1.1 All cutting, demolition, removal, patching, leveling and restoration work necessary to accomplish and complete all work under the Contract to be included in the Division 16 contractor's scope of work. This shall include any relocation or reuse of existing materials, equipment, systems, or other work, as well as the disposition of salvaged materials or debris.

- 1.2 Division 16 shall remove all exposed unused conduit and wiring from panel boards to light fixtures and from panel boards to all wiring devices such as receptacles, switches, floor outlets, special electrical devices, sound systems, fire alarm system etc., not indicated to remain. All work shall be coordinated with the Owner. Should any questions arise regarding the removal of a conduit and/or wiring as to its being energized, serving a load in an area not being remodeled, the Contractor shall confer with the Owner before such wiring or conduit is actually demolished. Existing unused pole-thru devices shall be removed and opening shall be sealed with an approved fire rated assembly.

- 1.3 Division 16 shall be responsible for field verify the accuracy of the existing conditions as shown on the drawings. Division 16 shall schedule and carry out his work in such a manner as to cause the Owner a minimum of inconvenience due to service interruption and to make sure no device is cut off from its power source, unless specifically noted to do so.

SECTION 16050 - BASIC ELECTRICAL MATERIALS AND METHODS

- 1.1 Division 16 shall be responsible for received delivery, storage, handling and protection of all material. If anything is damaged, the Contractor shall be responsible for replacement of all material. All material shall be UL listed components and procedures. All material shall be tested, visual inspected, certified or demonstrated to be accurate with industry accepted standards.

- 1.2 Division 16 shall provide engraved name plates to all electrical equipment.
- 1.3 The work included under Division 16 shall consist of furnishing labor and materials necessary for the complete installation of lighting, power, fire alarm and security systems and include minor items that are obviously and reasonably necessary to complete the installation. Such items include bolts, nuts, anchors, brackets, sleeves, and minor offsets in conduit, cable tray, etc. Division 16 shall guarantee all work and materials for the minimum period of one (1) year.

- 1.4 Division 16 shall be responsible for making all electrical connections to all motors, starter, pushbutton, associated wiring and other control devices associated with any mechanical or kitchen equipment. Arrange with appropriate utility companies to provide temporary and permanent utility services as required and coordinate their installation with general contractor.
- 1.5 Division 16 shall be responsible to pay for all fees, permits, licenses, costs charged by the utility companies for utility services and state / local sales taxes.

SECTION 16110 - RACEWAYS

- 1.1 All associated wiring to be enclosed in conduit or its electrical equivalent. All conduit in finished areas shall be concealed in building construction and where required, provide cable strain relief, grounding connectors, expansion fittings and etc. Division 16 shall take note that it is the intention that conduit be concealed in new poured concrete and block walls where it is considered to be the finished surface.

- 1.2 Surface conduit is not allowed in areas where exposed concrete and block walls is the finished surface. (Exceptions: Mechanical Rooms, Electrical Rooms and Garages).
- 1.3 Vertical conduit runs shall be supported every floor for conduit less than 2 1/2" and every other floor for runs 2 1/2" and greater.

- 1.4 Rigid or intermediate conduit shall be used for voltages over 600 volt; underground; in or under concrete floor slabs on grade; in exterior masonry walls, in wet locations; when exposed below 5'-0" A.F.F.
- 1.5 Flexible steel conduit shall be used for transformer connections and lighting fixture drops from junction boxes.

- 1.6 Flexible liquid light conduit shall be used on all motor and vibrating equipment connections.
- 1.7 Surface plug-in strip shall be finish painted steel Wiremold G-4000 series with duplex receptacle 36" on center or approved equal.
- 1.8 Wireway or Raintight wireway 6"x6" shall be steel enclosed wireway with hinged removable cover and be painted with corrosion resistant paint.

SECTION 16120 - BUILDING WIRING AND CABLE

- 1.1 All associated wiring to be enclosed in conduit and shall be labeled or listed by "UL" Underwriters Laboratory. All wiring to be run in 1/2" conduit minimum; homeruns shall be 3/4" conduit minimum.
- 1.2 All existing and new floor slab penetrations for conduit shall be fully packed and sealed in accordance with the applicable building and fire codes.

- 1.3 Furniture system is 3 circuit 8-wire system. Provide each workstation with three circuits. Contractor to provide final electrical connections 5 days prior to substantial completion date: 3 circuit, 3 hot/3neutral/2 ground (10 gauge neutral wires).
- 1.4 Should core drilling be required for the open office environment, conduit will be required for cabling and electrical.

- 1.5 Conduit shall not be mounted on the plywood walls in the telecomm room to support electrical outlets.
- 1.6 Approved flexible metal cable assembly shall be used only where approved as the maximum 6" connection to a light fixture. Home run to panel shall consist of approved conduit and wire.
- 1.7 Armored cable or Metal clad cable shall not be used for "Home runs", be installed in block or brick walls, in or under concrete slabs, be installed within or supported from a communications cable tray/ladder or be used in where cable would be exposed.

- 1.8 Support cables above accessible ceiling using spring metal clips to support cables from structure or ceiling suspension system. Do not lay cable on ceiling panels.
- 1.9 Division 16 shall confirm ceiling support system is rated to support cables. Parallel 3-phase feeder runs in conduit shall have all three phase conductors (including neutral and ground where required) installed in each conduit.

- 1.10 Building Wire
 - A. Description: Single conductor insulated wire.
 - B. Conductor: 98% Commercially pure copper conductors.
 - C. Insulation Voltage Rating: 600 volts.
 - D. Insulation: ANS/NFPA 70, 900C Type THHN, THWN, XHHW

- 1.11 Armored Cable
 - A. Description: ANS/NFPA 70, Type AC.
 - B. Conductor: 98% Commercially pure copper conductors.
 - C. Armor Material: Steel or Aluminum. Interlocked metal tape with continuous bond wire. Provide full size ground wire with all AC cable applications.

- 1.12 Metal Clad Cable
 - A. Description: ANS/NFPA 70, Type MC.
 - B. Conductor: 98% Commercially pure copper conductors.
 - C. Armor Material: Steel or Aluminum.
 - D. Armor Design: Interlocked metal tape, corrugated tube, smooth tube.

SECTION 16130 - BOXES

- 1.1 All pull and junction boxes shall be constructed with seal gaskets, code gauge galvanized steel in concealed and unfinished spaces, prime painted steel in finished spaces.
- 1.2 Install grounding bushings with bonding conductor on all feeder conduits entering box.
- 1.3 Ground bushings and bonding conductors are not required on branch circuit conduits.
- 1.4 All outlet boxes shall be set plumb level and not more than 1/8" back from finished surface. Conduit fittings ("LB", "C", "T") or types approved for the location may be employed as required to facilitate pulling in conductors.

- 1.5 All outlet boxes shall be either pressed steel with knockouts or cast with threaded hubs and be of high conductive metal to maintain maximum electric continuity. Minimum outlet box size shall be 4" square and shall be cover if not in use. Such covers or plates shall conform substantially to the outlet of the boxes with no projecting edges or corner.

- 1.6 Outlet boxes shall not be mounted back to back with through-box. Provide separate outlet boxes offset with flexible conduit loop connection or separate feeds.
- 1.7 Do not cut any re-bar at any new floor cores. Locate re-bar with magnetic locator. Shift cores as required. Fire-stop voids with approved fire stopping and provide 5,000 psi high strength grout. Post-tensioned slab construction may require x-raying the floor for cable locations.

SECTION 16140 - WIRING DEVICES

- 1.1 Furnish and install Underwriters Laboratories, Inc. (UL) labeled devices throughout.
- 1.2 All GFCI switches, fluorescent dimmers or receptacles devices shall be white in color. NEMA 5, made of high impact nylon material, one-piece solid brass ground strap with integral ground and be rated for 20 amperes.

- 1.3 All wall switch occupancy sensors shall be white in color and self-adjusting time delay and sensitivity adjustments. Sensor shall utilize both infrared and ultrasonic (or Microphonic) technology. Wall switch occupancy sensors are default option.

- 1.4 All device cover plates, weatherproof and tamper resistant covers shall be white in color and stainless steel #430 or Thermoplastic (Nylon). High-impact thermoplastic device plates to be used when stainless steel device plates are not desired.

- 1.5 Maintain a 4" minimum clearance between cover plates of wall mounted outlets and adjacent cover plates, walls, columns or similar elements. For floor mounted outlets, maintain a 4" minimum clearance unless noted otherwise, from the edge of a monument (i.e., furniture pedestal). The distance shall be measured from the edge of the cover plate.
- 1.6 Adjacent outlets shall not be greater than 6" O.C. apart, unless noted otherwise.

- 1.7 Outlets in/nice and/or attached to cabinetry shall be furnished and installed to match similar conditions in walls and floors, unless noted otherwise. Furnish and install box extension or other appropriate devices as required.

SECTION 16440 - DISCONNECT SWITCHES

- 1.1 All disconnect switches shall have switch blades which are fully visible in the off position when the door is open.
- 1.2 Switches shall be of dead-front construction with permanently attached arc suppressors hinged or otherwise attached to permit easy access to line-side lugs without removal of the arc suppressor.
- 1.3 Lugs shall be UL listed for copper and/or aluminum cables and front removable.

- 1.4 All current carrying parts shall be plated by electrolytic processes.
- 1.5 Interior disconnect switches shall be furnished in NEMA 1 general purpose enclosures.
- 1.6 Exterior disconnect switches shall be furnished in NEMA 3R enclosures.
- 1.7 Disconnect fused switches shall have an AIC withstand rating of 200,000A minimum.

SECTION 16470 - DISTRIBUTION PANELBOARDS

- 1.1 All distribution panel board shall consist of wall mounted, tin plated electrical grade copper bus, ground bus rated at 50% secondary bus amperes, bus bracing shall be UL listed for the AIC interrupting, fully accessible, completely enclosed, metal structure, incorporating circuit breaker and/or fusible switches.
- 1.2 Main and Distribution breakers 600 amp and less, shall be molded case, quick make, quick break thermal-magnetic, trip indicating, and have common trip on all multiple pole breakers. Each circuit breaker shall have adjustable magnetic trip, bolt-on type, and amperage rating shall be identified by molded or engraved numbers. Any ground fault protection circuit breakers shall be zero sequence type with adjustable trip and time delay settings.

- 1.3 Main and distribution circuit breakers 800 amps and larger shall be stationary, insulated case, manually operated, quick make, quick break type with common trip on all multiple poles. Each circuit breaker shall have adjustable current settings, long time delay, short time delay, short time pick-up, high range instantaneous and I2T in or Out. Any ground fault protection circuit breakers shall be zero adjustable ground fault pick-up and ground fault delay.

SECTION 16475 - OVERCURRENT PROTECTIVE DEVICES

- 1.1 All fuses shall have a single fusible element to eliminate the possibility of unequal current sharing in parallel paths and melting time-current characteristics that are permanently accurate with a maximum total tolerance of 10% in terms of current.
- 1.2 Fuses shall include a "Blow-Fuse" indicator that provides visible evidence of fuse operation while installed in the fuse mounting.
- 1.3 Provide label inside each switch and motor starter cover stating type of fuse required for replacement.

SECTION 16500 - LIGHTING

- 1.1 All fluorescent lighting fixtures shall be installed complete, including canopies, suspensions of proper lengths, hangers, casings, sockets, holders, reflectors, ballasts, diffusing material, louvers, plaster frames, lamps recessing boxes, etc.
- 1.2 All fluorescent lighting fixtures in lay-in type ceilings shall be provided with two No. 12 gauge wire hangers connected from the fixture housing to the structures above and shall include fastening clips.
- 1.3 Sockets shall be porcelain screw-type mogul or medium units, securely fastened to fixture body.
- 1.4 All diffusers shall be framed in a hinged, continuous assembly, lenses, side panels, gasketed seat between the frame and fixture body to prevent light leaks, etc., are to be of .125" thick acrylic plastic and lens prism shall be full size.

- 1.5 Deep celled louvers shall be a minimum of .025" thick and of the specularity.
- 1.6 Provide protective enclosure around recessed light fixtures to maintain minimum of 3" air space between fixture assembly and thermal insulation. Enclosure to be constructed so as to allow free circulation of air around fixture, and not trap heat.

SECTION 16501 - LAMPS

- 1.1 All fluorescent lamps shall be rapid start, T8, Bi-Pin, 3500K and a minimum CRI of 80.
- 1.2 All incandescent lamps shall be 120 volt inside frosted.

SECTION 16502 - LUMINARE ACCESSORIES

- 1.1 All fluorescent, compact and dimmer ballasts shall be electronic style ETL-CBM approved and shall have characteristics for 60 Hz operation with a power factor of not less than 90%. Ballasts shall not exceed 70v C, with the ambient air at 40v C. Fluorescent fixture ballasts shall be Type "P", Class A sound rating, must not exceed a total harmonic distortion (THD) of 10% and shall provide 3 year warranty on ballasts, covering all replacement labor and material costs.
- 1.2 All pulse start metal halide system or HPS ballasts shall be electronic style ETL-CBM approved and shall have characteristics for 60 Hz operation with a power factor of not less than 90%. Ballasts shall not exceed 70v C, with the ambient air at 40v C. Class A sound rating, must not exceed a total harmonic distortion (THD) of 10% and shall provide 3 year warranty on ballasts, covering all replacement labor and material costs.

SECTION 16721 - FIRE ALARM SYSTEM

- 1.1 All fire alarm equipment shall be provided to form a complete coordinated system ready for operation. It shall include, but not be limited to, alarm initiating devices, alarm indicating devices, control panel, auxiliary control devices, annunciators, power supplies, and wiring.
- 1.2 Supervision: The system shall be electrically supervised and monitor the integrity of all conductors. Each designated initiating point shall simultaneously transmit separate and distinct alarm, supervisory and trouble signals to the fire alarm control panel and annunciator.
- 1.3 System Wiring Connections: The system shall be a proprietary, low voltage, closed circuit, electrically supervised, non-coded, continuous sounding type as described in NFPA 72. Circuit type and supervision shall be Class B Style 4 for the SLC and Class B Style W for the NAC.
- 1.4 Audible Alarm Indication: Complete building audible horns to provide a synchronized temporal code fire alarm evacuation signal.
- 1.5 Visual Alarm Indication: Complete building visual xenon-strobe type units to provide a synchronized flash rate. The strobe units will provide the intensities as indicated on the drawings. Additional strobe units are indicated on the drawings to provide supplementary visual signaling in the elevated sound level areas of the building.

- 1.6 Alarm acknowledging, alarm silencing and system resetting shall be accomplished only from the fire alarm control panel. The system shall only be reset by a factory trained and authorized personnel for the installed system. These three (3) functions shall be password protected.
- 1.7 All new components shall be compatible with the existing system and listed to operate with the base building system.

SECTION 16741 - VOICE-DATA AND SECURITY RACEWAY SYSTEM

- 1.1 Provide new and pullings as indicated for voice/data cabling and security devices. Owner's contractor to provide voice/data cabling and security cabling/equipment.
- 1.2 Provide a raceway system for the telephone utility wiring and for the voice/data communication systems wiring. For each wall telephone, stand voice/data outlet, provide one 1800 electrical outlet box with a single-gang mud ring and a 3/4" conduit stubbed to cable tray system, or into nearby accessible ceiling space.

- 1.3 For each voice/data outlet containing more than two (2) voice/data cables, provide one 1900 electrical outlet box with a single-gang mud ring and a 1-1/2" conduit stubbed to cable tray system or into nearby accessible ceiling space. Provide bushings on both ends.
- 1.4 The telecommunications raceway system shall carry only conductors for low voltage communication systems.

- 1.5 Distribution throughout the building shall be through sleeves, cable trays, wireways, and empty conduits stubbed from boxes into ceiling space. Empty conduits are to be utilized where the above are not practical such as exposed areas.
- 1.6 Install 4" sleeves in ceiling stubbed up into plenum space for cable entrance. No more than 4" can show in telecommunications room.
- 1.7 Provide telecommunications grounding bus in each telecommunications room and shall also be directly bonded to building structural steel. Ground connection shall be via a minimum 6 AWG insulated copper conductor.

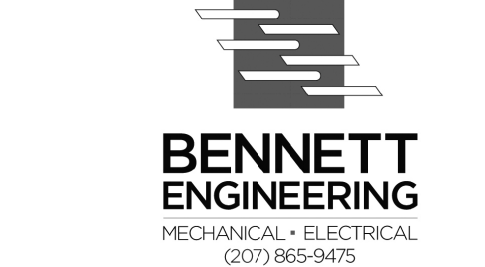
- 1.8 Furnish and install plywood terminal boards in all telecommunication rooms as called out in the architectural plans and specifications.



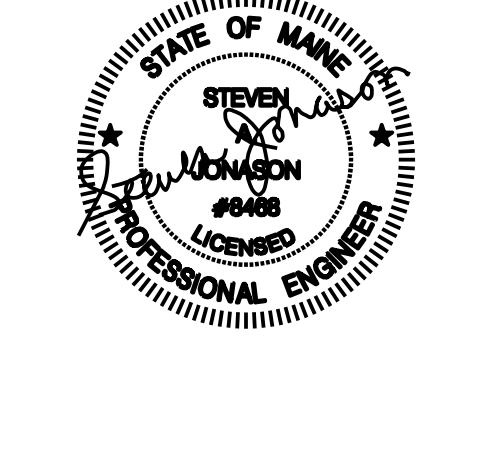
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Certification



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Signing Date

Project For



AMPF Project #

17621008028E

AMPF Cost Center #

3071

AMPF Project Name

PORTLAND

TENANT IMPROVEMENT

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Project No. 17621008028

Drawn By CAT

Checked By SAJ

Date 9/16/16

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Revisions

No.	Date	Description
	9/16/16	PERMIT BID SET

ELECTRICAL SPECIFICATIONS

ES-101