

ELECTRICAL PERFORMANCE SPECIFICATIONS

SECTION 16000 - SCOPE OF WORK

GENERAL REQUIREMENTS: This project requires the installation of electrical systems, in accordance with these Specifications, for the new Skagway Bazaar Building in Skagway, Alaska.

DESCRIPTION OF ELECTRICAL SYSTEMS

- **Service:** Serve the new Skagway Bazaar Building underground from the existing Alaska Power and Telephone distribution system utility pole and transformer. Provide all conduit, wire, grounding, metering and coordination to connect this service. Utilize a single exterior service entrance for the building. The service shall be single-phase, 120/240 volts, with gangable meter bases and main disconnects sufficient for all the phases as follows.
 - Phase 1: Three (3) 200 ampere [two Retail, one House] and one (1) 125 ampere [Retail]
 - Phase 2: Three (3) 125 ampere [all Retail]
 - Phase 3: Six (6) 125 ampere [all Apartments]
- **Distribution:** Provide a 42-circuit, 200-ampere distribution panelboard for the House panel and in each noted retail space to serve all loads in the new areas. Provide a 30-circuit, 125-ampere distribution panelboard in each apartment and each noted retail space to serve all loads in those new areas. Equip each panelboard with sufficient circuit breakers to serve the various loads plus 20 percent spare 20 ampere, single-pole circuit breakers. All feeder circuits shall be run in metallic conduit and all branch circuits shall be in metallic conduit. Type MC (metal clad) cable or type NM (nonmetallic sheathed) cable may be used in concealed spaces. Provide separate equipment grounding conductors in all runs.
- **Receptacles:** Provide duplex convenience receptacles at a minimum spacing of eight feet on center except at front showroom walls where the spacing shall be two feet on center. Circuit loading shall be limited to no more than six devices per circuit. Provide a GFI duplex receptacle adjacent to each sink (total of three) and on the building exterior, one by each retail door (total of six) and one on the back of each building (total of two). Provide an exterior receptacle or powered junction box for each exterior sign location (total of six). Ensure all Ground Fault Interrupting (GFI) devices are provided and located as required by the NEC. Multi-outlet assemblies (plugmold) may be used in lieu of the receptacles noted on the front display wall.
- **Equipment:** Provide final electrical connection to all mechanical, architectural or Owner-furnished equipment specified herein or provided on the job by others. Include disconnects, overcurrent protection, flexible connections, access and guards as required by the equipment, these Specifications and pertinent codes.
- **Lighting:** Provide energy efficient lighting as specified and described herein. Provide basic fluorescent luminaires (industrial type with two 32-watt T-8 lamps and electronic ballasts), switched from both entrances to each retail space, to illuminate the space to 30 footcandles maintained. Feed these lights from an interconnected grid of raceways and junction boxes ten feet on center for future tenant improvement lighting. Include conduit connection to the

panelboard and four-gang boxes at each door. Provide an overhead fan/light combination, switched at the room door, to light and ventilate each toilet room. Provide a single wet location exterior wall mount luminaire at each back door, switched from that area. Provide illuminated exit signs at each door and emergency egress lighting, each with battery backup, as required by applicable codes.

- Telephone System: Provide a telephone service with four receptacles to each retail space. Include the Telephone Termination Board (TTB), recessed boxes, receptacles (devices or jacks), cover plates, raceways and all cabling for each telephone receptacle location. Each individual receptacle box shall be connected with cable via conduit to the TTB.
- Electric Baseboard Heat: Provide electric baseboard heat for the retail spaces and toilet rooms, each with individual thermostat control. Utilize commercial grade equipment and provide the heat loss calculations in the submittals.

COORDINATION: The Electrical Contractor shall review the Contract Documents of other trades involved in the Project and shall coordinate the installation of electrical features with the work of all other trades. Where conflicts are likely with structural, mechanical or other features, perform the electrical installation after the other trades and arrange to eliminate conflicts.

SECTION 16010 -- GENERAL PROVISIONS

DEFINITIONS

Accepted/Approved:	Shall mean accepted by the Project Representative.
Project Representative:	Shall mean the Owner-authorized representative.
Furnish:	Shall mean deliver to the project site.
Install:	Shall mean build into the work, including connections and all parts considered incidental to a complete installation.
Provide:	Shall mean furnish and install complete.
Work or Project:	Shall mean all work required by the Contract Agreement.

ABBREVIATIONS AND INITIALS: Any or all of the following may appear in the Specifications, and shall be applied per the following explanations:

AFF	Above Finished Floor
AIC	Amperes Interrupting Capacity (RMS Symmetrical)
ANSI	American National Standards Institute
ASTM	American Society for Testing and Materials
AWG	American Wire Gauge Size
EMT	Electrical Metallic Tubing
GND	Ground
HP	Horsepower
IEEE	Institute of Electrical and Electronics Engineers
IES	Illuminating Engineering Society
NEC	National Electrical Code
NECA	National Electrical Contractors Association, Inc.
NEMA	National Electrical Manufacturers Association

NIC	Not in Contract
OSHA	Occupational Safety and Health Administration
RGS	Rigid Galvanized Steel Conduit
UL	Underwriters Laboratories

SECTION 16012 -- SUBMITTALS

CONTRACTOR'S CERTIFICATION: Each submittal shall contain a certification stating that the Electrical Contractor has reviewed the list and that the items proposed conform to the Contract requirements. Said certification shall be signed by the individual under whose Alaska Electrical Administrator's license the work will be performed, and a copy of the license shall be included.

GENERAL: Prior to the purchase of any materials or equipment, the Contractor shall submit to the Project Representative for acceptance data completely describing all items intended for use in the work. This data shall include the manufacturer and identifying number or nomenclature; the manufacturer's published data as to size, capacity, power requirements and dimensions; and such other information as necessary to properly describe each item. Catalog cuts fulfilling these requirements will be considered appropriate for this application. Such "commodity" items as those covered by Sections 16110, 16120, 16130, 16131, 16190, and 16450 need not be submitted if they are being provided exactly as specified.

SECTION 16020 -- WORK INCLUDED

GENERAL: Provide all work designated in these specifications for a complete, safe and functional installation. Unless otherwise noted, all materials shall be of new manufacture, American-made, of the manufacturer's standard construction for the application. The omission of express reference to any part, supplies, services, or facilities necessary for or incidental to a complete installation shall not be construed as a release from furnishing such items. Any deviations from the installation due to a particular manufacturer's requirements shall be made without additional cost to the Owner.

INSTALLATION: All materials shall be installed in a neat, orderly and secure fashion, as required by these specifications and commonly recognized standards of good workmanship, for which the Project Representative's judgment shall be final. In addition to the access and clearance requirements of the NEC, all items normally considered to be factory or field-serviceable shall be installed in such a manner as to be easily and safely accessible and removable without dismantling surrounding construction.

PROTECTION AND CLEANING: All electrical materials and equipment shall, both in shipment and during the entire duration of construction work, be protected against water, dust, debris, over spray or any other contamination or damage, whether environmental in origin or as a result of handling or construction work. Any damaged items shall be replaced or repaired to original manufactured condition, at no additional cost to the Owner. All construction dust, debris, over spray, scrap and surplus materials, etc. resulting from this work shall be cleared away, leaving the installation in completely clean condition.

WIRING OF UTILIZATION EQUIPMENT: Where equipment arrangement varies, making necessary additional disconnect switches in order to comply with the NEC, such disconnects shall be provided at no additional cost to the Owner. Prior to ordering materials or performing

the installation, the Electrical Contractor shall verify the sizes, configurations, and locations of all equipment, to ensure that all required connections are correctly provided.

REPAIR OF EXISTING FEATURES: Where previously completed building surfaces or other features must be cut, penetrated or otherwise altered for the installation of electrical features, such work shall be carefully laid out and performed, and any subsequent patching or repairs performed by skilled mechanics of the trades involved, at no additional cost to the Owner.

WORK INCIDENTAL TO SUBSTITUTIONS: When substitutions for specified methods or materials alter the relationship between the work actually required and that called for by the Specifications, the Contractor shall bear responsibility for all expenses incurred by any necessary revisions, including the work of other trades.

SECTION 16025 -- CODES AND FEES

CODES: All work shall comply with the latest editions of:

- The National Electrical Code (NEC).
- The National Electrical Safety Code (NESC).
- The NFPA Codes.
- OSHA Regulations.
- The International Building Code (IBC).
- The International Fire Code (IFC).
- Americans with Disabilities Act (ADA)
- Previous editions of the above, where required by Federal, State, or Local laws and regulations.
- All applicable Federal, State, and Local laws and regulations.

PERMITS AND FEES: The Contractor shall obtain and pay for all permits and connection fees required for the work in this Division.

OTHER STANDARDS: Unless otherwise noted or specified, all materials and work shall be in conformance with the applicable standards of the following organizations:

- American National Standards Institute (ANSI).
- American Society for Testing and Materials (ASTM).
- Institute of Electrical and Electronic Engineers (IEEE).
- National Electrical Contractors Association (NECA).
- National Electrical Manufacturers' Association (NEMA).
- Underwriters Laboratories (UL) or Factory Mutual (FM).

SECTION 16032 -- O & M MANUALS, AS-BUILTS

OPERATION & MAINTENANCE MANUALS: The electrical Contractor shall submit for review two (2) copies of Operation and Maintenance Manuals for the project. These manuals shall be bound and shall include:

- All information covered by the final accepted submittals, modified as necessary to reflect the final as-built condition.

- Complete listings of repair and replacement parts for all equipment, and names and addresses of the suppliers from which the equipment was obtained.
- Complete listing of all equipment that may require periodic servicing, with recommended schedules and complete instructions for performing said servicing. Service instructions shall include complete English-language narrative descriptions and illustrations necessary to describe all service operations.

AS-BUILT DRAWINGS: The Electrical Contractor shall at all times keep a current set of Contract Drawings on the project site. This set shall be kept in good condition, and shall be neatly and accurately marked to show the as-built condition of the electrical installation. Of particular importance are the precise locations of buried or otherwise concealed features such as conductors, raceways and junction boxes. Upon completion of the project, the field-marked set of drawings shall be forwarded to the Project Representative, along with any supplementary drawings, sketches, notes or other materials necessary to completely describe the as-built condition of the electrical installation.

SECTION 16040 -- IDENTIFICATION

EQUIPMENT LABELING: Panelboards, disconnect switches, switches, circuit breakers and the like shall be labeled with laminated plastic labels engraved with white letters on black background. Lettering shall be block style, 1/4" tall, except where space limitations, drawing notes, or other requirements dictate otherwise. Labels shall be secured with pop rivets or fasteners per 16190. Adhesive attachment is not acceptable. Temporary markings will not be permitted to remain on equipment; they shall be removed, and any defaced finishes repaired to match original manufactured condition.

CONDUCTORS: All conductors in pull or junction boxes or other enclosures shall be permanently and legibly tagged or labeled with panel and circuit numbers or other data that clearly identifies their origin, function, and destination.

SECTION 16110 -- RACEWAYS

APPLICATIONS: All conductors shall be run in metal raceways as follows:

- Raceways Outdoors, Buried in Ground or Under Slab: RGS Conduit or PVC Conduit.
- Branch Raceways in Heated Areas Above Slab on Grade: EMT or MC Cable
- The final connection to any motor or other rotating or vibrating equipment, or equipment which may require position adjustment after installation, shall be made through a slack section of liquidtight flexible metal conduit 18" to 36" long.
- Type MC cable may be utilized for accessible lighting and power circuits. All runs for signal, communications, computer and lighting control shall be in raceway.

LAYOUT: Raceways shall be concealed within finished walls and ceilings and as otherwise noted. Exposed raceways shall be run square with the building lines. Concealed raceways may be run in direct lines where practical. Underfloor raceways for slab-on-grade construction shall be embedded in the fill under the slab, not in the slab itself. Where raceways are required or

permitted to be embedded in concrete, the thickness of concrete on all sides of each raceway shall not be less than 2".

VAPOR BARRIER: At all raceway penetrations of the vapor barrier provide a double splice patch (one on each side of vapor barrier) by cutting a square piece of vapor barrier 6" larger on all sides than the pipe. Cut a round hole in the center of each splice patch, smaller than the pipe, to form a stretched fit. Force the pipe through each splice patch and tape all sides with vapor-barrier tape.

ASSEMBLY: Raceways shall be physically and electrically continuous from enclosure to enclosure. Electrical continuity for non-metallic conduits shall be ensured by inclusion of an NEC-sized grounding conductor. For metallic conduits, all joints and fittings shall be free of foreign materials and made up wrench tight.

PULL STRINGS: Provide nylon pull strings in all conduits without conductors.

SECTION 16120 -- WIRE AND CABLE

CONDUCTORS: All conductors shall be copper. Conductors #10 AWG and smaller may be solid, unless otherwise noted or specified in a product that is only available stranded. Conductors #8 AWG or larger shall be stranded. Provide an oversized (#10) neutral for all receptacle circuits.

INSULATION TYPES: Branch circuit conductors shall be 600 volt insulated, and unless otherwise noted, shall have type THHN/THWN or XHHW insulation. Outdoors or other cold location conductors shall have type THW or XHHW insulation. Nylon-jacketed conductors such as types THHN or THWN shall not be used in any location subject to ambient temperatures below 32° F. Conductors in fluorescent fixture wiring channels shall have 90° C insulation rating.

SECTION 16130 -- OUTLET BOXES

BOXES: Provide outlet boxes for connection of branch circuits to fixtures and devices as specified herein. Boxes shall be the products of Racor, Steel City, Appleton, Crouse-Hinds, or accepted equal.

INSTALLATION: Outlet boxes shall be installed plumb with, and securely fastened to the structural framing of, the surrounding construction. Recessed boxes shall have plaster rings such that the device cover plates are tight to the wall or ceiling finish.

THROUGH-WALL BOXES: No through-wall boxes will be permitted. Where outlets are mounted back-to-back on a common wall, they shall be offset horizontally a minimum of 12", to minimize sound transmission.

VAPOR BARRIER: Where sheet metal boxes penetrate the building vapor barrier, their exterior surfaces shall be completely covered with overlapped application of vapor-barrier tape to effectively seal all unused knockouts and other holes against vapor migration. The edges of the hole in the vapor barrier shall be securely sealed to the lip of the box with vapor barrier tape and/or an adhesive compatible with the vapor barrier material.

SECTION 16131 -- PULL AND JUNCTION BOXES

GENERAL: Where necessary in raceway systems to facilitate conductor installation or to redirect raceway runs, provide conduit bodies or pullboxes as further specified herein. At the minimum, raceway runs shall have a pullbox or conduit body every 100 feet or after every 270° of bends, whichever comes first. Where otherwise necessary to tap or terminate raceway runs, provide junction boxes as specified herein.

SIZES: Unless otherwise noted or specified, pull and junction boxes shall be sized according to NEC requirements for the number, size and entry configuration of the conduits and conductors entering them.

INSTALLATION: Pull and junction boxes shall not be installed in visible locations in finished areas unless specifically called for or accepted by the Project Representative. Pull and junction boxes shall be securely fastened to the building structure by means independent of the raceways entering.

SECTION 16140 -- WIRING DEVICES

RECEPTACLES: Single and duplex receptacles shall be premium specification grade, ivory-faced, self-grounding, 120 volt, 15 ampere, 3wire, NEMA 5-15R configuration, with screw terminals. Where individual receptacles are connected to 20-ampere branch circuits, they shall be rated 20 amperes.

GFCI: GFCI receptacles shall have NEMA 5-15R face configuration, single-strap mounting and shall have "TEST" and "RESET" buttons accessible from front. Ground fault trip level shall be 5 milliamperes, and the trip circuitry shall be essentially immune to nuisance tripping due to spurious influences such as RF noise.

SWITCHES: Switches shall be premium specification grade, AC quiet type, with screw terminals, rated 20 amperes at 120 volts. Switch handles shall be ivory.

PLATES: Cover plates for devices in recessed boxes shall be made of break resistant nylon, colored to match the device. Cover plates for devices in surface-mounted boxes shall be of pressed or machined metal construction, specifically designed to suit the boxes.

TERMINALS: Wiring devices shall have binding-screw or screw-held pressure-plate type terminals only. Terminals using spring pressure to secure the wire and make electrical contact are specifically forbidden.

SECTION 16180 -- OVERCURRENT DEVICES

CIRCUIT BREAKERS: Unless otherwise noted, circuit breakers shall be of the molded-case thermal-magnetic type, with the size, number of poles and interrupting capacity as required by the installation. Ampere ratings shall be clearly visible, even when the breaker is installed in its appropriate enclosure. Each breaker pole shall provide both instantaneous and inverse-time

tripping, with tripping clearly indicated, and a common-tripping tie to any other poles in the same breaker. Breakers shall be operated by a toggle handle and shall have a quick-make, quick-break, over-center switching mechanism that includes a trip-free feature so that the contacts cannot be held closed against tripping currents.

SECTION 16190 -- FASTENING HARDWARE

FASTENERS: Raceway supports, boxes, fixtures and other electrical features shall be securely fastened by wood screws or sheet metal screws on wooden surfaces, toggle bolts on hollow masonry units, expansion bolts on concrete or brick, and machine screws or welded threaded studs on steel work. Threaded studs driven by a powder charge and provided with a lock washer, flat washer and nut(s) are acceptable in place of expansion bolts or machine or wood screws.

ASSOCIATED HARDWARE: All fasteners shall be provided with flat washers. All fasteners having non-tapered threads (such as machine screws) shall also be provided with a lock washer under the bolt head or nut, whichever is turned in the process of tightening. Fasteners through resilient materials shall have stop sleeves. Nuts, washers and sleeves shall be of the same material and finish as the fastener to which they are applied.

HARDWARE COMPOSITIONS AND FINISHES: In heated indoor areas, all threaded fasteners and associated hardware shall be steel, with a zinc or cadmium-plated finish. Where PVC or liquidtight flex conduit is installed on wood construction in outdoor, damp or corrosive environments; fasteners shall be made of monel or a stainless steel alloy suitable for marine environments. Fasteners on steel construction in outdoor, damp, or corrosive environments shall be of the largest trade size that will fit the item being fastened, shall have the coarsest threads commercially available in that size and shall be hot-dip galvanized steel. Zinc electroplate will be acceptable only in the smaller sizes where hot-dip galvanized is not commercially available.

INSTALLATION: All fasteners shall be tightened to within secure limits for the size of fastener and material(s) fastened. For critical applications, such as busbar connections, a torque wrench shall be used to tighten the fasteners to the manufacturer's recommended value.

SECTION 16450 -- GROUNDING

SCOPE: All metal raceways, enclosures, other electrical equipment, as well as non-electrical equipment that may pick up harmful potentials from the electrical system, shall be bonded and grounded as required by the NEC.

CONDUCTORS: All grounding conductors and bonding jumpers shall be copper, sized according to the NEC. Where separate equipment grounding conductors are called for, they shall be green insulated where run with branch circuits and bare where run with feeders.

SECTION 16471 -- BRANCH CIRCUIT PANELBOARDS

PANELBOARD FEATURES: Branch panelboards shall be of the surface mounted, circuit breaker type, with the following features:

- Current rating of the main buses and all bus components shall be as required by the installation and shall be braced to withstand fault currents of the peak magnitude. Each panelboard shall be bussed full height (including bus fingers and related hardware).
- Panelboard shall have main lugs only, sized to accommodate the appropriate feeders.
- Panelboard front shall not contain any visible screws or other fasteners. Front shall have a lip or bracket that rests on the bottom return flange of the panel enclosure, to permit the front to be held in place with one hand while fastening. Each front shall have a hinged door with a locking latch, furnished with two keys.
- An adequate ground bus shall be provided for all branch circuit equipment grounding conductors, plus 20% spare.

BRANCH CIRCUIT BREAKERS: Panelboard shall be furnished with bolt-on branch circuit breakers in conformance with Section 16180, in the quantity, size, number of poles, and interrupting ratings specified.

CIRCUIT DIRECTORY: Branch panelboard door shall have a typed circuit directory card of the two-column type, with odd numbers down the left, and even numbers down the right.

INSTALLATION: Branch panelboard shall be securely fastened to the structural framing of the surrounding construction and shall be installed plumb with the surrounding construction. Ensure controls or other enclosures are not mounted on or adjacent to the top, bottom or sides in such a manner as to obstruct any future branch raceway entry space.

SECTION 16500 -- LIGHTING

SUBMITTALS: Acceptance of lighting equipment shall be obtained via the submittal process before equipment is ordered. Contractors seeking substitution of competitive equipment shall be prepared to furnish samples of specified and proposed substitute fixtures for comparison.

LAMPS: Unless otherwise noted, lamps shall be the product of General Electric, Osram Sylvania or Philips.

LENSES AND DIFFUSERS: Where plastic lenses or diffusers are used, they shall be made only of discoloration-resistant virgin acrylic, with a minimum overall thickness of 1/8".

BALLASTS: Unless otherwise noted, fluorescent lighting ballasts shall be rapid start electronic, high power factor type, listed or labeled by UL and certified by CBM or CSA, sound-rated "A", equipped with Class "P" thermal protection, full light output, energy-saving type. In applications where this type is not commercially available, the most energy-efficient type commercially available for the application will be acceptable. Ballast(s) that the Project Representative judges to be excessively noisy at the time of final inspection or during the warranty period shall be replaced at no cost to the Owner.

ACCESSORIES: Lighting fixtures shall be provided complete with all suspension, trim, mounting and operating accessories normally considered necessary for a complete, functional and safe installation. Canopies for pendant-hung fixtures shall be of the ball-joint type.

SPARE LAMPS: Provide spare lamps for each lamp type, in the quantity of 10% of the number of lamps of each type (minimum two of each).

SECTION 16670 -- TELEPHONE RACEWAYS

SCOPE: Furnish complete raceway and outlet systems as specified herein for installation of telephone cables and equipment.

RACEWAYS: Raceways shall be as specified for power wiring, for the locations where they are to be installed. All raceways shall be 3/4" minimum, UON.

OUTLETS: Provide outlet boxes at least 2-1/8" deep by 4" square with single-gang ring. Cover plates shall comply with Section 16140, single gang with appropriate configuration for the receptacle type. Cover plates shall be engraved "TELEPHONE" as required.

SECTION 16865 -- ELECTRIC BASEBOARD HEAT

SUBMITTAL REQUIREMENTS: Provide submittal data, per Section 16012, for all baseboard heaters, controls and associated components. Include the heat loss calculations for each area along with all design parameters.

BASEBOARD HEATERS: Provide light commercial duty electric baseboard heaters. Each heater shall be equipped with overheat protection along the full length of the heating element. Baseboard units may be rated for 120 volts up to a capacity of 1000 watts. Above that size all units shall be rated for operation at 240 volts. Provide baseboard heaters in each retail space and in each toilet room. Install heaters level and plumb, in accordance with manufacturer's instructions. All connections to the baseboard heaters shall be made from a wall-mounted box.

THERMOSTATS: Thermostats shall be line voltage devices compatible with the baseboard heaters. Provide heavy-duty units with a nominal temperature range 50° to 90° F, nominal 5° F differential, standard-response, DPST contacts rated 20 amperes minimum at 240 VAC. Provide a single thermostat in each toilet room to control the each room heater and a single thermostat in each retail space, with auxiliary relay(s) as required, to control the respective baseboard heaters in the space. Wall mount thermostats on interior walls, opposite the heater controlled. Feed the thermostat from the circuit breaker such that the heater is downstream.

BRANCH CIRCUIT WIRING: Provide branch circuit wiring using the materials and methods described elsewhere in these specifications.

END OF ELECTRICAL PERFORMANCE SPECIFICATIONS