



State of Alaska
Department of Environmental Conservation
Village Safe Water Program

555 Cordova Street
Anchorage, AK 99501
John.mcdonald@alaska.gov

May 03, 2022

To: Vendor List

Re: Amendment 5
ITB 22-VSW-UNK-040
Unalakleet Well House
ITB Due Date: May 06, 2022 @ 2:00 PM AST

The following are vendor questions and the department's response:

1. Vendor: We would request the lab testing results be removed for a shelter manufacturer who is using non-proprietary building materials, as the international building code (IBC) has already tested these items. When you invent or have a proprietary product, you have it lab tested so you can prove what you have. When you're building using common IBC materials, those properties are already well known, tested and proven. At that point, you have it engineer stamped to prove that the calculations have been completed and authenticated.

If you were to call State of Alaska DOT, they use a standard called "L-109" that they use for all their shelters. We meet that specification and have provided many shelters according to that specification this year and have several PO's on the books to send up to Alaska as well. If you would adopt "L-109" instead of laboratory testing, we would be covered.

On the attachment, please scroll down to page (4) 109-3.21 and it will talk about the structure that State of Alaska DOT accepts.

Department: Technical Specification 80903.00 Unalakleet Water Source IFAR Technical Specifications, Section 13 34 23, part 1.1 System Description, A.4. Delete current language and replace with “Roof deck Shall be compliant with the latest version of International Building Code (IBC) adopted by the State of Alaska Fire Marshal”.

Technical Specification 80903.00 Unalakleet Water Source IFAR Technical Specifications, Section 13 34 23, part 1.2 Quality Assurance, A.1, c. Delete current language and replace with “Manufacturer shall provide engineered drawings for the structure showing all elements of the building envelope. The drawings shall be stamped by a professional engineer licensed in the State of Alaska”.

The attachment titled “Item L-109 Airport Transformer Vault and Vault Equipment” is attached for reference purposes only.

John McDonald

John McDonald
Procurement Specialist

ITEM L-109 AIRPORT TRANSFORMER VAULT AND VAULT EQUIPMENT

DESCRIPTION

109-1.1 This item shall consist of removing an existing airport transformer vault and equipment ~~electrical enclosure~~, and constructing an airport transformer vault or a prefabricated metal housing ~~electrical enclosure~~ per these Specifications and per the design and dimensions shown on the Plans. This work shall also include the installation of conduits in the floor and foundation, painting and lighting of the vault or metal housing, and the furnishing of all incidentals that are necessary to produce a completed unit. Included as a separate part under this item or as a separate item where an existing structure (vault, metal housing, enclosure, or building) is to be utilized shall be the furnishing of all vault equipment, wiring, electrical buses, cable, conduit, and grounding systems. This work shall also include the painting of equipment and conduit; the marking and labeling of equipment and the labeling or tagging of wires; the testing of the installation; and the furnishing of all incidentals necessary to place it in operating condition as a completed unit to the satisfaction of the Engineer.

EQUIPMENT AND MATERIALS

109-2.1 GENERAL. Obtain approval of all materials and equipment proposed for the work. Submit to the Engineer five (5) complete listings of materials and equipment as indicated in the Specifications and shown on the Plans. Prepare the list to clearly identify the material or equipment by item, name, or designation used on the Plans or Specifications and indicate where specified. The submittals will be neatly bound, clearly indexed, and include applicable catalog numbers, cuts, wiring diagrams, performance data, operation and maintenance manuals, etc., for all material or equipment listed in this subsection, or elsewhere in these Specifications.

In addition, wherever called for in these Specifications, include in the submittal certificates of compliance, manufacturer's instructions and/or shop drawings, or proposed construction, or installation procedures. All materials of similar class or service will be from one manufacturer. Unless otherwise indicated, the capacities, sizes, and dimensions provided will be considered minimum values.

Deliver and store all manufactured materials in their original containers, with the manufacturer's name, brand, and identifying number clearly indicated on the container.

- a. Airport lighting equipment and materials covered by advisory circulars (AC) shall be certified in AC 150/5345-53, *Airport Lighting Equipment Certification Program* (AC 150/5345-53) and listed in the AC 150/5345-53 Addendum. AC 150/5345-53, the latest certified equipment list, and the address list of certified airport lighting equipment manufacturers are available on the FAA Airport Engineering, Design, & Construction web page: <https://www.faa.gov/airports/engineering/>
- b. All other equipment and materials covered by other referenced specifications shall be subject to acceptance through manufacturer's certification of compliance with the applicable specification when requested by the Engineer.
- c. Equipment and materials shall meet the Buy American requirements contained in GCP Section 60.

CONSTRUCTION OF VAULT AND PREFABRICATED METAL HOUSING

109-3.1 ELECTRICAL VAULT BUILDING. (Not Used).

109-3.2 CONCRETE. The concrete for the vault or electrical enclosure shall be proportioned, placed, and cured per P-610 Concrete for Miscellaneous Structures.

109-3.3 PRECAST CONCRETE STRUCTURES. Precast concrete structures shall be furnished by a plant meeting National Precast Concrete Association Plant Certification Program or another third party certification program approved by the Engineer.

~~109-3.4 REINFORCING STEEL.~~ Reinforcing steel bars shall be intermediate or structural grade deformed type bars and shall be per ASTM-A615.

~~109-3.5 BRICK.~~ Brick shall be per ASTM C62, Grade SW.

109-3.6 STEEL CONDUIT. Rigid steel conduit and fittings shall be per Underwriters Laboratories Standards (UL) 6 and 514B. They shall be galvanized on the outside. All fittings shall conform to the same specification as the conduit.

- a. **Electrical Metallic Tubing (EMT).** EMT shall be according to UL Standard 797. All fittings shall be steel, compression type with insulated throats. EMT shall only be used in dry interior locations.

~~109-3.7 PLASTIC CONDUIT AND FITTINGS.~~ Plastic conduit and fittings shall conform to the requirements of UL-651 schedule 40 polyvinyl chloride (PVC) suitable for use above or below ground.

109-3.8 LIGHTING. ~~Vault, metal-housing or e~~Electrical enclosure light fixtures shall be of a vapor-proof type. Indoor lighting fixtures for metal-housing or electrical enclosures shall be LED type with frosted lens, surface mounted, approximately 4000 lumen output, 4000K color temperature.

Emergency lights shall include two LED lamp heads with battery backup and integral charging and transfer electronics with self-testing features and diagnostic indicators.

109-3.9 OUTLETS. Convenience outlets shall be heavy-duty duplex units designed for industrial service. Outlets shall be grounding-type, AC rated 20 amperes, 125 volts, 2-pole, 3-wire NEMA 5-20R, housed in device boxes with cover plates.

109- 3.10 SWITCHES. ~~Vault, metal-housing or e~~Electrical enclosure light switches shall be single-pole switches. Switches shall be heavy-duty grade, 277 volts of Alternating Current (AC), rated for inductive and fluorescent lamp loads up to 20 amperes. Switches shall be of the type indicated by a symbol on the Plans. Where more than 1 switch is shown at a point, they shall be set under 1 plate, unless otherwise noted.

109-3.11 PAINT.

- a. Priming paint for non-galvanized metal surfaces shall be a high solids alkyd primer compatible with the manufacturer's recommendations for the intermediate or topcoat.
- b. White paint for body and finish coats on metal and wood surfaces shall be ready-mixed paint conforming to the Master Painter's Institute (MPI), Reference #9, Exterior Alkyd, Gloss.
- c. Priming paint for wood surfaces shall be mixed on the job by thinning the specified white paint by adding 1/2-pint of raw linseed oil to each gallon.
- d. Paint for the floor, ceiling, and inside walls shall be a urethane-modified alkyd floor enamel. Walls and ceiling shall be light gray and the floor shall be medium gray.
- e. The roof coating shall be hot asphalt material per ASTM D2823. Asbestos-free roof coating per ASTM D4479 may be substituted if required by local codes.

~~109-3.12 GROUND BUS.~~ Ground bus shall be 1/8 x 3/4-inch minimum copper bus bar.

109-3.13 SQUARE DUCT. Duct shall be square, factory finished steel with NEMA 1 or 3R rating for interior and exterior use, respectively. The entire front of the duct on each section shall consist of a hinged or removable cover for ready access to the interior. The cross-section of the duct shall be not less than 4 x 4 inches except where otherwise shown on the Plans.

109-3.14 GROUND RODS. Ground rods shall be copper-clad steel, 3/4-inch x 10 feet.

~~109-3.15 VAULT PREFABRICATED METAL HOUSING.~~ The prefabricated metal housing shall be a commercially available unit.

109-3.16 FAA-APPROVED EQUIPMENT. Certain items of airport lighting equipment installed in vaults are covered by individual FAA equipment specifications in ACs listed below.

AC 150/5345-3	Specification for L-821, Panels for Remote Control of Airport Lighting
AC 150/5345-5	Circuit Selector Switch
AC 150/5345-7	Specification for L-824 Underground Electrical Cable for Airport Lighting Circuits
AC 150/5345-10	Specification for Constant Current Regulators and Regulator Monitors
AC 150/5345-13	Specification for L-841 Auxiliary Relay Cabinet Assembly for Pilot Control of Airport Lighting Circuits.
AC 150/5345-49	Specification for L-854, Radio Control Equipment

The L-821 control panel shall be a custom-fabricated FAA-certified panel with controls for lighting systems as shown on the Plans. The control panel shall be wall-mounted with a NEMA 4 or 12 enclosure and shall include all components necessary for FAA certification and to accomplish the sequence of operations as described and depicted on the Plans.

109-3.17 OTHER ELECTRICAL EQUIPMENT. Distribution transformers, oil switches, cutouts, relays, terminal blocks, transfer relays, circuit breakers, and all other regularly used commercial items of electrical equipment not covered by FAA equipment specifications and ACs shall conform to the applicable rulings and standards of the Institute of Electrical and Electronics Engineers (IEEE) or the National Electrical Manufacturers Association (NEMA). When specified, test reports from a testing laboratory indicating that the equipment meets the specifications shall be supplied. In all cases, equipment shall be new and a first-grade product. This equipment shall be supplied in the quantities required for the specific project and shall incorporate the electrical and mechanical characteristics specified in the proposal and Plans. Equipment selected and installed by the Contractor shall maintain the short circuit current bracing rating and interrupting current rating of the existing systems or specified rating whichever is greater.

109-3.18 WIRE. Wire in conduit rated up to 5,000 volts shall be per AC 150/5345-7, Specification for L-824 Underground Electrical Cables for Airport Lighting Circuits. For ratings up to 600 volts, thermoset wire conforming to Fed. Spec. A-A-59544, Type XHHW-2 shall be used. The wires shall be of the type, size, number of conductors, and voltage shown on the Plans or in the proposal.

a. **Control Circuits.** Unless otherwise indicated on the Plans, wire shall be not less than #12 American wire gauge (AWG) and shall be insulated for 600 volts. If telephone control cable is specified, #19 AWG telephone cable per ANSI/Insulated Cable Engineers Association (ICEA) S-85-625 specifications shall be used.

b. **Power Circuits.**

(1) 600 volts maximum – Wire shall be #12 AWG or larger and insulated for at least 600 volts.

(2) 3,000 volts maximum – Wire shall be #8 AWG or larger and insulated for at least 3,000 volts.

(3) Over 3,000 volts-Wire shall be #8 AWG or larger and insulated for at least the circuit voltage.

109-3.19 SHORT CIRCUIT / COORDINATION / DEVICE EVALUATION / ARC FLASH ANALYSIS. The Engineer shall ensure calculations and analysis are performed to ensure that all equipment bracing and overcurrent protection device interrupting ratings exceed the calculated available short circuit current. The Engineer shall ensure the arc flash incident energy has been calculated at all electrical equipment that is

likely to be accessed while energized and shall provide the information required to produce arc flash labels containing at a minimum, equipment name, voltage/current rating, available incident energy and flash protection boundary. The Engineer shall ensure overcurrent protection devices are adequately coordinated. The analysis shall comply with NFPA 70E and IEEE 1584.

Provide supporting data on new and existing electrical equipment to allow the performance of the arc-flash calculations, as facilitated by the Engineer. The data shall include size of the utility transformer and impedance, if available; size, length, and material of feeder conductors; and make, model, trip rating, and AIC rating of circuit breakers.

109-3.20 WOOD PLATFORM FOUNDATION. If a wood platform foundation is specified, the Contractor shall construct the platform as shown on the Plans. The floor system shall consist of urethane foam core insulated panels with interior and exterior surfaces or similar manufacturer to the building structure. The panels shall be constructed on grade beams of the size shown. Grade beams may be of timber or steel. Timber shall be Douglas Fir-Larch. Timbers shall be pressure treated according to the American Wood Preservers Bureau (AWPB) FDN Standard and shall bear AWPB Quality Mark of an approved inspection agency as described in the AWPB Standard. Preservative salt retention shall be not less than 0.6-pounds per cubic foot (lb/ft³). Wood shall be kiln dried after impregnation. Steel grade beams shall be hot-dipped galvanized according to ASTM A123. The building shall be anchored with soil anchors meeting the requirements of P-650 Aircraft Tie-Down, or as shown on the Plans.

109-3.21 ELECTRICAL ENCLOSURE. The electrical enclosure shall be a pre-engineered structure with minimum dimensions shown on the Plans. The enclosure shall be installed on either a concrete slab or wood platform floor/foundation as shown on the Plans.

The enclosure shall meet the following requirements:

a. Panels and Facings.

- (1) The enclosure may be constructed with separate interlocking panels forming the walls and roof or as a single unit. The enclosure exterior walls shall be foamed in place polyurethane core with 3/4- inch plywood on the interior surface. The exterior surface shall be 1/2-inch plywood with either a 26 gauge galvanized steel exterior skin or, fiberglass reinforced polyester. The exterior color shall be a factory applied and shall be white.
- (2) The side of the facings which contact the insulation core shall have a coating that will allow core-to-facing bond to be equal or greater than the cohesive strength of the core.

b. Insulation Core.

- (1) Factory foamed-in-place polyurethane between facings. Insulating value of the composite roof and floor systems shall be equal to or greater than R-38, and the wall system equal to or greater than R-19. No voids are allowed in the core.
- (2) Polyurethane shall have a minimum 2 lbs/ft³ density.
- (3) Polyurethane shall be certified UL flame spread 25 or less per ASTM E84.

- c. The panel joints shall have tongue and groove or ship lap interlock with continuous silicone sealant tape at interior and exterior faces.
- d. Panels shall be full length in single piece where practical.
- e. Panels shall have State Fire Marshal's approval if floor area exceeds 300 square feet.

- f. Metal flashing and trim at corners, intersections, openings, eaves, and ridges shall be of the same finish and 24 gauge thickness to effect a neat appearing, weather tight joint and closure. Provide wrap-around door jamb trim-flashing.
- g. Enclosure shall have two 12-inch x 12-inch vent openings installed in two end or side walls. Each opening shall include a 90-degree weather hood with galvanized bird screen. One opening shall be provided with a manually adjustable damper and replaceable dust filter. One opening shall be provided with an exhaust fan and backdraft damper.
- h. A refrigerator style door(s) of the dimensions shown shall be provided for the enclosure. The door(s) shall be of similar construction to the enclosure. Mounting hardware shall be of stainless steel or of forged brass with chrome plating, or approved equal. Provide neoprene weather-stripping. The door(s) shall be provided with a refrigerator safety lock with pushrod from interior, cast zinc with chrome plating. Provide lock(s) consisting of a brass, 6-pin E keyway padlock with a shackle that is 3/8-inch in diameter having a closed clearance of 2-1/4 inches. The lock shall have a control key removable core and shall have one separate replacement core. Provide 4 keys and 1 core removal key.
- i. Enclosure construction shall meet the following or those indicated in the currently adopted version of the International Building Code for the project location, whichever is more stringent:
 - (1) Live Snow Load 70 pounds per square foot (psf)
 - (2) Live Floor Load 200 psf
 - (3) Wind Load 110 miles per hour (mph) basic wind speed, applied according to the International Building Code, Exposure Category D, Risk Category III

Enclosure shall be an Equipment Enclosure for Runway Lighting Systems as manufactured by ALCHEM, Inc., of Anchorage, Alaska; Plaschem Shelter as manufactured by Plaschem Supply & Consulting, of Anchorage Alaska; or approved equal.

- ~~j. Provide Metal Storage Cabinet and Wall Mounted Shop Desk. Provide 30-inch-wide x 12-inch-deep x 26-inch-high wall-mounted locking metal storage cabinet, and 24-inch-wide x 23-inch-deep x 12-inch-high wall-mounted shop desk securely fastened to the wall at the location and elevation shown on the drawings. Set bottom of desk surface 36 inches above floor surface.~~

109-3.22 LIQUID-TIGHT FLEXIBLE METAL CONDUIT. Liquid-tight flexible metal conduit – Type LFMC shall be water-tight, listed for exposed or direct bury per UL-360, as an equipment grounding conductor per NEC 350.60, and rated for temperatures between -67 °F and +220 °F. Conduit fittings shall have an insulated throat.

109-3.23 TAPES.

- a. Pipe sealing tape: "Scotch" No. 48, Teflon pipe sealing or approved equal.
- b. Corrosion preventive tape: "Scotch" No. 50 or approved equal.
- c. Electrical insulating tape: "Scotch" No. 88 or approved equal.

109-3.24 RADIO CONTROL EQUIPMENT, L-854. Radio Control Equipment, shall be L-854, Type 1, Style A, with a field-adjustable receiver frequency set to the Common Traffic Advisory Frequency (CTAF) for the project airport as found in the Alaska Supplement of the U.S. Government Flight Publication.

109-3.25 ANTENNA FOR THE RECEIVER-CONTROLLER. Antenna shall be a heavy-duty omni-directional, tunable, ground plane antenna with vertical polarization in the 118 to 136 megahertz band, designed for 100 mph winds. The antenna shall be tuned for the correct system frequency as assigned with

a bandwidth of 2 megahertz. The antenna shall be of 50 ohms nominal impedance and have an operating VSWR of less than 2:1 at system frequency. The antenna shall be equipped with an integral gap-type lightning arrester. The coaxial cable shall be 50-ohm, type RG-8. Antenna shall be designed to mount on 1-inch pipe support. The antenna ground planes shall be a minimum of 4 feet above the top of the adjacent roof or structure. Antenna mountings shall be fabricated as shown and noted.

~~109-3.26 APRON FLOODLIGHT.~~ Apron floodlight shall be LED, 4000K color temperature, full-cutoff fixture, with light output and accessories as indicated on the Plans.

109-3.27 PHOTOELECTRIC CONTROL. Photoelectric control shall be a standard commercially available unit complying with UL 773, with supply voltage rating of 120-277 volts AC, integral surge protection, -40°F to 140°F operating temperature range, and EEL-NEMA standard twist-lock mounting base with a matching receptacle. The photoelectric switch shall be installed, connected, and adjusted according to the manufacturer's instructions.

109-3.28 PANELBOARDS. Panelboards shall be single phase, 3-wire, of sizes to provide all circuit breakers and spares indicated. The branch breakers shall be bolt-on type. The enclosure shall be NEMA 1 with lockable flush door front, provided with a circuit index card under plastic on the interior side of the panel door; and the enclosure shall have an engraved phenolic label, lettered to indicate the voltage and current rating of the panel, attached to the panel front exterior.

The panelboard circuit breakers shall be bolt-on molded case type, 120/240 volts, 10,000 amperes interrupting capacity minimum, with an insulation temperature rating of 60/75 °C or 75 °C to operate with conductors with insulation rated up to 75 °C per NEC Table 310.15(B)(16). 1- and 2-pole type with current ratings as shown on the Plans. Each pole of the breaker shall provide inverse time delay and instantaneous circuit protection. Breakers shall be operated by toggle type handle and have a quick-make, quick-break over center switching mechanism that is mechanically trip free so that contacts cannot be held closed against short circuits and abnormal currents. Tripping shall be clearly indicated. Non-interchangeable trip breakers shall have sealed covers and interchangeable trip units shall have sealed trip units. Ampere ratings shall be clearly visible.

Panelboard circuit breakers shall be UL listed (where procedures exist), and conform to the applicable requirements of the latest NEMA Standard. Breakers shall be standard thermal-magnetic type unless otherwise noted. Circuit breakers for the duplex receptacles shall incorporate overload, short circuit, and UL Class A ground fault circuit interruption.

~~109-3.29 TRANSFER SWITCH.~~ Transfer switch shall be heavy-duty, 2-pole, 3-wire, solid neutral, double-throw, non-fusible type in a NEMA 1 enclosure.

~~109-3.30 IDENTIFICATION TIES.~~ Identification ties shall be self-locking, heavy duty nylon ties and shall be labeled by heat stamp.

109-3.31 SERVICE ENTRANCE EQUIPMENT. The meter/main breaker combination service entrance unit for the Electrical Equipment Enclosure shall be an overhead source or an underground source as shown on the Plans, bottom (underground) load type, 125 A, 120/240 volts, single phase, with 2-pole, 100 amperes, main breaker, and 4-jaw kilowatt-hour (kWh) meter. The service entrance enclosure shall be rain tight NEMA 3R rated with a conduit entry hub fitting on top.

The service entrance disconnect switch shall be mounted as shown on the Plans. Disconnect switch shall be 100 amperes, 240 volts, 3-wire (third blade not used), with NEMA 3R enclosure, non-fused, with field installation kit, or as shown on the Plans

109-3.32 PLUG CUTOUT. The plug cutout shall be a lockable, 2-pole type rated 20-ampere at 5,000 volts, 60 hertz. The plug shall be insertable in three positions for normal operations, maintenance, and testing. The plug cutout shall be mounted in a NEMA-1 enclosure with a hinged and lockable door sized to allow the plug and key to be operable by a worker standing in front of the enclosure.

109-3.33 SUPPORTS FOR WALL-MOUNTED PANELS, PANELBOARDS, AND FIXTURES. Supports for wall mounted panels, panelboards and fixtures shall be metal channels with accessory nuts and fittings; Unistrut or approved equal, or 3/4-inch plywood panels.

109-3.34 PUSH-BUTTON STATIONS. Push-button stations shall be off-on, momentary-contact types in water/dust-tight boxes. Provide metal labels identifying the function of each section.

109-3.35 ELECTRIC HEATER. The electric heater shall be surface mounted and rated 2,000 watts at 240 volts, with mounting kit as required. Thermostat shall be wall mounted on a suitable junction box and be of the line voltage type with an off position and a temperature range of 40 °F to 90 °F. Thermostat current rating shall be suitable to control the specified heater.

109-3.36 HARDWARE. All miscellaneous hardware items, nails, bolts, and screws shall be galvanized steel.

109-3.37 EXHAUST FAN. The exhaust fan shall be sidewall propeller fan rated for a minimum of 150 cubic feet per minute (CFM) at 0.20 in water gauge (WG). The fan shall include wire guards on the interior and a backdraft damper at the exterior wall. The fan shall be controlled by a wall-mounted thermostat, adjustable 40-85 °F minimum.

CONSTRUCTION METHODS

CONSTRUCTION OF VAULT AND PREFABRICATED METAL HOUSING

109-4.1 GENERAL. The Contractor shall construct the transformer vault or prefabricated metal housing at the location indicated on the Plans. Vault construction shall be reinforced concrete, concrete masonry, or brick wall as specified. The metal housing shall be prefabricated equipment enclosure to be supplied in the size specified. The electrical enclosure shall be a pre-engineered building placed on either a poured concrete foundation or a wood platform as specified. The mounting pad or floor details, installation methods, and equipment placement are shown on the Plans.

Precast concrete structures shall be furnished by a plant meeting National Precast Concrete Association Plant Certification Program or another engineer approved third party certification program. If the vault, metal housing or electrical enclosure are to be placed on a site not prepared for that purpose under other items of work, the Contractor shall clear, grade, and seed the area around the vault or metal housing for a minimum distance of 10 feet on all sides. The slope shall be not less than 4% away from the vault, metal housing or electrical enclosure in all directions. Cost for site work will be considered incidental to this item and no separate payment will be made.

109-4.2 FOUNDATION AND WALLS.

- ~~a. Reinforced Concrete Construction.~~ The Contractor shall construct the foundation and walls per the details shown on the Plans. Unless otherwise specified, internal ties shall be of the mechanical type so that when the forms are removed the ends of the ties shall be at least 1 inch beneath the concrete surface; the holes shall be plugged and finished to prevent discoloration. Reinforcing steel shall be placed, as shown in the drawings, and secured in position to prevent displacement during the concrete placement.

~~The external surfaces of the concrete shall be thoroughly worked during the placing operation to force all coarse aggregate from the surface. Thoroughly work the mortar against the forms to produce a smooth finish free from air pockets and honeycomb.~~

~~The surface film of all pointed surfaces shall be removed before setting occurs. As soon as the pointing has set sufficiently, the entire surface inside and outside of the vault shall be thoroughly wet with water and rubbed with a No. 16 carborundum stone, or equivalent quality abrasive, bringing the surface to a paste. All form marks and projections shall be removed. The surface produced shall be smooth and dense without pits or irregularities. The materials which have been~~

ground into a paste during the rubbing process shall be spread or brushed uniformly over the entire surface, except the interior surfaces that are to be painted shall have all paste removed by washing before painting, and permitted to reset. Final exterior finish shall be obtained by rubbing with No. 30 carborundum stone, or an equivalent quality abrasive. The surface shall be rubbed until the entire surface is smooth and uniform in color.

- b. Brick and Concrete Construction.** When this type of construction is specified, the foundation shall be concrete conforming to the details shown on the Plans. The outer edge of the foundation at the floor level shall be beveled 1-1/2 inches at 45 degrees. Brick walls shall be 8 inches thick, laid in running bond with every sixth course a header course. Brick shall be laid in cement mortar (1 part masonry cement and 3 parts sand) with full mortar bed and shoved joints.

All joints shall be completely filled with mortar, and facing brick shall be back-parged with mortar as work progresses. All joints shall be 3/8-inch thick, exterior joints tooled concave, and interior joints struck flush. Both interior and exterior brick surfaces shall be cleaned and nail holes, cracks and other defects filled with mortar. When specified, a nonfading mineral pigment mortar coloring shall be added to the mortar. Steel reinforcing bars, 3/8-inch in diameter and 12 inches long, shall be set vertically in the center of the brick wall on not more than 2 feet centers to project 2-1/2 inches into the concrete roof slab.

Lintels for supporting the brickwork over doors, windows, and louvers shall consist of two 4 x 3 x 3/8-inch steel angles. Lintels shall be painted with one coat of corrosion-inhibiting primer before installation, and all exposed parts shall be painted similar to doors and window sash after installation.

Window sills may be concrete poured in place or precast concrete as indicated on the Plans. All exposed surfaces shall have a rubbed finish as specified under reinforced concrete construction. After completion, all interior and exterior faces of walls shall be scrubbed with a solution of muriatic acid and water in the proportions of not less than 1 part acid to 10 parts of water. All traces of efflorescence, loose mortar, and mortar stain shall be removed, and the walls washed down with clear water.

- c. Concrete Masonry Construction.** When this type of construction is specified, the foundation shall be concrete conforming to the details shown on the Plans. The concrete masonry units shall be standard sizes and shapes and shall conform to ASTM C90 and shall include the closures, jambs, and other shapes required by the construction as shown on the Plans. Standard construction practice shall be followed for this type of work including mortar, joints, reinforcing steel for extensions into roof slab, etc. Plaster for interior walls, if specified, shall be Portland cement plaster.

109-4.3 ROOF. The roof shall be reinforced concrete as shown on the Plans. Reinforcing steel shall be placed as shown in the drawing and secured in position to prevent displacement during the pouring of the concrete. The concrete shall be poured monolithically and shall be free of honeycombs and voids. The surface shall have a steel-troweled finish and shall be sloped as shown in the drawing. The underside of the roof slab shall be finished in the same manner as specified for walls.

One brush or mop coat of hot asphalt roof coating shall be applied to the top surface of the roof slab. The asphalt material shall be heated to within the range specified by the manufacturer and immediately applied to the roof. The finished coat shall be continuous over the roof surface and free from holidays and blisters. Smears and dribbles of asphalt on the roof edges and building walls shall be removed.

109-4.4 REINFORCED CONCRETE FLOOR. The floor shall be reinforced concrete as shown on the Plans. When present, all sod, roots, refuse, and other perishable material shall be removed from the area under the floor to a depth of 8 inches, unless a greater depth is specified. This area shall be backfilled with materials consisting of sand, cinders, gravel, or stone. Fill shall be placed in layers not to exceed 4 inches and shall be thoroughly compacted by tamping or rolling. A layer of building paper shall be placed over the fill prior to placing concrete. The floor surfaces shall have a steel-troweled finish. The floor shall be level unless a drain is specified, in which case the floor shall be pitched 1/4 inch per foot downward toward the

drain. A 1/4-inch asphalt-felt expansion joint shall be placed between floor and foundation walls. The floor shall be poured monolithically and shall be free of honeycombs and voids.

109-4.5 FLOOR DRAIN. If shown on the Plans, a floor drain and dry well shall be installed in the center of the floor of the equipment room. The dry well shall be excavated 4 x 4 feet square and to a depth of 4 feet below the finished floor elevation and shall be backfilled to the elevation of the underside of the floor with gravel which shall all pass a 2-inch mesh sieve and shall all be retained on a 1/4-inch mesh sieve. The gravel backfill shall be placed in 6-inch maximum layers, and the entire surface of each layer shall be tamped either with a mechanical tamper or with a hand tamper weighing not less than 25 pounds and having a face area of not more than 36 square inches nor less than 16 square inches. The drain inlet shall be set flush in the concrete floor. The drain shall have a clear opening of not less than 8 inches in diameter.

109-4.6 CONDUITS IN FLOOR AND FOUNDATION. Conduits shall be installed in the floor and through the foundation walls per the details shown on the Plans. All underground conduit shall be painted with an asphalt compound. Conduit shall be installed with a coupling or metal conduit adapter flush with the top of the floor. All incoming conduit shall be closed with a pipe plug to prevent the entrance of foreign material during construction. Space conduit entrances shall be left closed.

109-4.7 DOORS. Doors shall be metal-clad fireproof Class A (three (3) hour rated) doors conforming to requirements of the National Electrical Code (NEC) and local electrical codes. Panic bar exit hardware shall be installed per NEC requirements. Refer to the new electrical vault detail plan sheets for construction requirements.

109-4.8 PAINTING. The floor, ceiling, and inside walls of concrete construction shall first be given a hardening treatment, after which the Contractor shall apply two coats of paint as specified below, except that interior face brick walls need not be painted. The hardening treatment shall consist of applying two coats of either a commercial floor hardener or a solution made by dissolving 2 pounds of magnesium fluorosilicate or zinc sulfate crystals in one gallon of water.

Each coat shall be allowed to dry at least 48 hours before the next application. After the second treating coat has dried, the surfaces shall be brushed clean of all crystals and thoroughly washed with clear water. Paint for walls and ceiling shall be a light gray color approved by the Engineer. The floor paint shall be a medium gray color approved by the Engineer. Before painting, the surfaces shall be dry and clean. The first coat shall be thinned by adding 2/3-quarts of spar varnish and 1/3-quarts of turpentine to each gallon of paint. The second coat shall be applied without thinning. All doors, lintels, and windows shall be cleaned to remove any rust or foreign material and shall be given one body and one finish coat of white paint. Bare metal surfaces shall be given a prime coat of corrosion-inhibiting primer prior to the body and finish coats.

109-4.9 LIGHTS AND SWITCHES. The Contractor shall furnish and install a minimum of two duplex convenience outlets in the **enclosure** vault room. Where a control room is specified, at least two duplex outlets shall be installed.

INSTALLATION OF EQUIPMENT IN VAULT, PREFABRICATED METAL HOUSING, ENCLOSURE OR BUILDING

109-5.1 GENERAL. The Contractor shall furnish, install, and connect all equipment, equipment accessories, conduit, cables, wires, buses, grounds, and support necessary to ensure a complete and operable electrical distribution center for the airport lighting system as specified herein and shown on the Plans. When specified, an emergency power supply and transfer switch shall be provided and installed.

The equipment installation and mounting shall comply with the requirements of the NEC and local authority having jurisdiction.

109-5.2 POWER SUPPLY EQUIPMENT. Transformers, regulators, booster transformers, and other power supply equipment items shall be furnished and installed at the location shown on the Plans or as directed by the Engineer. The power supply equipment shall be set on steel "H" sections, "I" beams, channels, or concrete blocks to provide a minimum space of 1-1/2-inch between the equipment and the floor. The

equipment shall be placed so as not to obstruct the oil-sampling plugs of the oil-filled units; and name-plates shall, so far as possible, not be obscured. All equipment shall be securely anchored to the floor.

If specified on the Plans and Specifications, equipment for an alternate power source or an emergency power generator shall be furnished and installed. The alternate power supply installation shall include all equipment, accessories, an automatic changeover switch, and all necessary wiring and connections. The emergency power generator set shall be the size and type specified.

109-5.3 SWITCHGEAR AND PANELS. Oil switches, fused cutouts, relays, transfer switches, panels, panelboards, and other similar items shall be furnished and installed at the location shown on the Plans or as directed by the Engineer. Wall or ceiling mounted items shall be attached to the wall or ceiling with galvanized bolts of not less than 3/8-inch diameter engaging metal expansion shields or anchors in masonry or concrete vaults.

109-5.4 DUCT AND CONDUIT. The Contractor shall furnish and install square-type exposed metallic ducts with hinged covers for the control circuits in the vault. These shall be mounted along the walls behind all floor-mounted equipment and immediately below all wall-mounted equipment. The hinged covers shall be placed to open from the front side with the hinges at the front bottom.

Wall brackets for square ducts shall be installed at all joints 2 feet or more apart with intermediate brackets as specified. Conduit shall be used between square ducts and equipment or between different items of equipment when the equipment is designed for conduit connection. When the equipment is not designed for conduit connection, conductors shall enter the square-type control duct through insulating bushings in the duct or on the conduit risers.

109-5.5 WIRING AND CONNECTIONS. The Contractor shall make all necessary electrical connections in the vault per the wiring diagrams furnished and as directed by the Engineer. In wiring to the terminal blocks, the Contractor shall leave sufficient extra length on each control lead to make future changes in connections at the terminal block. This shall be accomplished by running each control lead the longest way around the box to the proper terminal. Leads shall be neatly laced in place. Wiring shall be installed according to the Plans and L-108. Circuits rated 60 or greater amperes shall be tested in accordance with L-108.

109-5.6 MARKING AND LABELING. All equipment, control wires, terminal blocks, etc., shall be tagged, marked, or labeled as specified below:

- a. **Wire identification.** The Contractor shall furnish and install self-sticking wire labels or identifying tags on all control wires at the point where they connect to the control equipment or to the terminal blocks. Wire labels, if used, shall be of the self-sticking preprinted type and of the manufacturer's recommended size for the wire involved. Identification markings designated on the Plans shall be followed. Tags, if used, shall be of fiber not less than 3/4-inch in diameter and not less than 1/32-inch thick. Identification markings designated on the Plans shall be stamped on tags by means of small tool dies. Each tag shall be securely tied to the proper wire by a nonmetallic cord.
- b. **Labels.** The Contractor shall stencil identifying labels on the cases of regulators, breakers, and distribution and control relay cases with white oil paint as designated by the Engineer. The letters and numerals shall be not less than one inch in height and shall be of proportionate width. The Contractor shall also mark the correct circuit designations per the wiring diagram on the terminal marking strips, which are a part of each terminal block.
- c. **Warning Labels.** The Contractor shall install self-adhesive arc-flash warning labels on service disconnects, panelboards, and transfer switches. Arc-flash data for the labels will be provided by the Engineer.

METHOD OF MEASUREMENT

109-6.1 VAULTS. The quantity of vaults to be paid for under this item shall consist of the number of vaults constructed in place and accepted as a complete unit.

109-6.2 PREFABRICATED METAL HOUSINGS. The quantity of prefabricated metal housings to be paid for under this item shall consist of the number of housings constructed in place and accepted as a complete unit.

109-6.3 ELECTRICAL ENCLOSURES. The quantity of electrical enclosures to be paid for under this item shall consist of the number of enclosures constructed in place and accepted as a complete unit. Removal of existing electrical enclosures shall be subsidiary to installation of new enclosures.

109-6.4 INSTALLATION OF ELECTRICAL EQUIPMENT IN NEW OR EXISTING STRUCTURE. The quantity of electrical equipment installed in a new or existing structure (vault, prefabricated metal housing, electrical enclosure, or building) to be paid for under this item shall consist of all equipment installed, connected, and accepted as a complete unit ready for operation. Removal of existing electrical equipment from existing structures shall be subsidiary to installation of new electrical equipment.

BASIS OF PAYMENT

109-7.1 Payment will be made at the contract unit price for each completed and accepted vault or prefabricated metal housing equipment installation. This price shall be full compensation for furnishing all materials and for all preparation, assembly, and installation of these materials, and for all labor, equipment, tools, and incidentals necessary to complete the work.

a. **Work Items Paid in this Subsection.** Completed and accepted work paid at the contract unit price for each.

~~(1) L109.010.0000 Transformer Vault in Place Pay Item.~~ This pay item includes all work required to construct, or install, the complete transformer vault in place.

~~(2) L109.020.0000 Prefabricated Metal Housing and Foundation Pay Item.~~ This pay item includes all work required to construct and install the complete prefabricated metal housing and foundation.

~~(3)~~(1) **L109.030.0000 Electrical Enclosure and Foundation in Place Pay Item.** This pay item includes all work required to construct the electrical enclosure and foundation in place.

~~(4)~~(2) **L109.0540.0000 Installation of Electrical Equipment in New or Existing Structure Pay Item.** This pay item includes all work required to install electrical equipment in new or existing structure.

b. **Work Items Paid in other Subsections.**

(1) **Lighting Regulators.** Lighting regulators are paid for under L-125 pay items.

Payment will be made under:

Item ~~L109.010.0000~~ Transformer Vault in Place - per each

Item ~~L109.020.0000~~ Prefabricated Metal Housing and Foundation in Place - per each

Item L109.030.0000 Electrical Enclosure and Foundation in Place - per each

Item L109.0540.0000 Installation of Electrical Equipment in New or Existing Structure - per each *lump sum*

REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

Advisory Circulars (AC)

AC 150/5340-30	Design and Installation Details for Airport Visual Aids
AC 150/5345-3	Specification for L-821, Panels for Remote Control of Airport Lighting
AC 150/5345-5	Circuit Selector Switch
AC 150/5345-7	Specification for L-824 Underground Electrical Cable for Airport Lighting Circuits
AC 150/5345-10	Specification for Constant Current Regulators and Regulator Monitors
AC 150/5345-13	Specification for L-841 Auxiliary Relay Cabinet Assembly for Pilot Control of Airport Lighting Circuits
AC 150/5345-49	Specification L-854, Radio Control Equipment
AC 150/5345-53	Airport Lighting Equipment Certification Program

American National Standards Institute / Insulated Cable Engineers Association (ANSI/ICEA)

ANSI/ICEA S-85-625	Standard for Telecommunications Cable Aircore, Polyolefin Insulated, Copper Conductor Technical Requirements
--------------------	--

ASTM International (ASTM)

ASTM A615	Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
ASTM C62	Standard Specification for Building Brick (Solid Masonry Units Made from Clay or Shale)
ASTM C90	Standard Specification for Loadbearing Concrete Masonry Units
ASTM D2823	Standard Specification for Asphalt Roof Coatings, Asbestos Containing
ASTM D4479	Standard Specification for Asphalt Roof Coatings – Asbestos-Free

Commercial Item Description (CID)

A-A 59544	Cable and Wire, Electrical (Power, Fixed Installation) Institute of Electrical and Electronics Engineers (IEEE)
IEEE 1584	Guide for Performing Arc-Flash Hazard Calculations

Master Painter's Institute (MPI)

MPI Reference #9	Alkyd, Exterior, Gloss (MPI Gloss Level 6)
------------------	--

Underwriters Laboratories (UL)

UL Standard 6	Electrical Rigid Metal Conduit – Steel
---------------	--

UL Standard 514B Conduit, Tubing, and Cable Fittings

UL Standard 514C Nonmetallic Outlet Boxes, Flush-Device Boxes, and Covers

UL Standard 651 Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings

UL Standard 651A Type EB and A Rigid PVC Conduit and HDPE Conduit

National Fire Protection Association (NFPA)

NFPA-70 National Electrical Code (NEC)

NFPA-70E Standard for Electrical Safety in the Workplace