

**MICHIGAN DEPARTMENT OF TRANSPORTATION  
AIRPORTS DIVISION - STANDARD SPECIFICATION  
L-101  
Airport Rotating Beacons**

**DESCRIPTION**

**1.1** This item shall consist of airport rotating beacons furnished and installed in accordance with this specification and shall conform to the design and dimensions shown in the plans. This work shall include the mounting, leveling, wiring, painting, servicing, and testing of a new or refurbished beacon and all materials and incidentals necessary to place the beacons in operating condition as a completed unit to the satisfaction of the Engineer. This item shall include a mounting platform if specified in the plans.

**EQUIPMENT AND MATERIALS**

**2.1 General.**

(a) Airport lighting equipment and materials covered by Federal Aviation Administration (FAA) specifications shall be certified and listed under Advisory Circular (AC) 150/5345-53, Airport Lighting Equipment Certification Program.

(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) Manufacturers certifications shall not relieve the contractor of responsibility to provide materials in accordance with these specifications and acceptable to the Engineer. Materials supplied and/or installed that do not meet specifications, as determined by the Engineer, shall be removed and replaced by material meeting specifications. No additional compensation shall be due the contractor for such replacement.

**2.2 Beacon.** The airport rotating beacon shall conform to Advisory Circular 150/5345-12, Specification for Airport and Heliport Beacons. The beacon shall have one clear lens and one green lens.

**2.3 Panel Boards and Breakers.** Panel boards and breakers shall conform to the requirements of Fed. Spec. W-P-115.

**2.4 Weatherproof Cabinets.** The weatherproof cabinets shall conform to National Electrical Manufacturers Association standards and shall be constructed of steel not less than No. 16 USS gauge.

**2.5 Wire.** Wire in conduit rated up to 5,000 volts shall conform to AC 150/5345-7, Specification for L-824 Underground Electrical Cable for Airport Lighting Circuits for Rubber Insulated Neoprene Covered Wire, or Fed. Spec. J-C-30, Type RHW, for rubber insulated fibrous covered wire. For ratings up to 600 volts, the thermoplastic wire conforming to Fed. Spec. J-C-30, Types TW, THW, and THWN, shall be used. The wires shall be of the type, size, number of conductors, and voltage shown in the plans or in the proposal.

**2.6 Conduit.** Rigid steel conduit and fittings shall conform to the requirements of Underwriters Laboratories Standard 6, 514, and 1242.

**2.7 Paint.**

(a) Priming paint for ungalvanized metal surfaces shall be a high solids alkyd primer conforming to TT-P-664D.

(b) Priming paint for galvanized metal surfaces shall be zinc dust-zinc oxide primer paint conforming to MIL-DTL-24441/19B. If

necessary, add not more than ½ pint (0.06 liter) of turpentine to each gallon (liter).

(c) Orange paint for the body and the finish coats on metal and wood surfaces shall consist of a ready-mixed non-fading paint meeting the requirements of Fed. Spec. TT-E-489. The color shall be in accordance with Federal Standard 595, Aviation Gloss Orange Number 12197.

(d) White paint for body and finish coats on metal and wood surfaces shall be ready-mixed paint conforming to the Master Painter's Institute, Reference #9, Exterior Alkyd, Gloss, VOC Range E2.

(e) Priming paint for wood surfaces shall be mixed on the job by thinning the above-specified orange or white paint with ½ pint (0.06 liter) of raw linseed oil to each gallon (liter).

## CONSTRUCTION METHODS

**3.1 Placing the Beacon.** The beacon shall be mounted on a beacon tower, platform, or building roof as shown in the plans.

**3.2 Hoisting and Mounting.** The beacon shall be hoisted to the mounting platform by using suitable slings and hoisting tackle. Before fastening the beacon to the mounting platform, the mounting holes shall be checked for correct spacing. Beacon base or mounting legs shall not be strained or forced out of position to fit incorrect spacing of mounting holes. The beacon base shall be raised first, set in position, and bolted in place. The drum shall then be raised and assembled to the base.

**3.3 Leveling.** After the beacon has been mounted in place, it shall be accurately leveled following manufacturer's instructions. The leveling shall be checked in the presence of the Engineer and shall be to the Engineer's satisfaction.

**3.4 Servicing.** Before placing the beacon in operation, the Contractor shall check the manufacturer's manual for proper servicing requirements. Follow the manufacturer's servicing requirements for each size beacon.

**3.5 Beam Adjustment.** After the beacon has been mounted and leveled, the elevation of the beams shall be adjusted. The final beam adjustments shall be made at night so that results can be readily observed. The beams shall be adjusted to the elevation directed by the Engineer or as shown in the plans, except that, in no case shall the elevation of the beams be less than 2 degrees above the horizontal.

**3.6 Beacon Mounting Platform.** Where the beacon is to be mounted at a location other than the beacon tower and where a special mounting platform is required, the construction of this mounting platform and any necessary lighting protection equipment shall be in accordance with the details shown in the plans.

**3.7 Wiring.** The Contractor shall furnish all necessary labor and materials and shall make complete above ground electrical connections in accordance with the wiring diagram furnished with the project plans. The electrical installation shall conform to the requirements of the latest edition of National Fire Protection Association, NFPA-70, National Electric Code. Copies of the National Electric Code may be obtained from the National Fire Protection Associations, Inc., One Batterymarch Park, Quincy, Massachusetts 02269.

If underground cable for the power feed from the transformer vault to the beacon site and duct for this cable installation is required, the cable, ground rods and duct shall be installed in accordance with and paid for as described in Item L-108, Underground Power Cable for Airports, and Item L-110, Airport Underground Electrical Duct Banks and Conduit.

Unless otherwise specified, the Contractor shall connect the tell-tale relay mechanism in the beacon to energize the tower obstruction light circuit when failure of the beacon service (primary) lamp occurs.

If lightning protection is specified in the plans or proposal as a part of this item, it shall be installed in accordance with 103-2.3 in Item L-103, Airport Beacon Towers.

**3.8 Panel and Cabinet.** Unless otherwise specified, the Contractor shall furnish and install at the top of the beacon tower or mounting platform a circuit-breaker panel consisting of four 15-ampere breakers mounted in a weatherproof cabinet to provide separate protection for the circuits to the beacon lamps, motor, obstruction lights, and other equipment. The cabinet shall be located on the side of the beacon platform, as directed by the Engineer.

**3.9 Conduit.** All exposed wiring shall be run in not less than ¾ inch (19 mm) galvanized rigid steel conduit. No conduit shall be installed on top of a beacon platform floor. All conduit shall be installed to provide for drainage. If mounted on a steel beacon tower, the conduit shall be fastened to the tower members with “wraplock” straps, clamps, or approved fasteners, spaced approximately 5 feet (150 cm) apart. The conduit shall be fastened to wooden structures with galvanized pipe straps and with galvanized wood screws not less than No. 8 or less than 1-¼ inches (31 mm) long. There shall be at least two fastenings for each 10-foot (3 m) length.

**3.10 Booster Transformer.** If shown in the plans or specified in job specifications, a booster transformer to compensate for voltage drop to the beacon shall be installed in the vault. The installation shall be as indicated in the plans and described in the proposal. If the booster transformer is required, it shall be installed in accordance with and paid for as described in

Item L-109, Installation of Airport Transformer Vault and Vault Equipment.

**3.11 Photoelectric Control.** If shown in the plans or specified in job specifications, the Contractor shall furnish and install an automatic control switch at the location indicated in the plans. The switch shall be a photoelectric type. It shall be a standard commercially available unit that will energize when the northern sky illuminance falls below 60 footcandles (645.8 lux) but before reaching a level of 35 footcandles (367.7 lux). The photoelectric switch should de-energize when the northern sky illuminance rises to a level of not more than 60 footcandles (645.9 lux). It shall be installed, connected, and adjusted in accordance with the manufacturer's instructions.

**3.12 Obstruction Lights.** When specified in the bid documents, the Contractor shall install two L-810 obstruction lights atop and at opposite corners of the beacon tower or mounting platform. These lights shall be mounted on conduit extensions to a height of not less than 4 inches (100 mm) above the top of the beacon. The obstruction lights shall be connected in series into the tell-tale circuit of the beacon and will energize upon failure of the beacon lamp.

**3.13 Painting.** If construction of a wooden mounting platform is stipulated in the proposal as part of this item, all wooden parts of the platform shall be given one priming coat of white or aviation-orange paint after fabrication but before erection and one body and one finish coat of aviation-orange paint after erection. Steel mounting platforms shall be given one corrosion-prohibiting priming coat before erection and one body and one finish coat of aviation-orange paint after erection. All equipment installed under this contract and exposed to the weather shall be given one body and one finish coat of aviation -orange or white paint as required. This shall include the beacon

(except glass surfaces), beacon base, breaker cabinet, all conduit, and transformer cases. It shall not include air terminals or obstruction light globes.

The paint shall be applied uniformly and in the proper consistency. The finished paint shall be free from sags, holidays, and smears. Each coat of paint shall be given ample time to dry and harden before the next coat of paint is applied. A minimum of 3 days shall be allowed for drying on wood surfaces, and a minimum of 4 days shall be allowed for drying on metal surfaces. Painting shall not be done in cold, damp, foggy, dusty, or frosty atmospheres, or when air temperature is below 40E F (4E C), nor started when the weather forecast indicates such conditions for the day.

All surfaces shall be cleaned before painting. The surfaces shall be dry and free from scale, grease, rust, dust, and dirt when paint is applied. All knots in wood surfaces shall be covered with shellac immediately before applying the priming coat of paint. Nail holes and permissible imperfections shall be filled with putty.

The ready-mixed paint shall be thinned for the priming and body coats in accordance with the manufacturer's recommendations.

**3.14 Testing.** The installation shall be fully tested in operation as a complete unit prior to acceptance. These tests shall include taking

megger and voltage readings. The insulation resistance to ground of the beacon supply circuit shall be not less than 50 megohms when measured ungrounded. Testing equipment shall be furnished by the Contractor. Tests shall be conducted in the presence of the Engineer and shall be to his or her satisfaction.

#### **METHOD OF MEASUREMENT**

**4.1** The quantity to be paid for under this item shall be the number of beacons installed as completed units in place, accepted, and ready for operation.

#### **BASIS OF PAYMENT**

**5.1** Payment will be made at the contract unit price for each completed and accepted job. 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 this item.

Payment will be made under the nomenclature and seven digit item number specified in the plans and proposal for beacon installations.

The first three digits of any item number for work included under this specification shall be 101, i.e. 101XXXX.

MATERIAL REQUIREMENTS

AC 150/5345-7	Specification for L-824 Underground Cable for Airport Lighting Circuits
AC 150/5345-12	Specification for Airport and Heliport Beacons
FED SPEC J-C-30	Cable and Wire, Electrical (Power, Fixed Installation) (cancelled; replaced by A-A-59544 Cable and Wire, Electrical (Power, Fixed Installation))
FED SPEC TT-E-489	Enamel, Alkyd, Gloss, Low VOC Content
FED SPEC TT-P-664D	Primer Coating, Alkyd, Corrosion-Inhibiting, Lead and Chromate Free, VOC-Compliant
FED SPEC W-P-115	Panel, Power Distribution
FED STD 595	Colors Used in Government Procurement
MIL-P-24441/19B	Paint, Epoxy-Polyamide, Zinc Primer, Formula 159, Type III
Underwriters Laboratories Standard 6	Rigid Metal Conduit
Underwriters Laboratories Standard 514	Fittings for Conduit and Outlet Boxes
Underwriters Laboratories Standard 1242	Intermediate Metal Conduit
NFPA-70	National Electric Code
NFPA-780	Standard for the Installation of Lightning Protection Systems
Master Painter's Institute	