

**MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF AERONAUTICS -- STANDARD SPECIFICATION
L-103
Installation of Airport Beacon Towers**

DESCRIPTION

1.1 This item shall consist of furnishing and installing an airport beacon tower of the type shown in the plans, in accordance with these specifications. This work shall include the clearing of the site, erection of the tower, installation of lightning protection, painting, and all incidentals necessary to place it in operating condition as a completed unit to the satisfaction of the Engineer.

EQUIPMENT AND MATERIALS

2.1 **General**

a. All equipment and materials covered by referenced specifications shall be subject to acceptance through manufacturer's certification of compliance with the applicable specification when requested by the Engineer.

b. Manufacturer's certifications shall not relieve the Contractor of the Contractor's responsibility to provide materials in accordance with these specifications and acceptable to the Engineer. Materials supplied and/or installed that do not materially comply with these specifications shall be removed, when directed by the Engineer and replaced with materials, which do comply with these specifications, at the sole cost of the Contractor.

c. All materials and equipment used to construct this item shall be submitted to the Engineer for approval prior to ordering the equipment. Submittals consisting of marked catalog sheets or shop drawings shall be provided. Submittal data shall be presented in a clear, precise and thorough manner. Original catalog sheets are preferred. Photocopies are acceptable provided they are as good a quality as the original. Clearly and boldly mark each copy to identify pertinent products or models applicable to this project. Indicate all optional equipment and delete non-pertinent data. Submittals for components of electrical equipment

and systems shall identify the equipment for which they apply on each submittal sheet. Markings shall be boldly and clearly made with arrows or circles (highlighting is not acceptable). Contractor is solely responsible for delays in project accruing directly or indirectly from late submissions or resubmissions of submittals.

d. The data submitted shall be sufficient, in the opinion of the Engineer, to determine compliance with the plans and specifications. [The Contractor's submittals shall be neatly bound in a properly sized 3-ring binder, tabbed by specification section.] The Engineer reserves the right to reject any and all equipment, materials or procedures, which, in the Engineer's opinion, does not meet the system design and the standards and codes, specified herein.

e. All equipment and materials furnished and installed under this section shall be guaranteed against defects in materials and workmanship for a period of at least twelve (12) months from final acceptance by the Owner. The defective materials and/or equipment shall be repaired or replaced, at the Owner's discretion, with no additional cost to the Owner.

2.2 **Tower** The beacon tower shall conform to the requirements of Advisory Circular (AC) 150/5340-30, Design and Installation Details for Airport Visual Aids, Chapter 6.

2.3 **Lightning Protection** Lightning protection shall comply with NFPA-780, Standard for the Installation of Lightning Protection Systems. All materials shall comply with Class II requirements regardless of tower height. Ground rods and underground cables shall be installed in accordance with and paid for as described in Item L-108, Underground Power Cable for Airports.

2.4 Paint

a. Priming paint for galvanized steel towers shall be zinc dust-zinc oxide primer paint conforming to MIL-DTL-24441/19B. If necessary, add not more than 1/2 pint (0.06 liter) of turpentine to each gallon (liter).

b. Priming paint for ungalvanized steel towers shall be a high solids alkyd primer conforming to the Master Painter's Institute, Reference #9, Exterior Alkyd, Gloss, VOC Range E2.

c. Orange paint for the body and finished 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 steel tower shall be ready-mixed paint conforming to Commercial Item Description A-A-3067.

CONSTRUCTION METHODS

3.1 Clearing and Grading The site on which the beacon tower is to be erected shall be cleared and leveled. All trees and brush shall be removed from the area within a distance of 25 feet (7.5 m) from the tower or as called for in the plans. Stumps shall be removed to a depth of 18 inches (45 cm) below finished grade and the excavation filled with earth and tamped. If a transformer vault or other structure is included as part of the installation, the area shall be cleared to a distance of 25 feet (7.5 m) from these structures. The ground near the tower shall be leveled to permit the operation of mowing machines. The leveling shall extend at least 2 feet (60 cm) outside the tower legs. All debris removed from the tower site shall be disposed of by the Contractor to the satisfaction of the Engineer and in accordance with Federal, state, or local regulations.

3.2 Excavation and Fill Excavation for the tower footings shall be carried to a minimum of 4 inches (100 mm) below the footing depth. The

excess excavation below the footing depth shall then be backfilled with gravel or crushed stone and compacted to the required level. The footing plates shall be installed and a thickness of not less than 18 inches (45 cm) of the same gravel or crushed stone shall be placed immediately above the footing plates in layers of not over 6 inches (150 mm). Each layer above the footing plates shall be thoroughly tamped in place. The remainder of the backfill may be of excavated earth placed in layers not to exceed 6 inches (150 mm). Each layer shall be thoroughly compacted by tamping.

Where solid rock is encountered, which prevents the carrying of the foundation legs to the required depth but which is of sufficient strength to use holddown bolts, the tower anchor posts shall be cut off at the required length and the holddown bolts shall be installed as indicated in the plans with the approval of the Engineer. Each tower leg shall be anchored to the rock by means of two 7/8-inch (21 mm) diameter by 3-foot (90 cm) long expansion or split bolts and shall be grouted with neat portland cement into holes drilled into the natural rock. Except as required for rock foundations, the footing members shall not be cut off or shortened. If excavated material is of such character that it will not readily compact when backfilled, the Engineer may order the excavation backfilled with concrete or other suitable material.

The concrete footing for tubular beacon towers shall be installed in accordance with the manufacturer's recommendations. Portions of the footing in the topsoil layer shall not be included in the footing height.

3.3 Erection Detail erection drawings furnished by the manufacturer shall be strictly followed during construction. All towers shall be erected in sections from the ground up unless otherwise specified. In final assembly, all bolts and fastenings shall be installed, and the structure shall be plumb, true, square, and level. Nuts shall be taken up to a firm bearing after which the bolts shall, if necessary, be cut to proper length to protrude three full threads.

Approved locknuts shall be placed on each bolt over the regular nut. Ladder bolts shall be inserted with the head to the outer face of the tower. Diagonal, leg, and handrail bolts shall be installed with nuts on the outer face of the tower, unless otherwise specified. Bent parts shall be straightened before erection without damage to the protective coating. Surfaces abraded or bared of protective coating shall be painted with the proper priming paint as specified in these specifications.

The Contractor shall install the ladder on the side of the tower adjacent to the driveway or most accessible approach to the tower. Tubular beacon towers shall be erected in accordance with the manufacturer's recommendations. The safety cable shall be located on the side of the tower adjacent to the driveway or most accessible approach to the tower.

3.4 Lightning Protection The Contractor shall furnish and install an air terminal, down conductor, and at least one ground plate or rod for each beacon tower or as indicated in the plans. The air terminal shall be installed at the top of the tower with the tip of the rod extending not less than 6 inches (150 mm) above the top of the beacon.

Down-conductor cables shall be securely fastened to the surface of the tower leg at 5-foot (150 cm) intervals with suitable bronze fasteners having bronze or noncorrosive metal bolts. Sharp turns or bends in the down conductor will not be permitted.

All connections of cable to cable, cable to air terminals, and cable to ground plates or rods shall be made with solderless connectors or noncorrosive metal approved by the engineer and shall be of substantial construction.

The down-conductor cable shall be securely attached to ground rods or plates placed at least 2 feet (60 cm) away from the tower foundations. The ground rod shall be driven into the ground so that the top is at least 6 inches (150 mm) below grade. The down-conductor shall be firmly

attached to the ground plate or rod by means of a ground connector or clamp. Plates shall be embedded in the area of permanent moisture.

The complete lightning protection installation shall be accomplished to the satisfaction of the Engineer. The resistance to ground of any part of the lightning protection system shall not exceed 25 ohms.

3.5 Painting The Contractor shall furnish all materials and labor for painting the beacon tower. The color scheme for the steel tower shall be as shown in the plans.

a. Parts to be Painted. Tower parts (except those parts to be exposed to earth) shall not be treated or primed before erection. All tower parts placed below ground level or within 12 inches (300 mm) above ground level shall be given two coats of approved bituminous paint.

The paint shall be applied uniformly in the proper consistency by skilled painters. The finished paint shall be free from sags, holidays, and smears. Division lines between colors shall be sharply defined. Each coat of paint shall be given ample time to dry and harden before the next coat is applied. 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 40° F (4° 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.

The number of coats of paint applied shall be in accordance with the following instructions:

b. Steel Towers, Galvanized. One priming coat of zinc dust-zinc oxide primer after erection and one body and one finish of white or orange paint (as required by the color scheme) shall be applied after erection.

c. Steel Towers, Not Galvanized. One priming coat of corrosion-inhibiting primer and one body and one finish coat of white or orange paint (as required by the color scheme) shall be applied after erection.

The above specified orange and white ready-mixed paints shall be thinned for the body coats in accordance with the manufacturer's recommendations. In the absence of such recommendations, the following shall apply:

d. Body Coats. Add not more than 1/2 pint (0.06 liters) of turpentine to each gallon (liter) of ready-mixed paint for body coats.

e. Finish Coats. The ready-mixed paint shall be used as it comes from the container for finish coats.

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 103, i.e. 103XXXX.

MATERIAL REQUIREMENTS

<u>Number</u>	<u>Title</u>
AC 150/5340-30	Design and Installation Details for Airport Visual Aids
FED SPEC TT-E-489	Enamel, Alkyd, Gloss, Low VOC Content
FED STD 595	Colors Used in Government Procurement
MIL-DTL-24441/19B	Paint, Epoxy-Polyamide,Zinc Primer, Formula 159, Type III
NFPA-780	Standard for the Installation of Lightning Protection Systems

Master Painter's Institute