

ATTACHMENT B

NEW LUMINAIRE LOWERING SYSTEM FOR EXISTING HIGH MAST TOWERS

GENERAL

Only a two-drum bottom tethered (TDBT) or a single-drum top latching (SDTL) high mast lowering system will be accepted for replacement. All replacement systems being supplied shall be of the same type and manufacturer.

The replacement lowering system shall be a luminaire ring hoisting device consisting of galvanized or stainless steel head assembly, galvanized or stainless steel luminaire ring, winch drum(s) and winch assembly, Internal Power Unit, luminaire ring hoist cables (if applicable), winch cable(s), luminaire power cable, circuit breakers, lightning rod and arrestors, power connections to the power unit assembly and a luminaire ring guide system to protect the tower and luminaire ring assembly during raising and lowering operations.

Luminaire ring hoist cables shall be 3/16" diameter, stainless steel, anti-rotational aircraft cable of 7x19 construction and manufactured to the requirements of military specification MIL-DTL 83420M. The three-hoist cable system shall provide a safety factor of five.

The winch cable(s) shall be a 1/4" diameter, stainless steel, anti-rotational aircraft cable of 7x19 construction and manufactured to the requirements of military specification MIL-DTL 83420M. A winch cable shall have a safety factor of three.

All electrical components of the lowering system shall be U.L. approved.

The lowering system shall be of a design that will allow the luminaire ring to be lowered to within 3 ft. of the tower base plate for servicing.

The lowering assembly shall be a system which has been in use for at least five years and proven itself to be a reliable and functional unit. All changes or design modifications to the system during this five-year period shall be noted by the manufacturer.

Any of the design changes, considered by the Lighting Engineer to be critical to the proper operation of the lowering system and which, in his opinion, have not been in use long enough to establish an acceptable service record, will be sufficient cause for rejection of the entire system.

DESIGN LOADS AND ALLOWABLE STRESSES

The lowering system and all of its components, including a light ring with 12 high mast luminaires, shall be designed to withstand natural wind loading in accordance with the current edition of the "AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals". The design to withstand natural wind loading shall be based upon a basic wind velocity of 90 mph with a 50-year recurrence interval and a Fatigue Category of 1. The lowering system, together with all of its components, shall also be designed to withstand vortex shedding-induced wind loads based upon a yearly mean wind velocity of 11.2 mph. Each tower lowering system with light ring shall be designed to support twelve high mast luminaires but shall be detailed and manufactured to support the number of fixtures shown on the plans for the particular tower in question.

MAST HEAD ASSEMBLY

The mast head assembly shall contain stainless steel sheaves for the support of the hoisting cables and a roller assembly or a large diameter deep groove pulley on which the luminaire power cable will ride.

All hoist cable sheaves shall be precisely sized and formed to fit the cables which they will carry. The cross-section of the groove shall have a radius of 0.005" to 0.009" greater than half the nominal cable diameter and a minimum radius of 6", as specified by the Wire Rope Technical Board. All sheaves shall have permanently lubricated bearings or oil-impregnated bronze bushings mounted on stainless steel shafts. Hoist cable sheaves that are not completely enclosed and captured shall have retainers or keepers to prevent the cables from disengaging the sheaves under slack conditions.

The main power cable shall be supported by one of the two following methods:

- (1) A series of rollers placed between two vertical side plates. The roller assembly shall be of such design as to support the power cord in a 7-inch minimum bending radius. Keeper bars shall be positioned along the assembly to keep the cord in its track during raising and lowering of the light ring.

(2) A large (14" diameter minimum) power cable pulley (sheave) which is totally enclosed by a tight-fitting cover. The tight-fitting cover shall act as a restraint to the power cable leaving the pulley groove.

The mast head assembly shall include a galvanized steel or aluminum cover that will effectively protect the mechanism from the elements.

LUMINAIRE RING ASSEMBLY

The luminaire ring assembly shall be fabricated of galvanized or stainless steel and shall contain the required number of 2" diameter luminaire mounting arms. The luminaire mounting arms shall be of schedule 40 pipe meeting ASTM A-53 specifications. A weather-tight NEMA 3R junction box containing a pre-wired 600-volt terminal block shall be mounted to the ring. The junction box shall be provided with a twist lock type receptacle capable of receiving the plug of the pigtail lead when testing the luminaires in the lowered position. Pre-wiring shall consist of Type "ST" distribution cable with the insulation suitable for at least 105 degrees C. and properly sized to power each luminaire. The terminal block shall contain a sufficient number of terminals to allow connecting all luminaires plus an approved lightning arrester. The luminaire power cable shall be Type "G" or Type "SEOOW" with five #8 133-strand copper conductors. Strain relief shall be provided at both ends of the power cable by using proper sized cable clamps. The use of Kellern-type grips alone will not be allowed. The power cable shall be MSHA approved.

All electrical connections shall be made using weather-tight, twist-lock type plugs, connector bodies and receptacles. Connector bodies used on the luminaire power cable shall be as small as possible in physical size to prevent hang-up inside the tower.

Two 240-volt, 30 amp. double pole circuit breakers shall be furnished in the base of each tower. Two 240-volt circuits will be run to each tower. Connect half the luminaires to each circuit in a manner that will provide an alternate feed to the luminaires.

TOP LATCHING SYSTEM

The top latching system shall consist of three symmetrically located two piece latching assemblies consisting of latch pin and latch barrel. The latch pin and latch barrel of each assembly shall be manufactured of precision cast stainless steel. Latching of the luminaire ring to the headframe assembly shall be accomplished by the alternate raising and lowering of the luminaire ring using the winch and hoisting assembly. There shall be no moving latch parts or springs attached to the head frame assembly. The latch mechanism shall not be impaired by the formation of ice and shall not require adjustment after the original installation. Highly visible reflective indicator flags shall be used to show if the luminaire support ring is in the latched or unlatched position.

WINCHING ASSEMBLY

The winch assembly shall consist of worm gear speed reducer with either one or two output shafts with cable drum attached. The winch shall be securely anchored and capable of supporting five (5) times the maximum lifted load. The winch shall include an integral drag brake to prevent unwinding, slipping or free spooling of the winch cable. The drum(s) shall be provided with keepers to ensure that the cable will properly wrap onto the drum. The winch, when powered by the Internal Power Unit, shall raise the luminaire ring at a minimum rate of 12 ft./min.

Single drum units will require the use of a transition device (clevis assembly) to properly attach the winch cable to the hoisting cables. The clevis shall not allow either the winch cable or any of the hoist cables to independently rotate. No bearings of any type will be allowed in the clevis. The clevis shall be beveled or tapered on the bottom of the plate to ensure that the transition device will not hang up on the inside of the tower.

FINAL POSITIONING OF LUMINAIRE RING

Means shall be provided to accurately position, stabilize and hold the luminaire ring in place when in the raised position.

The luminaire ring shall be held in its raised position by either a top-latching or bottom tethered system. If a top-latching system is supplied, each latch (latch barrel and latch pin) must be capable of supporting three (3) times the weight of the luminaire ring with its full complement of luminaires attached. Rotation of the luminaire ring to achieve positive latching with this system will not be allowed.

With the bottom tethered system, compression springs shall keep the luminaire ring assembly securely in place against the masthead while the load of the luminaire ring assembly is transferred from the winch assembly to chain or turnbuckle tension latches at the bottom of the tower.

Latching or unlatching with either system shall impart no more than one "G" acceleration in any direction on the luminaires and lamps.

INTERNAL POWER UNIT

An Internal Power Unit shall be supplied with each lowering system installed under this contract. The power unit shall be a heavy duty, single phase, reversing type, continuous duty electric motor capable of correctly raising and lowering a luminaire ring with twelve high mast luminaires attached. The motor shall be rated a minimum of one true horsepower (746 watts of mechanical energy after motor and line losses have been applied). The motor shall be bi-directionally operated by a "dead man" type push button or lever control mounted at the end of a 20 ft. (min.) "SO" power cord. A step-down transformer shall convert the incoming 240-volt primary to 120 volts for safe operation of the motor.

The internal power unit will not be paid for directly but will be considered as part of the complete luminaire lowering system.

PIGTAIL LEAD

The pigtail lead used to power the lowered light ring and internal motor during servicing shall be a minimum of 12 ft. in length. The female pigtail end shall be supplied with a weather-tight rubber cap. The cap will protect the pigtail end when not in use and stored in the tower base. The rubber cap shall be loosely attached to the pigtail lead with a cord or other restraint to prevent it becoming lost.

LUMINAIRE RING GUIDE

Centering arms or a rubber bumper shall be mounted to the inside of the luminaire ring to protect the tower, luminaire ring and luminaires from damage during raising and lowering. If Centering Arms are employed, they must be interconnected or of a design that precludes any possibility of the tower slipping behind the arms and causing a "hang-up".

MISCELLANEOUS

The lowering system shall contain a lightning rod and lightning arrester.

The manufacturer shall supply all drawings, installation instructions, maintenance manuals and technical information required for the proper installation and maintenance of a complete operating assembly.

The entire assembly shall meet all applicable local, county, state and national codes.

A manufacturer's representative shall be present, on site, to advise the Contractor during the installation and testing of at least one complete lowering system. Duties of the manufacturer's representative shall include, but not be limited to the following:

- (1) Directing all adjustments to the lowering system to ensure positive latching and unlatching (this will consist of a minimum of three complete raising and lowering cycles).
- (2) Educating the maintaining utility in (a) the methods of proper maintenance to avoid hoist malfunctions, (b) the proper procedures to follow in the event of a hoist malfunction.

Contractor shall make necessary field adjustments to all of the high mast luminaires to ensure correct luminaire positioning with minimum light trespass.

WARRANTY

The manufacturer shall guarantee all equipment from failure due to defects in material or workmanship for two (2) full years from date of shipment and shall warrant to repair or replace any equipment that fails within that time. In addition, the manufacturer shall provide a "Pass-Through Warranty", for use by the Electrical Contractor or Utility assigned by the State as maintaining authority ("Pass-Through Warranty" means that the manufacturer, manufacturer's representative and distributor shall accept defective warranted material directly from the State appointed maintainer, on behalf of the State, without State personnel having to coordinate the return).

APPROVAL

The Contractor shall provide the Project Engineer with eight (8) complete sets of design drawings and specifications covering the lowering system he proposes to install on the project. These documents will be reviewed and, if found to meet specification requirements, will be approved and proper distribution made.

All documents must be signed and stamped (seal) by a registered Professional Engineer licensed in the State of Nebraska.

Errors in the documents not detected during their review shall not relieve the Contractor from completing his/her work in strict compliance with the requirements of the project plans and specifications.

DEVIATION FROM SPECIFICATIONS:

No deviations, substitutions, additions or omissions from the above specification will be allowed without the Lighting Engineer's approval. The Lighting Engineer's decision in this matter will be final.

PAYMENTS

The furnishing and installation of a new luminaire lowering system on an existing high mast tower shall be paid for as "Replacement Lowering System, Type ***."

Informational Only