

CHAPTER 16 – SIGNAL AND LIGHT POLES

SIGNAL AND LIGHT POLES

The standards and requirements for installing traffic control signal and light poles are presented in this chapter.

16.1 Traffic Control Signal Poles

16.1.1 MAST ARM POLES AND PEDESTALS

Mast Arm Poles

A PA traffic control signal pole consists of a transformer base, a vertical pole shaft, a mast arm truss, and where applicable, a luminaire shaft extension.

The PA pole is a 21-foot high tapered octagonal pole shaft. There are three pole types; the PA 85, PA 90, and the PA 100.

The tapered octagonal mast arm truss is attached to the top of the shaft. The mast arm consists of an upper and lower chord braced together to form a truss. The length of the mast arm trusses ranges from 15 – 55 feet depending on the PA pole type.



Figure 16-1: Type PA Mast Arm Pole

A BA traffic control signal pole consists of a vertical pole shaft, a mast arm truss, and where applicable, a luminaire extension shaft. The BA pole does not use a transformer base. Instead, a 10-inch by 12-inch access opening is provided in the pole shaft to access the wiring.

The BA pole is a 21-foot 10-inch high round shaft. There are five pole types; the BA 60, BA 65, BA 70, BA 75, and the BA 80.

The round tapered mast arm truss is attached to the top of the shaft. The mast arm consists of an upper and lower chord braced together to form a truss. The length of the mast arm trusses ranges from 60 - 80 feet depending on the BA pole type.



Figure 16-2: Type BA Mast Arm Pole

If required in the contract documents, a luminaire shaft extension is installed atop the signal pole shaft. Luminaires mounted on the shaft extension tenons are typically 40 feet above the roadway.

If required by the contract documents, swing away hinges must be installed on the mast arm. The hinges must be installed in such a manner that the mast arm swings away from the intersection.

Swing away hinges are used for traffic control signal systems that are located on house moving routes.



Figure 16-3: Swing Away Hinges

Before the project begins, the contractor must furnish to the engineer, for approval, four complete sets of shop drawings as specified in the contract documents.

The drawings must indicate all member materials and dimensions, section modules of the main component parts, and other pertinent data and calculations.

If approved by the engineer, one set of drawings must be distributed as specified in the contract documents.

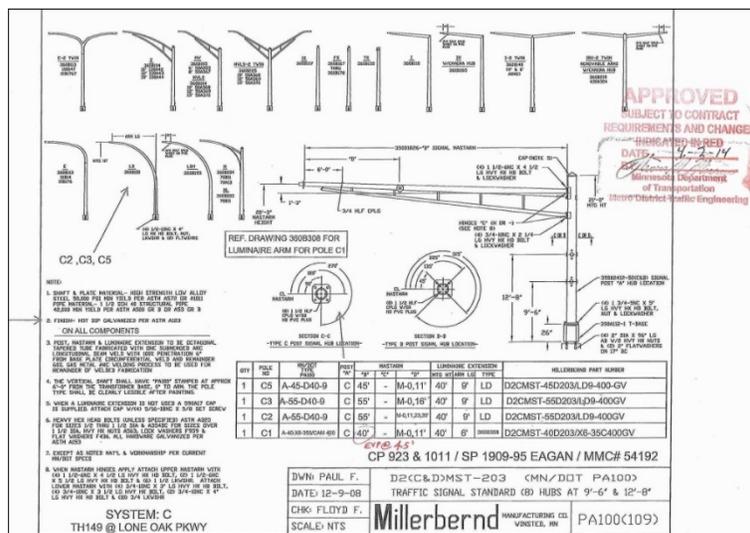


Figure 16-4: Shop Drawings

Mast Arm Pole Installation

Mast arm poles are plumbed by using the leveling nuts on the foundation anchor rods.

Poles must be carefully hoisted into position to avoid damage to the finish. Damaged areas must be repaired as specified in the contract documents.

The access door of the transformer base must be oriented away from the traffic, as specified in the contract documents, to allow service personnel to see the intersection while servicing the base.



Figure 16-5: Signal Mast Arm Pole Installation

The mast arm pole standard must be installed and tightened on the concrete foundation anchor rods as specified in the installation procedure as detailed in the contract documents.

After all mast arm pole standard wiring is complete, the access opening covers (see Figure 16-5) must be sealed with 100% clear silicone sealant at final installation.

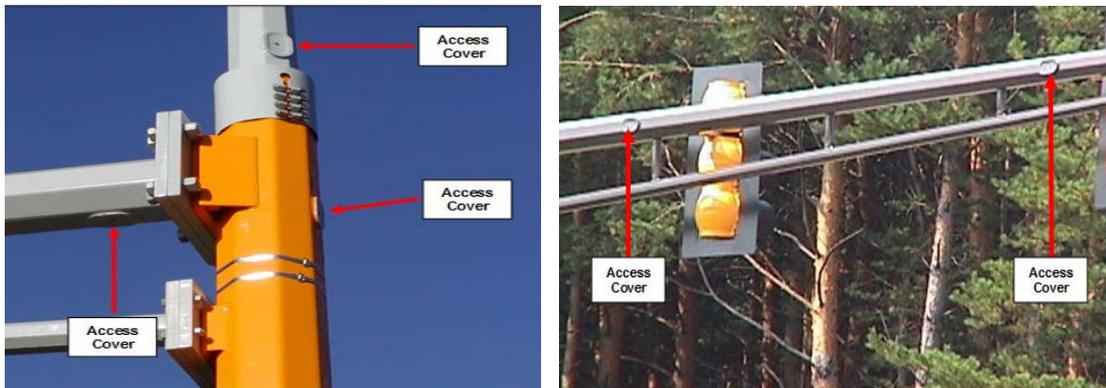


Figure 16-6: Access Opening Covers

Pedestals

Pedestal shafts and bases must be unpainted anodized aluminum, unless otherwise specified in the contract documents.

Pedestals consist of a shaft and a base. The base is designed to break away from the foundation when struck by a vehicle. A re-enforcing collar (wind collar) or a base with an extended neck and set screws is required with each pedestal installation.



Figure 16-7: Pedestal Base and with Wind Collar and Integrated Wind Collar

If steel pedestal shafts are specified, the steel shaft must be constructed of a welded 4-1/2 inch outside diameter steel tubing and a threaded 5-inch-long, 4-inch standard steel pipe nipple. The nipple is welded to the end of the steel tube and must follow American Welding Society requirements. See Standard Plate 8122 for all requirements.

Apply anti-seize compound to all threaded surfaces including set screws, door access bolt, and pedestal shaft.

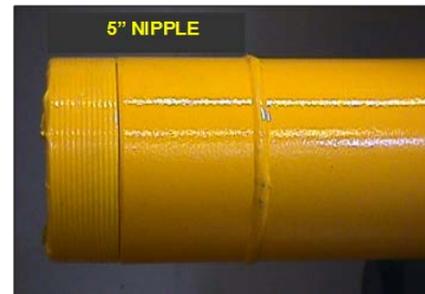


Figure 16-8: Steel Tubing and Nipple

The contract documents may require pedestal shafts and bases to be painted. All painting of pedestal shafts and bases must be in accordance with the contract documents. Pre-painted pedestal shafts and bases that have scratches or other type of damage will not be accepted.

The pedestal base must have a threaded top and square transformer base design. For steel pedestal shafts, a 4-inch threaded steel pipe nipple must mate with the pedestal base.

Four new anchor rods, with washers, and nuts must be furnished with each pedestal base.

The pedestal base access door must provide a positive closure with a fixed catch on the inside bottom of the door and a bolt type locking mechanism on the top. Anti-seize compound must be applied to the threads of the stainless-steel hex-head bolt.



Figure 16-9: Painted Pedestal Shaft and Base

As shown in Figure 16-11, one NRTL listed ground lug wire connector must be mounted with a single bolt on the sidewall, 3 inches from the door and 8 inches above the bottom of the base. The connector must accommodate a 6 AWG copper ground wire and must have a slot head screw to connect the ground wire.



Figure 16-10: Pedestal Base Access Door



Figure 16-12: Pedestal Concrete Foundation



Figure 16-11: Ground Lug Wire Connector

As shown in Figure 16-16, pedestal caps must be either steel or anodized cast aluminum based on the material of the pedestal shaft. The pedestal cap must be the same color as the pedestal shaft



Figure 16-13: Pedestal Cap

16.2 Light Poles

MnDOT light poles:

1. Must be in accordance with MnDOT 3811 and the current edition of AASHTO Standard Specifications of Structural Supports for Highway Signs, Luminaires, and Traffic Signals.
2. If providing breakaway poles, the poles must be certified from the manufacturer that the pole meets specifications as specified in the current edition of AASHTO Standard Specifications of Structural Supports for Highway Signs, Luminaires, and Traffic Signals.
3. Must have a nominal 2 3/8-inch schedule 40 tenon for slip fit luminaire installation.
4. Davit or mast arm must have an upward angle from horizontal of 3 degrees +/- 2 degrees.

There are several of types of light poles MnDOT uses. The most common types of poles used on MnDOT lighting systems are:

- Stainless steel 40-foot and 49-foot breakaway
- Aluminum alloy 40-foot and 49-foot breakaway
- Coated (galvanized) steel bridge and barrier 40-foot and 49-foot nominal height non-breakaway
- High mast light towers

16.2.1 DEFINITION AND OVERVIEW

A lighting unit is defined as follows:

A lighting unit includes the light pole, internal wiring with fuse holder and fuse to the luminaire, above ground splices, wire holder, stainless steel woven wire cloth, and luminaire. Underpass luminaires are lighting units even though they do not include some of these components. The foundation is not considered as part of this definition.

The type of light pole required for each project will be shown in contract documents.

Light poles that are specified by MnDOT are fabricated from stainless steel, high strength steel, or aluminum.

Light poles fabricated from aluminum must have a factory installed vibration dampener.

Light poles must be fabricated in accordance with MnDOT 3811.

Within 15 days after the contract approval notice mailing date, the contractor must furnish evidence to the engineer, in writing, that orders have been placed for all components of the lighting units required for the project.

The contractor must submit to the engineer, for approval by the district's traffic engineer, sets of prints of required shop detail drawings of the light poles and anchor rods, in accordance with 2471.3.B. For high mast lighting installations, the contractor must submit final reproducible

drawings in accordance with 2471.3.B. The drawings must be distributed after approval, to the following:

1. Contractor's fabricator
2. Contractor
3. Engineer
4. District traffic engineer

All light poles must be approved before installation.

The Engineer's acceptance of shop drawings will not relieve the contractor of full responsibility for submission of complete and accurate drawings and for the accurate assembly and fitting of all structural members.

16.2.2 TYPES OF LIGHT POLES

Stainless Steel 40-Foot and 50-Foot Breakaway

Stainless Steel Pole:

- Slip fit high base
- 16 sided
- Typically single davit (6 feet - 12 feet)
- Mounts on Design E and H foundations
- Can be double davit in areas such as gores

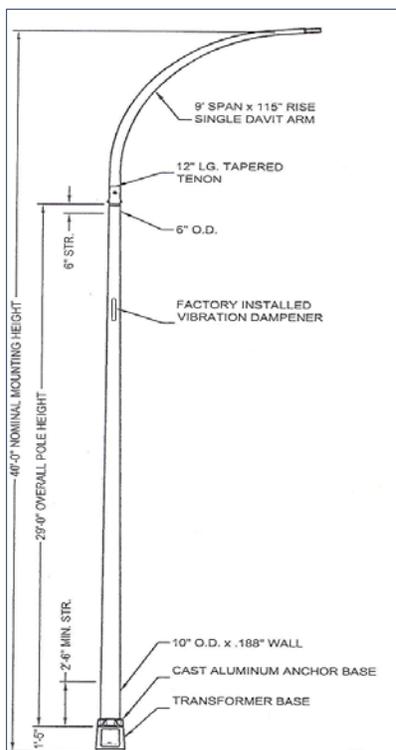


Figure 16-15: Aluminum Alloy Breakaway

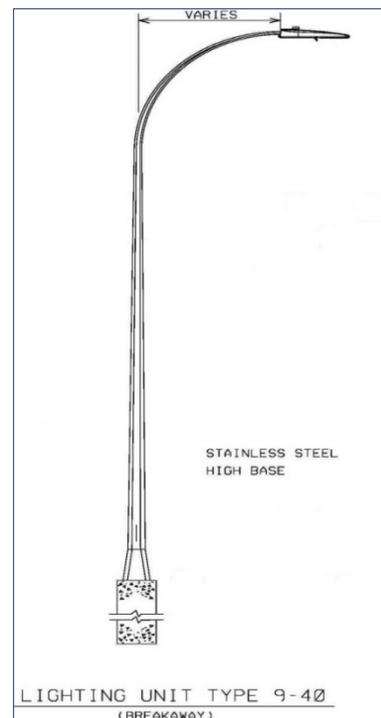


Figure 16-14: Stainless Steel Breakaway

Aluminum Alloy 40-Foot and 49-Foot Breakaway

Aluminum Alloy Pole:

- Transformer base (bolt on)
- Typically single davit (6 feet - 12 feet)
- Mounts on Design E and H foundations
- Can be double davit in areas such as gores

Bridge and Barrier Poles 40-Foot and 49-Foot

- Galvanized steel
- Non-breakaway
- High base
- 6-bolt base plate
- Two access door assembly
- Single and double davit
- Mounted on barrier (center median and bridge barrier foundations)

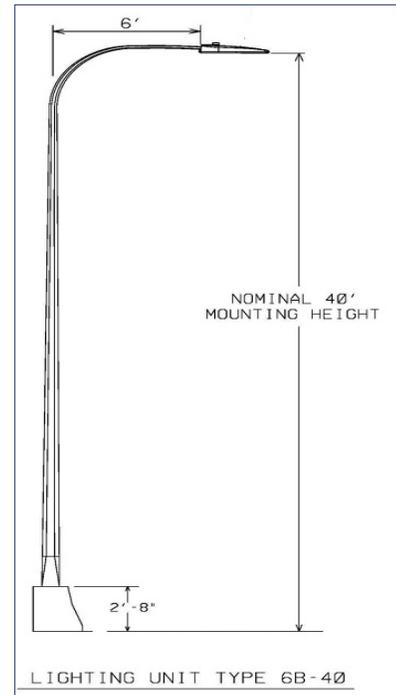


Figure 16-16: Bridge and Barrier Poles

High Mast Light Towers

- COR-TEN steel (weathering steel) or Galvanized
- High base design
- Typically 100 feet to 140 feet
- Typically ring assembly holds 3 to 4 luminaires

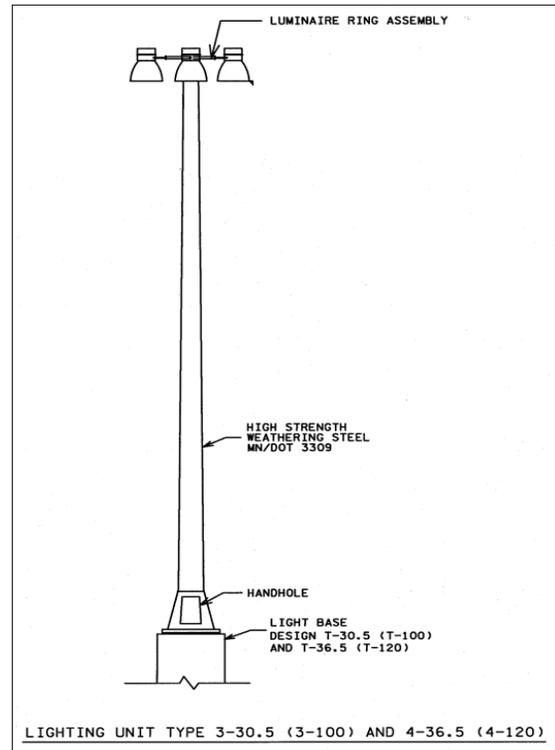


Figure 16-17: High Mast Tower

16.3 Installation for Signal and Light Poles

16.3.1 ANCHOR ROD CONSIDERATIONS

The anchor rod connection is a critical component of foundations and pole structures. The primary functions of anchor rod connections are to attach a pole to a foundation and safely transmit loads from the pole into the foundation. Failure of anchor rod connections could lead to collapse of the pole. Therefore, it is imperative to follow the installation instructions and requirements in accordance with the pole manufacturer, the current edition of AASHTO LRFD Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals, and MnDOT contract documents.

Lift and safely move poles without damage. Avoid abrasion during lifting operations. Do not drag the poles on the ground and use natural or synthetic fiber slings and chokers for lifting. Protect the pole finish from coming in direct contact with the ground surface and metal hardware used for lifting and rigging. Repair any finish surface damage in accordance with the manufacturer's requirements.

Before standing poles on foundations:

1. Verify the anchor rod pattern matches the base plate hole pattern.
2. Verify the required anchor rod grade by locating the steel die stamped grade identification on the end of the anchor rod projecting above the concrete.

3. Verify anchor rods meet projections for a properly secured pole, and meet AASHTO stub height requirements when breakaway is required.
4. Verify anchor rods are clean, not damaged, and plumb.
5. Verify nuts can be turned down on the anchor rods to the foundation and backed off by hand or by one worker using an ordinary wrench without a cheater bar.
6. Verify the base plate opening accommodates conduits and ground rod electrodes.
7. Ensure the pole is free of dirt or other foreign material, and
8. Inspect poles for damage.



Figure 16-18: Apply Anti-Seize "Bridge Grease" to Bearing Surfaces

As shown in Figure 16-21 and 16-22, clean and brush on an anti-seize and lubricating compound referred to as "bridge grease" to the exposed threads of all anchor rods (bolts) and nuts and the bearing surface of all nuts and washers just before installing signal service cabinets, mast arm poles, pedestals, light poles, lighting service cabinets, or other types of structures on anchor rods.

Bearing surface means the plane of contact between the washer and the nut or bolt head being turned when tightening the anchor rod (bolt) connection. Up to 70% of the friction of an anchor rod connection comes from turning the nut against the washer.



Use bridge grease on bearing surfaces and threads of nuts and anchor rods to reduce friction when tightening the connection.

Ensure a clean work area to prevent dirt from contaminating bridge grease on nuts, washers, and anchor rods. Contaminants will cause friction between the anchor rod and nut and therefore impede nut rotation to achieve proper tightening of the connection.

Clean anchor rods, nuts and washers and re-apply bridge grease if more than 24 hours has passed since earlier application or the anchor rods, nuts, or washers have become wet after applying bridge grease.

Figure 16-19: Apply Anti-Seize "Bridge Grease" to Bearing Surfaces

Installation Procedures

To install anchor rods, use fixed-sized wrenches designed to tighten nuts on anchor rods such as open-end wrenches, closed end or box end wrenches, combination wrenches, slugging wrenches, iron workers spud wrenches, or socket wrenches sized specifically for turning nuts. Do not use pipe wrenches and adjustable type wrenches for tightening anchor connections.



Figure 16-20: Do Not Use Pipe Wrenches

Anchor Rod Securement

Ensure the top of the anchor rod extends at least one thread beyond the top surface of the top nut. An anchor rod end inside the top nut where no threads extend beyond the top surface of the nut and the top nut is not fully engaged on the anchor rod after tightening is not acceptable.



Figure 16-21: Insufficient Anchor Rod Projection

Place nuts, washers, and pole base plate on the anchor rods in the installation order required by the manufacturer and contract documents. Do not remove required nuts or washers from the connection. Do not add extra washers or additional hardware to the anchor rod connection.

MnDOT anchor rod connections used to attach stainless steel light poles and signal poles to foundations are a typical double-nut connection. In this connection, there are top nuts and leveling nuts that sandwich the base plate.

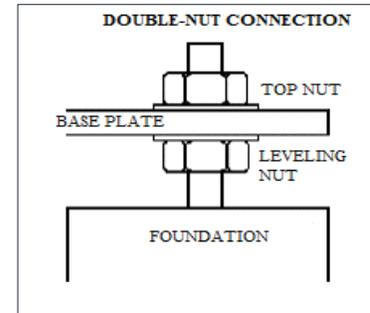


Figure 16-22: Double-nut Connection

Aluminum light poles and signal pedestal use a single-nut connection may be used to attach the pole to the foundation. In this connection, the base plate rests directly on the foundation and top nuts are used to tighten the anchor rod connections.

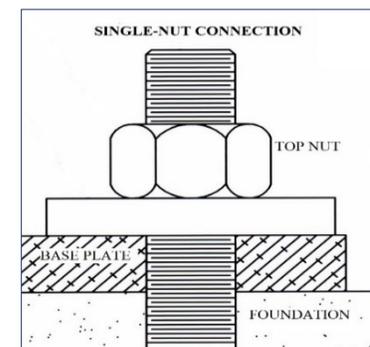


Figure 16-23: Single-nut Connection

Use the anchor rod connection required by the pole manufacturer.

Follow the standoff distances required by the pole manufacturer when installing double-nut connections. If no standoff distance is provided by the manufacturer, use the AASHTO recommended standoff distance of less than one bolt diameter. Standoff distance is defined as the clear distance between the bottom of the leveling nut and the top of the concrete for double-nut anchor rod connections.

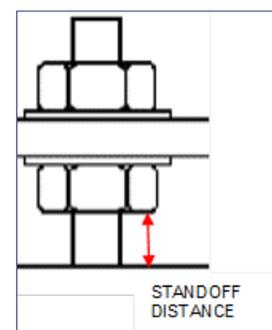


Figure 16-24: Standoff Distance

Use hardened flat washers under the nuts being turned for tightening in the anchor rod connection unless the manufacturer does not specify it in their installation instructions. For example, the manufacturer for the cast aluminum frangible transformer base does not require a hardened flat washer under the top nut being turned.

Do not use lock washers in anchor bolt connections unless otherwise indicated by the manufacturer.

Tighten anchor rod connections to full tension as required by the manufacturer and the contract immediately following placement of the pole on its foundation.

During snug tightening and final tightening turn the nuts in a star or crisscross pattern and in at least two full tightening cycles (passes).

“Snug Tightening” does not mean finger tightening or final tightening. It simply means bringing the plies (washers, nuts, base plate) of the connections together in firm contact. This can be accomplished in two ways. One method is using a torque wrench when possible to the required snug torque values provided on the Anchor Rod Tightening Torques and Turns Guide. If a torque wrench cannot be applied to the nuts then use an open end wrench with the length specified in the Anchor Rod Tightening Torques and Turns Guide. The anchor rod diameter determines the length of the wrench. Anchor rod diameters 1 ¼ inches or less can be snug tightened using a 12 inch long wrench and pulling with one arm. A wrench must be applied to both the top nuts and leveling for bringing the plies of the connections together in firm contact.



Figure 16-25: Tightening Anchor Rods

Once the plies of the connections have been brought together in firm contact then final tightening can begin. Final tightening is also known as preloading or pre-tensioning. When possible, final tightening should take place by turning the top nuts with a torque wrench to the required torque value specified on the Anchor Rod Tightening Torques and Turns Guide. Because torque values and torque wrenches are being relied upon for tightening accuracy and it is the preferred method of tightening, it is absolutely imperative that the required anti-seize and lubricating compound is applied to the threads of anchor rods and nuts and the bearing surfaces of nuts and washers. Failure to apply anti-seize and lubricating compound, especially to the bearing surfaces of nuts and washers will result in inaccurate torque readings.

Loose anchor rod connections on traffic signal and light poles can significantly shorten the life of the overall structure (pole and foundation). Following the required anchor rod tightening procedure and construction inspection can help prevent loose anchor rod connections.

16.3.2 TRAFFIC CONTROL SIGNAL MAST ARM POLE INSTALLATION

Install traffic control signal mast arm poles in accordance with the pole manufacturer requirements and the contract.

There is a 1 inch lip or flange that overhangs on the mast arm transformer base. This 1 inch lip partially covers the leveling nuts. If the leveling nuts are set too low on the anchor rods a wrench head will not fit between the top of the foundation and the bottom edge of the 1 inch lip for access to the leveling nut. A wrench must be applied to both the top nuts and the leveling nuts to ensure proper tightening of the anchor rod connections.

The manufacturer recommends a standoff distance of 3/8” to 1/2”. If a wrench cannot be applied onto the leveling nuts set the leveling nuts to the recommended standoff distance. Standoff distance is defined as the clear distance between the

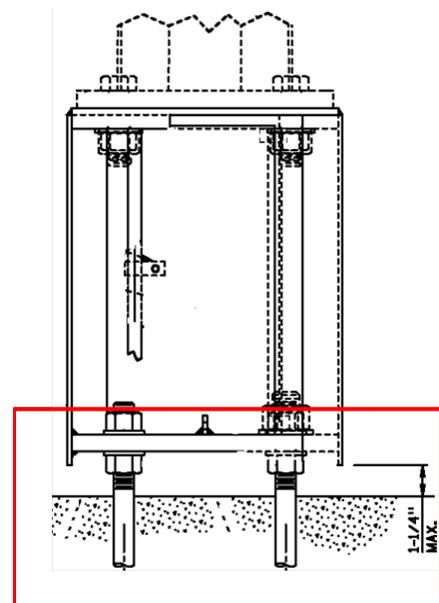


Figure 16-26: Flange Overhang on Base

bottom of the leveling nut and the top of the concrete for double-nut anchor rod connections.

A recommended anchor rod tightening procedure for the PA 90 and PA 100 traffic signal mast arm poles is as follows:

1. Snug torque the top nuts to the required 500-525 foot pounds using the recommended hydraulic torque wrench in a criss-cross pattern in 2 cycles.
2. In a crisscross pattern use an open end striking/slugging wrench and a 2.5 pound to 4 pound sledge hammer with a 14-16 inch handle to bring the leveling nuts, washers, and baseplate together into firm contact. Squarely strike the wrench no more than 3 times for each leveling nut. Or use a 48 inch long open end wrench to turn the leveling nuts. *PURPOSE OF THIS IS TO ONLY BRING THE PLIES OF THE ANCHOR ROD CONNECTIONS INTO FIRM CONTACT BEFORE FINAL TIGHTENING. THIS IS NOT FINAL TIGHTENING.*
3. In a crisscross pattern pre-tension the anchor rods by turning the top nuts in 2 full cycles to the required 3100-3150 foot pounds using the recommended hydraulic torque wrench. *THIS IS FINAL TIGHTENING!*

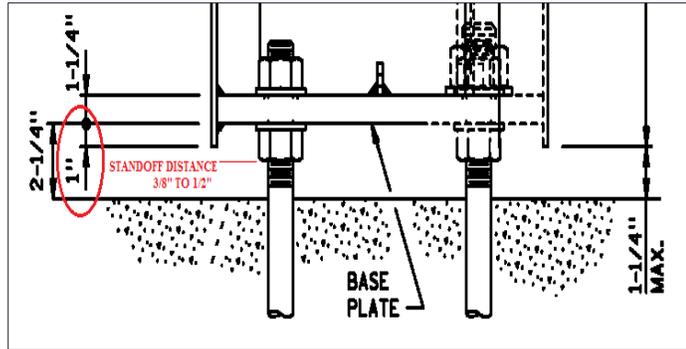


Figure 16-27: Recommended Standoff Distance Mast Arm Pole Transformer Base

The recommended hydraulic torque wrench is the “Stealth Series” low clearance (profile) hydraulic tool with digital pendant to tighten the top nuts to the required torque values.



Figure 16-28: Recommended Hydraulic Torque Wrench

The torque wrench can be purchased or leased from:

Hytorc MN- Sales & Rental Bolting Specialist
glenn@hytorcnorth.com
 20 Sycamore street west
 Stillwater, MN 55082
 651-260-1508

Or use a low clearance (profile) hydraulic torque wrench with digital pendant and working digital torque read out in foot pounds to tighten the top nuts. Ensure the wrench fits between the signal base sidewall and the top nuts to tighten the top nuts to the required torque values.

16.3.3 TRAFFIC SIGNAL PEDESTAL INSTALLATION

The pedestal base must be secured to anchorages of the concrete foundations or screw-in steel foundations utilizing nuts and anchor rods as specified in contract documents and washers in accordance with Standard Plate 8129.

The contract documents for each traffic control signal system project will dictate whether a pedestal concrete foundation or a pedestal screw-in foundation is to be installed by the contractor.

The pedestal base must be plumbed with galvanized steel shims only. See Standard Plate 8129 for additional requirements on shims.

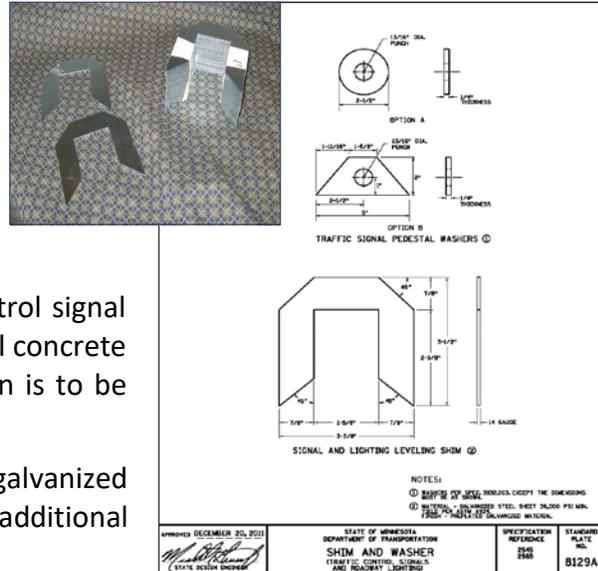


Figure 16-28: Galvanized Steel Shims

The access door of the base must be oriented away from traffic to allow maintenance personnel to see the intersection while servicing the base.

Using a calibrated torque wrench tighten the nuts on the 3/4 inch diameter galvanized steel anchor rods for pedestal bases to 90 foot pounds in a crisscross pattern in two cycles.



Figure 16-29: Access Door Orientation

16.3.4 ALUMINUM LIGHT POLE AND CAST ALUMINUM FRANGIBLE TRANSFORMER BASE INSTALLATION

Install aluminum light poles with cast aluminum frangible transformer bases in accordance with the pole and base manufacturer’s installation instructions and MnDOT Specification 2545.3.H.

Use shims in accordance with Standard Plate 8129 under the base if leveling is required. Do not use leveling nuts. The top nuts with the required 1/2-inch-thick washers sometimes called “holddown washers” are used to secure the base tightly to the foundation, bringing all the plies of the connection together. This is called a single-nut connection as required by the pole manufacturer.

As shown in Figure 16-4, this particular manufacturer posts the installation instructions on a yellow caution sticker affixed to the back inside wall of every base that is AASHTO approved for breakaway.

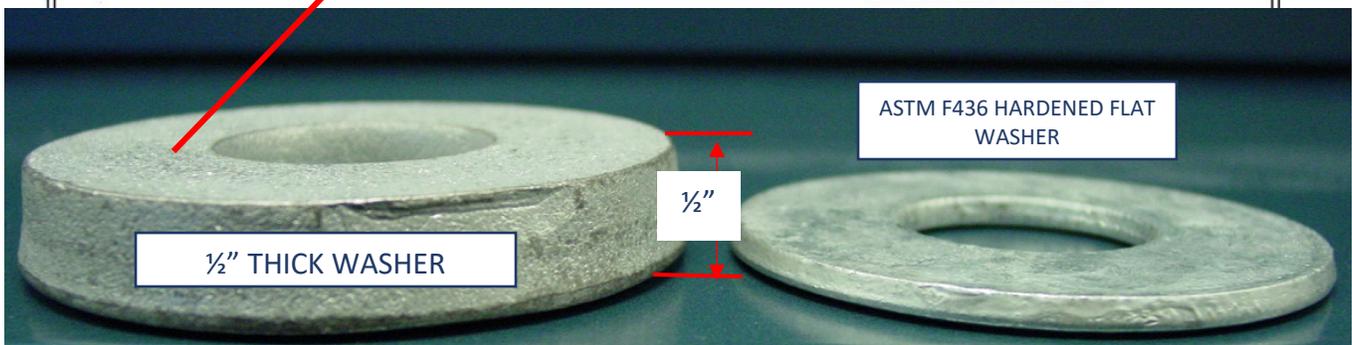
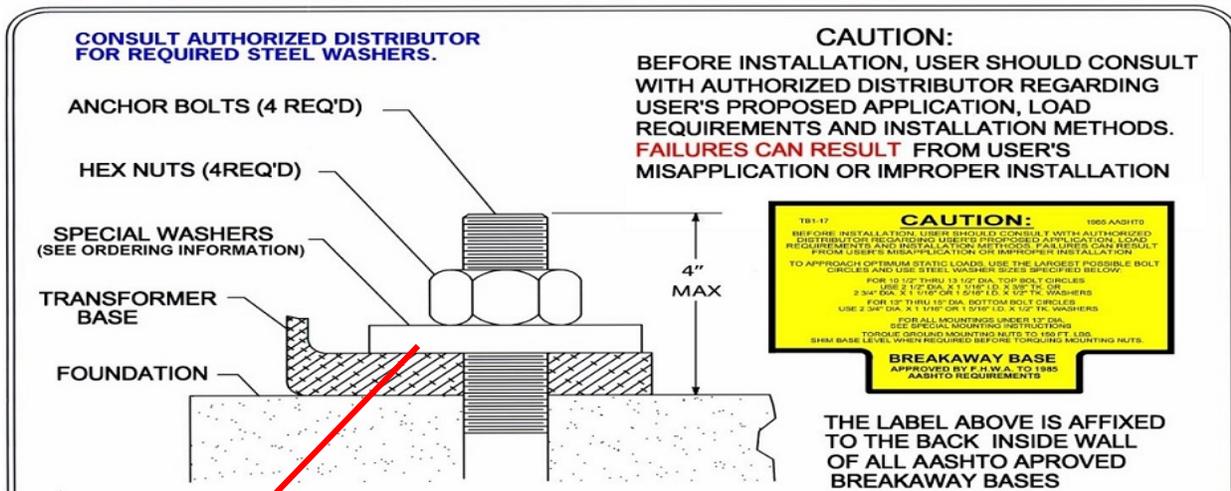
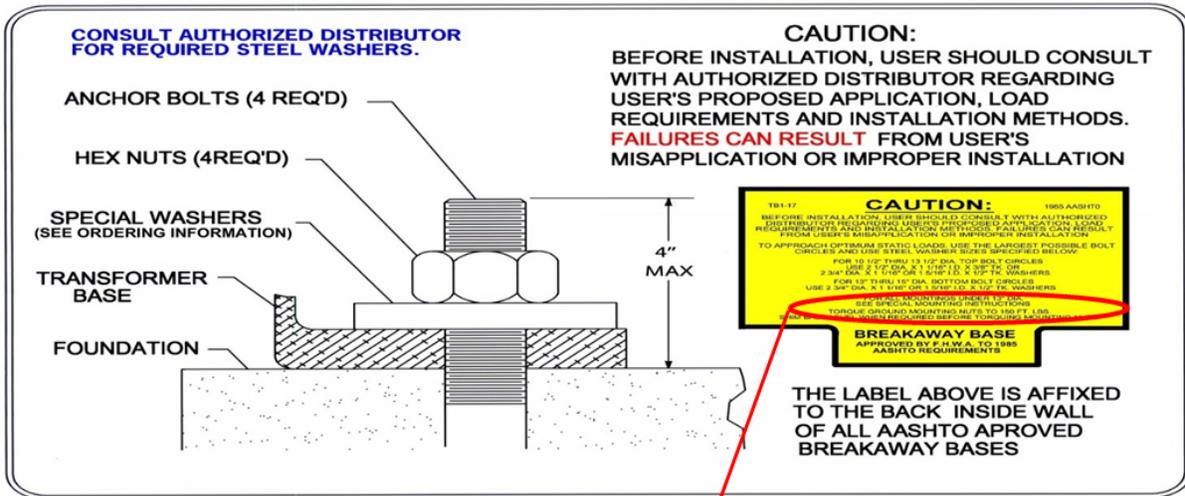


Figure 16-30: Installation Instructions

Torque the top nuts (ground mounting nuts) to the proper tightening level specified by the manufacturer. This manufacturer requires a torque value of 150 foot-lbs.

Use a torque wrench that has been recently calibrated to measure torque level and to verify that the manufacturer's specified torque value has been met.



TB1-17 AKRON FOUNDRY COMPANY AKRON, OHIO 1985 AASHTO

CAUTION

BEFORE THE INSTALLATION OF THIS BASE IN SERVICE, USER SHOULD ALWAYS CONSULT WITH AUTHORIZED DISTRIBUTOR REGARDING PROPOSED APPLICATION, LOADING TO BE SUSTAINED AND INSTALLATION INSTRUCTIONS. FAILURE(S) CAN RESULT FROM MISAPPLICATION, OVERLOADING/IMPROPER LOADING OR INCORRECT INSTALLATION.

TO APPROACH OPTIMUM STATIC LOADS, USE THE LARGEST POSSIBLE BOLT CIRCLES AND USE STEEL WASHER SIZES SPECIFIED BELOW:

FOR 10 1/2" THRU 13 1/2" DIA. TOP BOLT CIRCLES
USE 2 1/2" DIA. X 1 1/16" I.D. X 3/8" TK. OR
2 3/4" DIA. X 1 1/16" OR 1 5/16" I.D. X 1/2" TK. WASHERS

FOR 13" THRU 15" DIA. BOTTOM BOLT CIRCLES
USE 2 3/4" DIA. X 1 1/16" OR 1 5/16" I.D. X 1/2" TK. WASHERS

FOR ALL MOUNTINGS UNDER 13" DIA.
SEE SPECIAL MOUNTING INSTRUCTIONS

FOR OPTIMUM PERFORMANCE, MOUNT TRANSFORMER BASE ON A FLAT AND LEVEL FOUNDATION SURFACE. SHIM BASE WHEN REQUIRED. IF GAPS ARE PRESENT, THOROUGHLY FILL VOIDS WITH A NON-SHRINK GROUT. TORQUE GROUND MOUNTING NUTS TO 150 FT. LBS.

BREAKAWAY BASE
APPROVED BY F.H.W.A. TO 1985
AASHTO REQUIREMENTS

Figure 16-31: Torque Requirements

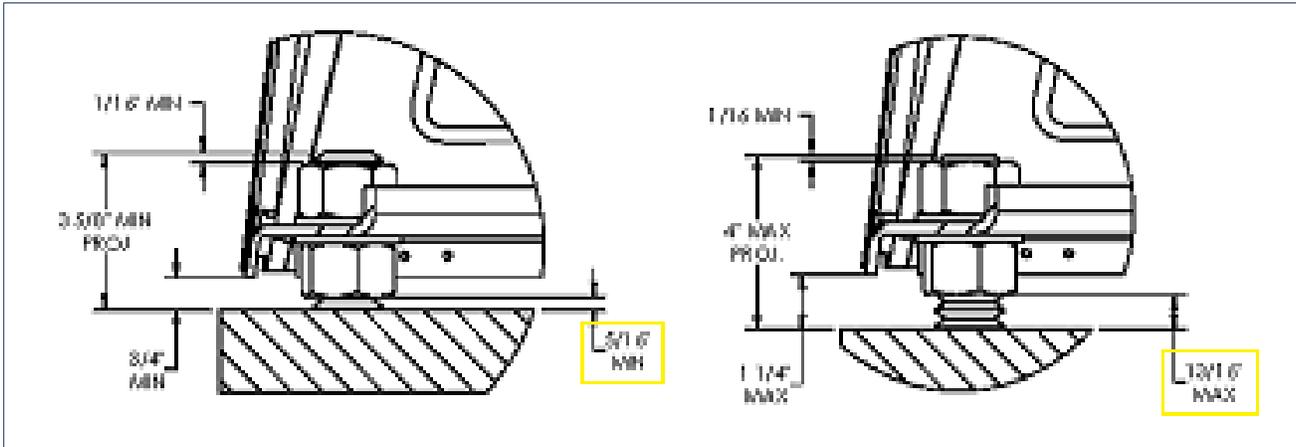


Figure 16-34: “Standoff” 17-inch Bolt Circle Base

Read carefully and strictly follow the instructions provided on the manufacturer’s installation instructions sheet to ensure adequate tightening of anchor rod connections.

For both types of bases, the installation steps found on the manufacturer’s installation instructions sheet requires the lower leveling nuts and the top nuts to be tightened to snug tight.

Using a torque wrench, snug torque the top nuts in a crisscross pattern in 2 cycles to 33 foot pounds for the Design E and 67 foot pounds for the Design H. In a crisscross pattern use the pole manufacturer’s specialty open end 30 degree offset 12 inch flat wrench to turn the leveling nuts with one arm in one smooth motion. If the leveling nuts cannot be accessed with the manufacturer’s specialty wrench, the light pole is installed incorrectly. **A WRENCH MUST BE APPLIED TO THE LEVELING NUTS!** Reinstall the light pole and follow the manufacturer’s standoff distances detailed on their installation instructions sheet.



Figure 16-35: Pole Manufacturer’s Specialty Wrench Used to Tighten the Leveling Nuts

After snug torque of the top nuts to the required torque value with a torque wrench and turning of the leveling nuts with the pole manufacturer’s specialty wrench, pre-tension the anchor rods by tightening the top nuts in a crisscross pattern in two full cycles to the required 200 foot pounds for a Design E and 400 foot pounds for a Design H using a torque wrench. This last step is “final tightening”.

16.3.5 HIGH MAST LIGHT TOWER (HMLT) INSTALLATION

Install HMLTs (poles) on foundations in accordance with the manufacturer's pole erection drawings and installation instructions, 2545.3 "Pole Installation" and 2545.3 "Double-Nut Anchor Rod Connections".

Before standing the HMLT on the foundation anchor rods provide the following:

- (1) Verify the position of the anchor rods matches the base plate holes
- (2) Verify the required 7 ½ inch anchor rod projection (measured from the top of anchor rod to the top of the foundation)
- (3) Verify that the leveling nuts turn onto the anchor rods well past the final elevation of the bottom of the leveling nut and backed off by one worker using an ordinary wrench without a cheater bar
- (4) Clean the anchor rods, nuts, and washers removing dirt, rust, burrs, loose scale and other foreign material that would prevent solid seating of the connections
- (5) After cleaning the anchor rods, nuts, and washers, but just before erecting the HMLT apply anti-seize and lubricating compound in accordance with 3842 on the threads of anchor rods and bottom nuts, and the faying surfaces between the bottom nuts and the bottom washers
 - (a) If more than 24 hours has elapsed since earlier lubrication, or if the anchor rods and nuts have become wet since they were first lubricated, then clean and re-lubricate threads of anchor rods and nuts, and the faying surfaces between nuts and the washers
- (6) Turn the leveling nuts onto the anchor rods. Set the leveling nuts approximately 3 inches measured from the top of the leveling nut to the top of the foundation, or provide approximately a 3 inch clearance between the bottom of the base plate and the top of the foundation
- (7) Install washers on top of the leveling nuts and align the nuts to the same elevation using a level

Stand the HMLT on the foundation and provide the following:

- (1) Install top washers on the anchors rods and onto the base plate
- (2) Lubricate the threads of the anchor rods and top nuts, and the faying surfaces between the top washers and top nuts with the anti-seize and lubricating compound in accordance with 3842. If more than 24 hours has elapsed since earlier lubrication or the anchor connections become wet, then clean and re-lubricate the required surfaces
- (3) Turn down the top nuts onto anchor rods by hand until the faying surfaces of the nuts and washers make contact
- (4) Use chalk or a marker to number the outside bottom edge of the base next to the leveling nuts in the star pattern shown on *Figure 16-36*, depending on the HMLT base plate bolt circle pattern

- (5) Snug torque the top nuts to 500-525 foot pounds in the star pattern shown on *Figure 16-36* in 2 cycles using the required hydraulic torque wrench
- (6) Using an open end striking/slugging wrench and a 2.5 pound to 4 pound sledge hammer with a 14 inch to 16 inch handle bring the leveling nuts, washers, and base plate together into firm contact in the star pattern shown on *Figure 16-36*. Squarely strike the wrench no more than 3 times for each leveling nut
- (7) In the star pattern shown on *Figure 16-36*, tighten the top nuts in 2 full cycles to 3,100-3150 foot pounds using the required hydraulic torque wrench

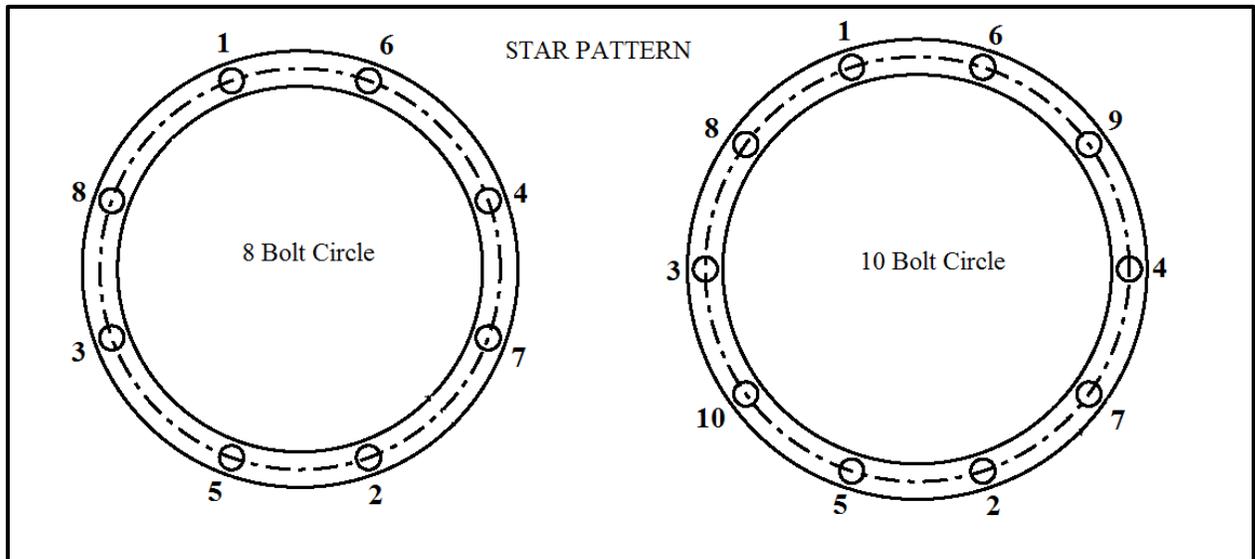


Figure 16-36: Star Pattern for Tightening HMLT Anchor Rods

The required hydraulic torque wrench is the “Stealth Series” low clearance (profile) hydraulic tool with digital pendant to tighten the top nuts to the required torque values in accordance with contract documents.

The “Stealth Series” wrench can be purchased or leased from:

Hytorc MN- Sales & Rental Bolting Specialist

651-260-1508

glenn@hytorenorth.com

420 Sycamore street west

Stillwater, MN 55082

Or use a low clearance (profile) hydraulic torque wrench with digital pendant and working digital torque read out in foot pounds to tighten the top nuts. Ensure the wrench fits between the tower base sidewall and the top nuts. Obtain Engineer’s approval before using.



Figure 16-37: Required Hydraulic Torque Wrench

16.3.5 LIGHT SYSTEM COMPONENT LABELING (2545.3)

The contractor must number the light poles or the luminaires when light poles are not required (underpass luminaires, tunnel luminaires, special luminaires, etc.) as specified in contract documents.

MnDOT approved labels are listed on MnDOT's Approved/Qualified Products List (APL) for roadway lighting.



Figure 16-35: Lighting Pole Numbering

16.4 Rodent Intrusion Barrier for Traffic Control Signal and Light Poles

16.4.1 TRAFFIC SIGNAL POLES

The contractor must provide stainless steel woven wire cloth as specified in 2545.2 or an approved rodent intrusion barrier found on MnDOT's APL in traffic signal pole transformer bases MnDOT Standard Plate No. 8121. The stainless steel woven wire cloth is inserted and wound around the opening at the bottom of the pole transformer base in accordance with 2545.3 "Rodent Intrusion Barrier".



Figure 16-36: Stainless Steel Woven Wire Cloth

The rodent intrusion barrier found on MnDOT's APL should be installed according to the manufacturer's installation instructions. Use 100% silicone sealant to fill voids between the approved barrier and the base plate.



Figure 16-37: Approved Rodent Intrusion Barrier Found on MnDOT's APL

16.4.2 STEEL AND STAINLESS STEEL LIGHT POLES

The contractor must provide a stainless steel woven wire cloth as specified in 2545.2 or an approved rodent intrusion barrier found on MnDOT's APL in steel and stainless-steel double-nut connection light pole bases with a 10 3/4 inch diameter base plate opening.

On light pole bases the woven wire cloth should be installed in accordance with 2545.3.

The entire stainless steel woven wire cloth assembly must be grounded in accordance with the National Electrical Code (NEC).

The rodent intrusion barrier found on MnDOT's APL should be installed according to the manufacturer's installation instructions. Use 100% silicone sealant to fill voids between the approved barrier and the base plate.

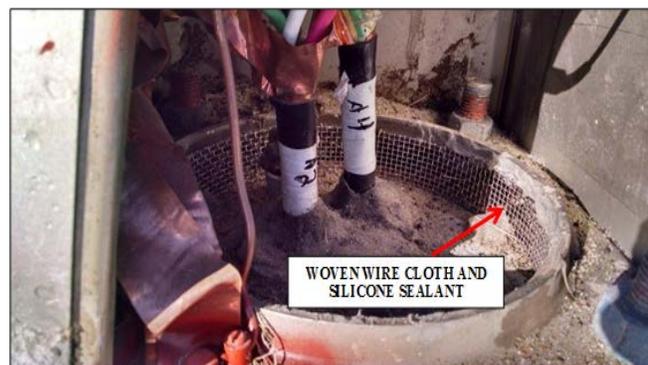


Figure 16-38: Woven Wire Cloth for Rodent Protection

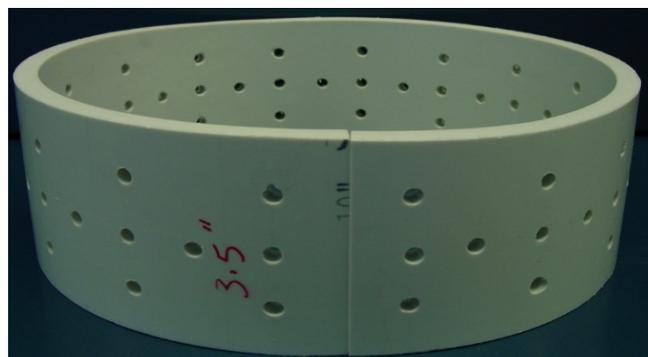


Figure 16-39: Approved Rodent Intrusion Barrier Found on MnDOT's APL

16.4.2 Aluminum Poles

For aluminum pole bases do not install stainless steel woven wire cloth. Instead, fill any gaps as a result of using leveling shims that exceed 1/8 in between the foundation and the aluminum pole base with 100% clear silicone sealant. Do not completely seal around the perimeter between the foundation and the aluminum pole base.

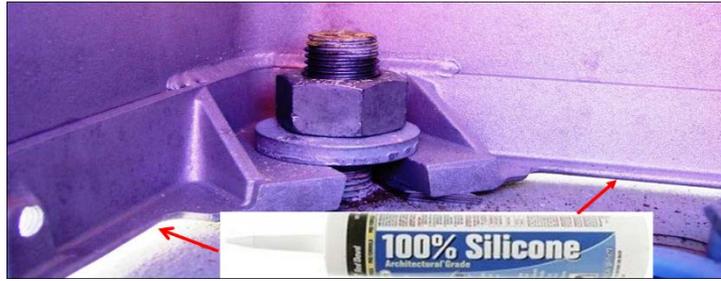


Figure 16-40: Aluminum Pole Rodent Intrusion

16.5 Chapter 16 Resources

- MnDOT Standard Specifications for Construction 3811, 2545.2, 2545.3,
- National Electrical Code (NEC).
- Standard Plate 8122, 8129
- AASHTO Standard Specifications of Structural Supports for Highway Signs, Luminaires, and Traffic Signals