

ENGINEERING BRIEF NO. 77

INTERIM FABRICATION AND INSTALLATION PROCEDURES FOR ADJUSTABLE LIGHT BASES AND EXTENSIONS

FEBRUARY 2008

PURPOSE

In response to a U.S. Court of Appeals for the District of Columbia's decision in *SAFE Extensions Inc. v. Federal Aviation Administration (FAA)*, 509 F.3d 593 (C.A.D.C. 2007), FAA is issuing these interim procedures for adjustable light bases and extensions. The court found FAA's changes requiring laboratory torque testing of adjustable devices in Advisory Circular 150/5345-42F, *Specification for Airport Light Bases, Transformer Housings, Junction Boxes, And Accessories* unsupported by sufficient justification in its administrative record. The FAA is concerned that adjustable light bases and extensions are unable to maintain horizontal azimuth.

The FAA is in the process of assembling further documentation on this issue and at least one incident of potentially catastrophic failure, which will be included in the release of a draft revised version of Advisory Circular 150/5345-42G, *Specification for Airport Light Bases, Transformer Housings, Junction Boxes, And Accessories*, for public comment. Until the draft is finalized, this engineering brief provides guidance for the fabrication and installation of L-868 adjustable light bases and extensions. In regard to the torque testing, the standards herein are those previously set forth in Advisory Circular 150/5345-42C.

APPLICATION

The installation of L-868, adjustable light bases and extensions, certified in compliance with the Airport Lighting Equipment Certification Program (ALECP) outlined in AC 150/5345-53 and listed in the addendum of that document are approved for airport projects receiving Federal funds under the airport grant assistance or the passenger facility charge programs. Equipment produced under this specification may be eligible for funding for installation on airports under Federal grant assistance programs for airports. In order to be eligible for installation under Federal grant assistance programs, manufacturers of the types of equipment specified herein are required to certify or furnish proof to the airport sponsor, or the sponsor's representative, that the equipment conforms to the following prototype, production, certification, and guarantee provisions established below.

The provisions of Advisory Circular 150/5345-42F, *Specification for Airport Light Bases, Transformer Housings, Junction Boxes, And Accessories* for Class 1A and Class 1B devices apply except as specifically detailed below. As adjustable light bases and extensions were previously certified as Class II devices under AC 150/5345-42C, required testing procedures from that document will apply in lieu of those specified in AC 150/5342-42F, paragraphs 4.3.1, *Type L-868, Class 1A and Class 1B Load Test*, and 4.3.10, *Type L-868, Class 1A and Class 1B Torque Test for Adjustable Height Bases and Extensions*, as detailed below.

1. Prototype Testing: L-868 adjustable light bases and extensions shall be capable of passing the following tests.

A. Load test. Two different load tests are specified depending on the intended application.

1) **Containers anchored into embedment material.** The test specimen shall consist of an assembly of the embedment material with or without the flange. The assembly shall be placed on a flat steel plate mounted in a standard testing machine. The bottom of the base shall be placed on a layer of high-strength gypsum plaster or sulphur mortar (See ASTM C 617) prior to testing to provide uniform support to the assembly. The thickness of the high-strength gypsum plaster or sulphur mortar will be sufficient to accommodate any roughness or eccentricity of the base such that uniform bearing on the assembly is achieved. The high-strength gypsum plaster or sulphur mortar must be hardened prior to testing. A load shall be applied to the top part of the assembly through a 1-1/2 inch (38 mm) thick rubber block with a diameter equal to that of the cover plate and having a durometer hardness of 55 to 70. A load of 400 psi (1724 kPa) shall be applied uniformly over the area of the rubber block at a rate not to exceed 10,000 lbs (4536 kg) per minute. The assembly shall be considered unsatisfactory if there is any permanent deformation or cracking of any of the components or the protective coating material. The above test shall be repeated three times. After each loading, bolts shall be checked for loss of tension. The bolts shall be torqued to the manufacturer's recommended service tension after the first two loadings. The assembly will be considered unsatisfactory if there is any loss of tension in the bolts after the third loading.

2) **Containers anchored to the surrounding pavement.** The test shall be performed on a specimen properly assembled and constructed so as to closely simulate actual installation in a pavement. The entire assembly, including the simulated pavement, shall be placed on a flat steel plate and loaded into a standard testing machine. The loading apparatus, applied load, loading rate, number of loadings, and bolt tightening shall be the same as described in paragraph 1.A.1) above. The container shall be considered unsatisfactory if: it fails to support the applied load, if the flange deforms permanently, or if there is any loss of tension in the bolts after the third loading.

B. Torque Test. Two different torque tests are specified depending on the intended application.

1) **Containers anchored into the surrounding pavement.** The torque test shall be performed on a specimen properly assembled and constructed so as to closely simulate actual installation in a pavement. Prior to test, reference "tick" marks shall be made on the mounting flange and surrounding pavement material. A torque of 100,000 in-lbs (11 300 Nm) shall be applied perpendicular to the vertical axis of the container through a steel cover plate. The maximum torque shall be achieved within 60 seconds of the start of test. The torque load shall be applied three times. Upon completion of the third torque loading, the reference "tick" marks will be measured to determine if the support ring has been displaced in azimuth. An azimuth displacement of 0.25 degree or greater shall be cause for rejection.

2) **Containers anchored into embedment material.** After completion of load testing, specimens shall be subjected to torque testing as described in paragraph 1.B.1) above to insure adequate material thicknesses, attachment, and assembly techniques. An azimuth displacement of 0.25 degree or greater shall be cause for rejection. Separation of the flange or bottom of the container from the body sidewalls, as well as,

buckling and/or permanent deformation of the body sidewalls shall also be cause for rejection.

2. **Production Testing.** The following production testing requirements are intended to assure that adequate quality controls are exercised during production to provide equipment which will meet applicable specifications. All tests are the responsibility of the manufacturer.

A. **Lot Size.** The lot size shall be equal to the daily production rate.

B. **Sample Size and Acceptance Criteria.** See AC 150/5345-42F, paragraph 4.4.2.

C. **Retesting.** If the lot is rejected, the remainder of the lot may be tested and inspected on an individual basis. As an alternative to individual testing and inspection, the remainder of the lot may be tested using criteria in ASQC Z1.4 for multiple sampling. Table IVB, Multiple Sampling Plans for Tightened Inspection, using the appropriate sample size and an AQL of 2.5, must be used. Should the lot fail under the multiple sampling plan criteria, all units must be inspected and tested individually and repaired as necessary. Any samples that fail under any of the above criteria must be repaired.

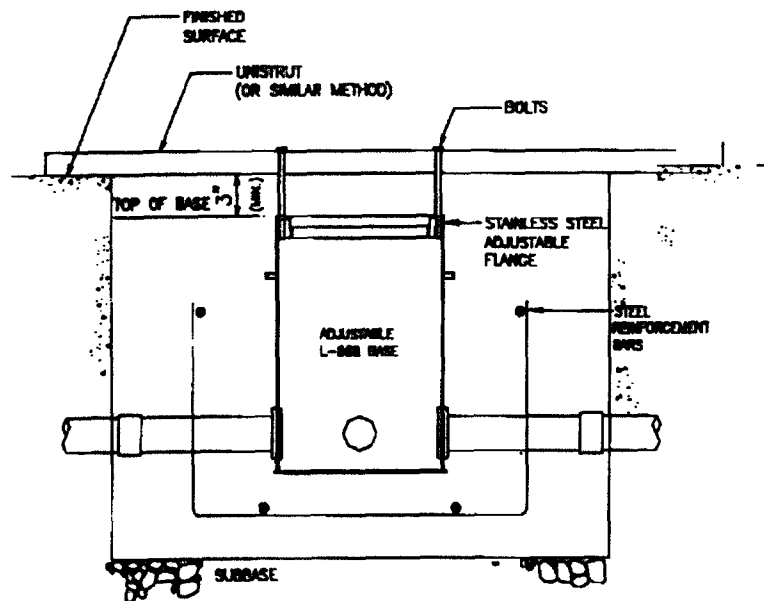
D. **Dimensional Tests – Flanges and Accessories.** Specimens must be measured for conformance to the dimensions specified in AC 150/5345-42F, Figures 5 & 9. Should any new product be introduced that does not exactly conform to the dimensions of fixed products shown in AC 150/5345-42F, Figures 5 through 9, the applicable dimensions necessary to ensure compatibility with certified light fixtures and bases must be applied.

E. **Load Test.** Random samples from each lot shall be load tested in the field by the manufacturer according to the following procedure: A vertical load of at least 40,000 pounds shall be applied to the top part of the container through a block of rubber 1-1/2 inches (38 mm) thick, with a diameter equal to the cover plate, and having a durometer hardness of 55 to 70. The load shall be applied at a rate not to exceed 10,000 pounds (4536 kg) per minute. The container, or any of the components, shall be considered unsatisfactory if there is any permanent deformation or cracking of materials or coatings. The above test shall be repeated three times. After each loading, bolts shall be checked for loss of tension. The bolts shall be torqued to the manufacturer's recommended service tension after the first two loadings. The container and/or assembly will be considered unsatisfactory if there is any loss of tension in the bolts after the third loading.

F. **Torque Test.** Random samples from each lot shall be torque tested in the field by the manufacturer according to the following procedure: Prior to test, reference "tick" marks shall be made on the mounting flange and surrounding pavement material. A torque of 100,000 in-lbs (11 300 Nm) shall be applied perpendicular to the vertical axis of the container through a steel cover plate. The maximum torque shall be achieved within 60 seconds of the start of test. The torque load shall be applied three times. Upon completion of the third torque loading, the reference "tick" marks will be measured to determine if the mounting flange has been displaced in azimuth. An azimuth displacement of 0.25 degrees or greater shall be cause for rejection.

G. **Additional testing.** All other testing specified in AC 150/5345-42F not specifically superseded by this engineering brief will apply.

DESCRIPTION



N.T.S.

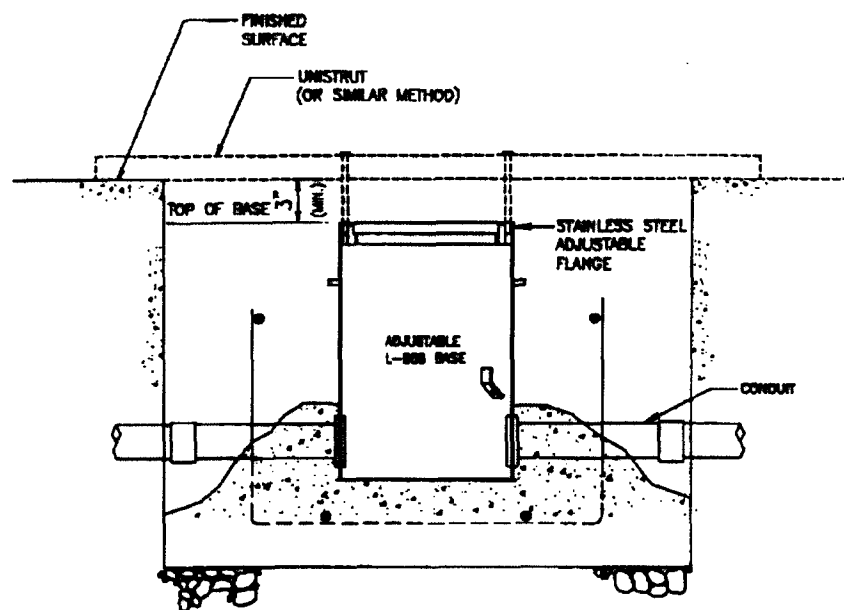
Procedures:

1. At each light location, make an excavation to accommodate the specified base.
(Note: The elevation of the flange, or top of the base must be at least 3 inches below the finished paved surface).
2. Insert the adjustable base in the light location. Hold the base in place with unistrut (or similar method) to maintain the proper base position until the concrete anchor is poured.
3. Connect each base to the conduit system.

Note:

1. If 3 or more inches are left after paving, the adjustable extension can be adjusted up a maximum of 1 3/4 inches or down a maximum of 3 1/2 inches. Extensions are available in different sizes.
2. The position of the azimuth may be adjusted as stated in the manufacturers installation guide.

FIGURE 1. New Fixture Installations with L-868, Adjustable Containers (Bases) and Extensions
Step 1, Base Installation



N.T.S.

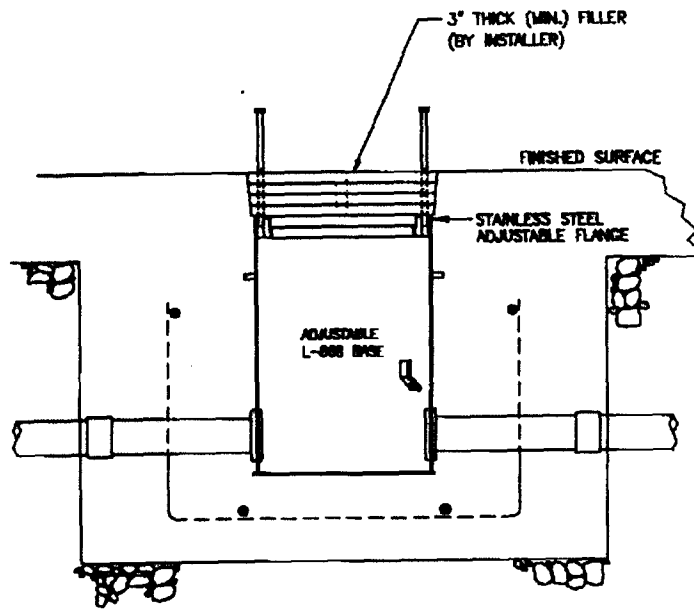
Procedures:

1. Pour the concrete anchor. Make sure the unistrut (or similar method) and the adjustable base remain level. The unistrut (or similar method) must remain in place until the concrete is set.
2. After the concrete is set, remove the unistrut (or similar method).

Note:

When two or more paving passes are required, the elevation of the flange, or top of the adjustable base shall not be more than the distance equal to the total of the two paving passes.

FIGURE 2. New Fixture Installations with L-868, Adjustable Containers (Bases) and Extensions
Step 2. Concrete Anchor Installation

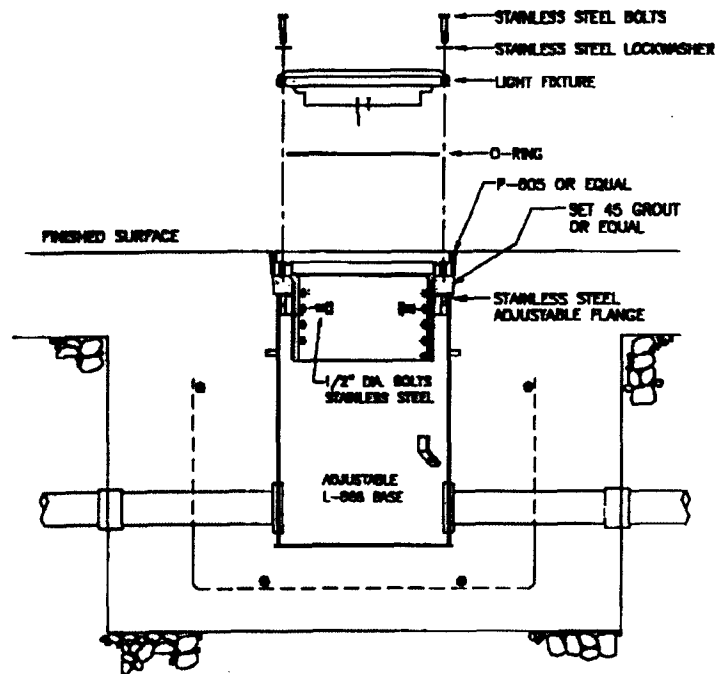


N.T.S.

Procedures:

1. Prior to paving, inset a 3 inch thick filler 1 inch larger in diameter than the base.
2. After the paving train has cleared the base, remove excess concrete from the top of the filler.
3. Remove filler.

FIGURE 3. New Fixture Installations with L-868, Adjustable Containers (Bases) and Extensions
Step 3, Paving

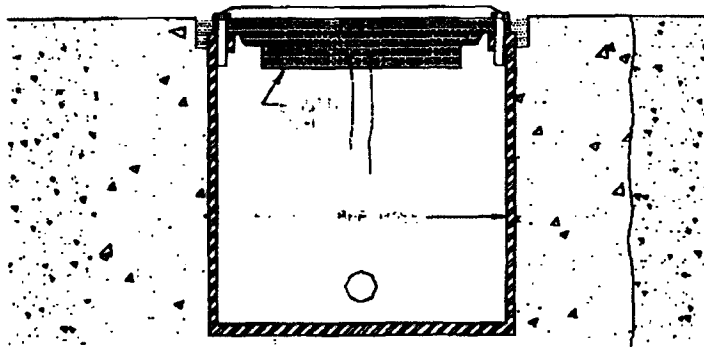


N.T.S.

Procedures:

1. Install the adjustable extension to the correct elevation and azimuth per the applicable FAA Advisory Circular for the specified lighting system.
2. Install three and one-half inch stainless steel hex head bolts through the threaded holes on the adjustable extension. Each bolt should make contact with the threaded surface of the flange.
3. Torque each bolt to 50 ft/lbs to secure proper elevation and azimuth alignment during the remainder of the installation.
4. Fill the void around the extension with set 45 grout (or equal) up to the bottom of the mud dam.
5. Install primary cables, transformers and connectors.
6. Install the "O" ring.
7. Install the light fixture, in compliance with FAA specifications. Apply nickel based anti-seize to all stainless steel bolts and torque bolts to the light fixture meeting the recommendations of the fixture manufacturer. (Note: To prevent over tightening the bolts, Do Not Use an Impact Drill Motor.)
8. Fill the void surrounding the mud dam with P-605 (or equal), until it is level with the top of the mud dam. Take caution to prevent any P-605 from flowing over the top of the mud dam.

FIGURE 4. New Fixture Installations with L-888, Adjustable Containers (Bases) and Extensions
Step 4, Extension and Fixture Installation



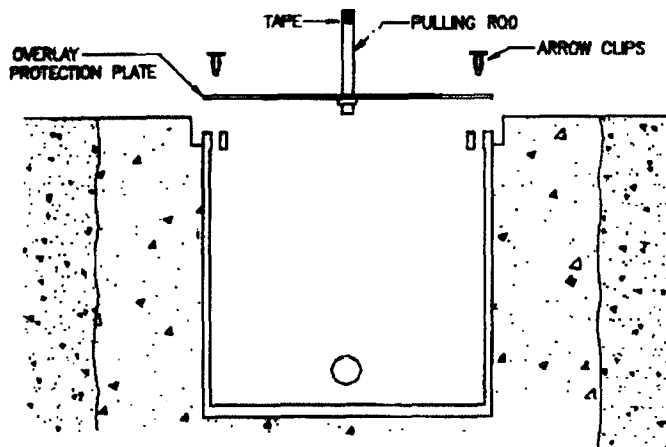
Procedures:

1. Remove existing light and all related components
2. Remove the transformer and store for re-use.
3. Tap ends of all existing cables.

Note: No cutting, welding, or other field modification to existing light bases is permitted. Adjustable extensions must be bolted to the light fixture mounting flange of the existing base.

N.T.S.

FIGURE 5. Pavement Overlays with L-868, Adjustable Containers (Bases) and Extensions
Step 1, Preparation for Overlay



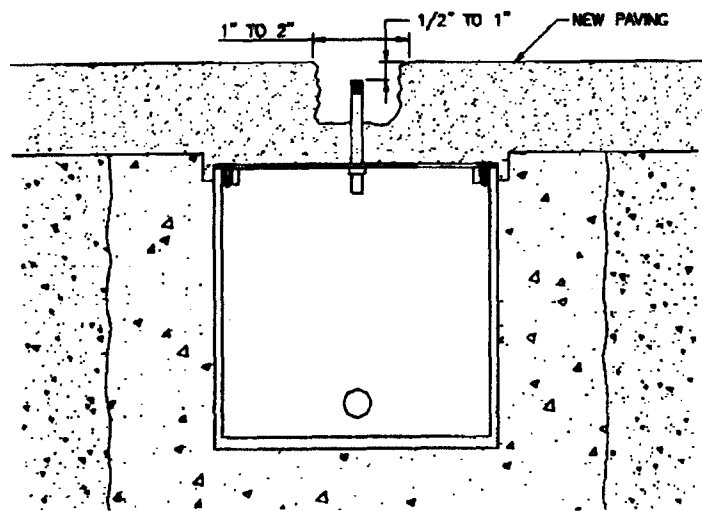
Procedures:

1. Place the metal overlay protection plate with a pull rod onto the existing base, aligning the holes with those in the base. The length of the pull rod should be 1/2 to 1 inch below the surface of the new pavement for clearance of the paving equipment.
2. Secure the overlay protection plate by inserting three arrow clips into the holes and secure them into place.
3. Protect the top 1 inch of the pulling rod threads with tape to prevent paving material from adhering to the threads.

Note: No cutting, welding, or other field modification to existing light bases is permitted. Adjustable extensions must be bolted to the light fixture mounting flange of the existing base.

N.T.S.

FIGURE 6. Pavement Overlays with L-868, Adjustable Containers (Bases) and Extensions
Step 2, Protection Plate Installation



N.T.S.

Procedures:

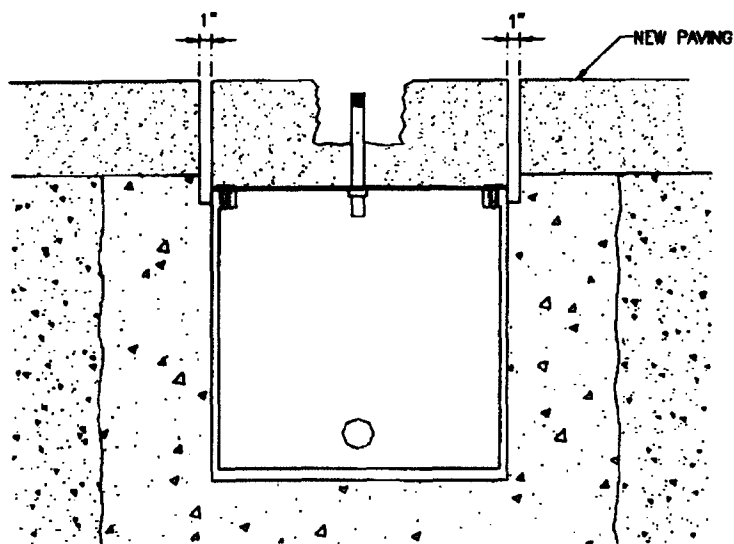
1. Determine the exact location of the pulling rod.
2. Remove a 1 to 2 inch diameter section of the new pavement around the pulling rod to expose the rod as shown.

Note:

The exact location of the pulling rod may be established using a predetermined reference mark, a metal detector, or a magnet.

Note: No cutting, welding, or other field modification to existing light bases is permitted. Adjustable extensions must be bolted to the light fixture mounting flange of the existing base.

FIGURE 7. Pavement Overlays with L-868, Adjustable Containers (Bases) and Extensions
Step 3, After Paving



N.T.S.

Procedures:

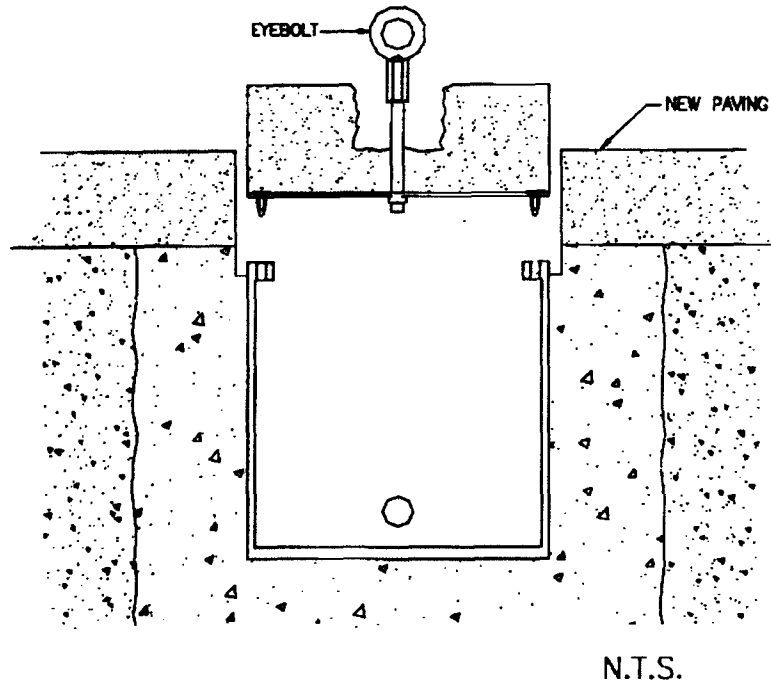
1. Mark the pavement for core drilling, using a wood template with the pulling rod as the center location of the base.
2. Core drill through the new pavement down to the top of the base. The depth of the core should be enough to remove all the paving material and the overlay protection plate.

Note:

The core diameter should be the diameter of the light base plus 2 inches to allow for pouring the grout.

Note: No cutting, welding, or other field modification to existing light bases is permitted. Adjustable extensions must be bolted to the light fixture mounting flange of the existing base.

FIGURE 8. Pavement Overlays with L-868, Adjustable Containers (Bases) and Extensions
Step 4, Core Drilling

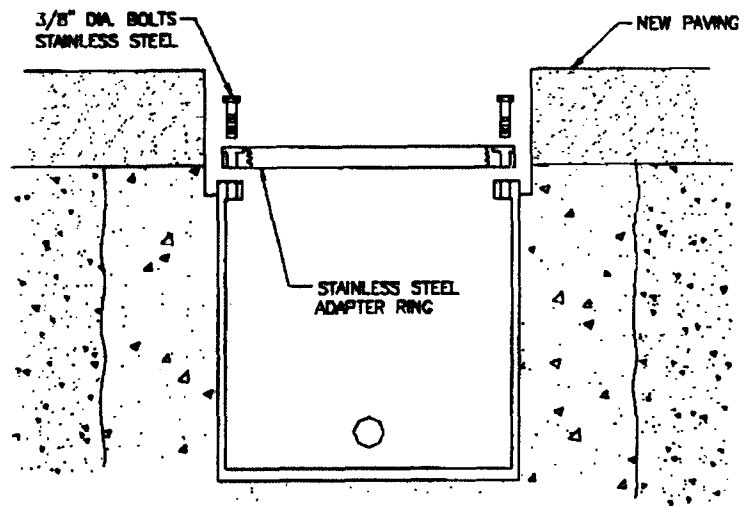


Procedures:

1. Remove protective tape and thread an eyebolt onto the pulling rod.
2. Lift the core of paving material in one piece.
3. Clean all debris away from the top of the existing base.

Note: No cutting, welding, or other field modification to existing light bases is permitted. Adjustable extensions must be bolted to the light fixture mounting flange of the existing base.

FIGURE 9. Paving Overlays with L-86B, Adjustable Containers (Bases) and Extensions
Step 5, Core Removal



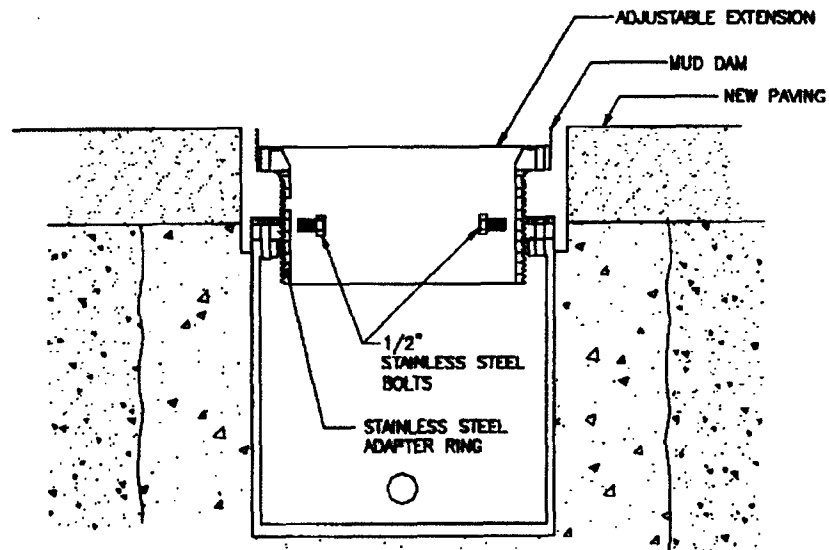
N.T.S.

Procedures:

1. Bolt the threaded stainless steel adapter ring to the top of the existing base with 1 1/4 inch stainless steel bolts.
2. Apply nickel based anti-seize to all bolts prior to installation.

Note: No cutting, welding, or other field modification to existing light bases is permitted. Adjustable extensions must be bolted to the light fixture mounting flange of the existing base.

**FIGURE 10. Paving Overlays with L-868, Adjustable Containers (Bases) and Extensions
Step 6, Adapter Ring Installation**



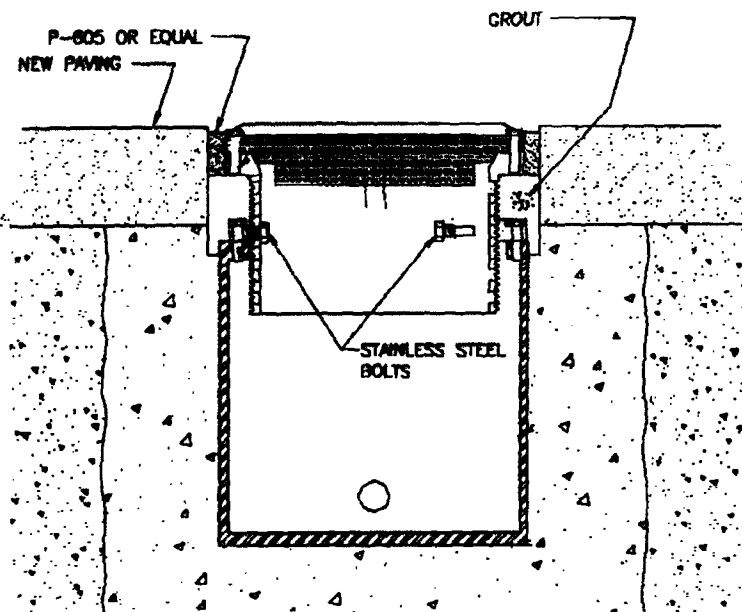
N.T.S.

Procedures:

1. Thread the adjustable extension into the adapter ring and adjust the extension below the new paving course to the required elevation and azimuth alignment, as specified in applicable FAA Advisory Circular for the specified lighting system.
2. Install three 1/2" diameter stainless steel hex head bolt through one of the threaded holes in the extension. The bolt should make contact with the threaded surface of the adapter ring. Tighten the bolt to secure proper elevation and azimuth.
3. Torque each bolt 50 ft. pounds in order to secure proper elevation and azimuth alignment during the remainder of the installation.

Note: No cutting, welding, or other field modification to existing light bases is permitted. Adjustable extensions must be bolted to the light fixture mounting flange of the existing base.

**FIGURE 11. Paving Overlays with L-868, Adjustable Containers (Bases) and Extensions
Step 7, Adjustable Extension Installation**



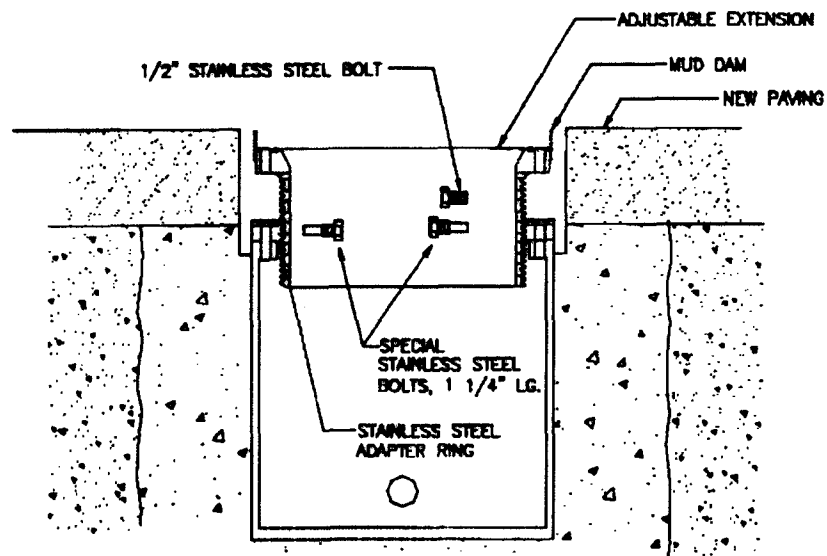
N.T.S.

Procedures:

1. Fill the void surrounding the extension with set 45 or equal up to the bottom of the mud dam.
2. Install primary cable, transformer and connectors.
3. Install the "O" ring.
4. Install light fixture, in compliance with FAA specifications. Apply nickel based anti-seize to all bolts prior to installation and torque to manufacturer's recommendations. (Note: To prevent over tightening the bolts, Do Not Use an Impact Drill Motor.)
5. Fill the void surrounding the mud dam with P-605 or equal, until it is level with the top of the mud dam. (Note: Take caution to prevent any P-605 from flowing over the top of the mud dam.)

Note: No cutting, welding, or other field modification to existing light bases is permitted. Adjustable extensions must be bolted to the light fixture mounting flange of the existing base.

FIGURE 12. Paving Overlays with L-868, Adjustable Containers (Bases) and Extensions
Step B, Fixture Installation



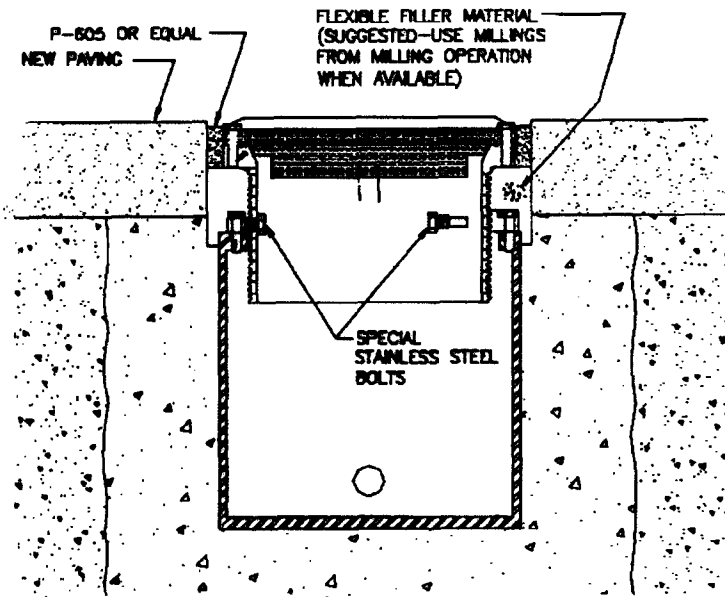
N.T.S.

Procedures:

1. Thread the adjustable extension into the adapter ring and adjust the extension below the new paving course to the required elevation and azimuth alignment, as specified in applicable FAA Advisory Circular for the specified lighting system.
2. Install one 1/2" diameter stainless steel hex head bolt through one of the threaded holes in the extension. The bolt should make contact with the threaded surface of the adapter ring. Tighten the bolt to secure proper elevation and azimuth.
3. Drill two 3/4" holes through the adjustable extension to the adapter ring.
4. Apply nickel-based anti-seize to the stainless steel bolts. Thread the bolts and hand tighten in place.
5. Remove the 1/2" stainless steel bolt that was used to temporarily secure the elevation and azimuth alignment. Repeat procedures 3 and 4 until there are three stainless steel bolts threaded through the extension and into the adapter ring.

Note: No cutting, welding, or other field modification to existing light bases is permitted. Adjustable extensions must be bolted to the light fixture mounting flange of the existing base.

FIGURE 13. Paving Overlays with L-868, Adjustable Containers (Bases) and Extensions
ALTERNATE Step 7, Adjustable Extension Installation



N.T.S.

Procedures:

1. Fill the void surrounding the extension with flexible filler material up to the bottom of the mud dam.
2. Install primary cable, transformer and connectors.
3. Install the "O" ring.
4. Install light fixture, in compliance with FAA specifications. Apply nickel based anti-seize to all bolts prior to installation and torque to manufacturer's recommendations. (Note: To prevent over tightening the bolts, Do Not Use an Impact Drill Meter.)
5. Fill the void surrounding the mud dam with P-605 or equal, until it is level with the top of the mud dam. (Note: Take caution to prevent any P-605 from flowing over the top of the mud dam.)

Note: No cutting, welding, or other field modification to existing light bases is permitted. Adjustable extensions must be bolted to the light fixture mounting flange of the existing base.

**FIGURE 14. Paving Overlays with L-868, Adjustable Containers (Bases) and Extensions
ALTERNATE Step 8, Fixture Installation**