
Installation Guidelines for Sports & High Mast Lighting Structures

The following information is intended as a guide for the installing contractor. This information cannot be comprehensive enough to cover all situations or the details of all structures. Therefore it is essential that the owner and contractor carefully plan all aspects of the installation process, not relying only on these guidelines to determine the steps to be followed. This is general information about standard American Lite Poles products. Special features required by individual owners may require unique installation methods. For these the contractor must be familiar with the owner's plans and specifications and the American Lite Pole submittal drawings (if any). Due to the varied methods used by contractors in actual field operations, American Lite Pole cannot be liable for structural damage occurring during erection.

ANCHOR BASED FOUNDATION

1. An evaluation of local soil conditions should be made by a competent foundation designer. The foundation size and reinforcing must be adequate to withstand the maximum reactions, which might be applied by the pole base.
2. Caisson foundations are first constructed by auguring a hole in the ground to the diameter and depth outlined in the foundation design. Steel reinforcing bars are required to carry any tension loads developed in the concrete foundation. The vertical bars should extend the full depth of the foundation, but should have at least 3 inches of concrete cover on all sides including top and bottom. These vertical bars should be tied together to form a "cage" with smaller bars. Refer to the foundation design for quantity and size of bars. DO NOT weld reinforcing bars to the anchor bolts. Place cage in augured hole resting on concrete block, bricks or other standoff device that will allow the minimum 3" clearance. To accommodate the underground electrical wiring, trenches should be dug to a depth consistent with electrical codes, typically 24". Conduit should be placed in the trenches and angled upward through the middle of the foundation.
3. Prior to pouring concrete, place a Sonotube matching the augured hole diameter, 6 inches into the hole and extending at least 3 inches above the reinforcement cage. This will give the top portion of the foundation a smooth finished appearance.
4. Once the reinforcement cage, conduit and Sonotube are secure, concrete may be poured into the hole. As the concrete is being poured, it should be vibrated to eliminate air pockets in accordance with concrete industry standard practice.
5. American Lite Pole will provide a steel or paper template which may be used to transfer the pattern onto a sheet of plywood. Set the anchor bolt template in the center of the foundation and rest on top of the Sonotube. Conduit should extend at least 6" from center cut out of template. Thread nuts and washers onto anchor bolts to the required projection dimension. Projection of the anchor bolts should allow for the thickness of the base plate and nuts (including leveling nuts). Push the assembled anchor bolts into the concrete until the nut is resting on the template. For "J" hook anchor bolts, the hook may be facing in any direction, but the preferred orientation is hooks outward given that there is at least 3 inches of concrete between the hook and edge of augured hole. Orientation of the anchor bolts in relation to the direction of the lighting must be checked carefully using data from American Lite Pole drawings and the owner's plans and specifications. The anchor bolts must also be vertical. Care must be taken not to disturb the position of the anchor bolts while pouring concrete.
6. Leveling nuts should be adjusted before installing the pole. They should be in a horizontal plane.
7. Concrete foundations should be installed well ahead of the installation of the poles. Standard concrete requires about 28 days to develop its full design strength.

DIRECT EMBEDDED FOUNDATION

1. In the case of structures, which utilize embedded base installation, typically the bottom (embedded) section of the pole is installed in the ground first. Care should be taken to assure that the bottom section is vertical before proceeding with the erection of the rest of the pole since there is no adjustment to this type of installation as there is with anchor type.
2. Caisson foundations are first constructed by auguring a hole in the ground to the diameter and depth outlined in the foundation design. In lieu of steel reinforcing bars, the embedded pole section provides enough strength to sufficiently support the tension created within the foundation. Therefore, reinforcing bars are typically not required.
3. Concrete blocks, bricks or other stand-off devices should be placed in the bottom of the augured hole to support the pole structure and allow the concrete to envelop the embedded pole section to maintain the 3" min concrete cover. Wooden wedges may be used to support the pole during concrete placement. Wedges can be constructed from 2"x12" lumber and placed between the pole and the augured hole.

4. The embedded pole section is equipped with two wire way access holes at 180° from each other 24 inches below ground-line to accommodate the underground electrical wiring. Conduit should be angled upward through the wire way access holes. Conduit should be in the center of the pole and extend at least 6 inches above the ground line.
5. The augured hole can now be filled with concrete around the perimeter of the pole. As the concrete is being poured, it should be vibrated to eliminate air pockets in accordance with standard industry practices. When the augured hole is approximately half full with concrete, the pole should be checked for plumb and adjusted accordingly. Concrete should then be poured to the ground line and wedges may be removed. Any supplemental bracing may be removed after 48 hrs

ASSEMBLY

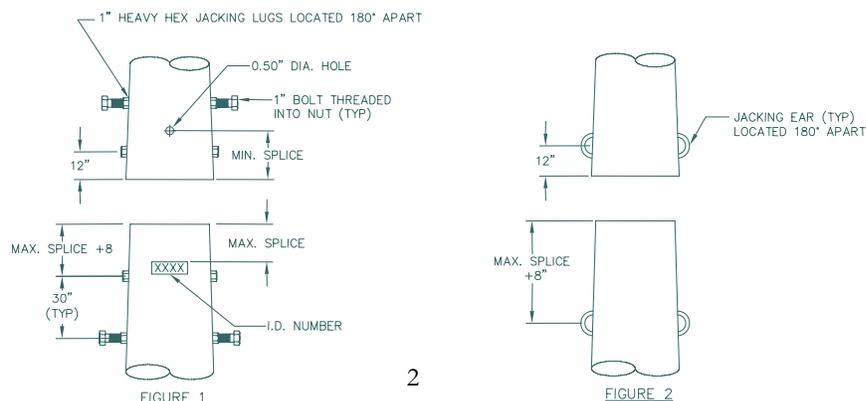
1. General:

- a. Where space near the foundation and lifting capabilities permit, it is preferable to assemble the complete structure on the ground and erect it as a unit (except embedded base poles). The sections of the pole should be aligned on the ground and supported typically with wood blocks, in such a manner that they will readily fit together. Care should be taken to prevent dirt, stones, etc. from getting trapped between the mating surfaces.
- b. If the structure is assembled vertically, extra care may be needed to assure that all joints are properly assembled as indicated in the following paragraphs.
- c. Pole sections can be aligned using the climbing device standoff plates and/or the pole step lugs. Poles with ID tags may be utilized for aligning the poles. These tags shall be welded to each member and incorporate the last five digits of its shop drawing number.

2. Slipover Joints:

- a. To facilitate the assembly, mating surfaces may be lubricated. Care should be taken not to use a lubricant that will later leak from the joint and stain the pole. Soapy water has been used successfully for this purpose.
- b. The contractor should mark the male (bottom) section with a marker to designate the minimum slip distance as detailed in the submittal project drawings. If drawings are not available, please contact the factory for this information. Typically the slip distance is 1.5 times the inside diameter of the female (top) section. In some cases the poles will have this distance pre-determined with a ½” diameter hole on the female section. Once the male section is visible through this hole, the minimum amount of slip has been met.
- c. There are a number of methods used to slip or “jack” the sections together. The method selected may depend upon the type of pole design or equipment available to the contractor. Below is a method using chain hoists (come-along). Use two chain hoists with at least a 2-ton capacity on opposite sides of the pole. Equal forces should be applied by the two hoists simultaneously. Means of attachment are listed below. Please note, the poles will be supplied with one of the options below.
 - i. Jacking Hex Nuts. The 1” heavy hex nuts will be welded to the female and male sections of the pole. Each section will have (4) nuts, two at 180 degrees from each other. Contractor may use 1” x 2” A325 bolts thread into the nuts two at 180 degrees on male section and likewise on female section. Contractor shall hook onto the bolts with the chain hoists no more than 1 ½” from the surface of the pole. Continue to slip the sections together. See FIGURE 1
 - ii. Jacking Ears. Welded 3/16” flat plate with center thru hole shall be welded the female and male sections of the pole. Each section shall have two ears welded at 180 degrees from each other. Contractor shall hook into the ears with the chain hoists and continue to slip the sections together. See FIGURE 2.

A final check should be made to assure that the specified minimum overlap has been achieved. Anywhere beyond minimum slice is considered an acceptable joint provided the joint is tight.



3. Attaching Equipment:

- a. Prior to attaching the high mast top assembly or the sports lighting cages, wiring should be strung through the pole.
- b. The bolts used for connections should be tightened in accordance with AISC guidelines (excerpts are attached). Threads may be lubricated in the field in order to achieve bolt tension in accordance with AISC recommendations. Hardware suppliers use beeswax and various commercial waxes as lubricants. They indicate that products like "WD-40" are commonly used in the field.
- c. High Mast lowering devices should be assembled in accordance with the instructions furnished by the supplier of the devices.
- d. Top mounted sports lighting cages should be oriented with the door opening on the side of the pole that will be climbed (i.e. the side on which the safety climbing device is located).
- e. Pole steps (when applicable) shall have two nuts per step. One shall be screwed onto the step as far as possible. Insert the other nut behind the lug welded on the pole and screw the step in until the step touches the surface of the pole. Tighten the outer nut against the lug sufficiently to prevent from loosening. Do not over tighten to the point of damaging the threads.

ERECTION

1. Prior to lifting the structure, any slipover joint below the crane attachment point should be securely lashed to prevent any possibility of separation during lifting. For additional safety, a hook capable of supporting the entire weight can be attached to the handhole opening and connected to the crane attachment point.
2. The lifting crane must be attached:
 - a. To the main pole member, not to appurtenances such as poles step lugs, top flange plate, etc.
 - b. Above the center of gravity of the entire assembly including the weight of all equipment mounted on the structure before erection.
 - c. As high as possible since higher attachment will result in more nearly vertical alignment of the assembly while suspended above the foundation.
3. Care should be taken to operate the crane very smoothly since jerkiness will cause impact loads which could damage some portion of the assembly.
4. At least a few anchor bolt nuts should be installed as quickly as possible after the plate is in place. If the pole is eccentrically loaded, the nuts on the side opposite the direction of eccentricity should be installed first.
5. The structure should be checked after erection to make sure it is plumb. If there is some curvature, make sure it is not due to wind or heating of one side of the structure by the sun before trying to correct alignment. Ideally, the top of the structure should be directly over the bottom with any curvature being toward the middle of the structure. The leveling nuts can be adjusted to accomplish this alignment by raising the leveling nuts on the side the structure is leaning toward. Note that a small amount of rotation of the leveling nuts can result in a number of inches in movement at the top of the structure. The taller the structure, the more sensitive it will be to adjustment of the leveling nuts. If, at this point, the curvature is objectionable contact American Lite Pole. After plumbing the structure, all remaining leveling nuts should be uniformly snug against the base plate. Next the top nuts should be tightened and some provision should be made to prevent unauthorized loosening. Two most common methods are: A) Slight amount of additional tightening of each top nut. B) Peening of a thread just above the nut (considered permanent).

FASTENER TENSION

Fasteners shall be tightened in properly aligned holes. When all fasteners in the joint are tight, at least the minimum tension shown in Table 1 for the size and grade of fastener shall be used.

TABLE 1
FASTENER TENSION (A325 Bolts)

Nominal Bolt Size Inches	Minimum Fastener Tension* in Thousands of Pounds (kips) * equal to 70% of specified min, tensile strengths of bolts rounded to nearest kip
1/2"	12
5/8"	19
3/4"	28
7/8"	39
1"	51
1-1/8"	56
1-1/4"	71
1-3/8"	85
1-1/2"	103

Impact wrenches, if used, shall be of adequate capacity and sufficiently supplied with air to perform the required tightening of each bolt in approximately 10 seconds.

Excerpts from American Institute of Steel Construction (RCSC)
Specification for joints using ASTM A325 or A490 Bolts – June 23, 2000

Turn-of-Nut Tightening

Bolts shall be brought to a "snug tight" condition to insure that the parts of the joint are brought into good contact with each other. Snug tight is defined as the tightness attained by a few impacts of an impact wrench or the full effort of a man using an ordinary spud wrench. All bolts shall then be tightened additionally by the applicable amount of nut rotation specified in Table 2, with tightening progressing systematically from the most rigid part of the joint to its free edges. During this operation there shall be no rotation of the part not turned by the wrench.

TABLE 2
NUT ROTATION* FROM SNUG TIGHT CONDITION

Bolt length (measured from under side of head to end point)	Nut Rotation
Up to and including 4 diameters	1/3 Turn
Over 4 diameters but not exceeding 8 diameters	1/2 Turn
Over 8 diameters but not exceeding 12 diameters**	2/3 Turn

* Nut rotation is relative to bolt, regardless of the element (nut or bolt) being turned. For bolts installed by 1/2 turn and less, the tolerance should be plus or minus 30°. For bolts installed by 2/3 turn and more, the tolerance should be plus or minus 45°.

** No research work has been performed by the council to establish the turn-of-nut procedure when bolt lengths exceed 12 diameters. Therefore, the required rotation must be determined by actual tests in a suitable tension device simulating the actual conditions.