Steel Structural Plate Assembly Guide

These instructions are intended to be a basic guide to the installation and assembly of plate structures. Job site specific conditions may require other procedures.

A Statement on Safety The assembly procedure of structural plates can vary widely from one job site to another. Although there is no substitute for experience; safe practices should be of utmost importance on all projects. A review of project safety requirements, regulations and established construction safety practices must be completed before attempting to assemble. Lane Enterprises' attention to quality in manufacturing and design insures that the structural plates can be assembled in a manner that will not compromise the safety of workers on the project. However, all those involved MUST adhere to those safety procedures and methods as dictated by regulations and good construction practice.

Supervisors and workers should review and confirm the understanding of the safety procedures and regulations before attempting the assembly of Lane Structural Plate.

A. Suggested Tool List

The following list of tools are suggested for the assembly of Lane structural plate. Job site conditions and special structural considerations may require different or additional tools.

1.Compressor: Suggest an air compressor of 125 CFM at 100 psi as a minimum.

2.Air Hose: Universal quick–fit fittings as found on most compressors.

3.Impact Wrench: Air impact wrench with adequate capacity for the torque ranges required (up to 300 ft–lbs).

4.Sockets for above 1'14' Diameter: With tapered tip to fit down into the corrugation.

5.Hand Tools: Tapered aligning bars and drift pins for use in positioning the plates. The preferred material is tempered steel bar stock, 11/s" diameter. Lengths of alignment bars and drift pins should be from 18" to 42" depending on the type of plate being assembled.

6.Band Cutters: To cut bands that are used in packaging.

7.Cables: With safety hook or clevis for moving individual plates.

8.Come–Along: For pulling the plates together where needed with use of eyebolts.

9.Scaffolding: Used for larger structures where needed.

10.Electric Extension Cords: Of adequate gage with proper ground.

11.Lifting Equipment: A crane, backhoe or boom truck of needed capacity and size will be required for lifting plates into place. Requirements can vary greatly depending on the weight of plates, size of structure and available access. The erector should review these factors with the site contractor and the manufacturer of the material for the needed information before acquiring this equipment.

B. Pipe Arch Structures Preparation of Foundation

The earth foundation upon which a pipe arch structure is to rest should be free from projecting stones, roots and inequalities in the bedding surface which will prevent the structure from having a firm, uniform bearing.

Where rock in either ledge or boulder formation is encountered, it should be removed to a depth as recommended by the engineer in charge. This additional excavation should be backfilled with suitable materials in such manner as to insure a uniform bearing for the entire length of the structure.

If, in the opinion of the engineer, the natural material exposed at the grade established for the bottom of a plate structure appears unstable and is of such a character as to invite unequal settlement along the length of the structure the engineer should instruct correction of this condition.

The foundation on which a plate structure is to rest should either be shaped to conform to the bottom of the structure or as otherwise approved by the engineer.

C. Description of Materials

1. Plates

Before starting the erection of a plate structure, study the assembly drawing (shop drawing) to acquaint yourself with the plate arrangement and to check the material on hand. The assembly diagram will show the plate width (N) for each plate in the structure. It will also show the length of each plate. If the structure ends are sloped or skewed, the cut plates forming the cut end are numbered and correspondingly marked on the assembly drawing for proper positioning.

Plates are made in standard 12' and 10' nominal lengths to permit staggering of the circumferential joints. Various combinations of these plate lengths result in structure lengths, typically in multiples of 2'.

Overall widths range from 34" (3–N) to 92" (9–N), in 9₃/₈" (1–N) increments. They are designated on the drawing as 3N, 5N, 6N, 7N, 8N and 9N.

Each standard plate is identified by a stencil which gives the N number (width), length and gage. Plates specially fabricated to assemble sloped, skewed or sloped and skewed ends or deflections (elbows) are marked with a welded numeral on the concave side of the plate (inside of structure) to correspond with the numbers shown on the drawing.

2. Bolts

The high strength bolls and nuts for plate structures conform to the requirements of ASTM A–449 and ASTM A–563 Grade C respectively and are galvanized. The bolts are 3/4" diameter and are 1₁/₄", 1₁/₂", 1₃/₄", 2" and 3₁/₂" long. The appropriate length of bolt is provided for a structure according to the gage of plate and number of plate layers in the lap.

The hexagonal bolt head is uniformly rounded on the underside and may be placed either in the valley or on the crest of the corrugation without special positioning.

The hexagonal nuts are American Standard Heavy across the flats with a round top to conform to the valley of the corrugation and permit tightening in that position.

The bolt threads are Unified National Coarse, Class 2 fit before galvanizing, and the nuts are tapped oversize after galvanizing to fit the coated bolts.

Usual practice is to insert the bolts so the head is in the valley and the nut is on the crest of the corrugation. It is acceptable to place the bolts so the head is either on a crest or in a valley. Reference TABLE 1, which indicates the proper usage of the various lengths furnished.

If the structure is composed of plates of different gages, for instance a pipe with a heavier invert the bolts supplied will be in accordance with the combination of gages. Bolts furnished with asphalt coated pipe will be 1/4" longer than those indicated in TABLE 1.

Care should be exercised to keep the bolts segregated. The workmen should be instructed where to use each length bolt, otherwise there will be insufficient long bolts to use where required.

3. Invert Plates

After the foundation has been prepared, and starting at the downstream end, start assembly by setting the first invert plate in position. The first plate laid should be oriented in the direction as shown on the assembly drawing. Pay close attention to the bolt pattern. Figure 1 shows the typical orientation when viewed from inside the structure. Flow direction is from right to left. This picture is consistent with the typical plate detail on the assembly drawing.

When the invert is composed of two or more plates, the additional plates overlap the adjacent plate. Place each succeeding plate in the longitudinal row, so as to lap it one corrugation on top of the preceding one. Circumferential seams are staggered 2', 4', 6', 8' or 10' as shown in Figure 3 on page 4. Insert the bolts in both the transverse and longitudinal seams, carefully align the plates and tighten all nuts. The end plate can be held up with a crane, or blocks can be used to gain access to these seams. Proceed in this manner until all invert plates are laid and all nuts tightened.

4. Corner Plates

After the invert plates are assembled, again start at the downstream end and add the corner plates. These plates lap inside the invert plates. Insert enough bolts in each plate as it is placed to hold it securely, but do not tighten the nuts, thus leaving the plates free to move slightly to facilitate matching the remaining holes. Always place the bolts in the transverse seams and at the plate corners where three layers are lapped before proceeding to the next plate. Each succeeding corner plate laps over the previous plate by one corrugation. No more than three plates should lap at any one connection. A typical 'three plate lap" is shown in Figure 2.

5. Top Plates

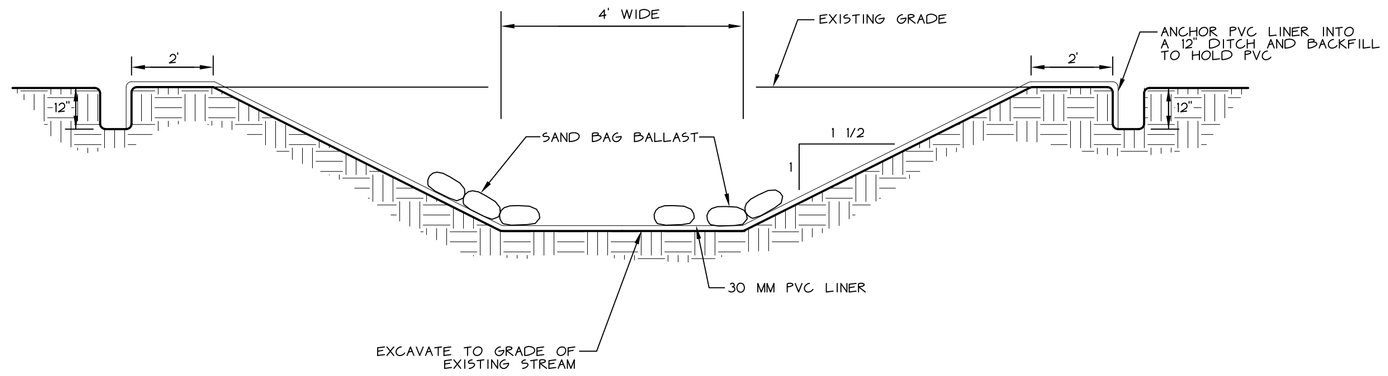
When all of the corner plates are attached and while the bolts are still loose, the first row of top plates adjacent to the corner plates are placed beginning at the upstream end. Refer to the assembly drawing section view to determine how to lap the corner plates (see Figure 3 on page 4). Extend each row only far enough to support the next row of plates above, to a place where one final plate can be added to complete the ring.

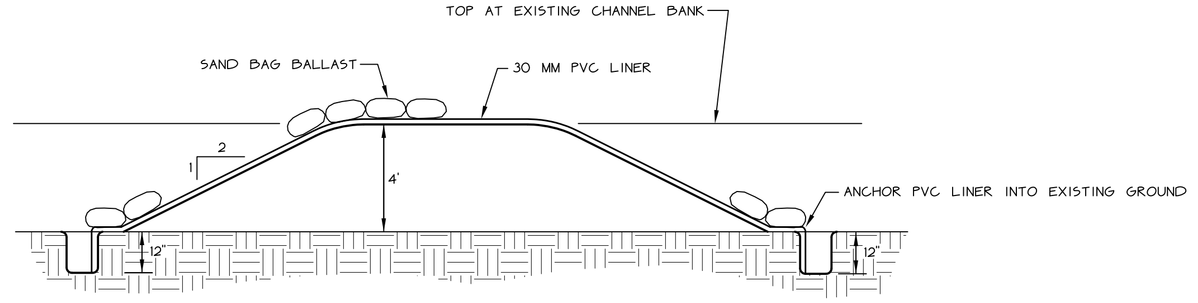
The balance of the pipe arch is assembled, progressing downstream, with the top closing plate added as soon as lower plates are in place to support it. The transverse seams and the three plate laps are bolted in advance of the rest of the seam in the same manner as in the corner plates. After all plates are in position, insert the remaining bolts using structural wrenches and drift pins or pointed bars to align the holes. Next, tighten all nuts to between 100 and 300 ft–lbs of torque. Make several passes over each seam to catch any nuts that have loosened as a result of the plates being drawn together. On long structures it will be advantageous to have a bolting crew follow the erection crew by three or four plate lengths to complete the bolting. Power wrenches will speed up the final bolting but should not be used beyond the point where all the bolts have been inserted.

6. Special Configurations

The above instructions apply also to structures with ends cut to fit a slope, skew, or slope and skew combination. Care should be taken to begin the invert row of plates with the numbered plate designated on the plan tor the downstream end, since the two ends on a pipe may not be designed to meet the same conditions.

If the pipe arch has an elbow, tee, lateral, manhole or other special shop fabricated section which depends on the bolt pattern in the plates for its proper position in the structure, care must be exercised to properly position the first invert plate at the downstream end. If the structure has cut ends, the downstream invert will have a detail sketch, which will establish the bolt pattern. If the ends of the pipe arch are not cut, or if the cut does not include the invert plate, the bolt pattern for the index plate will be noted on the drawing. If assembly of the pipe arch is begun at a point other than where the index plate would be used, a numbered plate from the special section should be laid on the ground in its correct position at the starting point. The first invert plate can then be laid in a direction so that the bolt patterns correspond.





TYPICAL CROSS-SECTIONS OF TEMPORARY DAM AND PUMP INTAKE AREA

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SURVEY: OBGA	☐ RECORD DRAWING ☐ DISCRETIONARY ■ FINAL ☐ PRE–APPLICATION	ROGERS ROAD CULVERT REPLACEMENT Westford, VT	DATE: 12/15/19
DESIGN: BWC	O'LEARY-BURKE CIVIL ASSOCIATES, PLC		JOB #: 2019-58
DRAWN: BWC	13 CORPORATE DR. ESSEX JCT., VT PHONE: 878-9990 FAX: 878-9989 E-MAIL: oboa@olearyburke.com		FILE: W2
CHECKED: PJO		DETAILS	PLAN SHEET #: 5
SCALE: AS-NOTED			