

## Tunnel Liner Plate Assembly Guide



# TUNNEL LINER PLATE ASSEMBLY GUIDE

**NOTICE:** PRIOR TO ASSEMBLY, REFERENCE THE CONTECH TUNNEL LINER PLATE BROCHURE AND THE ENGINEER'S PROJECT PLANS AND SPECIFICATIONS. DURING ASSEMBLY AND INSTALLATION, ALL OSHA SAFETY REGULATIONS SHALL BE OBSERVED.



**WARNING** Falling liner plates and accessories can cause severe personal injury or death. Read and follow all safety instructions before unloading tunnel liner plates and accessories.



Notwithstanding the instructions contained in this guide, it is the responsibility of the consignee or consignee's agent to devise safe unloading and handling procedures.

## UNLOADING AND HANDLING

The following equipment is recommended for unloading tunnel liner plates and accessories:

- Forklift
- Front-end loader with fork adapters
- Backhoe with fork adapters
- Cranes
- Non-metallic slings

Other unloading methods such as chains, wire rope, cinching, or hooks in the end of the bundles should not be used.



**Do not stand or ride on the load of tunnel liner plates and accessories while they are being unloaded.**

Failure to follow these instructions can result in serious injury, death and /or damage to tunnel liner plates and accessories.

1. Only trained and authorized equipment operators are to be permitted to unload the liner plates and accessories.
2. Wear approved safety hat and shoes, gloves, and eye protection.
3. Park the truck and trailer on level ground before unloading.
4. Keep all unauthorized persons clear of the area when the driver releases the binders from the trailer and during unloading.
5. Do not cut the steel strapping around the bundles until the bundles have been placed on level ground or secured, and will not be moved again as a unit. It is recommended that the steel strapping be cut with appropriate sized cutting tools. Stand to the side when cutting a strap. Always be aware that liner plates and accessories may move, roll, or fall when a strap is cut.

**6. Do not lift bundles by the steel strapping around the bundles.** 

7. Know the capabilities and rated load capacities of your lifting equipment. Never exceed them.

**8. Do not stand or ride on the load of tunnel liner plates and accessories while it is being unloaded. Do not stand beneath or near the tunnel liner plates and accessories while they are being unloaded.** 

9. If unloading at multiple site locations, make sure the truck driver secures the remaining load before proceeding to the next location.
10. The contractor shall be responsible for the safety of his/her employees and agents. Adequate safety indoctrination is his responsibility.
11. Safe practices on construction work as outlined in the latest edition of the "Manual of Accident Prevention in Construction," published by The Associated General Contractors, shall be used as a guide and observed.
12. The contractor shall comply with all applicable city, state, and federal safety codes in effect in the area where he is performing the work. This conformance shall include the provision of the current issue of the "OSHA Safety and Health Standards (29 CFR 1926/1910)" as published by the U.S. Department of Labor.



This safety alert symbol indicates important safety messages. When you see this symbol, be alert to the possibility of personal injury, and be sure you understand the message that follows.

### Terms you should know



**WARNING** Alerts you to hazards or unsafe practices that CAN result in severe personal injury or property damage.



**SAFETY INSTRUCTIONS** Messages about procedures or actions that must be followed for safe handling of tunnel liner plate.

## ASSEMBLY AND INSTALLATION

1. Contech recommends using non-metallic slings for all liner plates and accessories handling requirements.
2. Hooks, chains, or wire rope may damage the plates and accessories, and should not be used.
3. Do not push bundles off the trailers or permit plates and accessories to drop to the ground.
4. Prior to assembly, review and understand the engineer's project plans and specifications.
5. Thoroughly review and study the product catalog, assembly instructions, assembly drawings, and bill of material prepared for your order and enclosed by Contech with the shipment.
6. Observe all OSHA safety regulations and guidelines during assembly and installation.

**7. During and prior to the construction of permanent erosion control and end treatment protection, special precautions may be necessary to avoid damage.** 

**8. The maximum allowable live loads and dead loads are those specified by the project engineer. The structure must be protected from unbalanced loads and from any structural loads or hydraulic forces that might bend or distort the structure. Flotation of the structure must be prevented.**

### INTRODUCTION

AS WITH ANY INSTRUCTIONS, PLEASE READ THROUGH THIS INFORMATION COMPLETELY BEFORE ATTEMPTING ANY FIELD WORK OR ASSEMBLY.

The following is a guideline for the assembly of the Contech® 2-Flange Tunnel Liner Plate (TLP). Other procedures and field experience may yield better results. Prior to assembly, reference any assembly drawings provided, these guidelines and the engineer’s plans and specifications.

If your TLP structure requires special field work and assembly techniques, they are covered by additional drawings or instructions. The plates will go together quickly and accurately if these instructions are followed.

Many TLP structures have been assembled with hand tools and common labor. Power tools, lifting equipment, and skilled labor will, in many cases, decrease construction time and make the work easier.

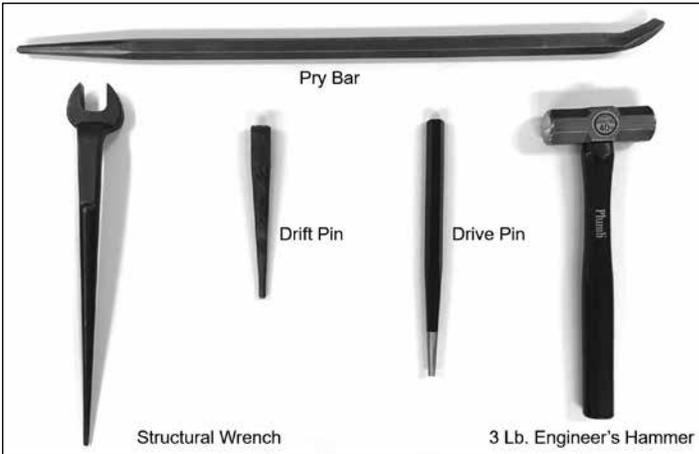
No mention is made here of excavating, backfilling, grouting or general earth-moving equipment. For more information please refer to the Contech Tunnel Liner Plate Brochure and the drawings specifications.

#### Minimum Tools Required (not supplied)

- ☑ Structural wrenches (1-1/16") or socket wrench
- ☑ Drift and/or drive pin
- ☑ Socket wrenches (1-1/16") with ratchet handles
- ☑ Transit and level (if line and grade must be established)
- ☑ Carpenter’s level
- ☑ Ordinary chalk lines, tapes, etc.

#### Desirable Tools and Equipment

- ☑ Power or impact wrenches
- ☑ 3 lb. Engineer’s hammer
- ☑ Pry bar
- ☑ Mobile crane, hydro-crane or “cherry picker”

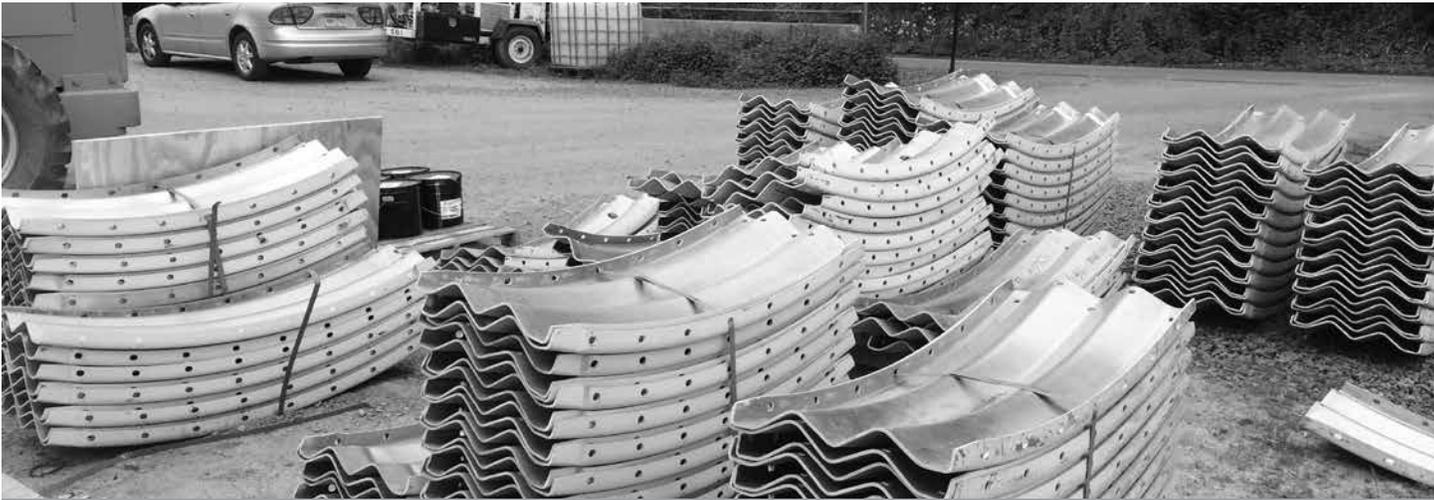


#### Tools Necessary if Field Cutting is Required

- ☑ 3/4" Electric drill with bits and reamers
- ☑ Metal cutting saw

#### Description of Materials:

- ☑ Plates
- ☑ Fasteners
- ☑ Clips
- ☑ Plate layout drawings/material identification sheet
- ☑ Optional base channel for foundation connection



## I - GENERAL

The plates for TLP structures are furnished in three overall circumferential widths:

- 12 pi (3'-5"), flange has 6 holes
- 14 pi (3'-11"), flange has 7 holes
- 16 pi (4'-5"), flange has 8 holes

All plates have a length of 18 inches and circumferential side flanges formed on the inside of the finished structure.

The flanges are punched on approximately 6¼" (2 pi) spacing to receive 5/8" diameter bolts which join the plates of two adjacent rings.

The plates for any one structure may have ends of one or more of the following types:

- No offset
- Single offset
- Double offset
- Plain ends (no bolt holes)

All no offset ends of plates are punched with square holes for 5 bolts. Plain ends on arches are unpunched. Bolts with square shoulders are furnished to resist turning. Offset ends of plates are designed to fit in a no offset end (See Photo 7 on page 7). The single offset plate has one no offset end as described above with the opposite end offset toward the flange face of the plate for approximately 3 inches of its length. The double offset plate has both ends offset for approximately 3-inches.

This offset construction minimizes any infiltration of the material surrounding the structure and increases the load carrying capacity of the lapped joint.

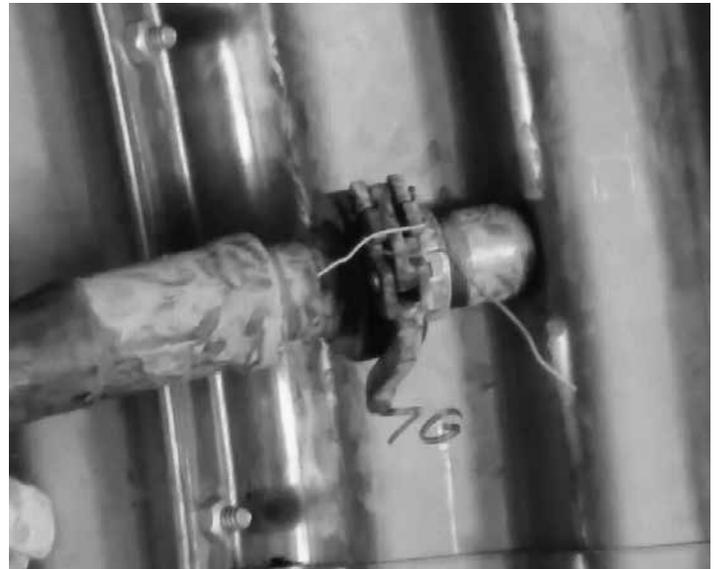
The bolting of TLP is accomplished entirely from the inside of the structure.

## II - SORTING PLATES

Sort plates of same widths and offsets into separate stacks before starting construction. In addition, further sorting should take into account whether or not the plate has a grout port. This will minimize the possibility of getting incorrect plates to the crew and will allow a quick check of the bill of material supplied with the order.

Layout drawings will accompany the order to indicate the correct location of each plate in any given ring.

All plates will have identifying marks which will match those on the layout drawings (see Figure 1 on page 5).



III - ASSEMBLY

1. If the size of the structure allows it, determine if the first ring of the structure can be built horizontally laying on the ground. If not, the structure will need to be built in place vertically and braced as needed. Regardless of the method used to build the first ring, the no offset plate has to be located at the top centerline of the structure.
2. When assembling the longitudinal seams it is important to check the circumferential bolt hole spacing from one plate to the next (offset into no offset; center of hole to center of hole should be 6 1/4").
3. After the first ring has been assembled, the assembly of any single ring of TLP will begin at the crown or top of the structure with a no-offset plate and progress down each side of the structure with single offset plates. The ring of plates will be completed by placing a double offset plate in the invert or bottom. With arch shapes, please see note 6 below. For vertical/shaft applications, the no-offset plate will be shown at the 12 o'clock orientation and is at the discretion of the installer.
4. Round and single radius arch structures should have the longitudinal lap joints of adjacent rings of plates staggered a minimum of 4 pi (approximately one foot or as shown on the layout drawing). Exceptions apply to arch structures that are less than 48 pi. The stagger of the longitudinal seam will be shown in the layout drawing accompanying the order.
5. The no-offset ends of plates have square holes and the offset ends have round holes. All bolts have square shoulders to seat in the square holes and allow nuts to be placed inside of the structure to resist turning.
6. Bolts are installed in the no-offset ends of the plates with bolt heads to the outside and held in place with push-on spring clips. This can be done either before the plate is carried into the tunnel or at the working face. The spring clips hold the bolts in place until the assembly is completed by installing the nuts (see Photo 3 on page 6).
7. The recommended installation bolt torque is 80-100 ft-lbs. Do not over torque the bolts. A good plate fit is far better than high torque. Torque levels are for installation, not residual, in-service requirements.
8. Install arch structures using the same process, starting at the top with a no-offset plate, typically ending on each side with a plate which has a plain end having no holes. The legs of the arch may rest in a base channel which may be anchored into footings. The arch may rest in one of the following:
  - Base channel
  - Slotted keyway
  - Sliding channel

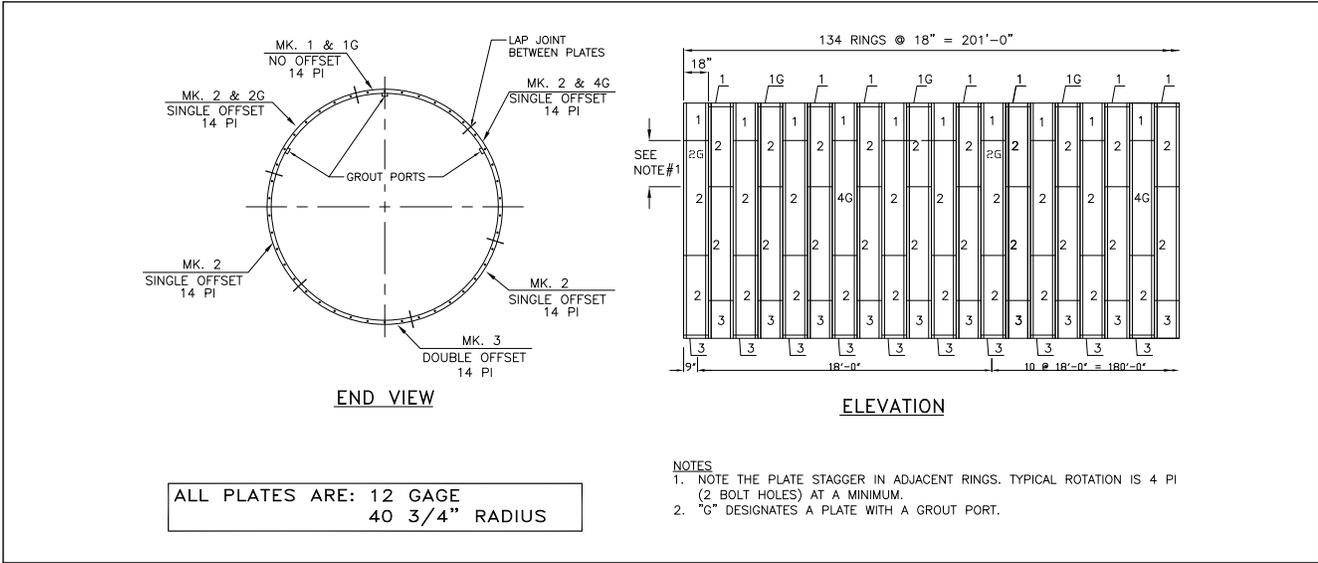
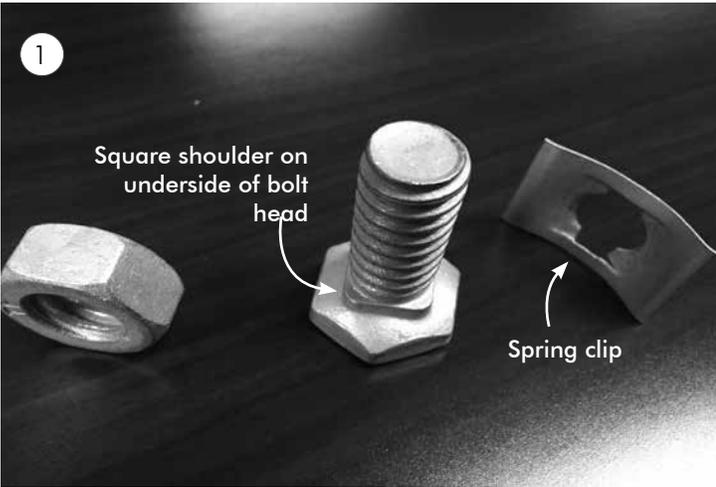
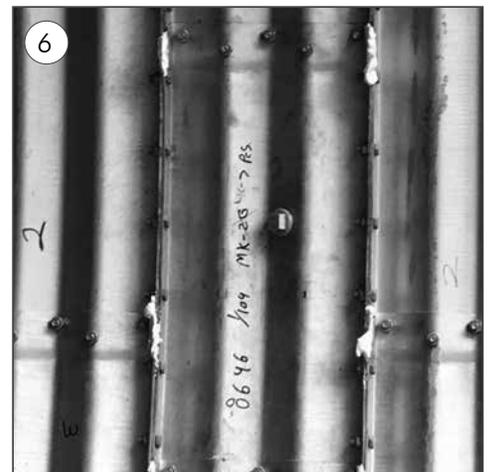
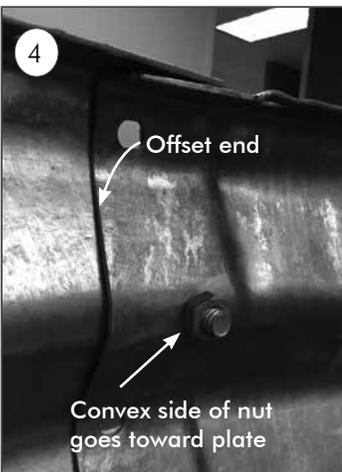
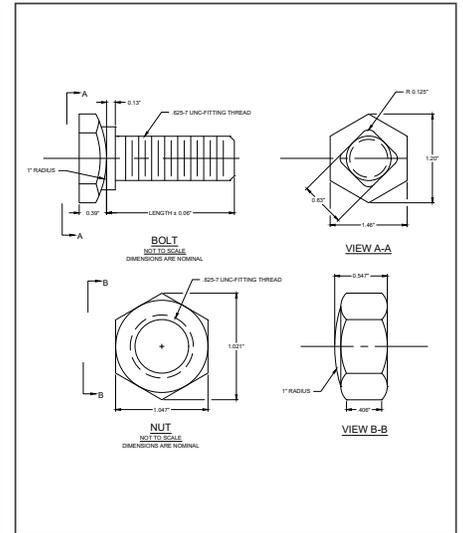
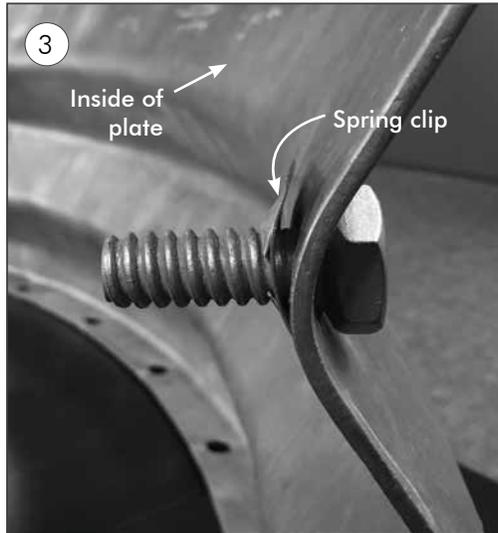


Figure 1. Tunnel Liner Plate Layout Drawing

IV. - TUNNEL LINER PLATE COMPONENTS



1. 5/8" diameter bolt, nut and spring clip
2. Plate bundles for shipment
3. Spring clip placement, in no offset end of plate
4. Convex side of nut toward the plate – Offset end under no offset end. 1-1/16" wrench size
5. No offset plate in top of structure
6. Plates with grout ports are marked with a "G" on the plate layout drawings



V. - TYPICAL END VIEW - PLATE LAYOUT DRAWING (EXPLANATION OF OFFSETS)

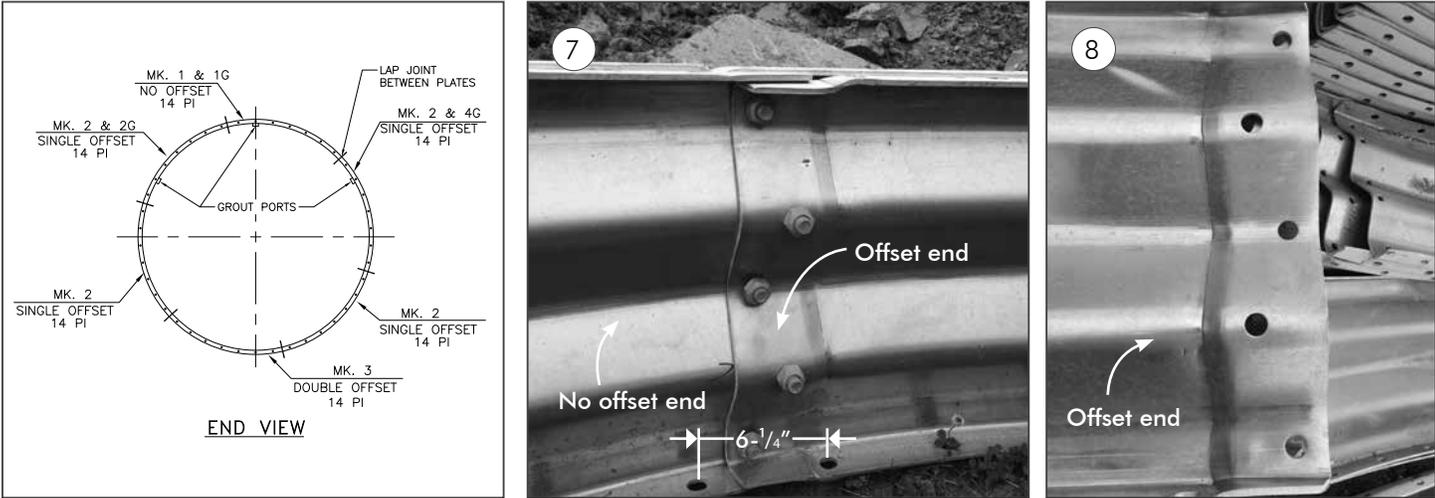


Figure 3. End View

- 7. Typical plate lapping of an offset end under a no offset end of a plate. 6 - 1/4" dimension critical.
- 8. An offset end of a plate is an indentation at the end of a plate to fit inside a no-offset end of another plate.

VI. - STANDARD GROUT PORT DETAILS & OPTIONS

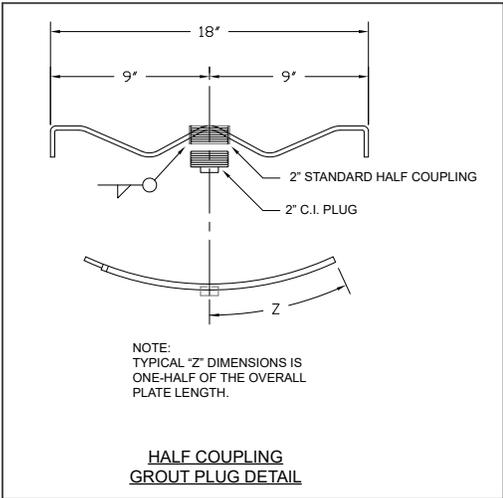


Figure 4. Half Coupling GROUT PLUG DETAIL

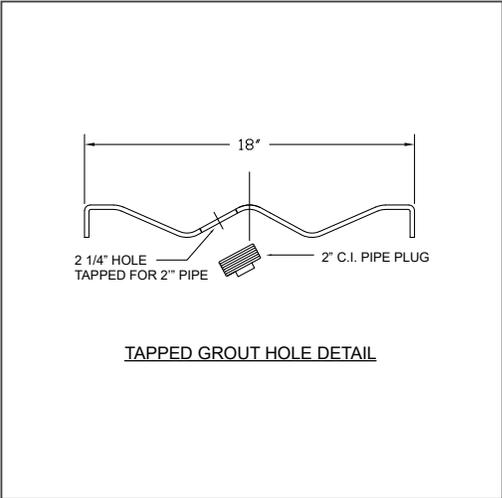
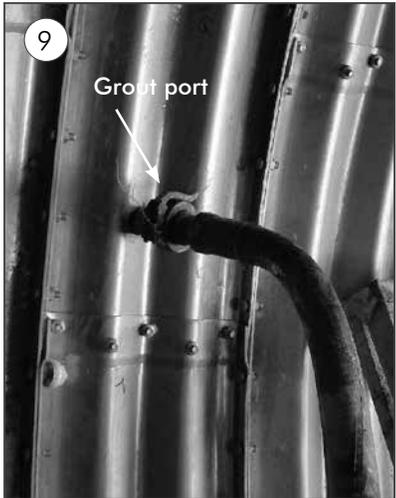


Figure 5. Tapped GROUT HOLE DETAIL



- 9. Grout hose connection through a grout port.



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Site-specific design support is available from our engineers.

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