

# INSTALLATION & SPECIFICATIONS

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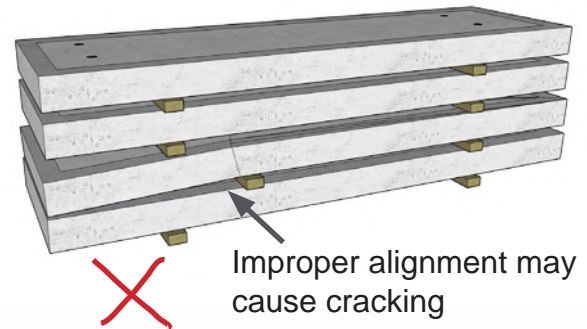
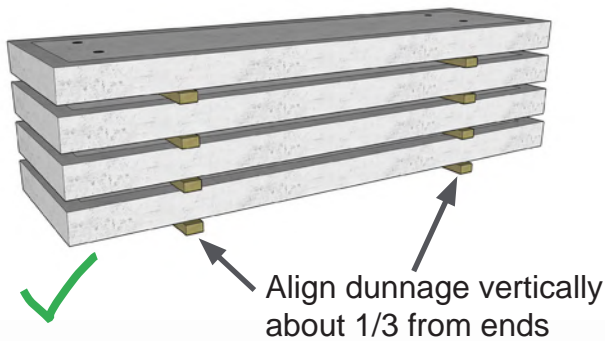
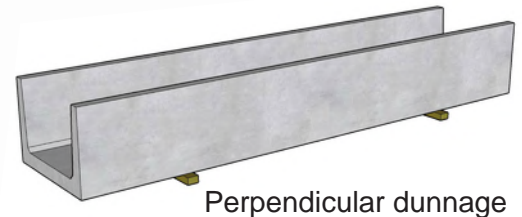
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**One Piece Multi-Duty, HS20 & XL**

**Unloading & Storage**

To reduce the risk of damage, care should be taken in unloading and storing trench material.

- All material should be stored on level, firm ground.
- Dunnage should be placed **vertically in-line with underlying dunnage** as additional pieces are stacked.
- Dunnage should be placed perpendicular under all bases and covers.
- Do not stack products higher than they were upon arrival.
- Do not store other materials on top of trench or lids.
- Do not store trench where it may be damaged by traffic or equipment.
- Ensure adequate clearance for forks to avoid chipping.



**Preparation & Excavation**

1. The contractor should review the drawings and installation instructions before attempting to install the trench. Establish a starting location, typically at one end of the trench or at a fixed point such as a building or manhole.
2. Establish a survey of the trench layout and stake critical turning points, tee's etc.
3. Excavate trench to a minimum width for the specified size of trench and to a sub-grade elevation 2"-3" below the bottom of the trench (8"-12" if a drain tile will be placed under the trench). Cut walls as vertical as possible. Deep excavations may require shoring or protection from cave-ins.
4. If a drain tile is used, backfill with crushed stone around the drain tile to within 3" of the trench bottom. A compactible material such as Dense Graded Aggregate should then be placed, leveled and compacted with a vibratory plate compactor to the bottom of trench elevation. For HS20 loading, material should be compacted to > 3,000 psf. (150KPa). To provide a uniform bearing surface for the trench base, top off with 1/2" of sand and rake smooth.



**Setting Trench Bases**

5. All trench bases and lids should be lifted with the coil, A anchors, or swift lift inserts cast into them. If coil inserts are provided, use a spreader beam lifting device (user provided) so that a vertical pull is applied to the coil eye-bolts. If recessed anchors or swift lift inserts are provided, use cable slings that are long enough to maintain a 30°-60° angle between the cables at the hook point.

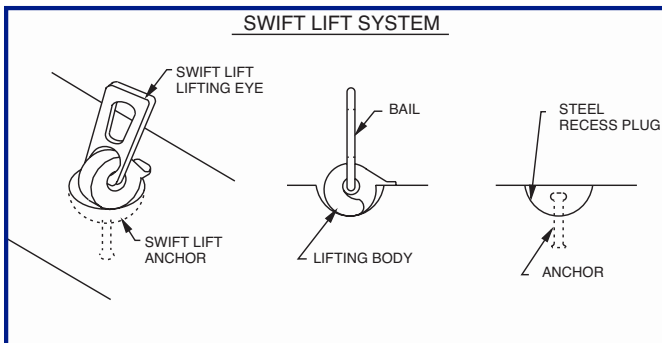
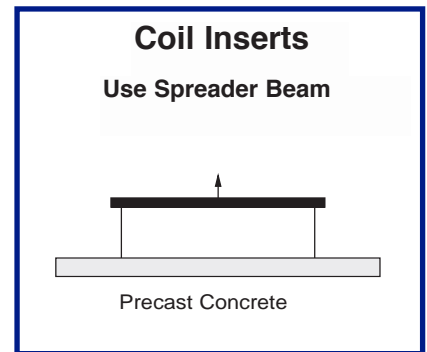
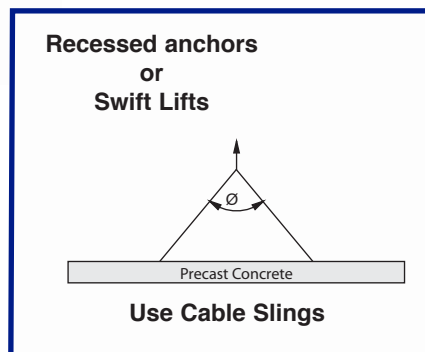
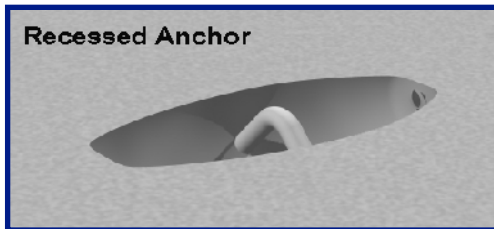
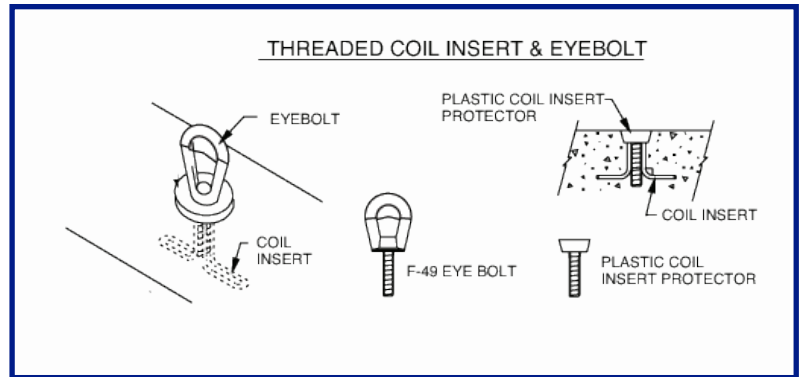


**LIFTING DEVICES**

Trenwa uses different lifting devices, depending on the project size and type of trench piece.

		Threaded inserts	Recessed anchors	Swift lifts
BM bases		X		
LM lids	X			
BH bases		X	O	
LHC lids	X		O	

Swift lifts are optional, cost extra and require a special lifting tool.



6. Begin the trench base installation at a fixed point such as a building, equipment foundation, manhole etc. then place subsequent base units in sequence per Trenwa's layout drawings. Set the elevation and alignment of the trench bases with an electronic level and a transit. An off set string line can be used to assist in keeping the trench aligned.

7. Trenwa's standard 10'-0" trench bases and lids are made 1/8" less than full length. This helps to minimize growth in the overall length between fixed points in the trench layout. Place the trench bases as close together as possible to minimize gapping between trench bases. If necessary, a chain winch or come-a-long can be attached to lifting points of the trench base already set and the trench base being set to assist with pulling the trench bases together. This is done while the trench base being set is still supported by the piece of equipment setting it.



8. Apply a bead of standard elastomeric concrete adhesive to the end of one trench base before setting the next and butt them together to provide a bond and silt seal. Alternatively, roofing paper or similar material may be placed over vertical joints between trench bases to minimize silt infiltration.

9. After setting two to three bases it is important to “continually” check the distance between the last trench base set and the next turning point, tee, etc. If an adjustment needs to be made in the trench base spacing it can be done over several trench bases to minimize the severity of the adjustment.

10. If it is decided that field modification is necessary to match the trench layout, please contact Trenwa to discuss the best options. Sometimes it is better to have Trenwa make a new trench base (and lid if necessary). Although we do not encourage field cutting the trench pieces, sometimes this may be the best solution.



### **Sealants and Mechanical Connections**

11. When installing a trench system that requires water-resistant joints, follow the manufacturers directions for applying the sealant. If sealant is included as part of our design follow the application instructions on the project drawings.

Some installations require a joint sealant material that is applied to the exterior of the base units overlapping the joint. Apply this type sealant material after the base units have been securely set.

12. If a mechanical connection is specified to join the base units, weld the Trenwa supplied steel tie-plate to the weld plates which are embedded in the end of the walls of adjacent bases. Do this after the bases have been securely set and pulled together. Weld the tie-plates prior to removing the chain winch or come-a-long. All exposed weld plates should be treated with a rust inhibitor coating after welding is completed and the trench is securely in place.

### **Backfilling**

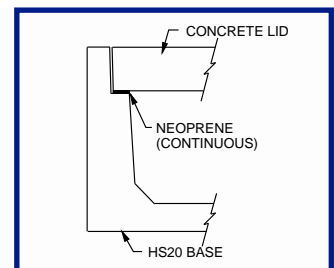
13. Backfilling should be done with sand or gravel and firmly compacted to the compaction specified in **Step 3**. The backfill can be topped off with excavated soils. A flowable grout may be used as an alternative to a granular backfill material so that it fills any voids between the bases and the backfill material.

### **Setting Lids**

14. Trench lids can be installed after all cable, piping, insulation, testing, etc. has been completed. Inserts are cast in the LM and LHC road crossing lids so that lifting devices can be attached. Care must be exercised to maintain an even strain on each lifting insert during lifting and setting of the lids. [Review the instructions for handling the base units in **Step 5**].

**15. The lids should match the trench base and not overlap the joints between the trench bases. Overlapping the joints can create an uneven bearing surface that could cause damage to the lids.**

16. For LHC trenches with concrete lids, Trenwa provides a neoprene gasket for the lids to bear on to minimize movement and to take up any irregularities in the mating surfaces. Place the neoprene strips the full length of the horizontal lid bearing surface on each side of the base.



17. Connect a chain winch or come-a-long to the lifting hardware of the lid being installed and the previous lid. While the crane is supporting the full weight of the lid, pull the lids together, then release the crane support. Pulling the lid with its full weight on the trench may damage the joint sealant on the top of the walls.

18. Chipping of LM, LHC Concrete lids can occur when stones and other hard debris are in the area, particularly during periods of construction. Tires can cause this debris to impact the lid and chip the edge or surface of the concrete

lid. Care should be exercised to keep the area clean or protect the lids during these periods. Snowplows can also cause damage to the lids or impact channels. The area should be marked and snowplow operators should be made aware and use caution when clearing the trench. The use of salts and other corrosive deicers is not recommended since they can cause the impact channels to rust prematurely and damage the surface of the concrete.

#### ***Road Crossing Concrete – LHC series lids***

- Prior to setting the trench lids, clean off the lid bearing surface and place the rubber neoprene pad the full length of the lid bearing surface on each side of the trench base. The neoprene pad has adhesive on one side to keep it in place, so it is important that the bearing surface is clean and free of debris before placing the neoprene pad. Do not pull or push the trench lid into position. This will damage the neoprene pad. The neoprene pad is only used on road crossing trench with concrete lids.

- Each road crossing concrete lid has four (4) coil inserts cast into them. We have provided EB  $\frac{3}{4}$  coil eye bolts that screw into the inserts. The shoulder of the eye bolt should be flush with the top of the lid and the eye bolt should be parallel with the length of the lid. Use cable slings that are long enough to maintain a 60° angle between the cables at the hook point. After connecting to the EB  $\frac{3}{4}$  eye bolts apply initial tension to the cables and anchors to check the security of the lift. Care must be exercised to maintain an even strain on each lifting insert during lifting and setting of the lids.

#### ***TIER 8 Concrete - LM series lids***

- Each LM concrete lid has four (4) NC-13 inserts cast into them. We have provided EB  $\frac{1}{2}$  NC-13 eye bolts that screw into the inserts. The shoulder of the eye bolt should be flush with the top of the lid and the eye bolt should be parallel with the length of the lid. Use cable slings that are long enough to maintain a 60° angle between the cables at the hook point. After connecting to the EB  $\frac{1}{2}$  eye bolts apply initial tension to the cables and anchors to check the security of the lift. Care must be exercised to maintain an even strain on each lifting insert during lifting and setting of the lids.

#### ***Steel & Aluminum lids – LHS, LPS, LPA, LMS, LMA series lids***

- Steel and Aluminum lids are generally light enough to be installed by hand using the LTSM lifting tool or with light equipment using the LTSE lifting tool.

#### ***Pedestrian Concrete - LP, LPP series lids***

- Pedestrian lids are generally light enough to be installed by hand using the LT lifting tool.

#### ***Fibrelite – LPF, LMF, LHF series lids***

- Fibrelite lids are generally light enough to be installed by hand using the FL7 lifting tool.

#### ***Vent Lids – VHS, VHC, VM, VP series lids***

- The galvanized steel bar grating vent lids are lifted by hand, strapping around the lid or by hooking onto the cross bars of the lid. If a strap is used wrap the strap around the length of the lid so the strap can be easily removed after the lid is in place.

### **Protection of Trenwa System After Installation**

1. The trench lids (especially the concrete road crossing lids) should be protected from construction traffic to prevent damage to them. Gravel or other hard debris can get lodged in the joint between the ends of the lids and along the edge of the lids. If vehicles cross the trench and force the gravel or hard debris into the joint it can cause the concrete to chip or spall off. Care should be taken to keep the surface of the trench lids and the joints free of gravel or hard debris.

2. Tool carts, wheelbarrows, etc. should not be rolled over the pedestrian lids. They are designed for foot traffic only.

3. If pedestrian lids are removed from the trench they must not be dropped on hard surfaces and should be stored no more than 10 to a stack.

## Component Trench

### Unloading & Storage

To reduce the risk of damage, care should be taken in unloading and storing pallets of trench material. If a forklift is not available for unloading, use a spreader bar to separate lifting cables or chains so material is not pinched. Pallets should be stored on level ground. Dunnage should be placed under road crossing bases and covers. In addition, the dunnage should be placed vertically in-line with underlying dunnage as additional pieces are placed on each stack of material.

### Preparation & Excavation

1. The contractor should review the drawings and installation instructions before attempting to install the trench. Establish a starting location, typically at one end of the trench or at a fixed point such as a building or manhole.
2. Excavate trench to a minimum width for the specified size of trench and to a sub-grade elevation 2"-3" below the bottom of the trench (8"-12" if a drain tile will be placed under the trench). Cut walls as vertical as possible. Deep excavations may require shoring or protection from cave-ins.
3. If a drain tile is used, backfill with crushed stone around the drain tile to within 3" of the trench bottom. A compactible material such as Dense Graded Aggregate should then be placed, leveled and compacted to the bottom of trench elevation. Top off with 1" of sand and rake smooth.



### Setting Trench Brackets & Sidewalls

4. Support brackets should be set on maximum 5'-0" centers (or less, as required by the layout). After setting each bracket to the required spacing, the bracket should be checked for level and alignment. A transit or string line should be used to maintain horizontal alignment of the brackets. At entrances to hand holes or buildings set trench support brackets on footings provided in foundation construction.
5. After setting the support brackets, place sidewalls on both sides of the support brackets (with the smooth side of the sidewall facing outside) so that they span from the center of one bracket leg to the center of the next bracket leg. Backfill should be placed against the sidewalls as soon as is reasonably possible to hold the sidewalls in place.
6. A minimum 4" bedding of sand should then be placed in the trench to form a level bottom, just covering the support brackets. If required, trench dividers or cable support blocks should be placed in the trench at this time.



### Backfilling

7. Backfilling should be done with sand in layers and firmly compacted. Be careful not to over-compact as this can damage the sidewalls. The backfill can be topped off with excavated soils.

### Setting Lids

8. Trench lids can be installed after all cable has been placed in trench. **Use care in handling and placing pedestrian covers. The impact from dropping a cover can damage it.**
9. The lid installation sequence should start at a fixed point (e.g. building, manhole, etc.). The lids should match the joint spacing of the sidewalls. **Overlapping the joints can create an uneven bearing surface that could damage the lids.**

## **GENERAL SPECIFICATIONS**

### **1. SCOPE**

- 1.1 Provide a precast concrete underground utility trench system (for electrical cabling or mechanical piping) as manufactured by Trenwa, Inc. (Patent #2862367); 1419 Alexandria Pike; Fort Thomas, KY 41075. The manufacturer must have experience in design and fabrication of similar products and with facilities for fabricating them with the quality specified herein and without delay to the specified schedule.

### **2. DESIGN**

- 2.1 The precast components shall be designed to conform to requirements stated in ASTM C857-07 "Practice for Minimum Structural Design Loading for Underground Precast Concrete Utility Structures, ASTM C858-07 "Specifications for Underground Precast Concrete Utility Structures" and ACI-318 "Building Code Requirements for Structural Concrete and Commentary on Building Code Requirements in Structural Concrete".

### **3. MATERIALS**

- 3.1 Cement shall conform to ASTM C150/C150M, "Specification for Portland Cement".
- 3.2 Fine and coarse aggregates shall conform to ASTM C33/C33M, "Specification for Concrete Aggregates".
- 3.3 Chemical Admixtures shall conform to ASTM C260/C260M "Air-Entraining Admixtures for Concrete and ASTM C494/C494M "Chemical Admixtures for Concrete".
- 3.4 Steel reinforcing bars shall conform to ASTM A615 "Specification for Deformed and Plain Carbon Steel Bars for Concrete Reinforcement".
- 3.5 Steel reinforcing wires shall conform to ASTM A496 "Specification for Steel Wire, Deformed, for Concrete Reinforcement".
- 3.6 Steel reinforcing welded wire mats shall conform to A1064 Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete".
- 3.7 Embedded steel shapes and plates shall conform to ASTM A36/C36M "Standard Specification for Carbon Structural Steel".

### **4. CONCRETE**

- 4.1 Batching, mixing and placing of concrete shall conform to ACI A301 "Specifications for Structural Concrete" and ASTM C94/C94M "Specification for Ready-Mix Concrete" and ACI 304 "Guide for Measuring, Mixing, Transporting and Placing Concrete". All materials shall be pre-weighed prior to mixing.
- 4.2 Concrete shall obtain a minimum compressive strength of 5,000 psi at 28 days of age.
- 4.3 Concrete shall contain 6% entrained air by volume (plus or minus 1%).

### **5. REINFORCEMENT**

- 5.1 Fabrication and placement shall conform to ACI-318 "Building Code Requirements for Structural Concrete".

### **6. SUBMITTALS**

- 6.1 Engineering layout drawings will be provided for approval and to assist field installation. The drawings will include dimensions, identification and location of each trench part in the trench layout along with a bill of material.