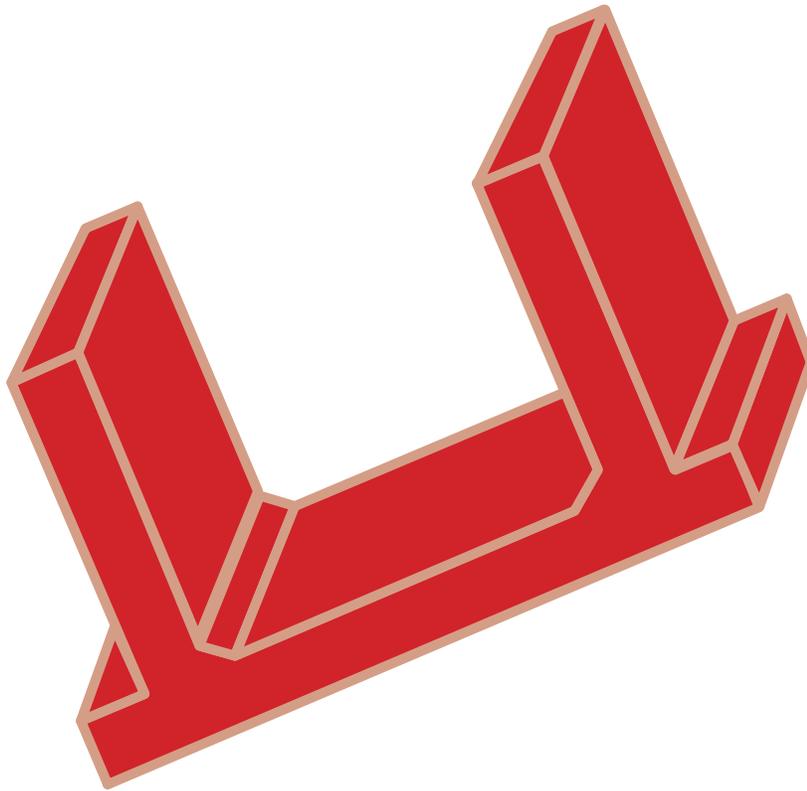


Installation, Specifications

- One Piece, HS20, C trench - 52
 - Component trench- 53
 - Specifications - 54



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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 ground. Dunnage should be placed under all bases and road crossing 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.

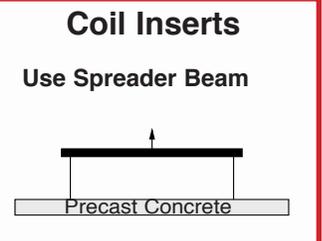
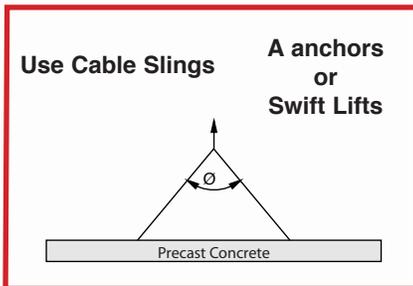
3. If a drain tile is used, backfill with crushed stone around the drain tile to within 3" of the trench bottom. A compactible material such as Dense Graded Aggregate should then be placed, leveled and compacted to the bottom of trench elevation. For HS20 loading, material should be compacted to > 3,000 psf. (150KPa). Top off with 1" of sand and rake smooth.



Setting Trench Bases

4. 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 A 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.



5. A transit or string line should be used to maintain horizontal alignment of the base units. The bases may follow any natural, gentle grade of the area. The first base unit should be set at a fixed point such as a building wall or manhole and subsequent base units placed in sequence so that gapping is minimal. If desired, roofing paper, Con-Wrap sealant, or similar materials may be placed over vertical joints between bases to minimize future silt infiltration.

6. With large trench bases, a chain winch or come-a-long can be attached to the lifting devices to pull the base units together while the crane supports the full weight of one base.

Sealants and Mechanical Connections

7. 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.

8. 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.

9. Any damp proof coating on the base units (if provided) may require touch up after handling.

Backfilling

10. 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.

Setting Lids

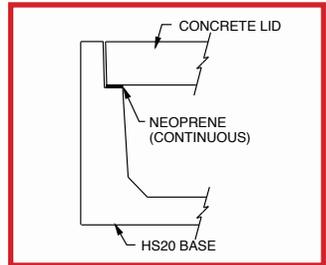
12. Trench lids can be installed after all cable, piping, insulation, testing, etc. has been completed. Inserts are cast in the Medium Vehicle, H10 and HS20 road crossing lids so that lifting devices can be attached. Care must be exercised to maintain an even strain on each lifting insert during lifting and setting of the lids. [Review the instructions for handling the base units in **Step 5**].

13. The lid installation sequence should start at a fixed point (e.g. building, end of trench, manhole, etc.). The lids should match the joint spacing in the base units. Overlapping the joints can create an uneven bearing surface that could cause damage to the lids.

14. For H10 & HS20 trenches with concrete lids, Trenwa can provide a neoprene gasket for the lids to bear on to minimize movement that may chip the lids. If provided, place the neoprene strips the full length of the horizontal lid bearing surface on each side of the base.

15. 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.

16. Chipping of H10 & HS20 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.



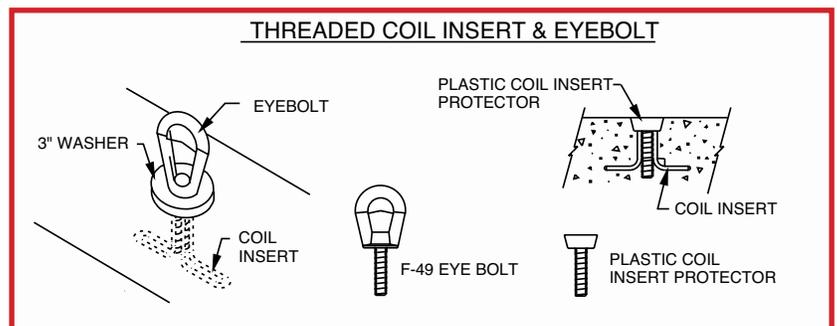
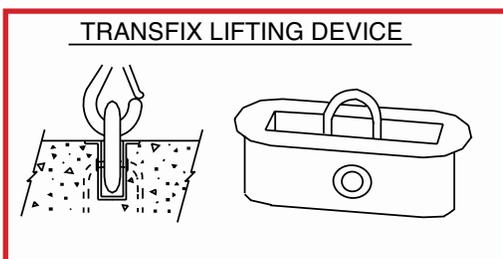
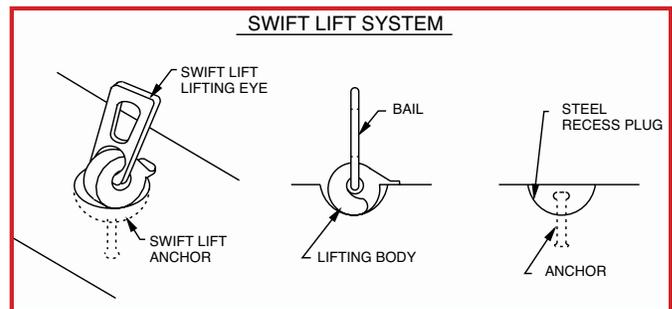
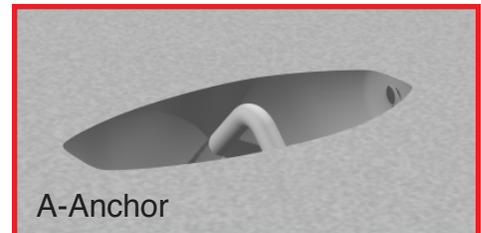
LIFTING DEVICES

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

Threaded Inserts
Transfix
A anchors
Swift lifts

Pedestrian bases			x	
MV bases			x	o
MV & H10 lids	x	o		
H10 & HS20 bases			x	o
HS20 lids	x			o

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



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. Impact from dropping a cover can exceed the pedestrian design load and damage the cover.**

9. **The lid installation sequence should start at a fixed point (e.g. building, end of trench, manhole, etc.). The lids should match the joint spacing in the base units. 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.

ONE PIECE TRENCH SPECIFICATIONS

1. GENERAL

- 1.1 The trench system will consist of precast concrete U-shaped bases and removable covers equivalent to Trenwa's One Piece trench system to be installed in earth trenches with covers extending above the surrounding crushed rock surface.
- 1.2 The trench system will be designed to support at least 200 pounds per square foot live load for pedestrian traffic or 9,000# G.V.W. for pickup trucks and light duty utility vehicles.
- 1.3 The trench shall have an interior clear cross sectional area of (10")(20")(24")(30")(40")(48") wide x (12") (15")(24") deep. The trench will be approximately (16")(26")(30")(36")(46")(54") wide x (19-1/4")(28 1/4") deep overall including cover
- 1.4 The precast U-shaped bases for the trench will be furnished in standard 10 foot lengths, except that special lengths will be furnished where required by the layout on the drawings. The U-shaped bases will (have openings in the bottom) (be solid bottom). The trench shall not require cross braces to support the walls during backfilling.
- 1.5 The precast trench covers will be furnished in lightweight sections, sized to permit removal by a single person. The covers will have slots for lifting tools and will be made of (Fiber and Steel Reinforced Concrete) (Polymer Concrete)(Galvanize Checker Plate)(Aluminum Checker Plate).
- 1.6 The precast trench system shall be designed and constructed so that neither the covers, nor temporary side-to-sides braces need to be installed to facilitate installation or subsequent machine backfilling and tamping.

ROAD CROSSING TRENCH SPECIFICATIONS

1. GENERAL

- 1.1 All sections of trench designated for road crossing use will be designed to carry HS20, 32,000 pound axle loading and will be furnished in standard 10 foot lengths, except that special lengths will be furnished where required by the layout on the drawings.
- 1.2 The lids for the road crossing trench will be made of (FRP Monolithic Composite)(Steel Reinforced Concrete) (Hot-dipped Galvanized Steel) designed to carry HS20, 32,000 pound axle loading.
- 1.3 The interior clear cross sectional area for the road crossing bases will be at least (10")(20")(24")(30")(36")(40") (48")(60") (72")(84")(96") wide x (12")(16")(24")(36")(48")(60")(72") deep.
- 1.4 The precast trench system shall be designed and constructed so that supplemental support such as protection rods or cross supports are not required.

COMPONENT SPECIFICATIONS

1. GENERAL

- 1.1 The trench system shall consist of precast concrete support brackets, sidewalls and removable covers assembled to form a completely enclosed trench, except with open earth bottom having a 4" bedding of sand.
- 1.2 The trench system will be designed to support at least 200 pounds per square foot live load for pedestrian traffic.
- 1.3 The trench shall have an interior clear cross sectional area of (20")(30")(40") wide by (16")(24") deep. The outside dimensions shall be approximately (32")(42")(52") wide x (20")(28") deep overall (including cover).
- 1.4 The precast sides of the trench system shall be furnished in standard 5 foot lengths, except that special lengths shall be furnished where required by the layout on the drawings. The trench design is such that the sidewalls are held in place by the pressure of the external earth backfill.
Provide U shaped support brackets at a maximum spacing of 5 feet center to center with rectangular sidewall panels spanning the brackets .
- 1.5 The precast trench covers will be furnished in lightweight sections, sized to permit removal by a single person. The covers will have slots for lifting tools and will be made of (fiber and steel reinforced concrete)(polymer concrete).