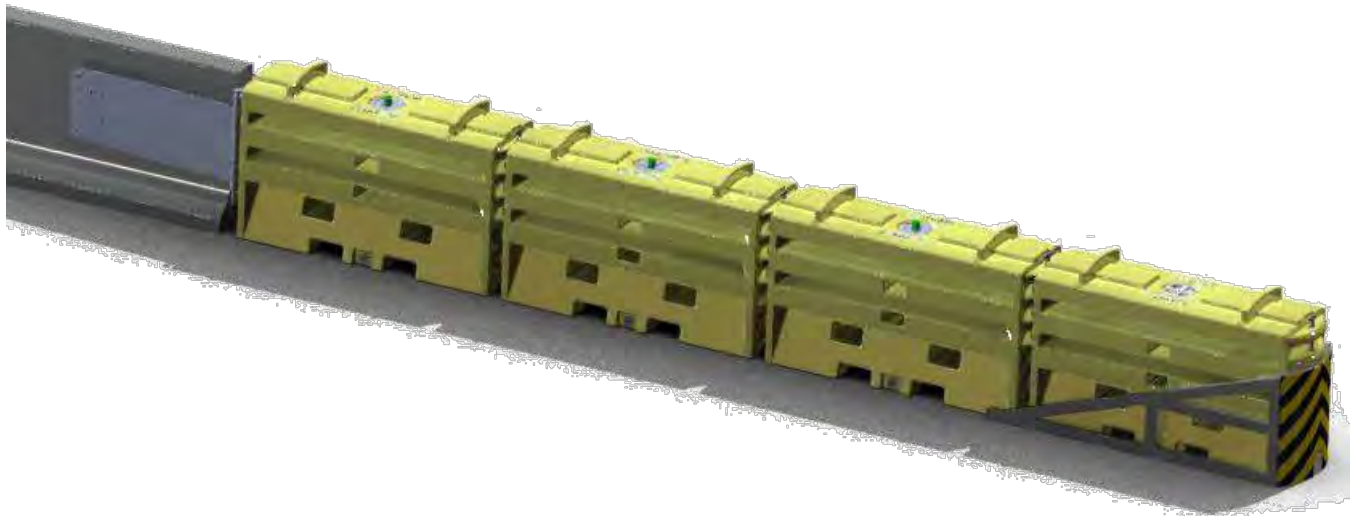


SLED End Treatment System Manual



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PN 45045 Revision E (Dated 11/26/12)

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IMPORTANT:

Read and understand ALL installation instructions before attempting to install the SLED End Treatment System.

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Limitations and Warnings

TraFFix Devices Inc., in compliance with the National Cooperative Research Highway Program 350 (NCHRP350) recommended procedures for safety performance evaluation of highway features, contracted the services of an approved ISO certified independent test facility, to conduct crash tests, report findings, and provide complete testing evaluation reports.

The SLED End Treatment System is accepted by the Federal Highway Administration (FHWA) for use on the National Highway System. TL-3 and TL-2 meet the NCHRP 350 requirements, using the test impact vehicles that range from light weight cars of approximately 820 kg (1800 lbs), to full-size pick up trucks of approximately 2000 kg (4400 lbs).

A series of inline, offset, side and angle impacts at a designated speed of 100 kph (62.1 mph) were conducted to verify the SLED's impact performance. All Occupant Risk Values were deemed a PASS per NCHRP 350 specifications.

The SLED End Treatment System is designed to be installed and maintained in accordance with the recommendations and guidelines of the governing state and FHWA.

After an impact, damaged components should be removed and replaced with new components.

Safety Precautions

CAUTION



Before handling any Traffix Devices product always be sure to wear proper protective equipment including:



SAFETY EYEWEAR



HARDHAT



HEARING PROTECTION



STEEL TOE BOOTS



SAFETY VEST



GLOVES

System Overview

The SLED End Treatment System is a gating, non-redirective crash cushion designed to shield the end of permanent and portable barriers made of concrete, steel, or plastic. The SLED End Treatment System is designed for uni- and bi-directional traffic flow applications (or on pp. 47-48).

Crash Performance

The SLED End Treatment Modules are yellow in color. The NCHRP 350 Test Level 3 (TL-3) System has an overall length of 26 ft (7.92m) long and is 1.875 ft (0.57m) wide. The NCHRP 350 Test Level 2 (TL-2) System has an overall length of 18.9375 ft (5.77m) long and is 1.875 ft (0.57m) wide. Each Module has overall dimensions of approximately 6.3 ft (1.93m) x 1.875 ft (0.57m) x 3.8 ft (1.16m) and weighs approximately 160 lbs empty and 2000 lbs full.

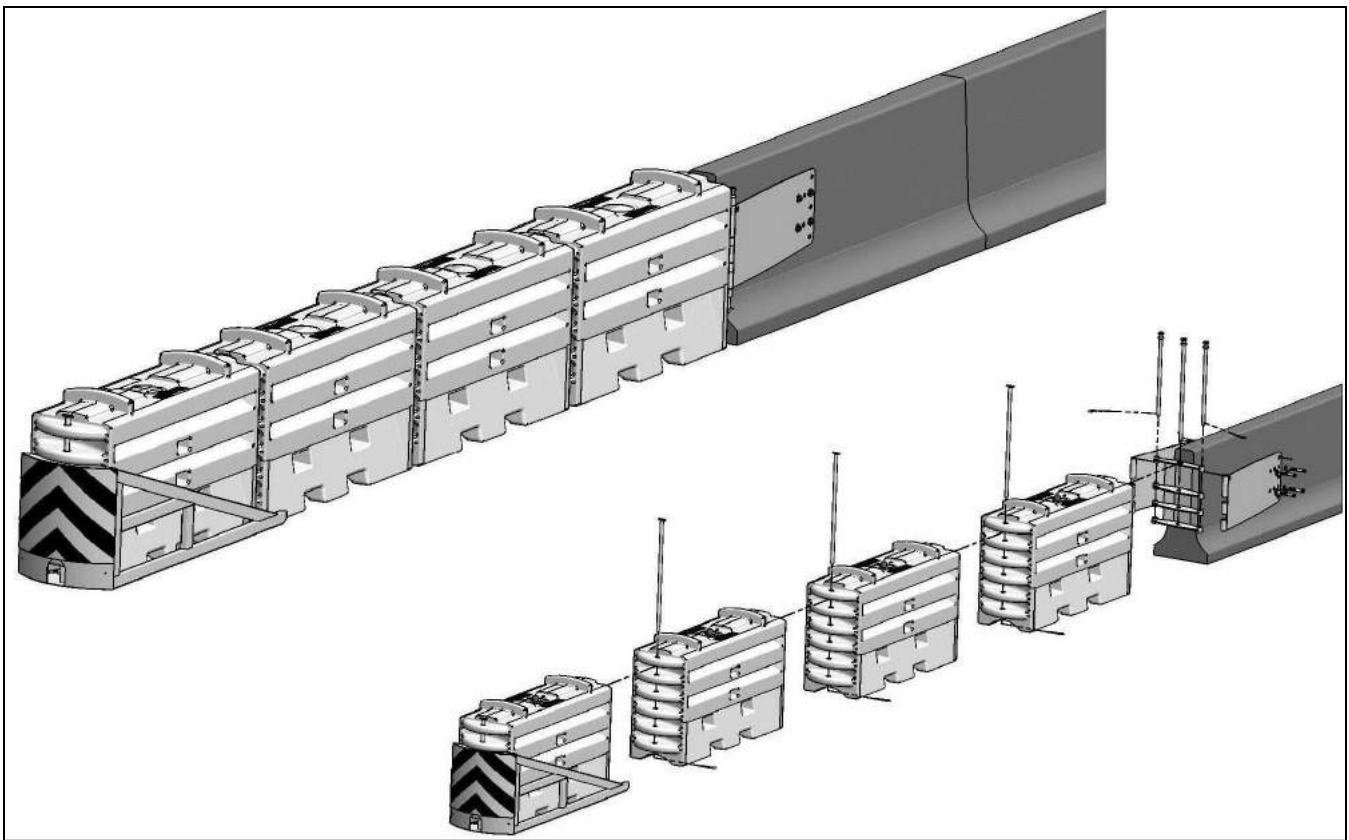


Figure 1: Traffix Devices SLED End Treatment System shown in TL-3 configuration.

Product Overview and Function

The SLED End Treatment System is a water filled gating non-redirective crash cushion designed to shield permanent and portable barriers. The TL-3 SLED End Treatment System consists of three water filled and one empty plastic modules to produce the desired energy attenuation characteristics to decelerate an impacting vehicle to meet TL-3 crashworthy requirements of Report NCHRP 350. Attached to the front empty module is the patented Containment Impact Sled (CIS) which collects the ruptured debris in front of the impacting vehicle..

Additional Features:

- NCHRP 350 TL-3 and TL-2 Tested – Accepted for use on the National Highway System as a TL-3, Crash Cushion, CC-114 and a TL-2, Crash Cushion, CC-117.
- Overall TL-3 array length is 26 ft (7.92m) and TL-2 array length is 18.9375 ft (5.77m) long.
- Acceptable for Permanent and Portable installations.
- Attaches to various barrier shapes made of concrete, steel, or plastic.
- All metal components are domestic sourced steel in accordance with Buy America requirements.
- Does not require any external steel for module assembly.
- Rotational molded plastic, modules are manufactured from specially formed material designed to be durable when handled and attenuate when impacted.
- Module sections up to ½” (14 mm) thick reduce nuisance hit damage and the potential for vandalism.
- Designed for use in uni– or bi-directional traffic flow applications.

SLED Identification and Orientation

Figure 2 (or on pg. 38) identifies the TL-2 SLED End Treatment Systems front and rear orientation for installation. Figure 3 (or on pg. 39) identifies the TL-3 SLED End Treatment Systems front and rear orientation for installation. The Containment Impact Sled orients the front. Module #1 attached to the shielded barrier orients to the rear. This same configuration can be used in uni- or bi-directional traffic flow applications.

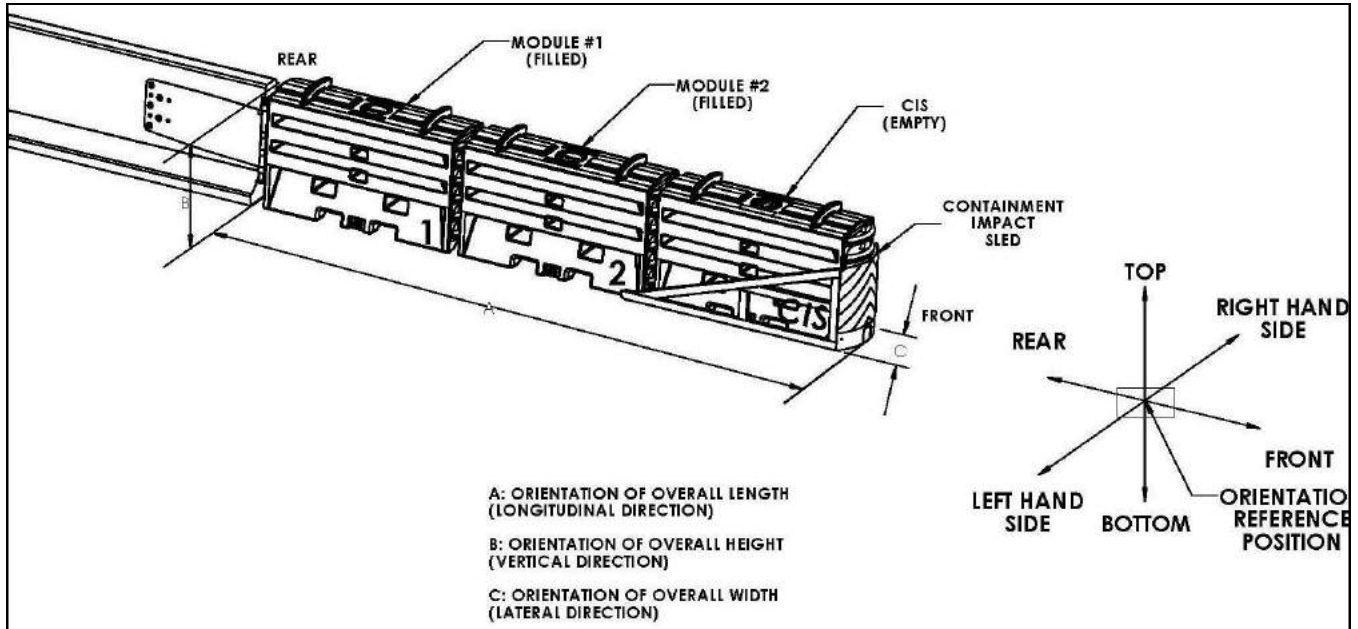


Figure 2: TL-2 SLED End Treatment Orientation.

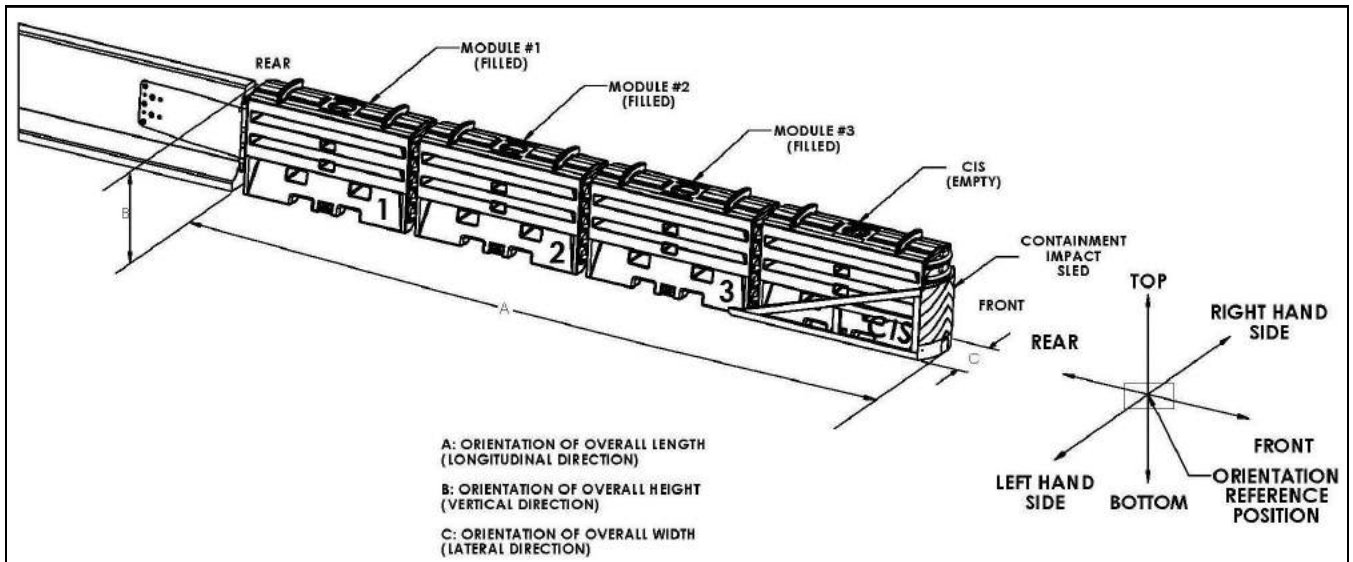


Figure 3: TL-3 SLED End Treatment Orientation.

Product Components and General Specifications

Module Specifications

All SLED End Treatment System Modules are yellow in color and have an outer shell made from energy attenuating plastic. The modules will collapse and rupture when impacted and disperse the contained water. The modules will not crack or corrode when left on the job site or stored for long periods of time.

Overall Dimensions:

Width: 22½" [571 mm]

Height: 42-11/16" [1084 mm]

Length 75-3/4" [1924 mm] pin to pin

Weight:

Empty Weight: 160 lbs. [73 kg]

Filled Weight: 2000 lbs. [907 kg]

Fill Capacity:

Volume: 220 Gal [832 L]

Each module contains an eight inch diameter water fill-hole located on the top surface of each module section. This large diameter opening allows for easy access for water filling using a large diameter hose from a water tanker truck. Each module comes with a twist lock lid to cover the fill hole opening when the water filling process is complete. A water level indicator is designed into the twist lock lid. Figure 6 (or on pp 7 and 52) .

For draining, a central drain hole is located at the bottom of each module. Each drain hole contains molded-in Buttress threads. The drain plug requires 1-1/2 turns to seal the plug preventing any water leaks. The molded-in Buttress threads eliminate the possibility of cross threading compared to standard threads used in a spin welded insert. Cracked spin welded inserts may require repair and are typically not reliable, leading to water leaks. The SLED Modules, with molded in Buttress threads, eliminates both issues of cross threading and insert repair.

Two forklift pockets (slots) are designed into the modules, located at grade level, which can be used to insert forklift blades for moving the filled or unfilled SLED Modules sections as needed. **The molded-in steel cables ARE NOT be to be used for lifting the modules. Only the two forklift pockets (slots) should be used to lift the modules as identified in Figures 4 and 5 (or on pp. 40 and 41).**

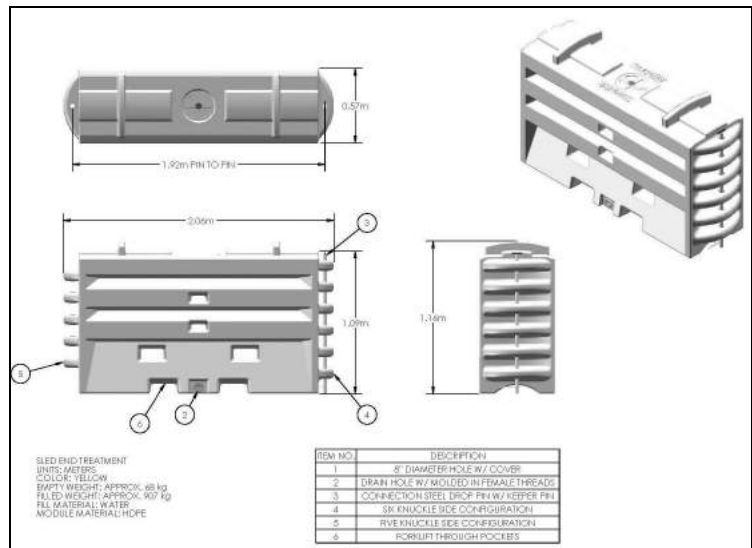


Figure 4: Module details.

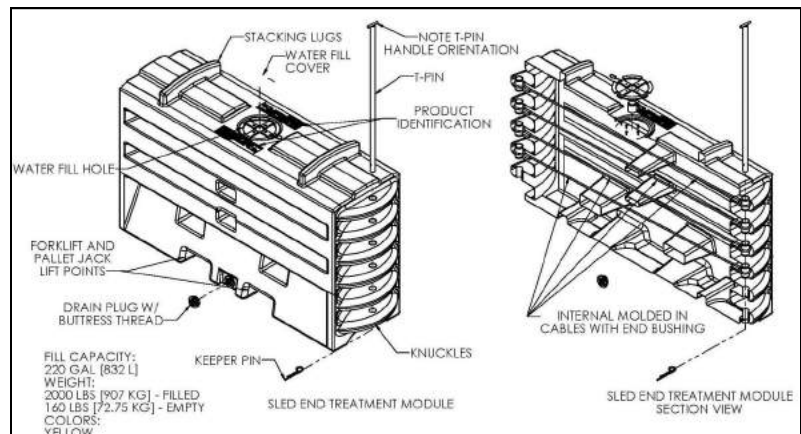


Figure 5: Module details.

Water Level Indicator Fill Cap

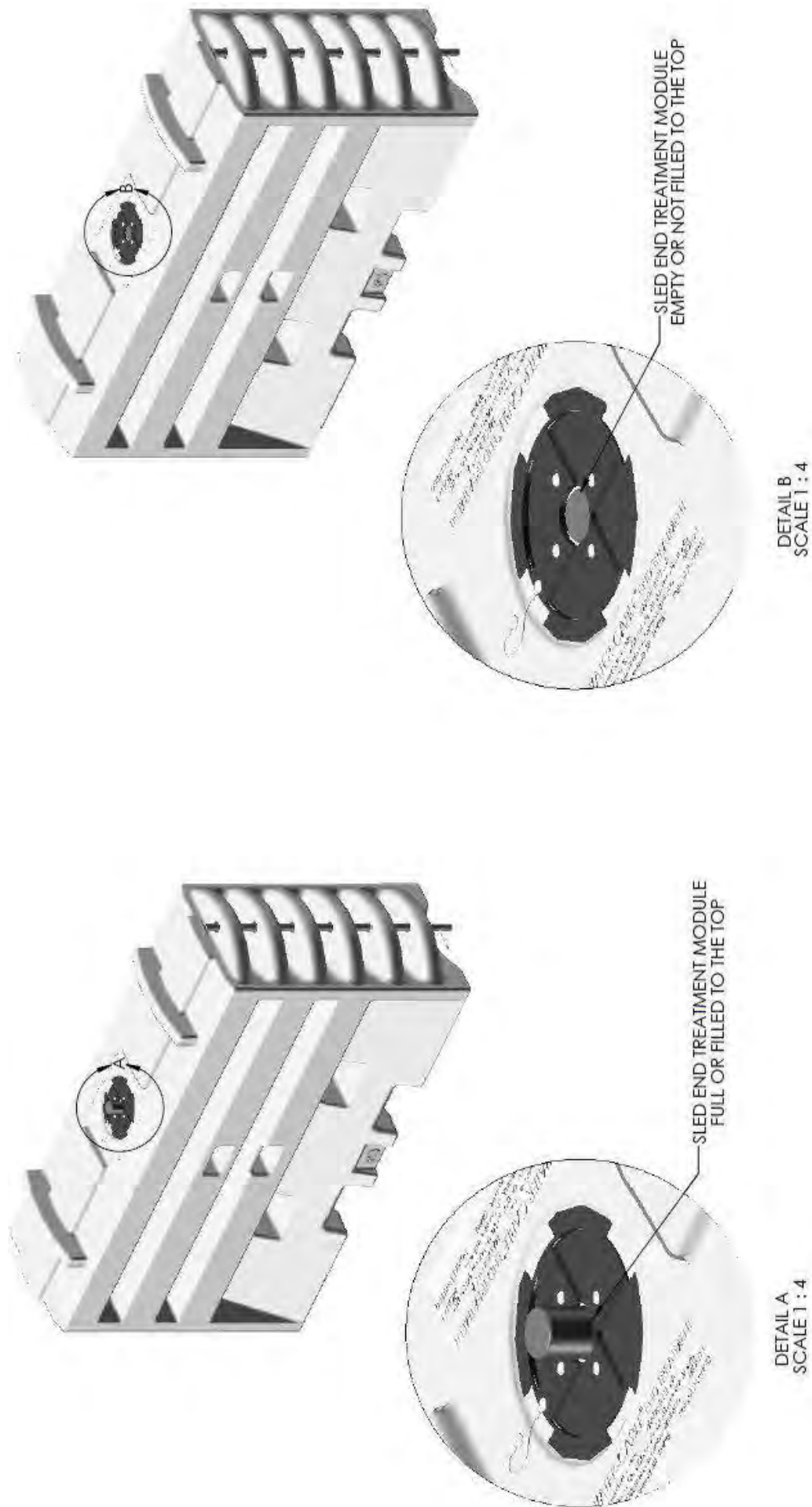


Figure 6: SLED End Treatment Module float cover.

Containment Impact Sled

The Containment Impact Sled (CIS) is attached to the front empty module Figure 7 (or on pg 42). The steel CIS is hot dipped galvanized to minimize the affects of corrosion. Upon impact, the CIS slides rearward collecting the ruptured modules.

Overall Dimensions:

Width: 27 1/4" [689 mm]

Height: 45 7/8" [1166 mm]

Length: 88 7/16" [2247 mm]

Weight:

Weight: 197 lbs [89 kg]

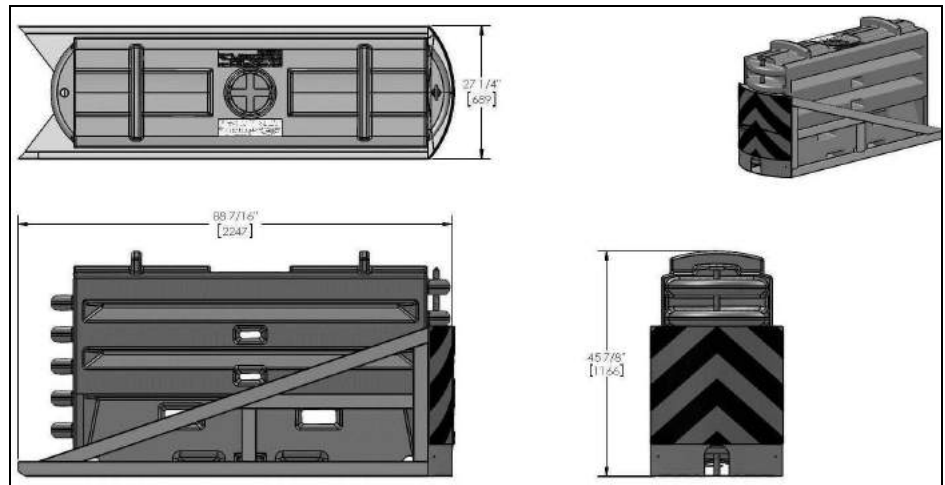


Figure 7: SLED End Treatment CIS Module.

The CIS is tube frame designed with a curved front cap and a flat steel bottom. The CIS is pinned onto empty No-Fill Module with a vertical T-pin that drops through a series of the concentric holes in the

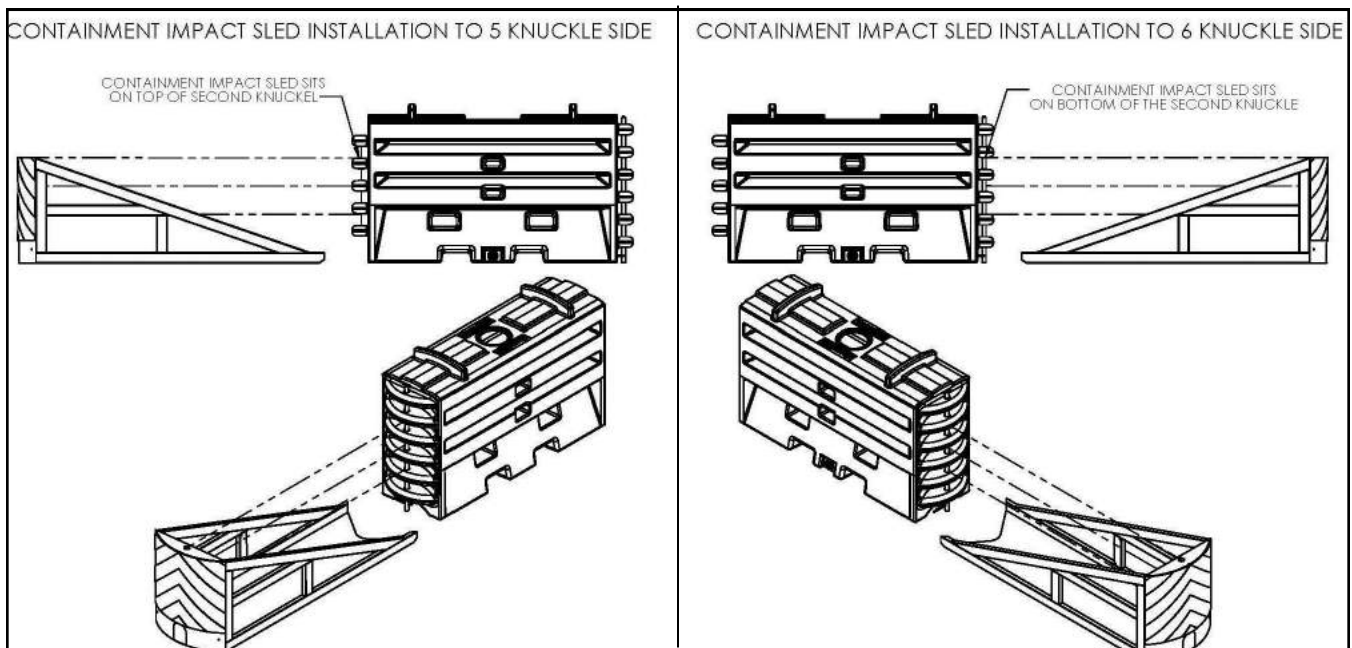


Figure 8: SLED End Treatment Sled installation to both ends of a module.

Transition Attachment For Attaching the SLED To An Array or Barrier

The Transition is made from steel sheet and tubing that is hot dipped galvanized to minimize the affects of corrosion. The Transition attaches to the rear of the SLED system and is fastened to the shielded barrier with a minimum of eight anchor bolts, with nine bolts preferred.

Overall Dimensions:

Width: 22 3/8" [568 mm]

Height: 20 7/8" [530 mm]

Length: 49 5/8" [1260 mm]

The Transition consists of a frame, right and left panels, and connection pins. The frame, Figure 9 and 11 (or on pg. 44) is connected to Module 1. The transition frame is designed to attach to either the five or six knuckle end of the rear module, Figure 10 (or on pg. 45).

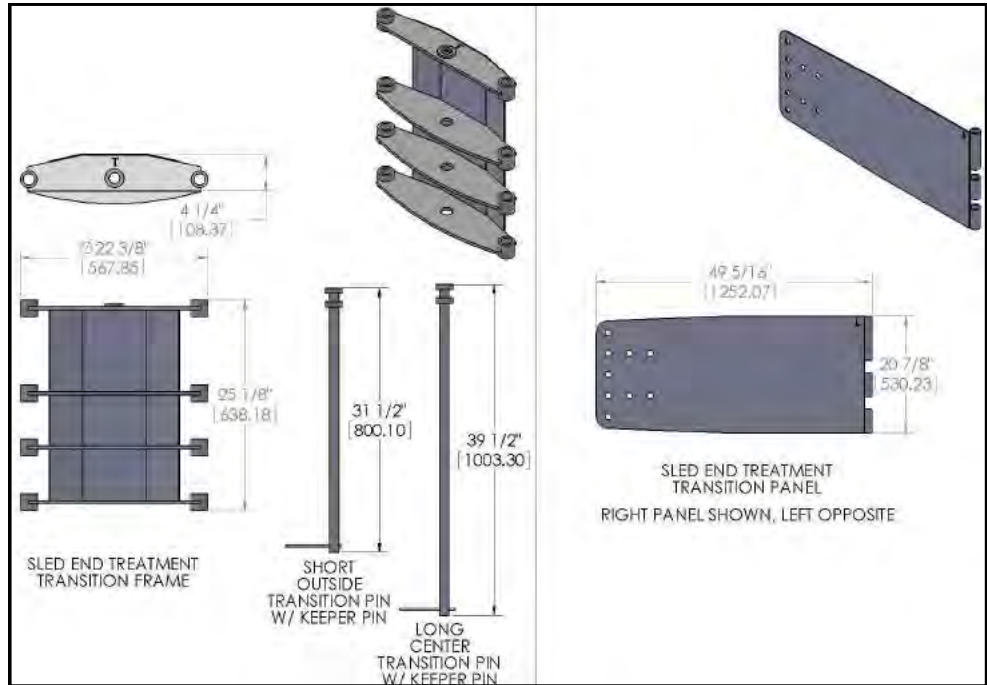


Figure 9: SLED End Treatment Transition.

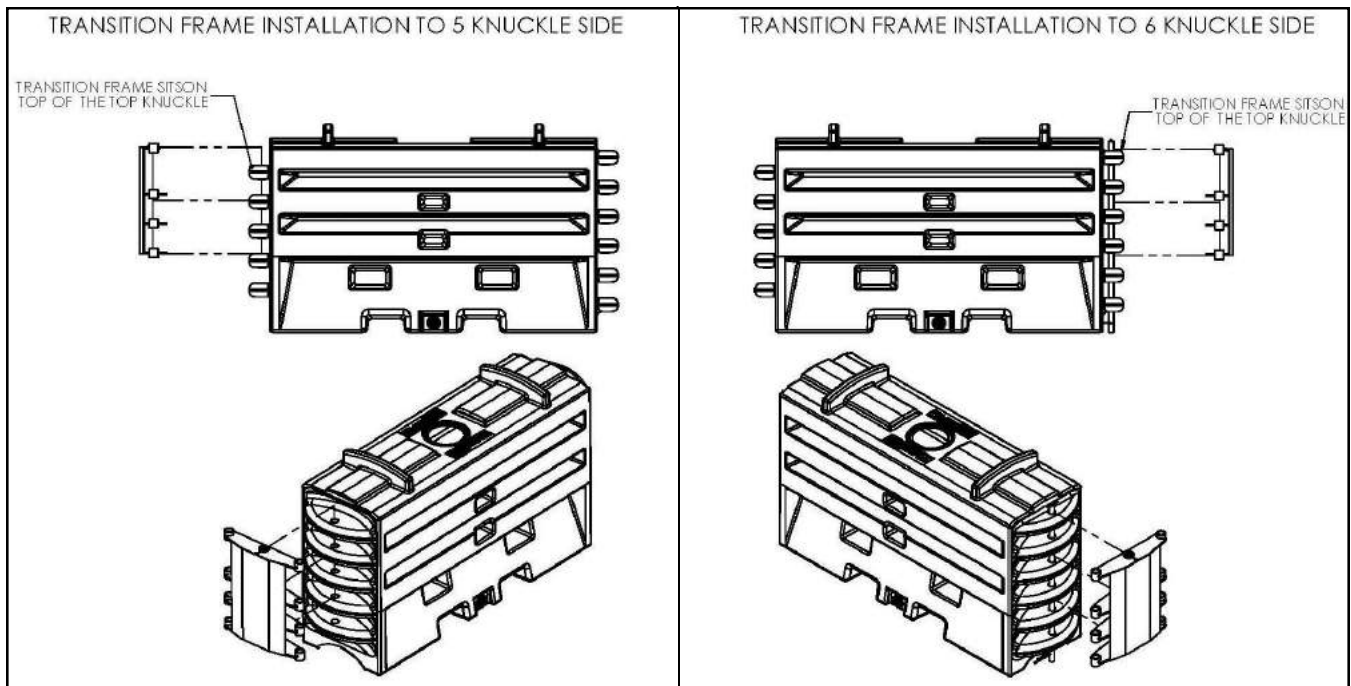


Figure 10: SLED End Treatment Transition Frame installation to both ends of a module.

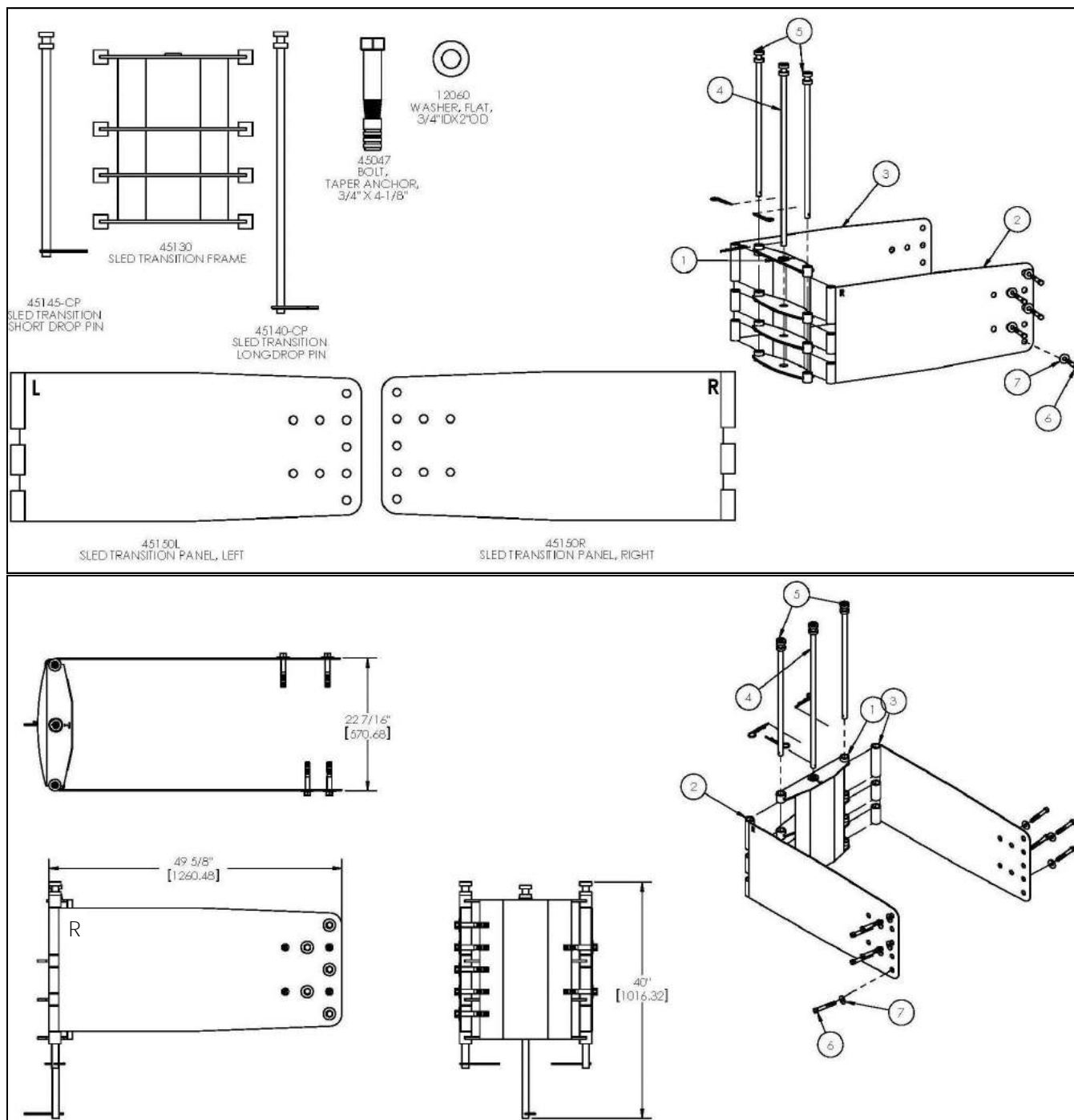


Figure 11: Transition Components

Directional Application Definition

The SLED End Treatment modules are designed for uni- and bi-directional traffic applications where a gating device is acceptable to the road authority*. A general definition of these applications are described below and graphically displayed in Figures 12 and 13(or on pp 47 and 48) .

Uni-Directional Application: Uni-directional refers to the flow of traffic in a single direction as seen in Figure 12. In this type of application opposite direction impacts would not be probable.

Bi-Directional Application: Bi-directional refers to the flow of traffic in both directions typically referred to as counter flow as seen in Figure 13. In this type of application the counter flow of traffic could result in a reverse impact into the SLED End Treatment System.

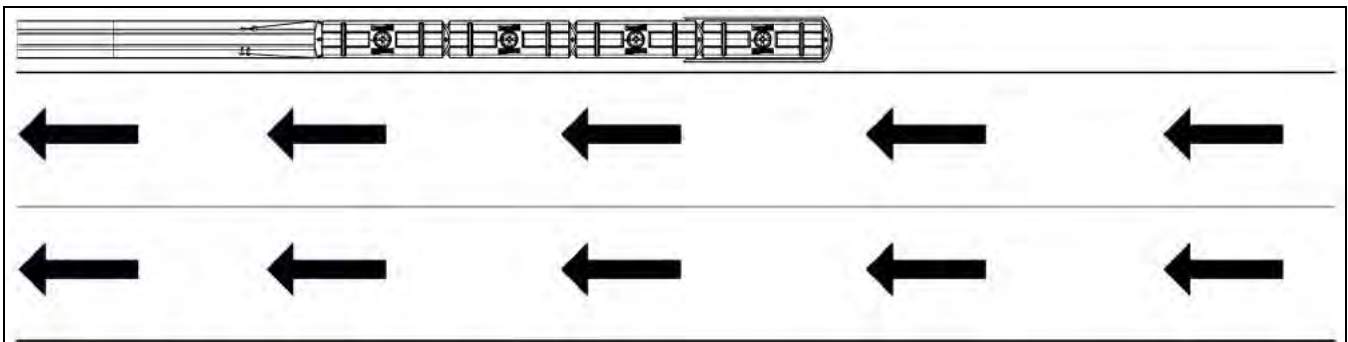


Figure 12: Traffic flow uni-directional application.

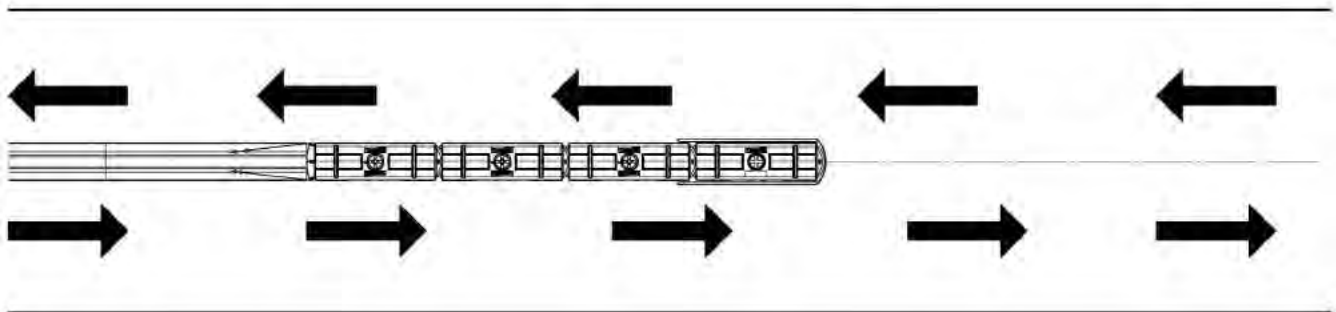
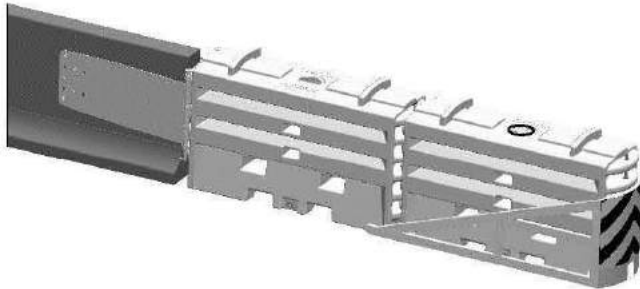
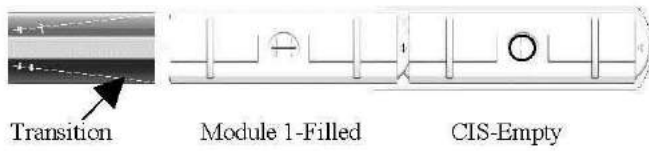


Figure 13: Traffic flow bi-directional application.

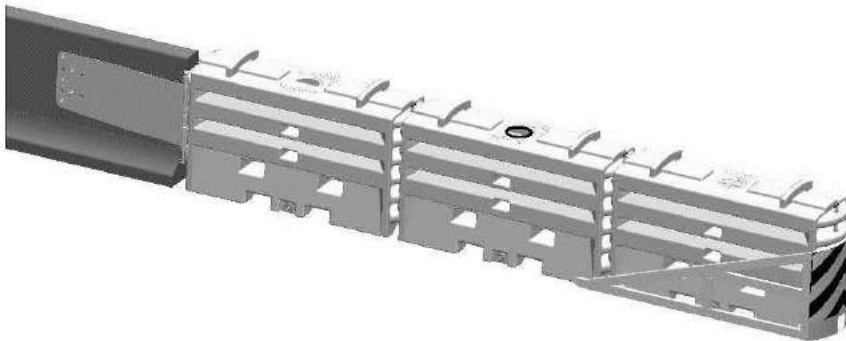
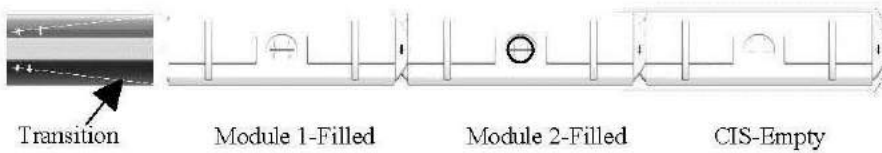
* Reference FHWA HSST/CC-114

Speed Configuration

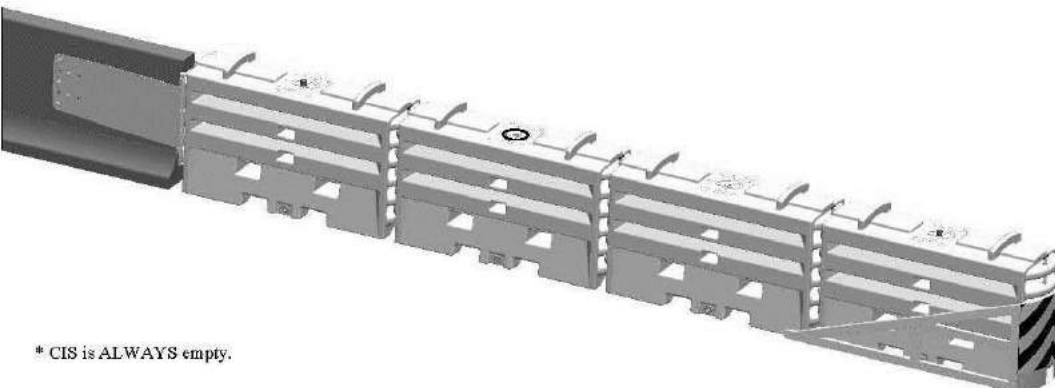
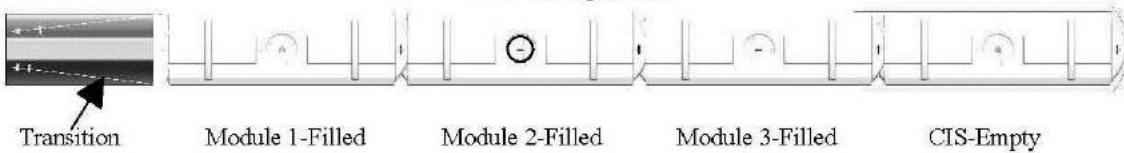
TL-1 Configuration



TL-2 Configuration



TL-3 Configuration



* CIS is ALWAYS empty.

Figure 14: SLED End Treatment Speed Configurations

Recommendations for Stacking

Modules can be stacked **ONLY** when empty and are not designed to be stacked on each other when filled. Stacked empty modules can be no more than three high as seen in Figure 15 (or on pg. 49). Designed into the top surface of each module are stacking lugs which fit into recessed formed sections on the bottom surface of each module as seen in Figure 15. These stacking lugs interlock the modules preventing the wall from shifting during transport or storage. The stacking lugs should be used in conjunction with straps to securely hold the entire stacked pieces together. For additional support, a long T-pin can be inserted into the knuckles to secure the modules as seen in Figure 15 (or on pg. 49).

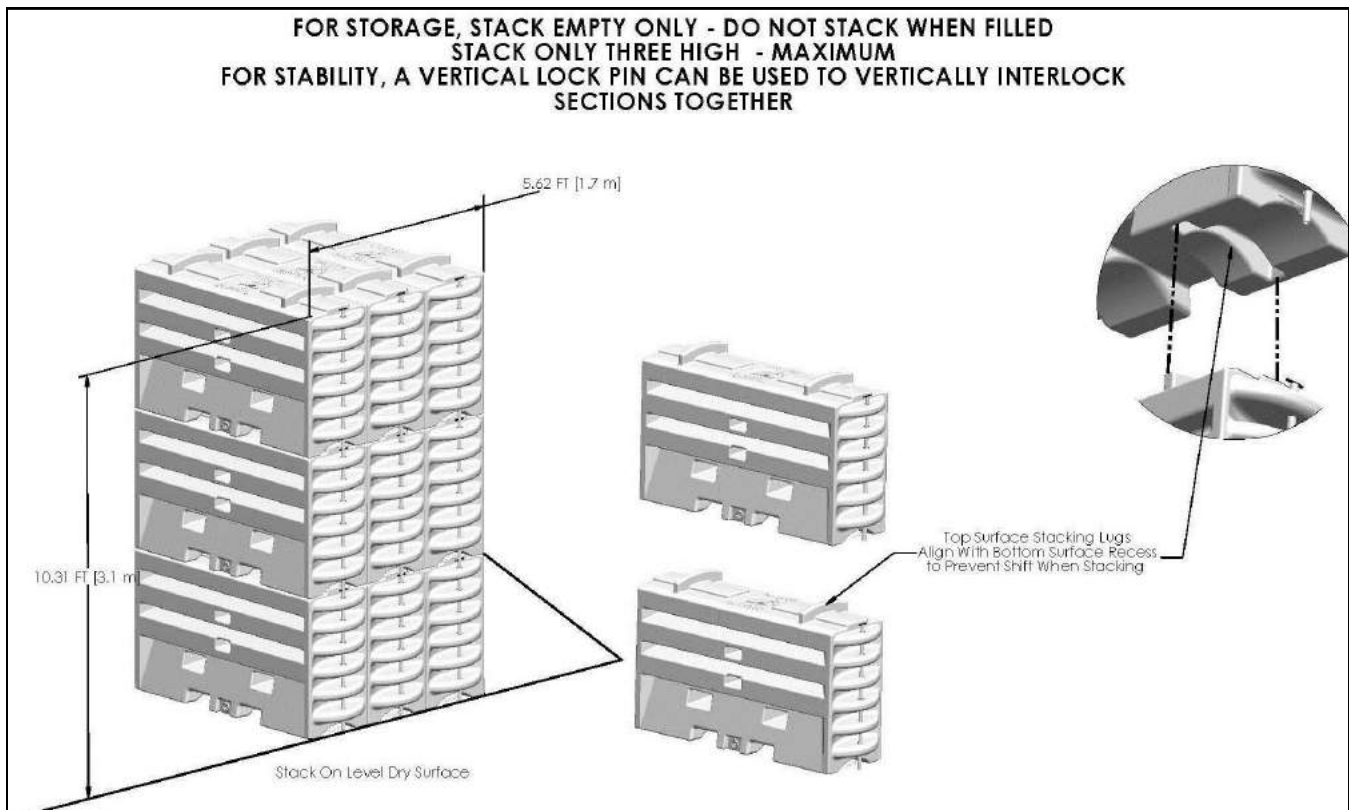


Figure 15: Module Stacking Diagram for Long Term Storage Requirements

SAFETY PRECAUTIONS WHEN HANDLING

THE SLED END TREATMENT MODULES

Do not drive with two (2) or more filled modules on a forklift. If maneuvering filled modules is necessary using a forklift, only move filled modules one (1) at a time. If the modules are empty, a maximum of three (3) stacked modules may be moved using a forklift. **NEVER STACK MODULES WHEN FILLED.** And most importantly, do not stand underneath or in front of the forklift when handling the modules with a forklift as modules may fall, see Figure 16.

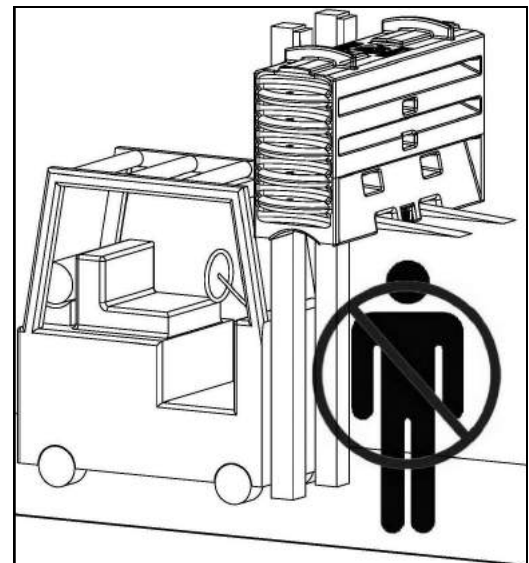


Figure 16: Proper Forklift Procedure

Installing SLED Nose Sheeting

The SLED nose sheeting has been provided in a way to customize field use as seen in Figure 17 (or on pg. 50). On Side A, the diagonal stripes can but used for Left Hand traffic flow or rotated 90° for Right Hand traffic flow. Turn the sheeting over and Side B is used for converging traffic flow. Once the direction is determined, secure the sheeting to the nose with supplied screws.

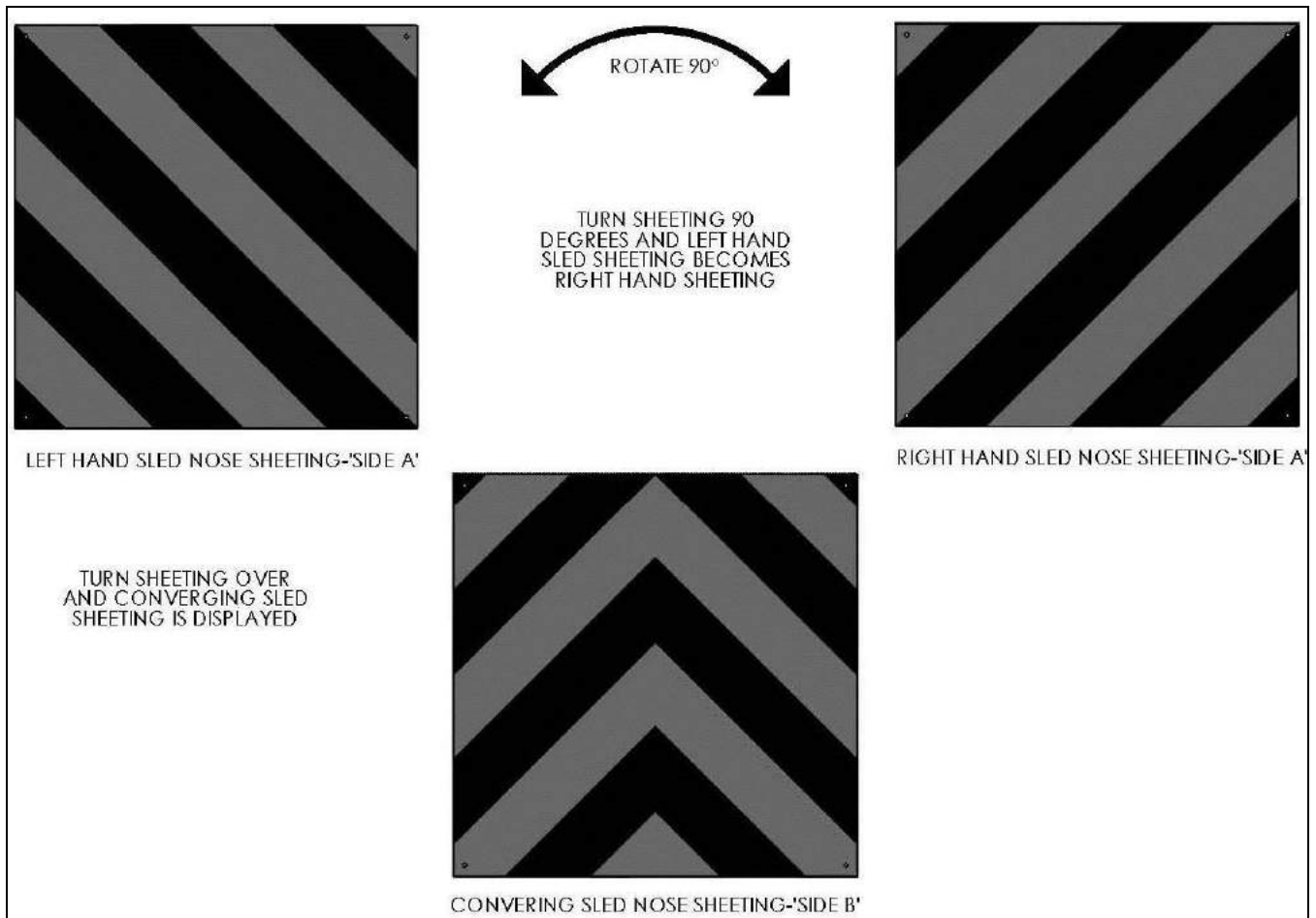


Figure 17: SLED Nose Sheeting Installation

Water Freezing Prevention

In freezing weather conditions, do not allow the water in the SLED modules to freeze to a solid mass of ice. If the temperature at the SLED site is expected to be at or below the freezing point of water 32° F [0°C], it is recommended that an additive be used to prevent the water in the SLED modules from freezing. See Table 1 on pg. 16.

-Common additives used to prevent water freezing currently used in work zone devices under the same category as the SLED Modules.

SALT (Sodium Chloride)

20% mixture by weight

Reduces freezing down to 0° F [-18° C].

Corrosive to inadequately protected steel components (Galvanizing adequately prevents corrosion)

Recommended - premix before filling

Prevent spilling since solution is harmful to vegetation, soils, and wildlife. Draining should be done in an acceptable area.

CALCIUM CHLORIDE

35% mixture by weight

Reduces Freezing down to 20° F [-6.6 °C].

Corrosive to thin zinc plated components

Corrosive to inadequately protected steel components (Galvanizing adequately prevents corrosion)

High tendency to stay on road surface resulting in slick road surface.

High level of heat created when mixing. It is recommended that pre-mixing is done before filling.

Prevent spilling since solution is harmful to vegetation, soils, and wildlife. Draining should be done in an acceptable area.

ETHYLENE/PROPYLENE GLYCOL

50% mixture by volume

Reduces water freezing to 0° F [-18° C].

High tendency to stay on road surface resulting in slick road surface.

Prevent spilling since solution is harmful to vegetation, soils, and wildlife. Draining should be done in an acceptable area.

LIQUID CMA (Calcium Magnesium Acetate)

25% mixture by volume

Reduces water freezing to 0° F [-18° C].

Has a low environmental impact.

LIQUID POTASSIUM ACETATE

60% mixture by volume

Reduces water freezing to 20° F [-6.6° C]

Low corrosive characteristics and has a low environmental impact.

Table 1- Recommended water freezing prevention chart solution comparison.

Additive	Environmental Impact	Cost Rating	Protection Temp	Mix Solution Ratio
Salt (Sodium Chloride)	Harmful	Low	0 °F [-18 ° C]	20% by weight
Calcium Chloride	Harmful	Medium	20 °F [-6.6 ° C]	35% by weight
Ethylene/Propylene Glycol	Dangerous	High	0 °F [-18 ° C]	50% by volume
Liquid CMA	Non-Toxic	High	0 °F [-18 ° C]	25% by volume
Liquid Potassium Acetate	Non-Toxic	High	20 °F [-6.6 ° C]	60% by volume

Tools and Equipment for Assembly and Installation

This list of tools is a recommendation. The actual tools required will depend on site conditions for the assembly and installation. Personal protective equipment should always be used during assembly and installation. Safety eyewear, steel toe boots, hard hat and gloves are recommended as protection devices for the installer's safety.

Documents:

Before the assembly and installation of this product, it is recommended that the complete manufactures manual and drawing package be reviewed for clarity of the installation.

Tools:

Concrete Hole Drilling Tools: (Suggestions Would Be)

- Two Fluted Concrete Drill Bit 3/4" Diameter (w/ 8" minimum drill length)
- Rebar Cutting Drill Bit 3/4" Diameter (w/ 8" minimum drill length)
- Rebar Eater or Cutter
- Rotational Hammer Drill

Drill bits should be capable of drilling to depths of a minimum of 6 inches into the concrete barrier and be of good quality to drill through 4000 psi concrete.

Additional Tools:

In addition to hole drilling tools, the following is suggested:

- Electrical Generator (5 kW) and Air Compressor (100 psi)
- Torque Wrench 200 ft-lbs min
- Impact Wrench 1/2" Drive
- Sockets 1/2" Drive 3/4"-2" Nut and Bolt Size Shallow and Deep Sockets
- Ratchet and Extensions 1/2" Drive
- Adjustable Wrench 12"
- Pry/Breaker Bars
- Sledge and Ball Peen Hammers
- Chalk Line
- Concrete Marking Pencil
- Tape Measure

Optional Tools:

Tools that may also be needed: Grinder, Hacksaw, or Torch

SLED End Treatment System Installation

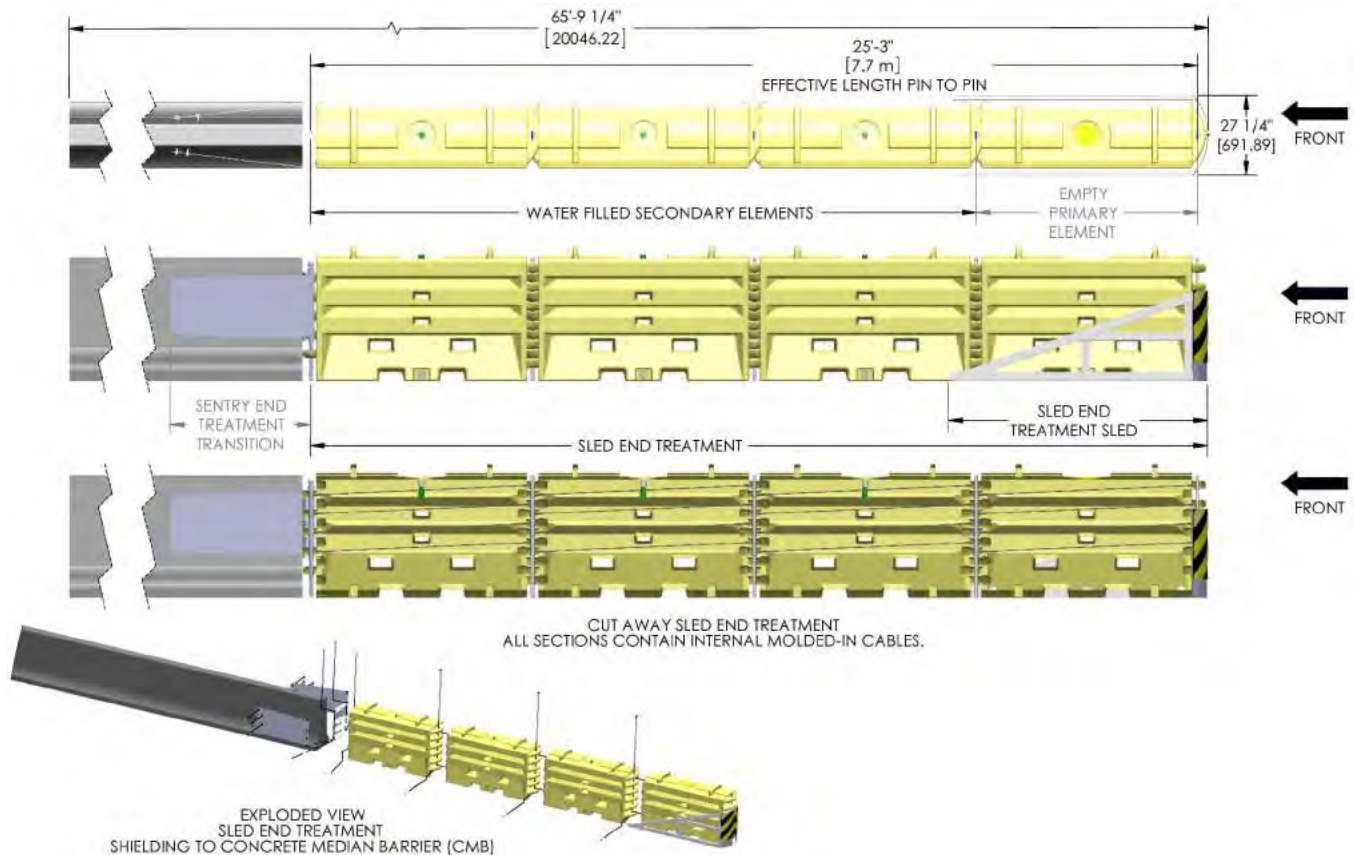


Figure 18: General specifications of installed TL-3 SLED End Treatment system with Transition (or on pg. 51).

Installation procedure to begin on next page

IMPORTANT:

Read and understand ALL installation instructions before attempting to install the SLED End Treatment System.

TERMS:

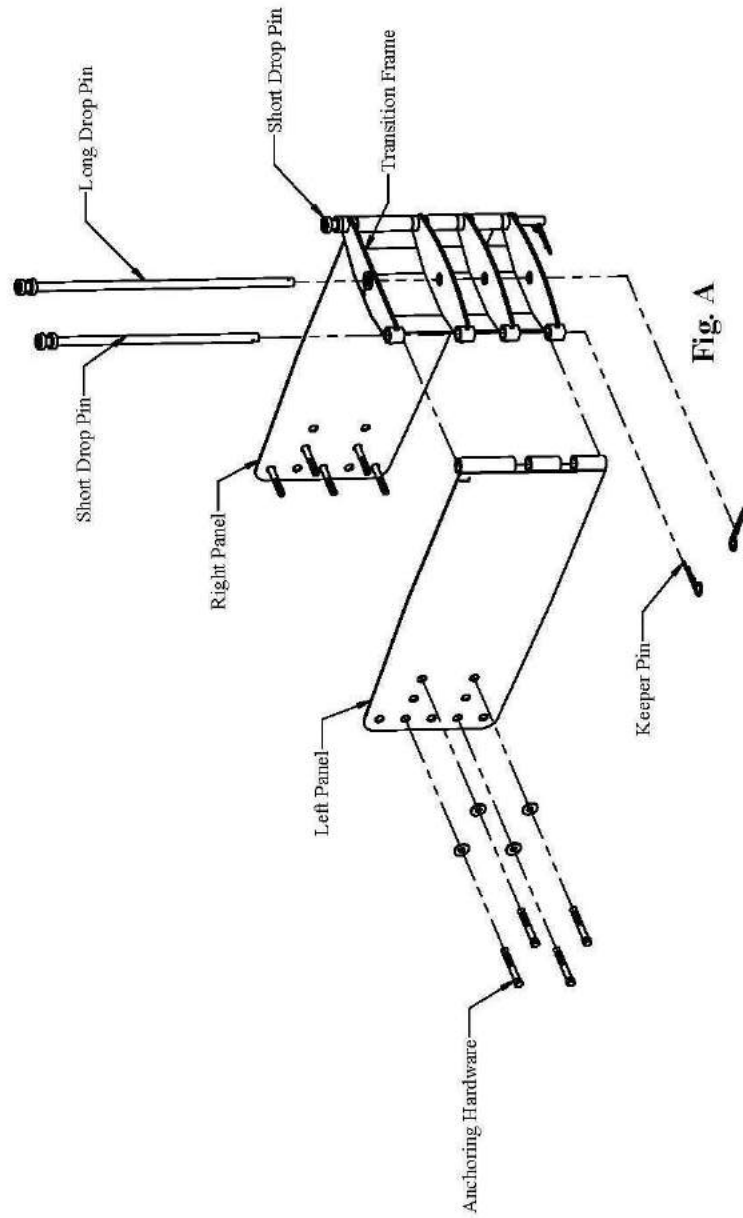
Orientation:

Front or Frontmost is towards the nose of the system - towards traffic.

Rear or Rearmost is towards the back of the system - towards the barrier wall.

SLED Transition System Overview:

The SLED Transition consists of several components including the Transition Frame, Left Panel, Right Panel, one Long Drop Pin (located in the middle), two (2) Short Drop Pins (one on left side, one on right side), three (3) Keeper Pins (R-Clips) and the anchoring hardware. (Fig. A)



Installing the Transition Frame and locating the Rearmost Yellow Water Fill Module

Step 1:

Install the Transition Frame to the rearmost Yellow Water Fill Module so that the top rib of the Transition Frame sits on the highest knuckle of the Module. Align center holes of the Transition Frame and the knuckles of the Module. The top of the Transition Frame is stamped with a "T". (Fig. B)

Note: For attaching to shorter CMB, use the second (or third) knuckle (from top) of the Module, depending if you are using the five (5) or six (6) knuckle end of the Module. (**Important:** Always start with the top knuckle and adjust downward, if necessary.) (Fig. C)

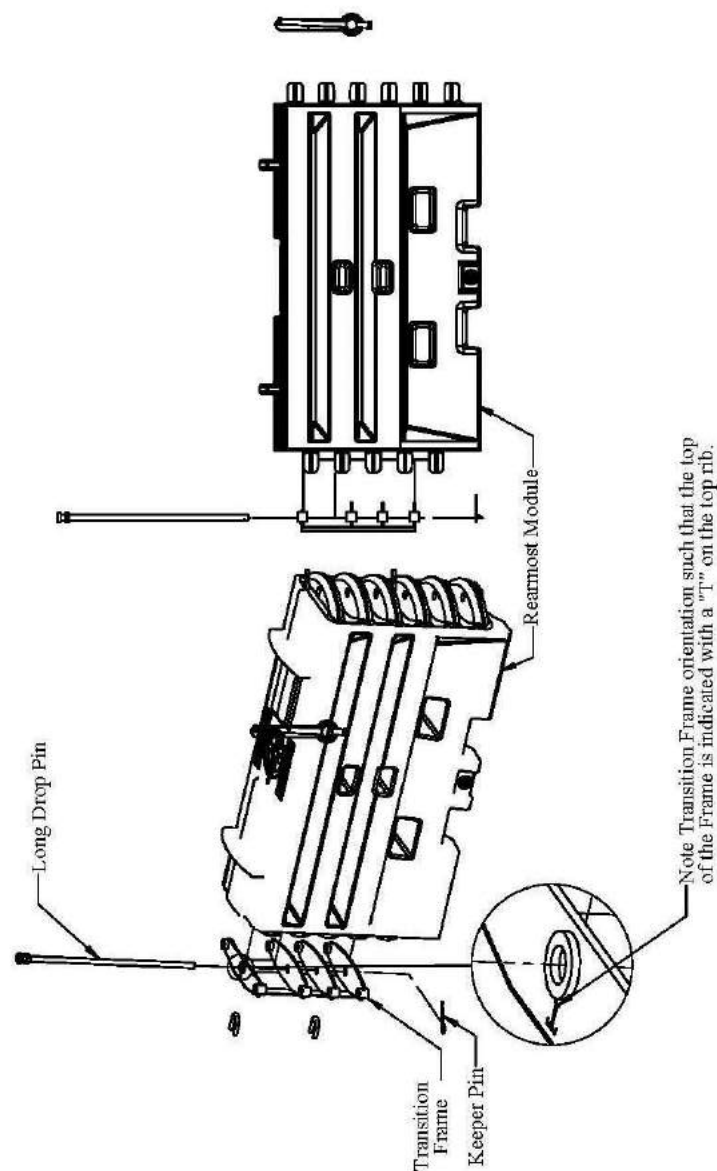


Fig. B

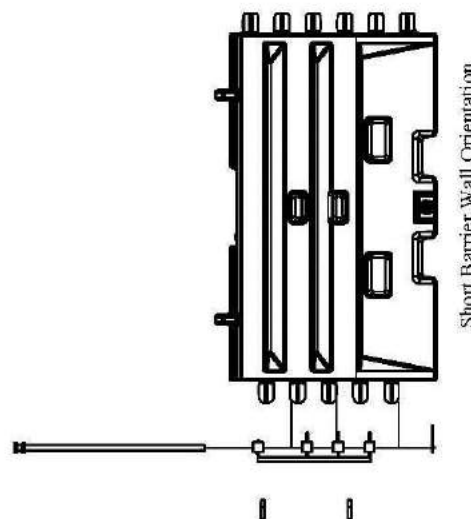


Fig. C

Installing the Transition Frame and locating the Rearmost Yellow Water Fill Module (Continued)
Step 2:

Insert the Long Drop Pin through the center holes of the Transition Frame and the Module knuckles until the Long Drop Pin is fully bottomed out.

Step 3:

Push the Module inline towards the barrier wall leaving approximately four (4) inches of space between the Module knuckles and the barrier. (Fig. D)

Step 4:

Secure the Long Drop Pin by inserting the Keeper Pin (R-Clip) through the small hole near the bottom of the Long Drop Pin. (Fig. E)

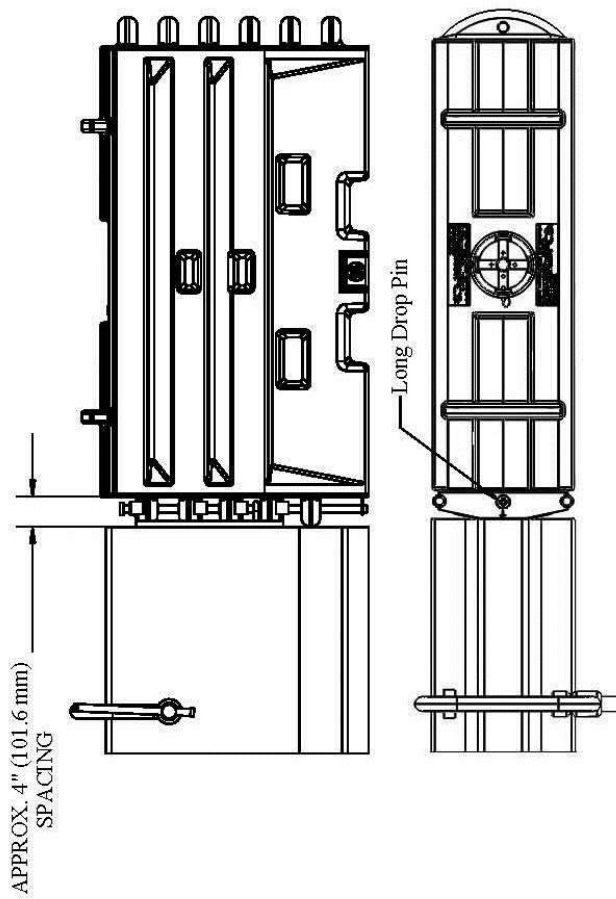


Fig. D

Fig. E

Installing the Short Drop Pins, Transition Panels, and anchoring to the barrier wall

Step 5:

Align the Transition Panel hinge(s) with the Transition Frame hinge(s). Each Transition Panel is marked "L" and "R" on the outside of the panel for left and right hand panels. (Fig. F)

Step 6:

Install the two (2) Short Drop Pins, one on the left and one on the right, from the top until the Pins have fully bottomed out. (Fig. G)
Secure the Short Drop Pins by inserting the Keeper Pins (R-Clips) through the small through hole near the bottom of each Short Drop Pin. (Fig. E) The hinges should now freely rotate about the hinge axis.

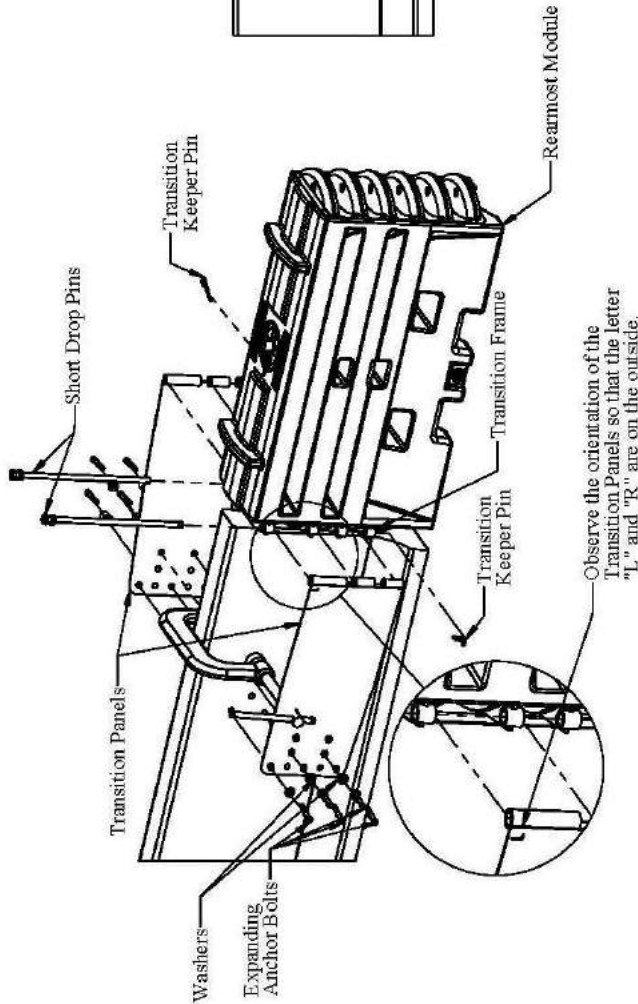


Fig. F

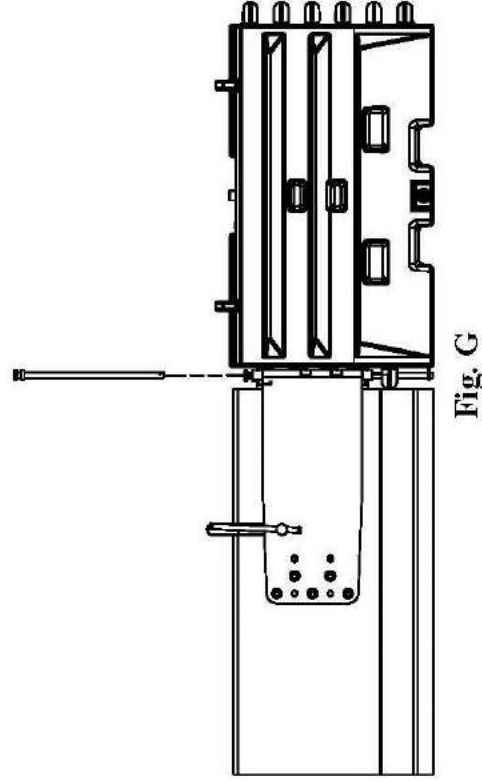


Fig. G

Installing the Short Drop Pins, Transition Panels, and anchoring to the barrier wall (Continued)

Step 7A:

Now that the Transition Panels have been installed and are free to hinge about the Short Drop Pins, rotate the Transition Panels to the barrier wall until contact is made. Depending on the profile of the barrier wall, observe that the Transition Panels may not be completely flush or parallel to the surface of the barrier wall. (Fig. H1)

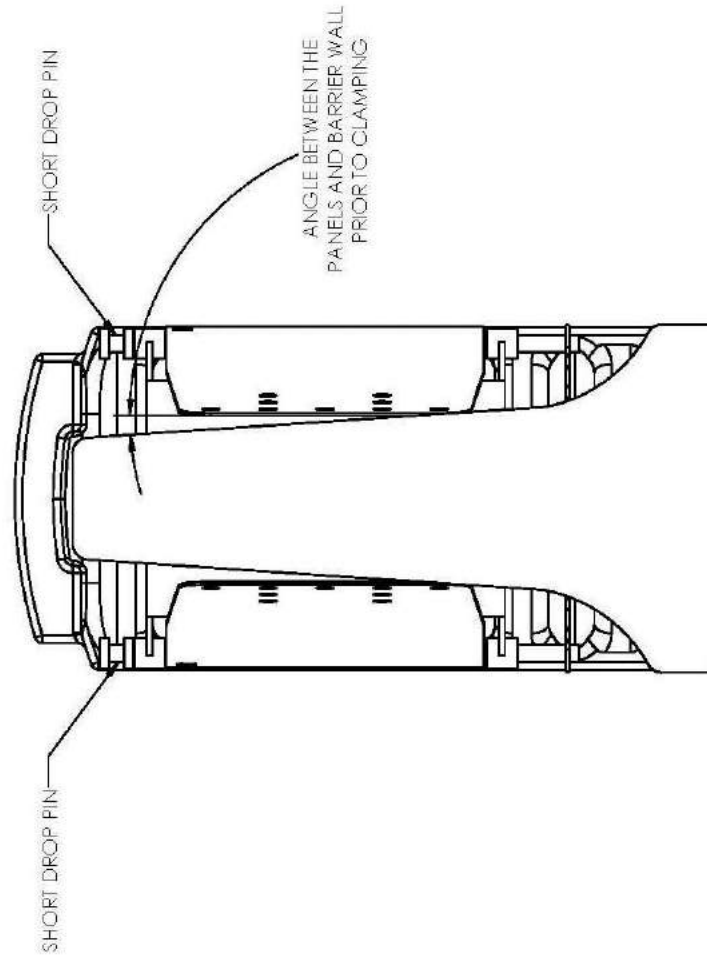


Fig. H1

Installing the Short Drop Pins, Transition Panels, and anchoring to the barrier wall (Continued)

Step 7B:

To locate the anchoring holes for drilling, use a clamp to conform the Transition Panels flush to the barrier wall. Position the clamp as shown. (Fig. H2)

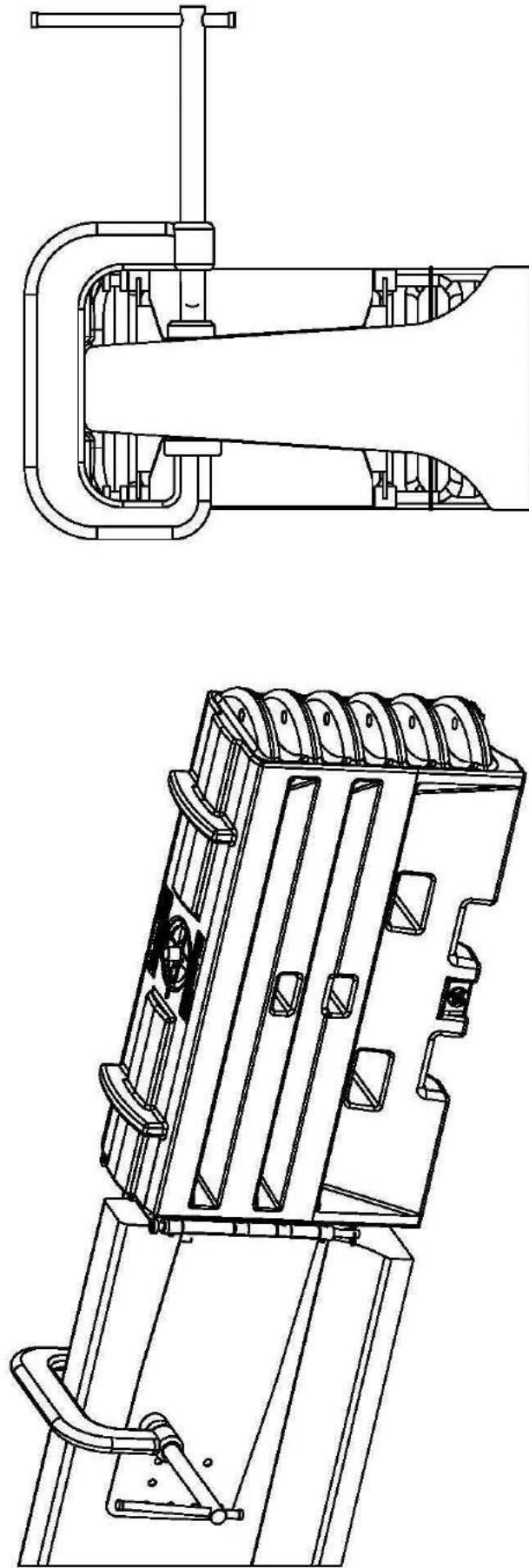


Fig. H2

Installing the Short Drop Pins, Transition Panels, and anchoring to the barrier wall (Continued)

Step 7C:

Locate the anchoring holes that are to be drilled into the barrier wall. A minimum of eight (8) anchor bolts are required but nine (9) is recommended. To prevent bolts from colliding in the barrier wall, five (5) bolts are used on one side and four (4) on the other. Once the holes are located, use a rotary hammer drill with the appropriate drill bit (typically 3/4" diameter rebar cutting bit) to drill into the barrier wall the total length of the anchor bolt. Clean the hole of debris. (Fig. H3)

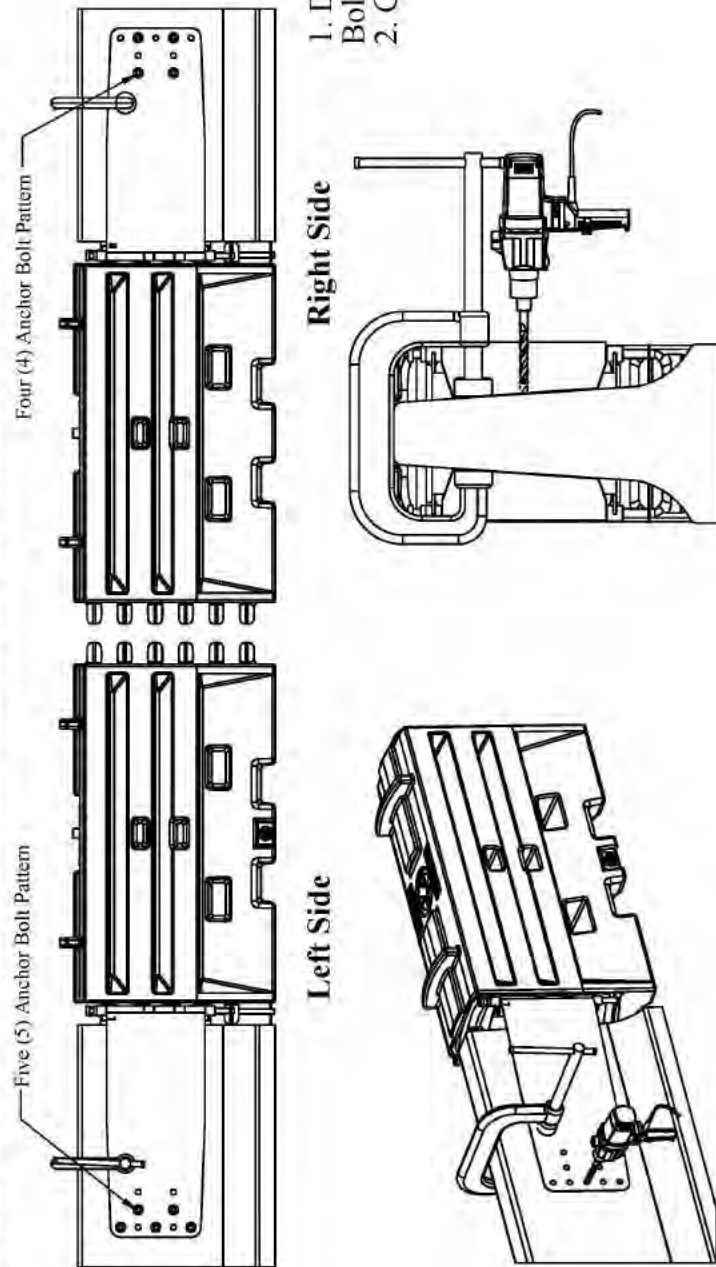


Fig. H3

Installing the Short Drop Pins, Transition Panels, and anchoring to the barrier wall (Continued)

Step 7D:

Once all of the anchor holes have been drilled and cleaned out, place an expanding anchor bolt in each hole and engage the expanding nut on the bolt so that the nut is snug with the inside of the hole. Use a sledgehammer to drive in the anchor bolts into the barrier wall. (Fig. H4)

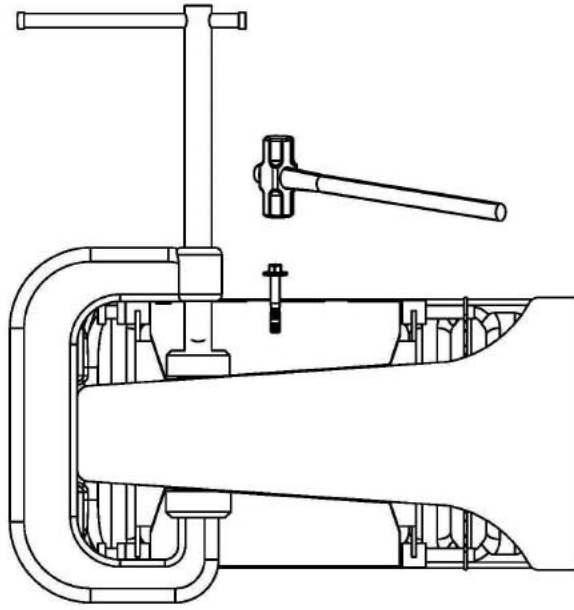
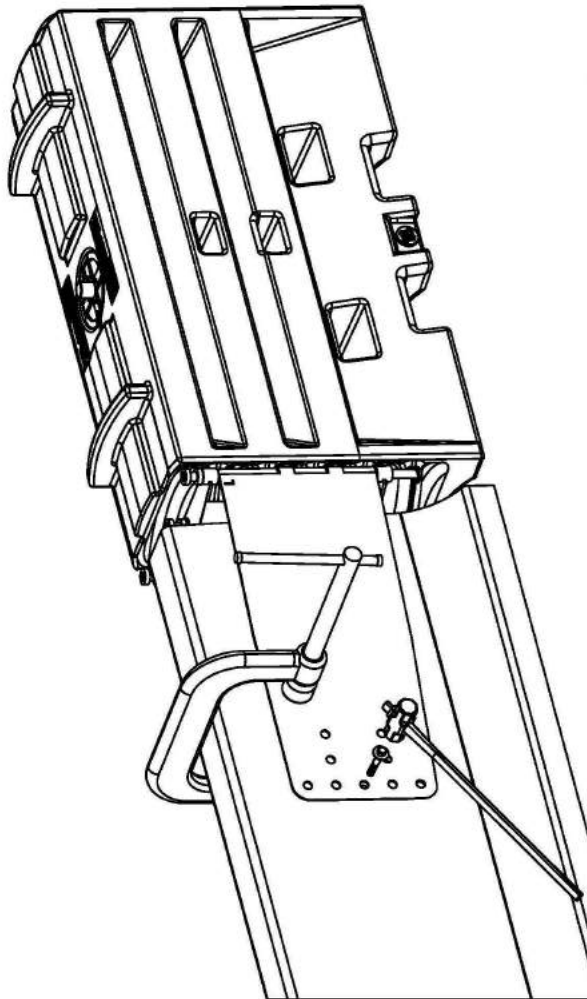
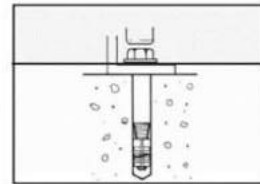


Fig. H4

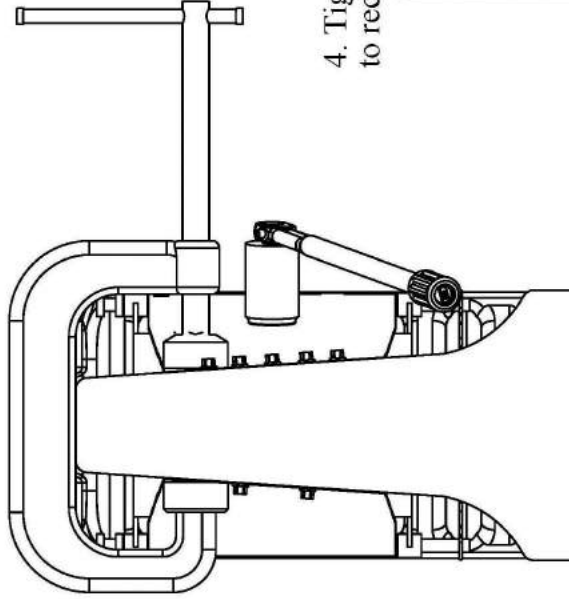
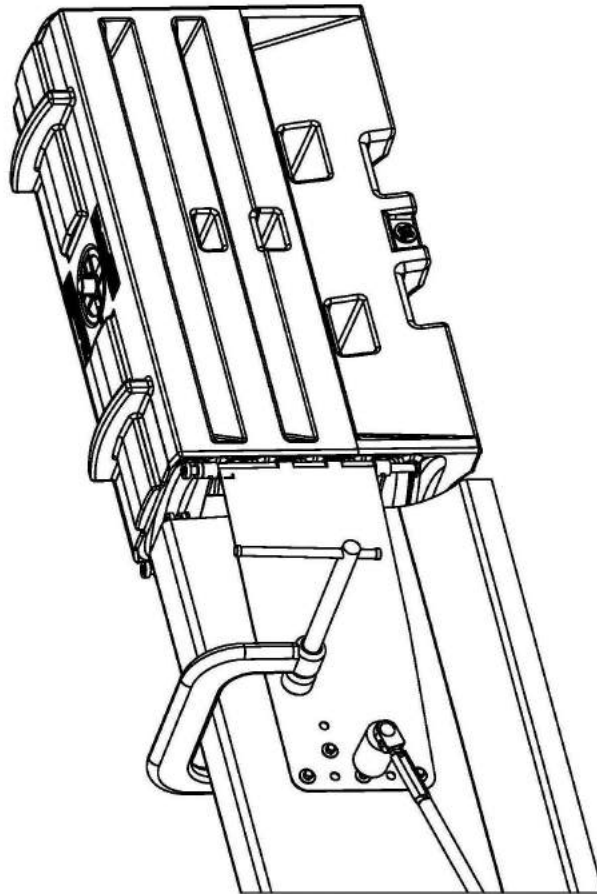
3. Drive Taper-Bolt into place leaving recommended head clearance. If hole is oversized, simply remove and pre-expand the expander nut to fit hole.



Installing the Short Drop Pins, Transition Panels, and anchoring to the barrier wall (Continued)

Step 7E:

Then use a torque wrench and torque the expanding anchor bolts to the barrier wall with the wrench set to the recommended 100 ft-lbs. If the bolts spin or rotate while torquing, the bolt needs to either be removed to engage more threads on the expanding nut and then reinserted in the barrier wall or the anchor bolt requires additional hammering until the expanding nut engages the wall of the drilled hole. (Fig. H5)



4. Tighten Taper-Bolt to recommended torque.

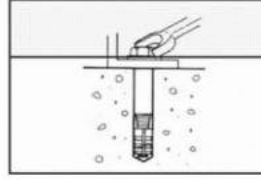


Fig. H5

Step 7F:

When all of the bolts have been torqued down to the barrier wall, remove the clamp from the barrier wall. The Transition Panels are now anchored to the barrier wall.

**TO COMPLETE TL-1 INSTALLATION, PROCEED TO STEP 10
FOR TL-2 INSTALLATION, PROCEED TO STEP 8**

Installing Additional Yellow Water Filled Modules

Step 8:

Install the next Yellow Water Filled Module by pushing this Module into the already installed rearmost Yellow Water Filled Module, such that the knuckles of each Module are positively interlocked and the holes are aligned. Be sure to mate up the five (5) knuckle Module end with a six (6) knuckle Module end. Insert the T-Pin from the top until the T-Pin contacts the ground. Secure the connection between Modules by inserting the Keeper Pin (R-Clip) through the small through hole near the bottom of the T-Pin. (Fig. 1)

TO COMPLETE TL-2 INSTALLATION, PROCEED TO STEP 10 FOR TL-3 INSTALLATION, PROCEED TO STEP 9

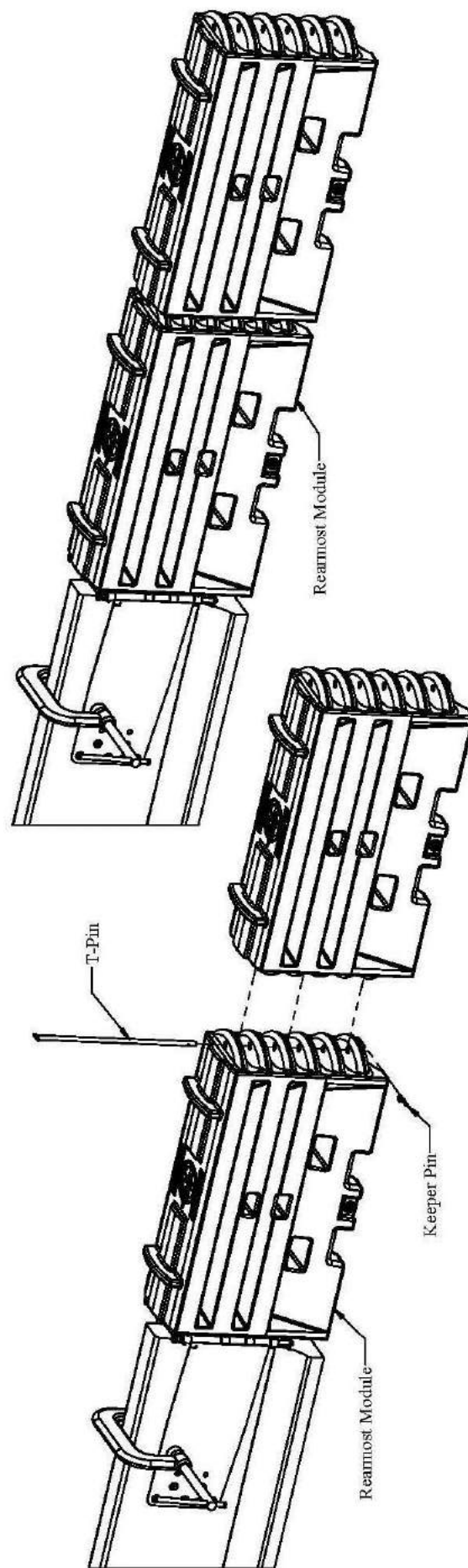


Fig. 1

Installing Additional Yellow Water Filled Modules (Continued)

Step 9:

Install the last Yellow Water Filled Module by pushing this Module into the already installed front most Yellow Water Filled Module, such that the knuckles of each Module are positively interlocked and the holes are aligned. Be sure to mate up the five (5) knuckle Module end with a six (6) knuckle Module end. Insert the T-Pin from the top until the T-Pin contacts the ground. Secure the connection between Modules by inserting the Keeper Pin (R-Clip) through the small hole near the bottom of the T-Pin. (Fig. J)

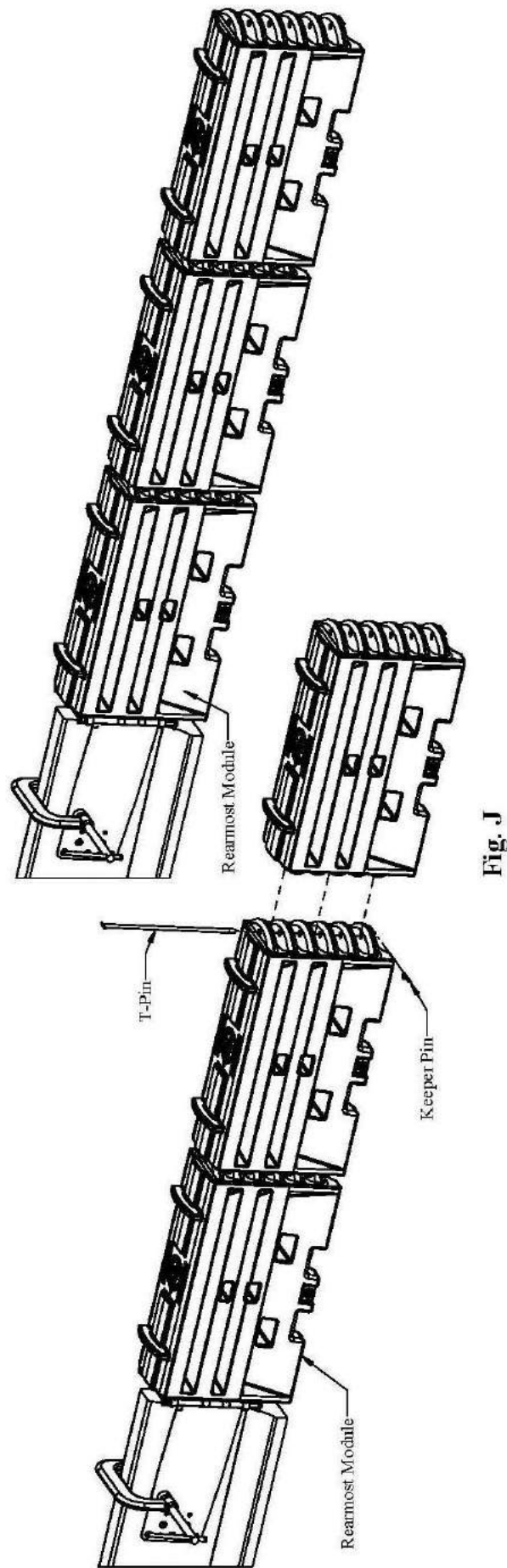
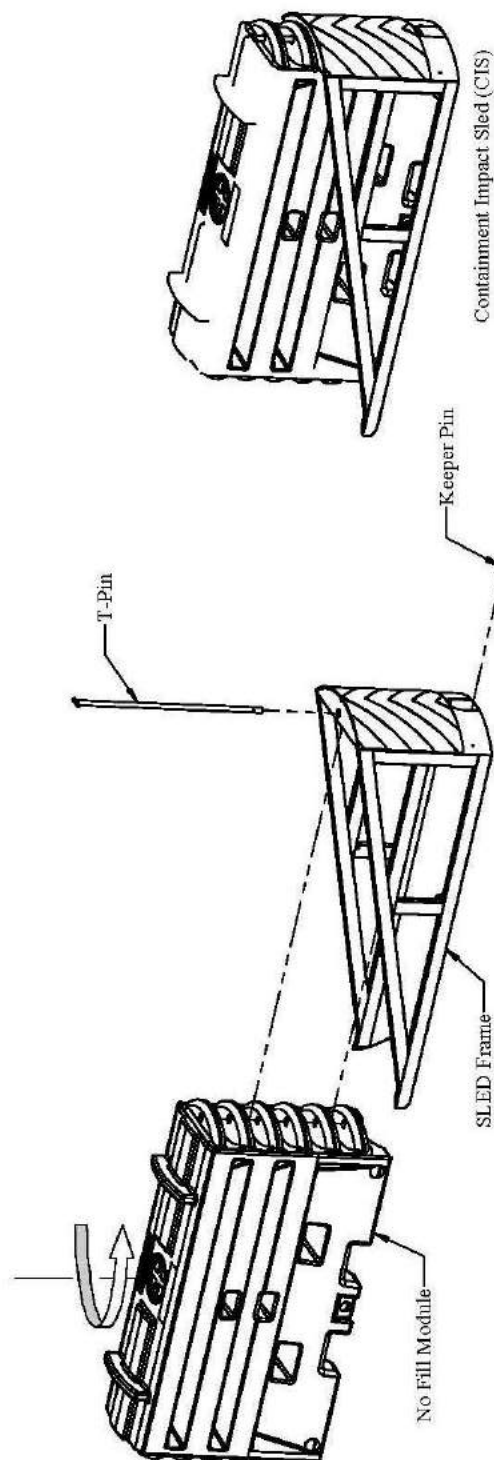


Fig. J

Installing the Containment Impact Sled (CIS)

Step 10:

The Containment Impact Sled (CIS) consists of several components including the SLED Frame, a Yellow No Fill Module, T-Pin and Keeper Pin. These items are pre-assembled and delivered as one unit. (Fig. K)



Step 10: (Continued)

Push the pre-assembled CIS up to the front most Yellow Water Filled Module. Determine that the Module knuckles will mate up (five (5) knuckle Module end to a six (6) knuckle Module end). If Module knuckles do not mate up, you will need to rotate the Yellow No Fill Module within the CIS. (Fig. L)

To rotate the CIS Yellow No Fill Module:

- Remove the SLED Frame's nose Keeper Pin (R-Clip); remove the T-Pin from the Yellow No Fill Module and the nose of the SLED Frame
- Remove and rotate the Yellow No Fill Module 180 degrees; re-install the Yellow No Fill Module into the SLED Frame
- Align the Yellow No Fill Module knuckle holes with the SLED Frame nose holes; re-insert the T-Pin and secure with the Keeper Pin (R-Clip).

Step 11:

Push the pre-assembled CIS into the front most Yellow Water Filled Module so that the knuckles of each are positively interlocked and holes are aligned. Be sure to mate up a five (5) knuckle Module end with a six (6) knuckle Module end. *Note:* The SLED Frame's bottom plate will slide under the front most Yellow Water Filled Module by approximately four (4) inches with the tip of the SLED Frame flanking each side of the front most Yellow Water Filled Module. Insert the T-Pin from the top until the T-Pin contacts the ground. Secure the connection between Modules by inserting the Keeper Pin (R-Clip) through the small hole near the bottom of the T-Pin. (Fig. L)

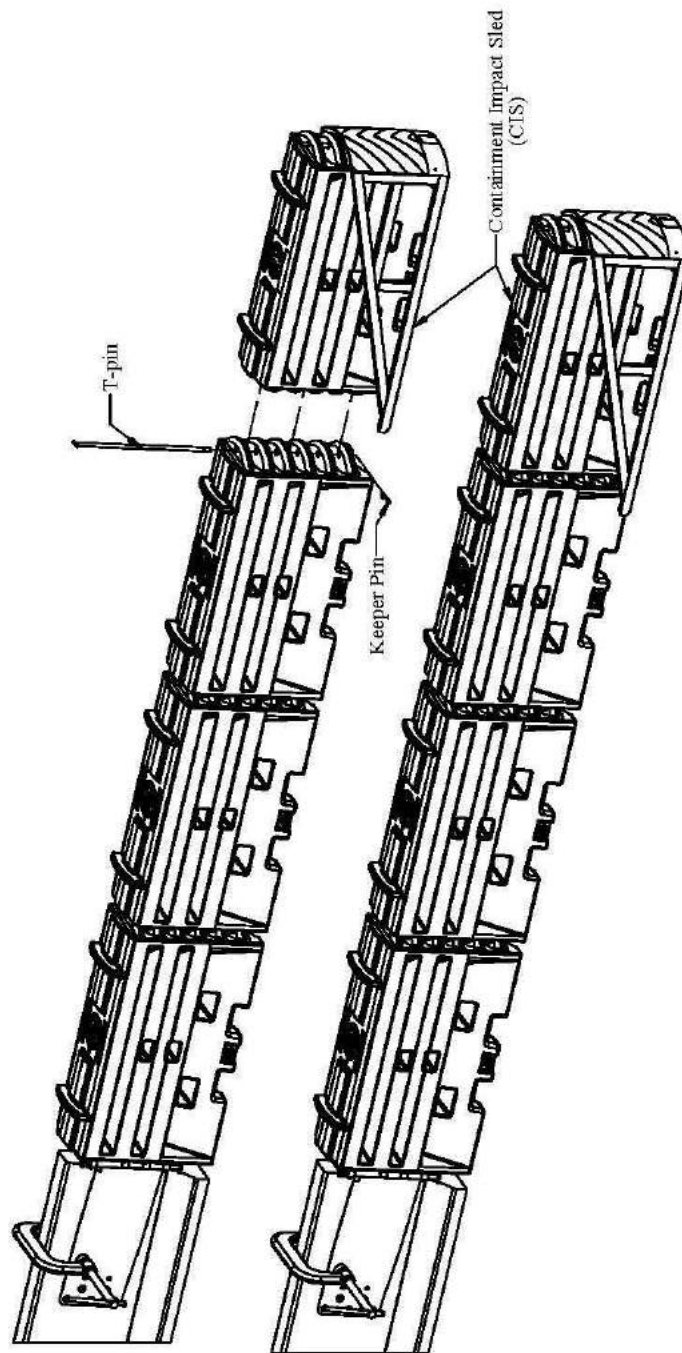


Fig. L

Step 12:

Before filling with water, double check all connections and the alignment of the Transition, the Water Filled Module(s) and the Containment Impact Sled (CIS) so that all are oriented correctly to the RE's requirements.

Filling the SLED End Treatment with Water

Step 13:

Make sure that the Buttress Thread Drain Plug is installed and secure in each Yellow Water Fill Module to be used. Remove the "Drive By" Float Fill Cap and fill the Yellow Water Fill Module(s) only with water or suitable non-freezing solution as described on page 16 of the Sled Installation, Maintenance, And Repair Manual. Replace the "Drive By" Float Fill Cap. The module is full when the green float of the "Drive By" Float Fill Cap is at the maximum height and fully extended. (Fig. M) (pg. 52)

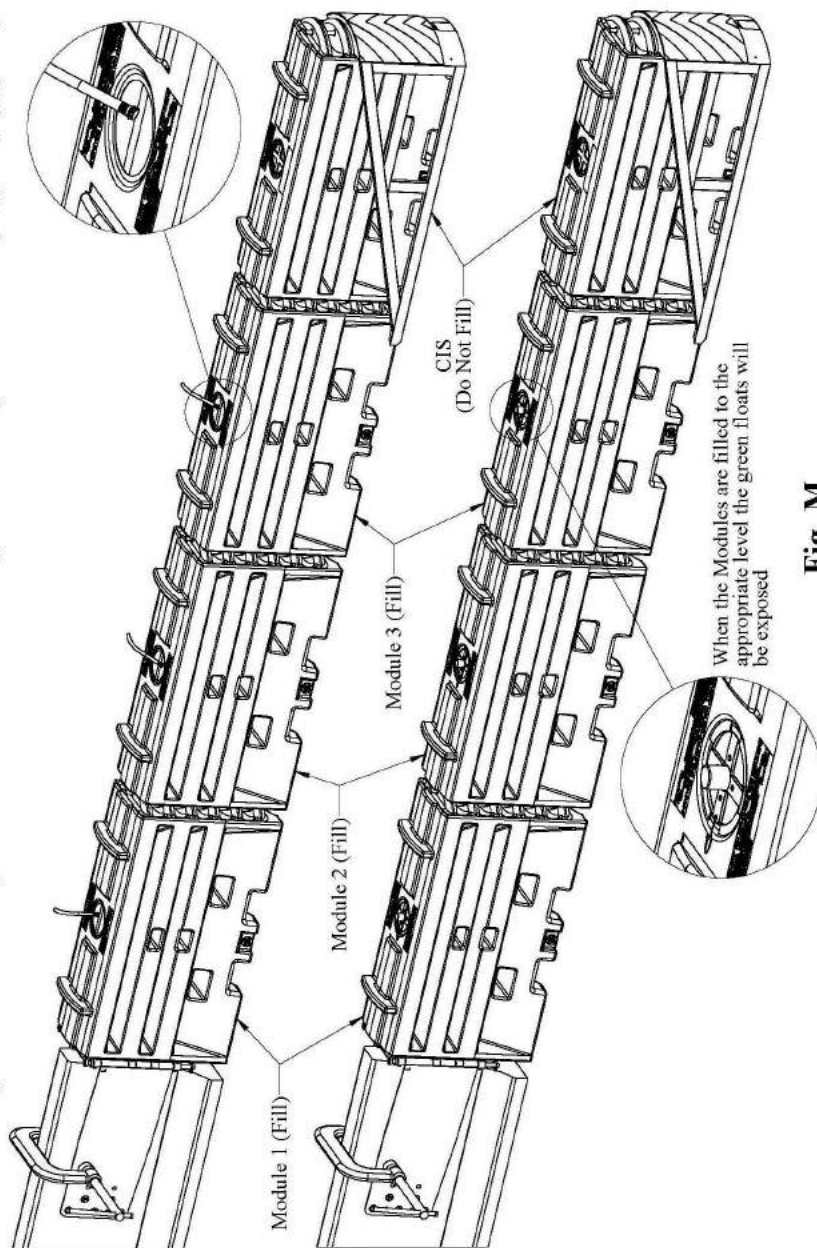


Fig. M

IMPORTANT:

The No Fill Module in the Containment Impact Sled (CIS) shall NOT be filled with water and is to remain empty ALWAYS.

The No Fill Module of the CIS contains six (6) open drain holes at the bottom ((3) on each side) and is intentionally manufactured to not retain water. (Fig. N)

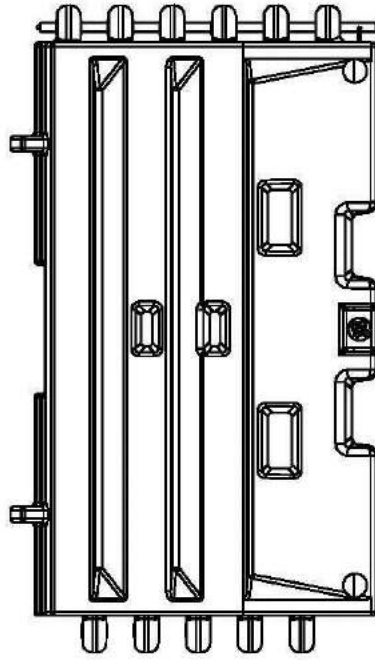


Fig. N

IMPORTANT:

DO NOT replace a Yellow No Fill Module with a Yellow Water Fill Module.

DO NOT replace a Yellow Water Fill Module with a Yellow No Fill Module.

DO NOT replace any Yellow SLED Module with an Orange or White Sentry Water Cable Barrier Module.
Doing so will alter the performance of the entire SLED End Treatment System.



Appendix A:

SLED End Treatment Specifications

160 Ave. La Pata
San Clemente, California 92673
(949) 361-5663
FAX (949) 361-9205
www.traffixdevices.com

TraFFix Devices Inc.
TraFFix SLED End Treatment
TL-3 General Specifications

I. General

The SLED End Treatment, components, and subassemblies shall be designed and manufactured by TraFFix Devices Inc. (TDI)
Corporate Office San Clemente, California
Manufacturing & Distribution Center, San Clemente, California

II. System Description

The SLED End Treatment is TL-3 gating non-redirective crash cushion designed to meet crashworthy requirements of Report NCHRP-350. The SLED End Treatment System shall be used in permanent and portable installations.

The TraFFix SLED End Treatment shall be constructed from a series of individually linked modules. Each individual module shall consist of:

- Virgin high density polyethylene (HDPE) plastic shell, containing UV stabilizers and antioxidants molded to a triple faced profile of a ribbed saw tooth shape, designed to reduce penetration, vaulting, and under riding. Each full length saw tooth ribbed surface contains a flat surface to adhere a reflective sheeted section.
- Designed into each top surface shall be two stacking lugs which assemble into two recessed voids on the bottom surface. This feature locks the sections together vertically and prevents shifting during transport or when stored.
- The ends of each module shall be constructed with vertically aligned knuckles which interlock with those of adjacent module and accept a 1 1/8 inch [28.58mm] diameter steel connecting T-pin. The T-pin is retained after installation by a keeper pin.
- Each module shall contain four internal molded-in corrosion resistant wire rope cables acting as a cable barrier when impacted. Each wire rope is connected to a corrosion resistant steel bushing which is molded into the knuckle sections and contains corrosion resistant surfaces and is of appropriate diameter to meet design speeds of TL-3 impacts.
- The approximate dimensions, weight, and volume of each module shall be: 22.5 in. [571 mm] width x 42 11/16 in. [1084 mm] height x 75 3/4 in [1924 mm] length (pin to pin). Empty weight 160 lbs [72.6 kg], weight filled 2000 lbs [907 kg], water ballast 220 gal [832 L].
- Modules shall be manufactured in yellow color.
- Each module shall be manufactured with fork lift openings to allow for lifting when empty or full.
- Each module shall be manufactured with one 8 in. [203.2 mm] dia. twist lock fill lid and a 2.25 in. [57.15 mm] dia. molded-in Buttress threaded drain hole with a plug to allow quick water ballast draining.

III. Performance Criteria

The SLED End Treatment shall be tested and pass all test requirements of Report NCHRP-350 for Test Level 3 (TL-3) impact conditions for 820 kg and 2000 kg [1808 and 4500 lbs] vehicles at speeds of 100 km/h [62.5 mph].

The SLED test results shall demonstrate that a water filled gating non-redirective crash cushion shall safely decelerate the 820C and 2000P impact vehicles and shall not exceed the maximum allowable occupant risk values.

Occupant impact velocity

Maximum allowable: 12 m/s for occupant

Ride down acceleration

Maximum allowable: 20 G

Detached debris shall not show potential for penetrating the vehicle occupant compartment or present a hazard to other traffic, pedestrians, or workers in a work zone.

A vehicle impacting the Traffix SLED End Treatment shall remain upright during and after the collision.

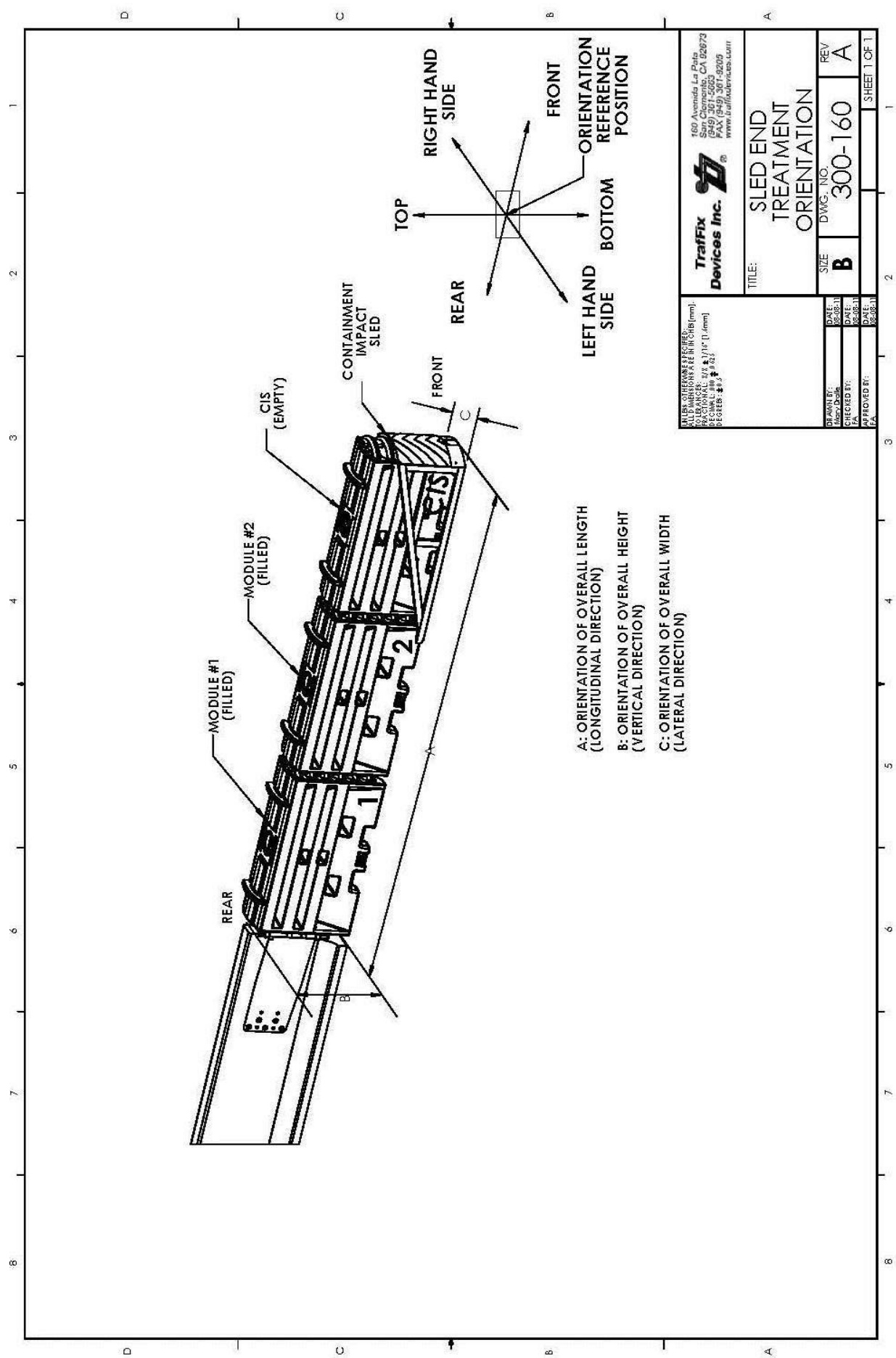
The impacting vehicle's intrusion into adjacent traffic lanes shall be minimized.



Appendix B:

Drawings

160 Ave. La Pata
San Clemente, California 92673
(949) 361-5663
FAX (949) 361-9205
www.traffixdevices.com

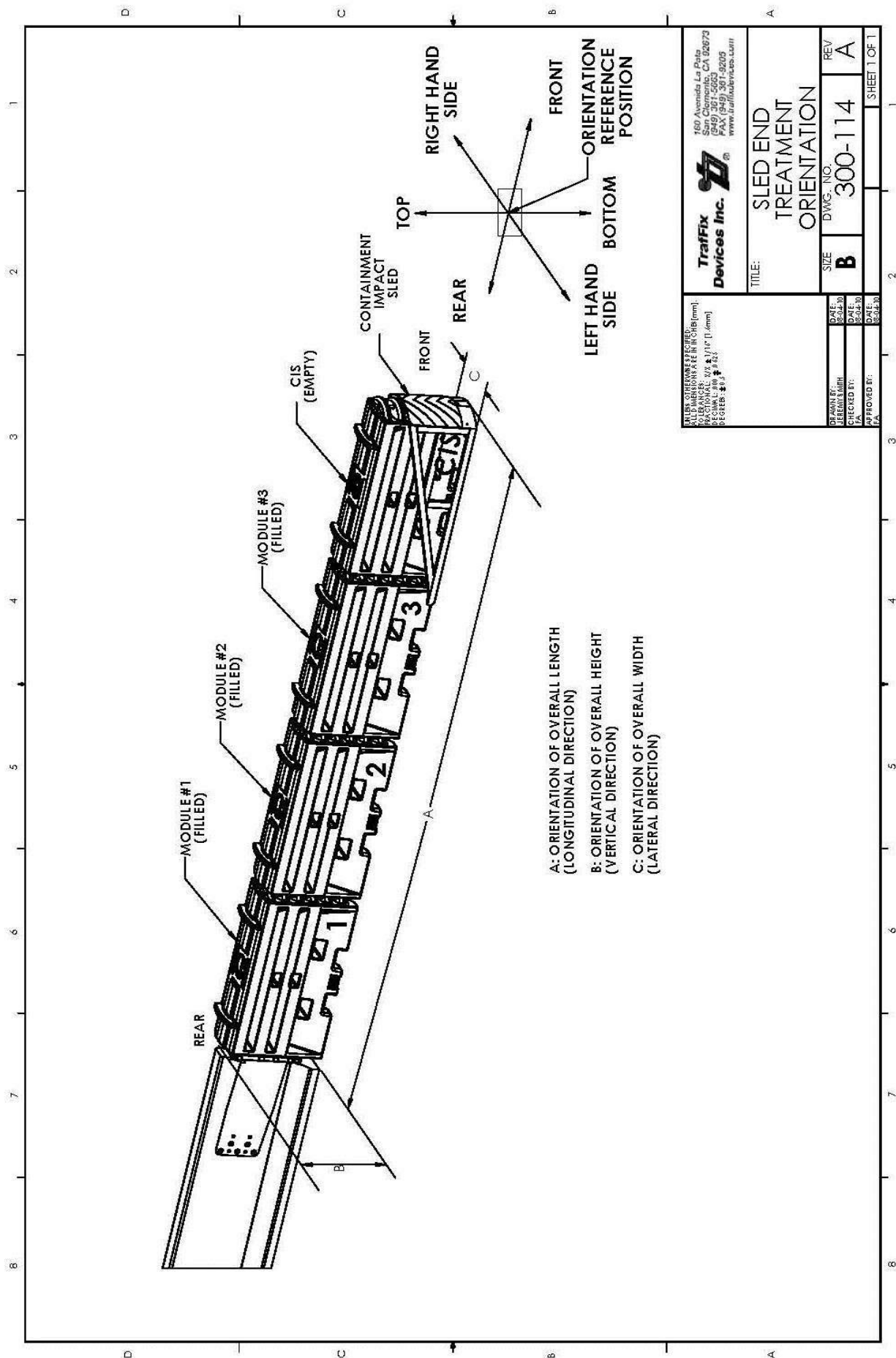


TrafFix
Devices Inc.

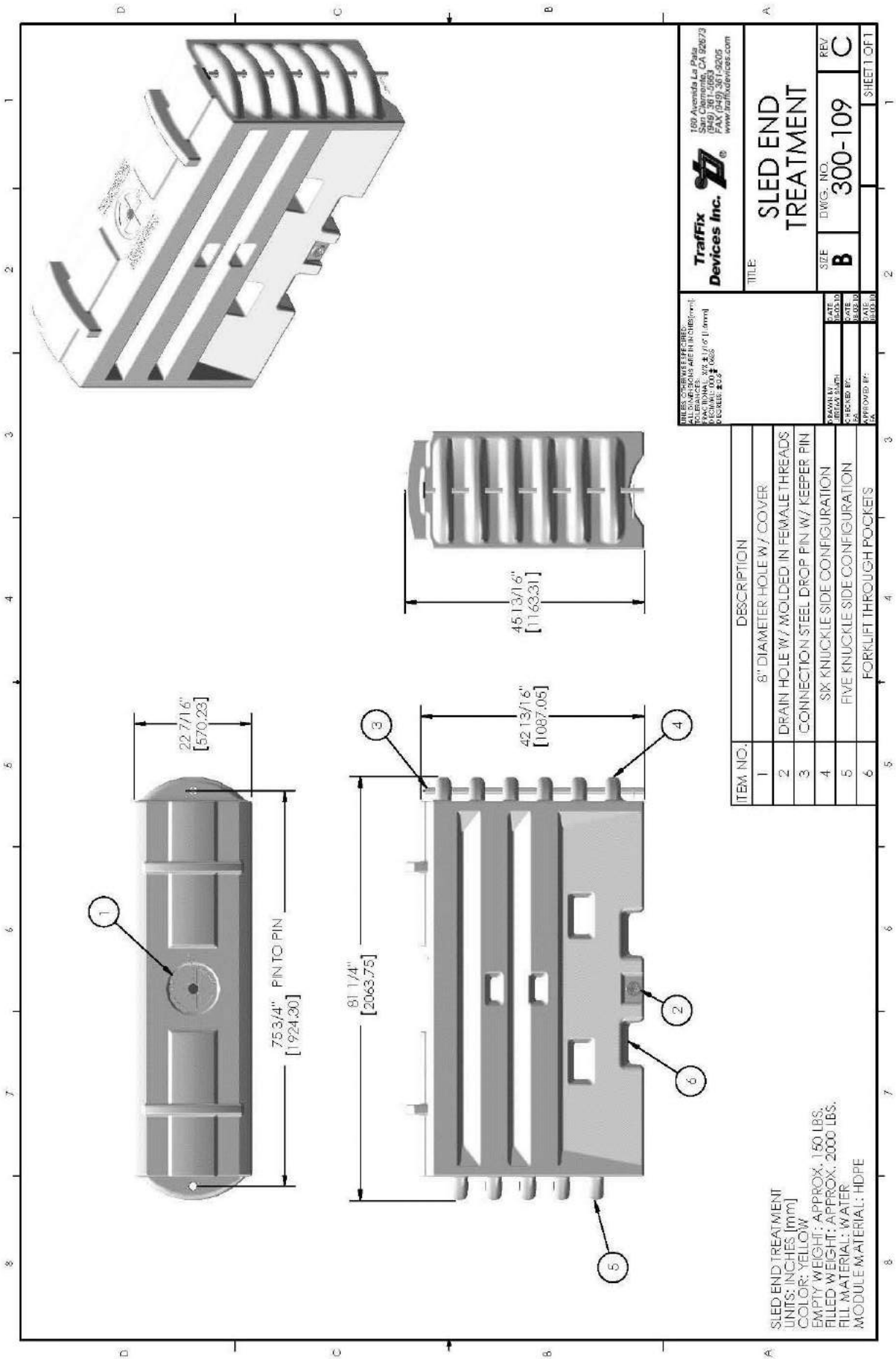
1600 Avenida La Brea
San Clemente, CA 92673
(949) 301-5003
FAX (949) 301-5205
www.traffixdevices.com

TITLE: SLED END TREATMENT ORIENTATION	
SIZE: B	DWG. NO. 300-160
REV A	

DATE: 08/08/11	DATE: 08/08/11
DESIGNED BY: [Signature]	DESIGNED BY: [Signature]
CHECKED BY: [Signature]	CHECKED BY: [Signature]
APPROVED BY: [Signature]	APPROVED BY: [Signature]



Traffix Devices Inc. 160 Avenida La Plata San Jose, CA 95128 (408) 291-2000 FAX (408) 291-2005 www.traffixdevices.com		DATE: 10/24/10 DESIGNED BY: [Signature] CHECKED BY: [Signature] DATE: 10/24/10 APPROVED BY: [Signature]	
TITLE: SLED END TREATMENT ORIENTATION		SIZE: B	REV: A
DWG. NO.: 300-114		SHEET 1 OF 1	



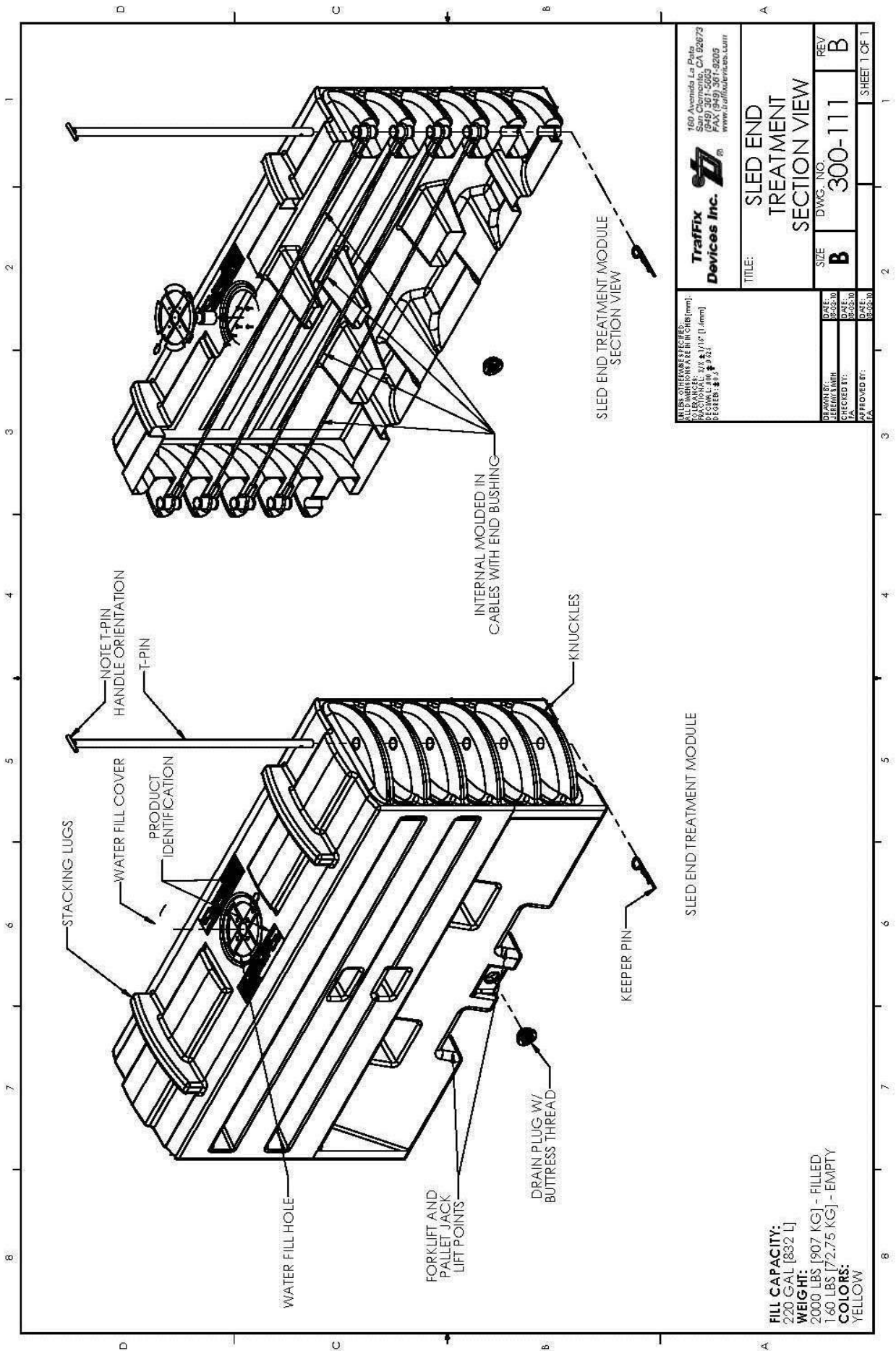
100 Avenida La Brea
San Clemente, CA 92673
(949) 381-0653
FAX (949) 381-9205
www.traffixdevices.com

TITLE: **SLED END TREATMENT**

SIZE: **B** DWG. NO.: **300-109** REV: **C**

SHEET 1 OF 1

TRAFFIX DEVICES INC. (TRAFFIX) IS THE DESIGNER OF THIS PRODUCT. ALL DIMENSIONS ARE IN INCHES (mm). TOLERANCES: FRACTIONS: 1/8" 1/4" 3/8" 1/2" 5/8" 3/4" 1" 1 1/4" 1 1/2" 1 3/4" 2" 2 1/4" 2 1/2" 3" 3 1/4" 3 1/2" 4" 4 1/4" 4 1/2" 5" 5 1/4" 5 1/2" 6" 6 1/4" 6 1/2" 7" 7 1/4" 7 1/2" 8" 8 1/4" 8 1/2" 9" 9 1/4" 9 1/2" 10" 10 1/4" 10 1/2" 11" 11 1/4" 11 1/2" 12" 12 1/4" 12 1/2" 13" 13 1/4" 13 1/2" 14" 14 1/4" 14 1/2" 15" 15 1/4" 15 1/2" 16" 16 1/4" 16 1/2" 17" 17 1/4" 17 1/2" 18" 18 1/4" 18 1/2" 19" 19 1/4" 19 1/2" 20" 20 1/4" 20 1/2" 21" 21 1/4" 21 1/2" 22" 22 1/4" 22 1/2" 23" 23 1/4" 23 1/2" 24" 24 1/4" 24 1/2" 25" 25 1/4" 25 1/2" 26" 26 1/4" 26 1/2" 27" 27 1/4" 27 1/2" 28" 28 1/4" 28 1/2" 29" 29 1/4" 29 1/2" 30" 30 1/4" 30 1/2" 31" 31 1/4" 31 1/2" 32" 32 1/4" 32 1/2" 33" 33 1/4" 33 1/2" 34" 34 1/4" 34 1/2" 35" 35 1/4" 35 1/2" 36" 36 1/4" 36 1/2" 37" 37 1/4" 37 1/2" 38" 38 1/4" 38 1/2" 39" 39 1/4" 39 1/2" 40" 40 1/4" 40 1/2" 41" 41 1/4" 41 1/2" 42" 42 1/4" 42 1/2" 43" 43 1/4" 43 1/2" 44" 44 1/4" 44 1/2" 45" 45 1/4" 45 1/2" 46" 46 1/4" 46 1/2" 47" 47 1/4" 47 1/2" 48" 48 1/4" 48 1/2" 49" 49 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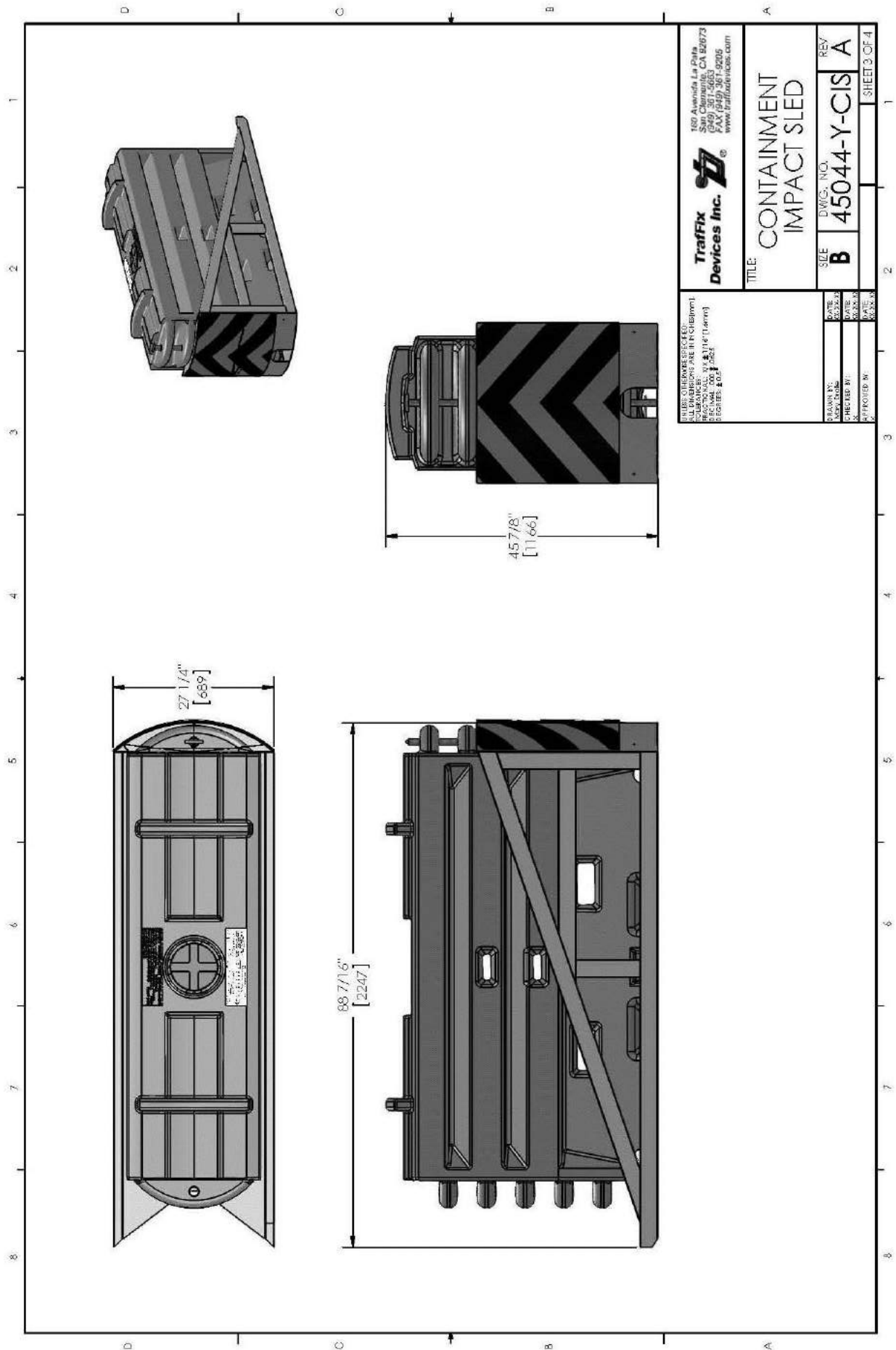
TrafFix
Devices Inc.

160 Avenida La Pata
San Clemente, CA 92673
TEL: (949) 361-9205
FAX: (949) 361-9205
www.traffixdevices.com

TITLE: SLED END TREATMENT MODULE		REV B	
SIZE	DWG. NO.	300-111	
B			

DESIGNED BY: JEREMY LAM	DATE: 08/08/10
CHECKED BY: JAL	DATE: 08/08/10
APPROVED BY: JAL	DATE: 08/08/10

FILL CAPACITY:
220 GAL [832 L]
WEIGHT: 1907 KG] - FILLED
2000 LBS [907 KG] - FILLED
160 LBS [72.75 KG] - EMPTY
COLORS:
YELLOW



Traffix
Devices Inc. ®

160 Avenida La Pita
San Clemente, CA 92673
(949) 351-5653
FAX (949) 351-9208
www.traffixdevices.com

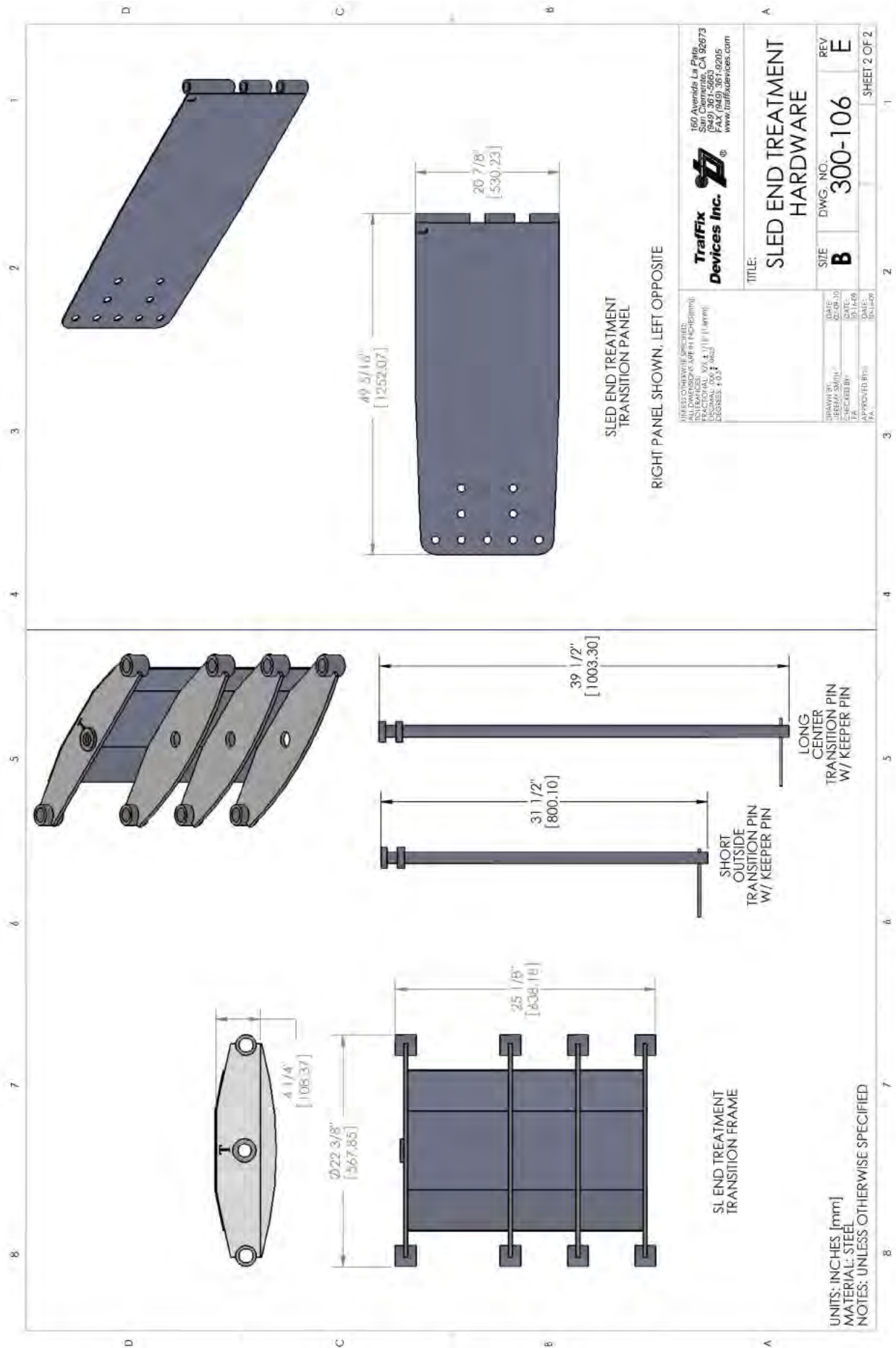
TRAFFIX IS AN ISO 9001 CERTIFIED COMPANY.
ALL DIMENSIONS ARE IN INCHES (PARENT).
TOLERANCES: FRACTIONS: 1/16" (1.5mm)
DECIMAL: .001 (0.0254)
DECIMAL: .001 (0.0254)
DECIMAL: .001 (0.0254)

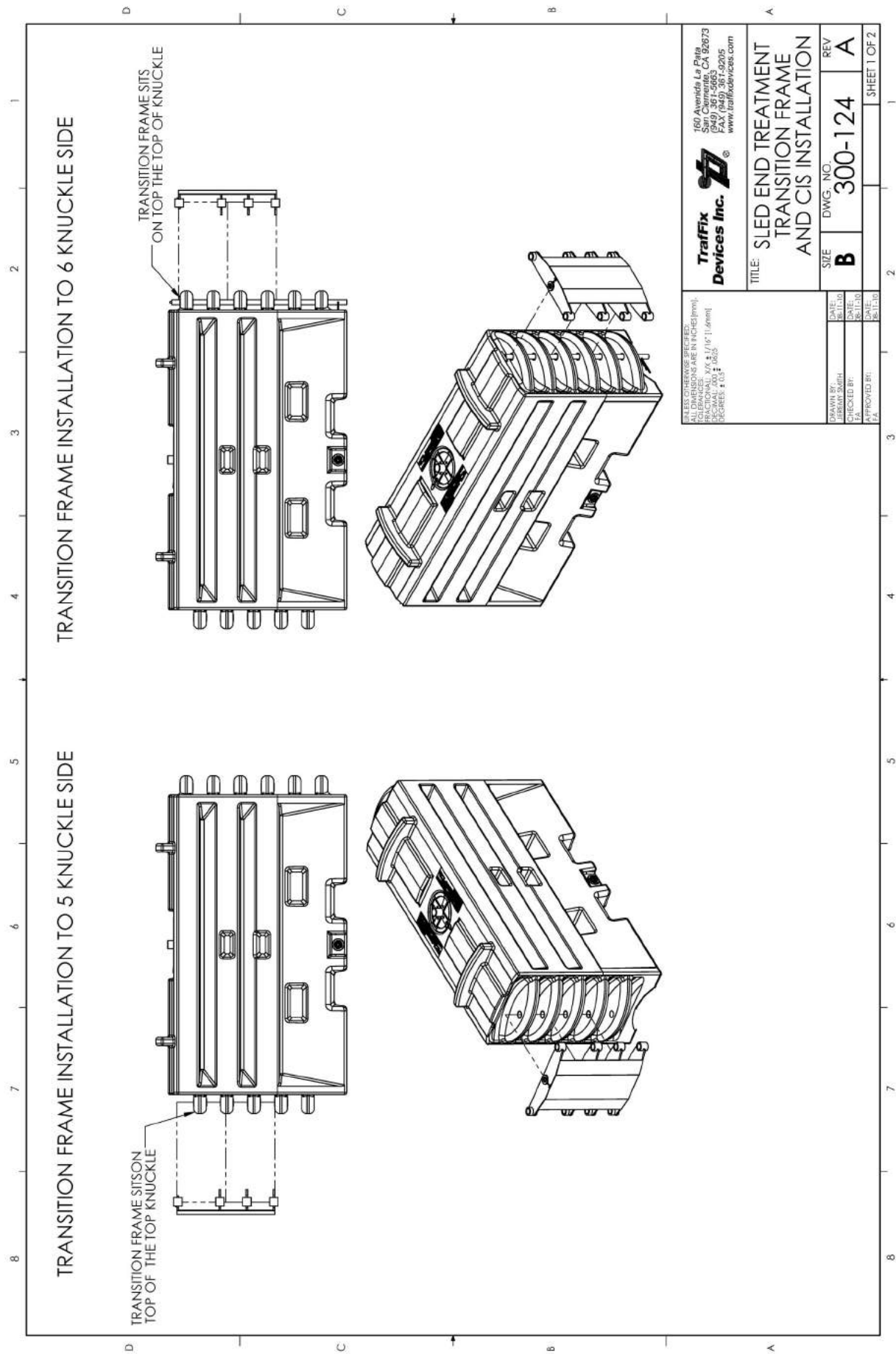
TITLE: CONTAINMENT
IMPACT SLED

SUE	DWG. NO.	REV
B	45044-Y-CIS	A

DRAWN BY:	DATE:
CHECKED BY:	DATE:
APPROVED BY:	DATE:

SHEET 3 OF 4





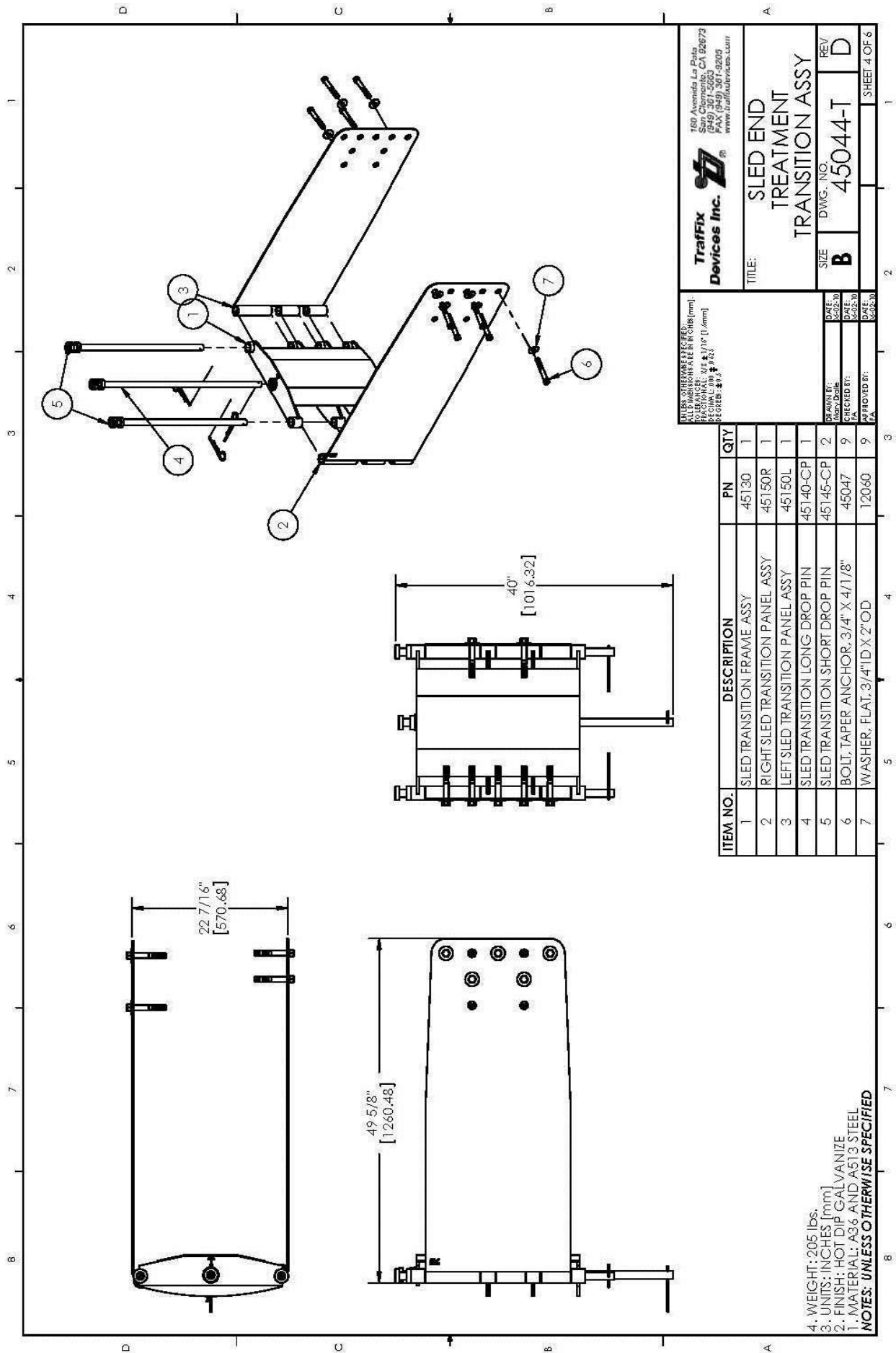
TRAFFIX OTHERWISE SPECIFIED:
ALL DIMENSIONS ARE IN FIFTEENTH (1/16") INCHES UNLESS OTHERWISE SPECIFIED.
FRACTIONAL: 1/16" & 1/32" (1.6mm)
DECIMAL: .001" & .005"
TOLERANCE: ± .005"

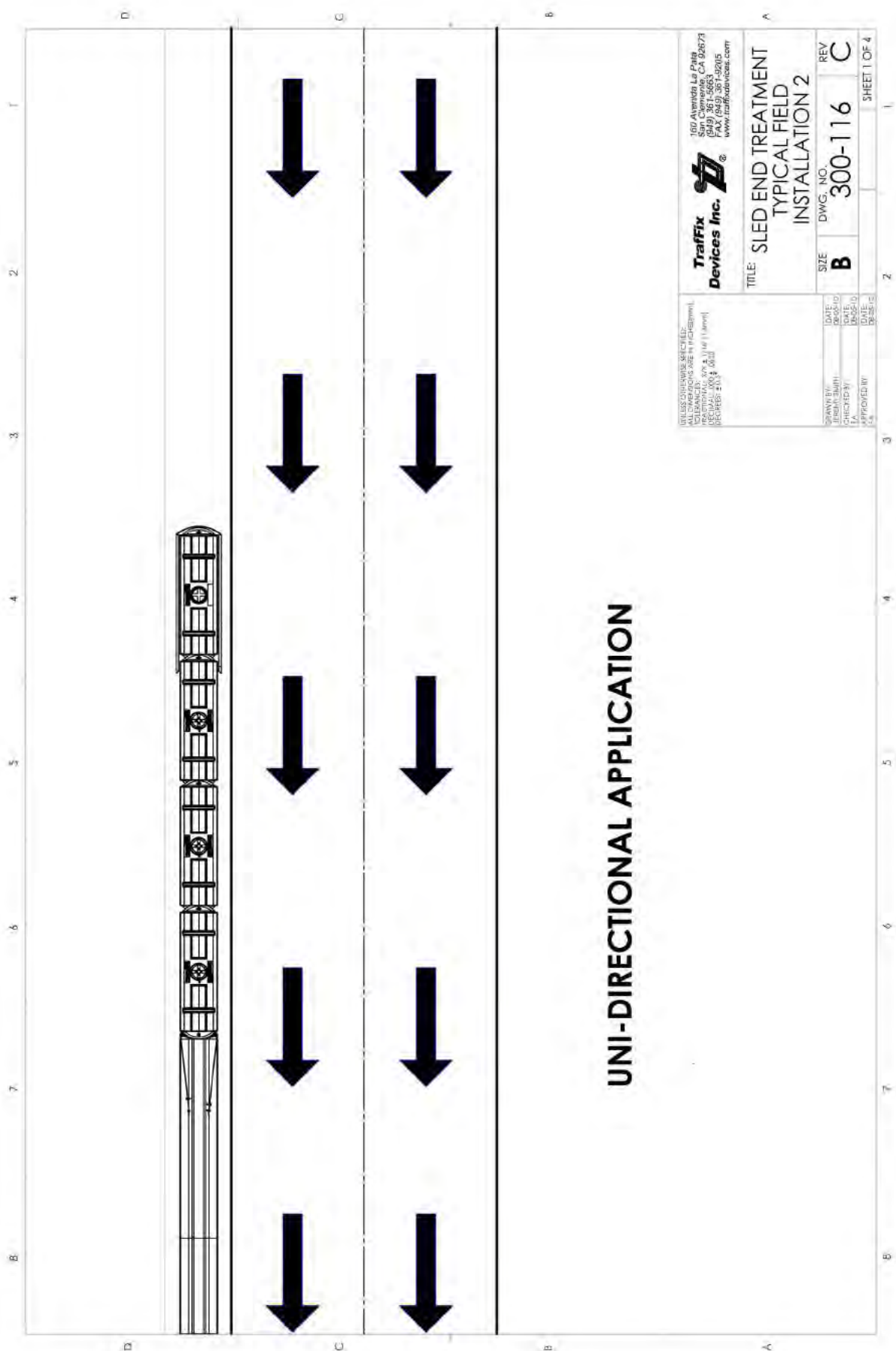
Traffix
Devices Inc.

160 Avenida La Playa
San Clemente, CA 92673
(949) 361-5000
FAX: (949) 361-0205
www.traffixdevices.com

TITLE: SLED END TREATMENT
TRANSITION FRAME
AND CIS INSTALLATION

DRAWN BY: JACOB TA	DATE: 10/11/10	SIZE B	DWG. NO. 300-124	REV A
CHECKED BY: TA	DATE: 06/11/10	SHEET 1 OF 2		
APPROVED BY: JA	DATE: 05/11/10			



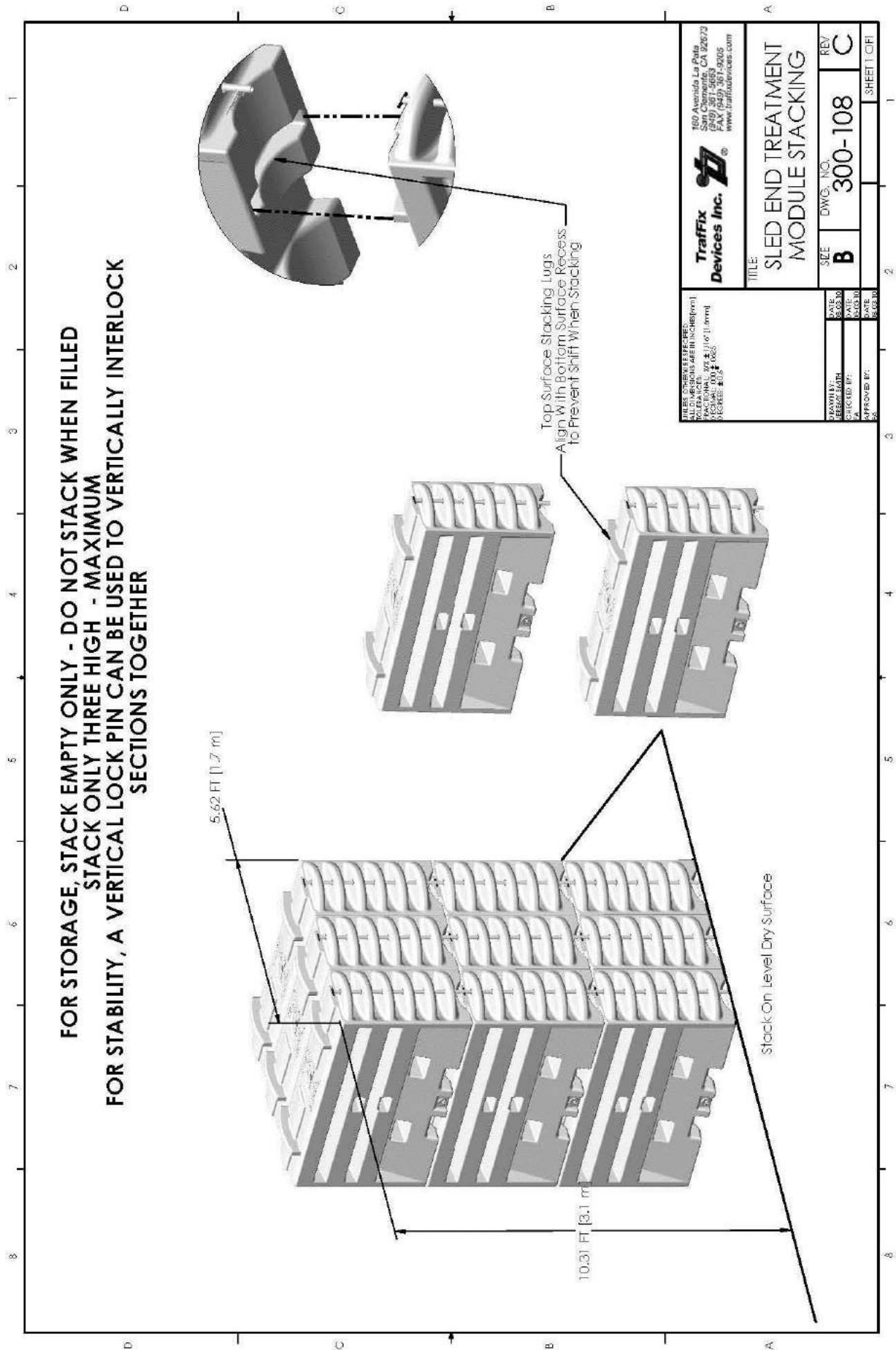


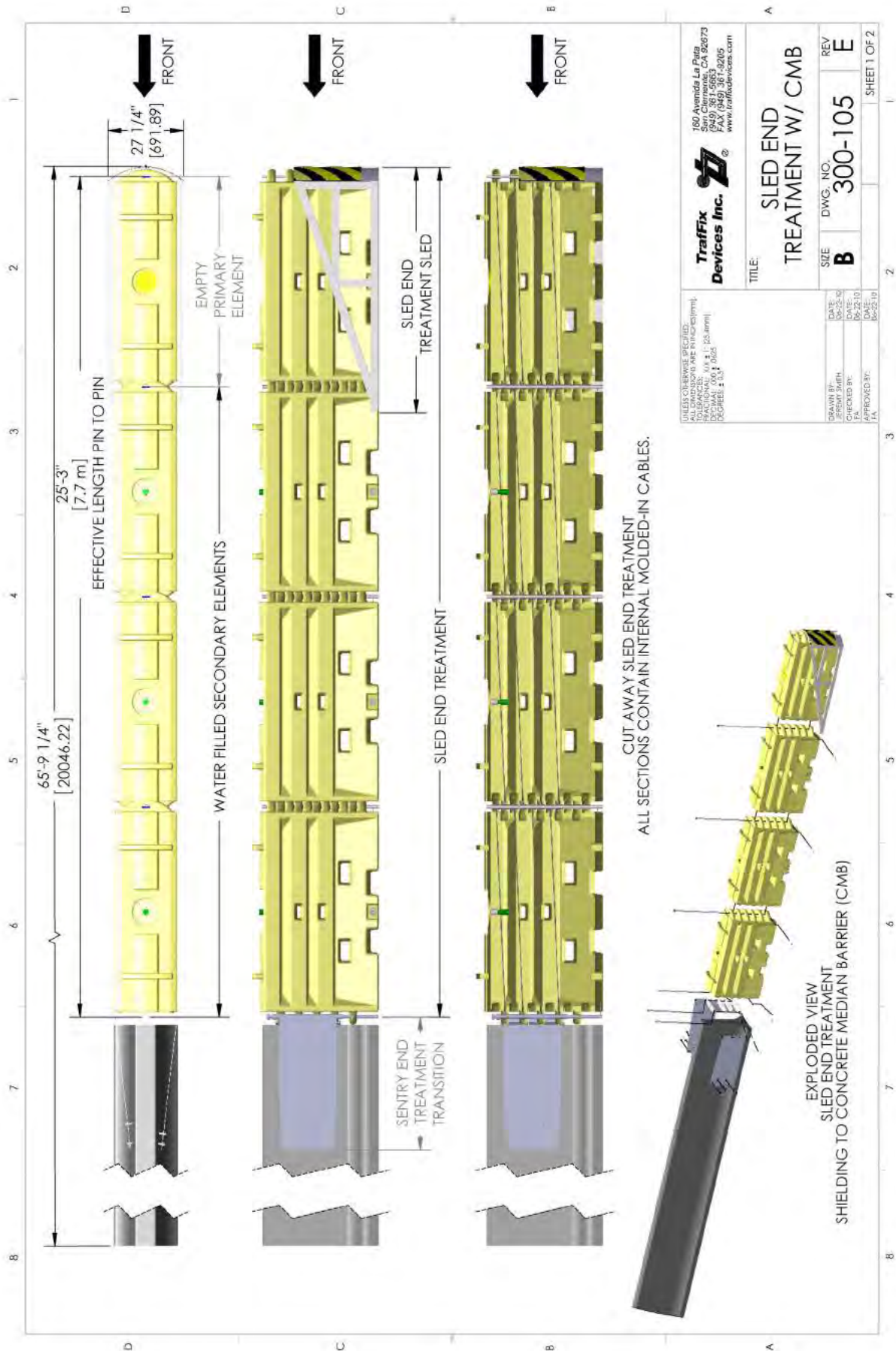
TRAFFIX DEVICES INC. 100 Avenida La Pita
San Clemente, CA 92673
(949) 381-5653
Fax: (949) 381-5295
www.traffixdevices.com

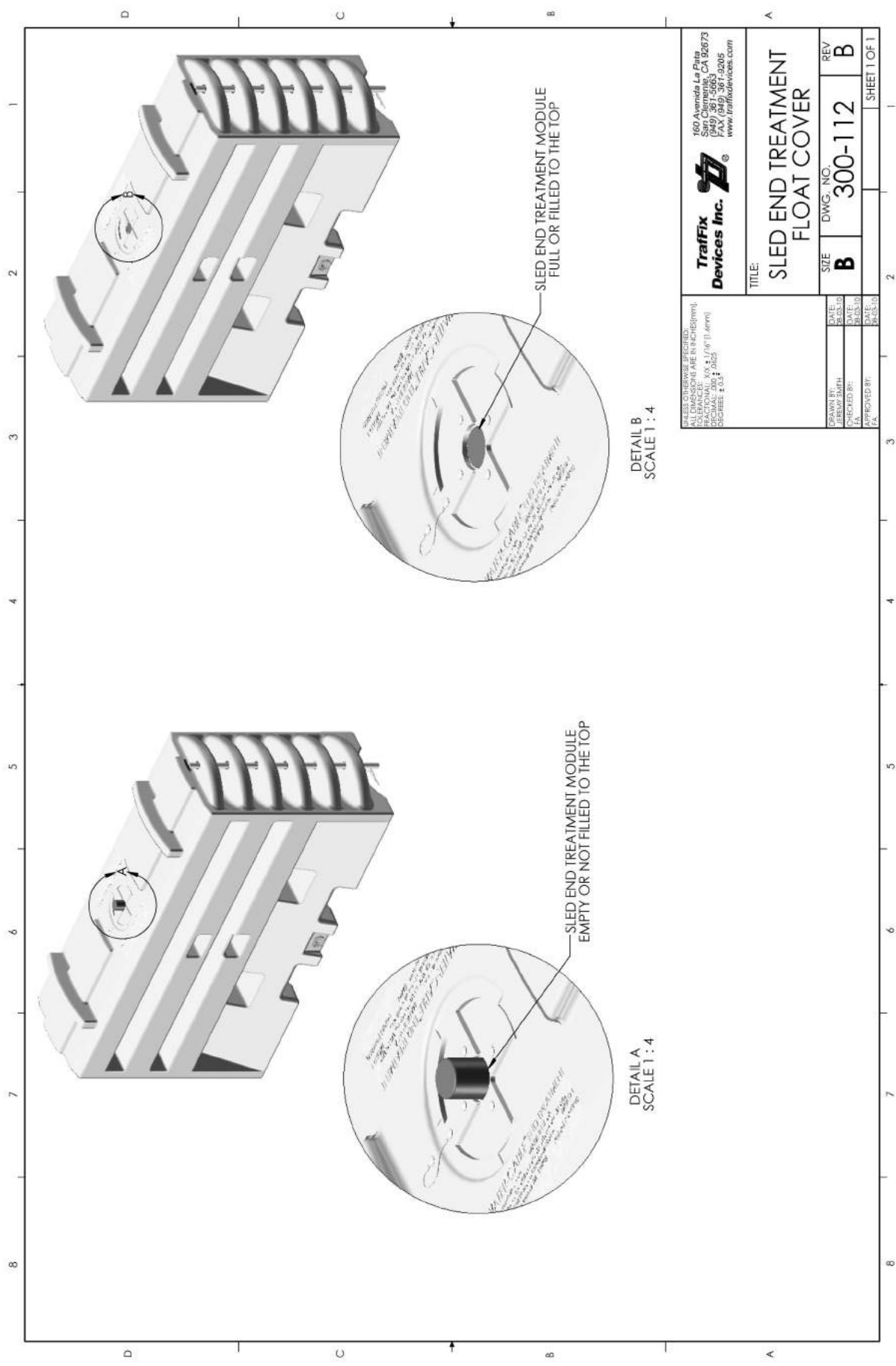
TRAFFIX DEVICES INC. 100 Avenida La Pita
San Clemente, CA 92673
(949) 381-5653
Fax: (949) 381-5295
www.traffixdevices.com

TITLE: SLED END TREATMENT TYPICAL FIELD INSTALLATION 2		REV	C
SIZE	B	DWG. NO.	300-116
DATE	DATE	DATE	DATE
DESIGNED BY	CHECKED BY	DATE	DATE
DATE	DATE	DATE	DATE

SHEET 1 OF 4



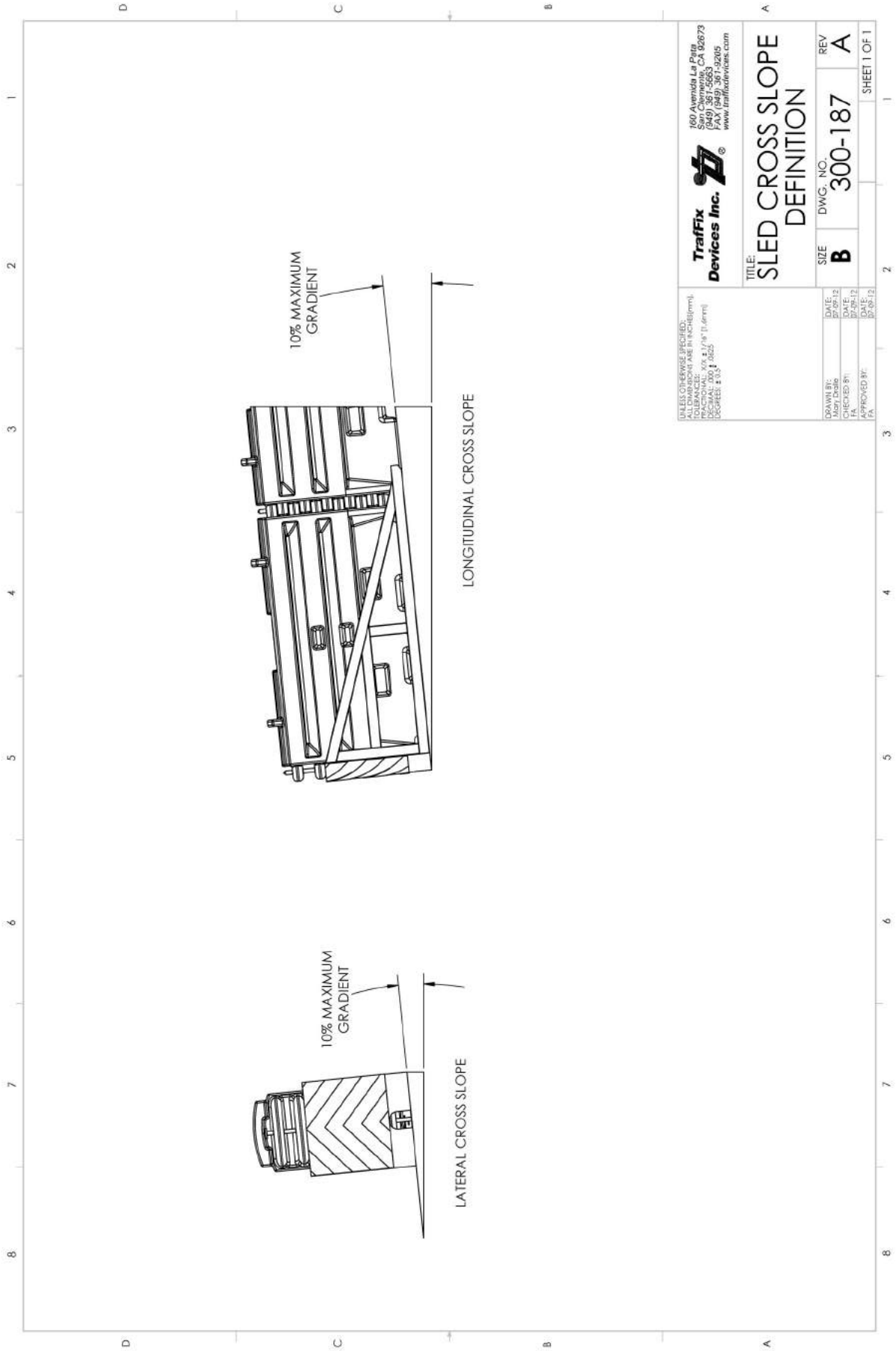




TrafFix Devices Inc.		160 Avenida La Plata San Clemente, CA 92673 (949) 367-9205 FAX (949) 367-9205 www.traffixdevices.com	
TITLE: SLED END TREATMENT FLOAT COVER			
SIZE B	DWG. NO. 300-112	REV B	
DRAWN BY: JRM/MSH	DATE: 05/05/10	SHEET 1 OF 1	
CHECKED BY: JRM	DATE: 05/05/10		
APPROVED BY: JRM	DATE: 05/05/10		

DETAIL B
SCALE 1:4

DETAIL A
SCALE 1:4



<small>UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES (mm). TOLERANCES: FRACTIONS: 1/16" & 1/8" (1.6mm) DECIMAL: .001 (.025) DECIMAL: .001 (.025) DECIMAL: .001 (.025)</small>		TrafFix Devices Inc.		160 Avenida La Brea Suite 100 Los Angeles, CA 90027 (349) 361-5553 FAX (349) 361-5205 www.traffixdevices.com	
TITLE: SLED CROSS SLOPE DEFINITION					
SIZE B		DWG. NO. 300-187		REV A	
DRAWN BY: J. J. J.	DATE: 11/26/12	CHECKED BY: J. J. J.	DATE: 11/26/12	SHEET 1 OF 1	
APPROVED BY: J. J. J.	DATE: 11/26/12				



U.S. Department
of Transportation

**Federal Highway
Administration**

Appendix C:

FHWA

Product Acceptance Letter

CC-114 and CC-117

Use this link to locate the letters on the FHWA
Website:

[http://safety.fhwa.dot.gov/roadway_dept/
policy_guide/road_hardware/listing.cfm?
code=cushions](http://safety.fhwa.dot.gov/roadway_dept/policy_guide/road_hardware/listing.cfm?code=cushions)



Appendix E:

Regional Sales Managers, Key Contacts & Customer Service

160 Ave. La Pata
San Clemente, California 92673
(949) 361-5663
FAX (949) 361-9205
www.traffixdevices.com

Regional Sales Managers, Key Contacts & Customer Service

➤ Regional Sales Managers

Northeast Territory Office

VA, WV, DL, MD, NJ, NY, PA, CT, MA, RI, NH, VT, ME, D.C.

John D. Risley

Philadelphia, PA

(610) 337-9556 office

(949) 573-9239 fax

jrisley@traffixdevices.com

Northwest Territory Office

MT, UT, ID, WA, OR, NV, CO, WY

Cary LeMonds

Salt Lake City, UT

(801) 446-4450 office

(949) 573-9290 fax

clemonds@traffixdevices.com

Western Territory Office

CA, HI, AK, AZ

Eric Jones

San Clemente, CA

(949) 350-7048 office

(949) 573-9267 fax

ejones@traffixdevices.com

International Sales

Brent Kulp

San Clemente, CA

(949) 361-5663 office

(949) 573-9264 fax

bkulp@traffixdevices.com

Southeast Territory Office

TN, NC, SC, GA, MS, AL, FL

David L. Evans

Atlanta, GA

(770) 794-7338 office

(949) 573-9289 fax

devans@traffixdevices.com

Midwest Territory Office

OH, MI, IN, KY, IL, WI, MN, ND, SD, IA, MO

Dave H. Lindquist

Chicago, IL

(630) 406-0760 office

(949) 573-9240 fax

dlindquist@traffixdevices.com

Southwest Territory Office

TX, OK, KS, NE, NM, AR, LA

John Gense

Dallas, TX

(214) 704-1476 office

(949) 573-9291 fax

jgense@traffixdevices.com

To Place Orders

Email : orders@traffixdevices.com

Fax: (949) 573-9250

Office: (949) 361-5663

➤ Key Contacts

Geoff Maus	Director of Engineering	gmaus@traffixdevices.com	Ph: (949) 361-5663	Fax: (949) 573-9250
Felipe Almanza	Technical/Engineering Director	falmanza@traffixdevices.com	Ph: (949) 573-5663	Fax: (949) 573-9250
Brent Kulp	VP Int. Sales & Marketing	bkulp@traffixdevices.com	Ph: (949) 573-9214	Fax: (949) 573-9264
Scott Ryan	VP North American Sales	sryan@traffixdevices.com	Ph: (949) 573-9216	Fax: (949) 573-9266

➤ Customer Service Department

Yvette Cervantes	Customer Service Manager	ycervantes@traffixdevices.com	Ph: (949) 573-9220	Fax: (949) 573-9270
Jessica Pearcy	Customer Service Rep.	jpearcy@traffixdevices.com	Ph: (949) 573-9221	Fax: (949) 573-9271
Alyson Strohsahl	Customer Service Rep.	astrohsahl@traffixdevices.com	Ph: (949) 573-9222	Fax: (949) 573-9272
Diane Womack	Customer Service Rep.	dwomack@traffixdevices.com	Ph: (949) 573-9237	Fax: (949) 573-9287
Jim Abercrombie	Inside Sales Specialist	jabercrombie@traffixdevices.com	Ph: (949) 573-9217	Fax: (949) 361-9205

TraFFix Devices, Inc. Headquarters

160 Ave. La Pata, San Clemente, CA 92679 - (949) 361-5663 - Fax (949) 361-9205

www.traffixdevices.com



160 Ave. La Pata San Clemente, California 92673
(949) 361-5663 FAX (949) 361-9205
www.traffixdevices.com

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