REACT 350® II

System

Crash Cushion

Product Description Instructional Manual

Part No. 618083B

Rev - Sept 2011

TRINITY
HIGHWAY PRODUCTS
ENERGY ABSORPTION SYSTEMS

REACT 350® II System

Crash Cushion

Product Description
Instructional Manual

TRINITY HIGHWAY PRODUCTS
ENERGY ABSORPTION SYSTEMS
2525 Stemmons Freeway
Dallas, Texas 75207

IMPORTANT: These instructions are to be used only in conjunction with the installation, maintenance, and repair of the REACT 350® II System. These instructions are for standard installations specified by the appropriate highway authority only. In the event the specified system installation, maintenance, or repair requires or involves special circumstances, contact the appropriate highway authority engineer. Energy Absorption Systems representatives are available for consultation if required.

This Manual must be available to the worker at all times.
For additional copies, contact Energy Absorption Systems at (888) 323-6374.

The instructions contained in this Manual supersede all previous information and manuals. All information, illustrations, and specifications in this Manual are based on the latest REACT 350® II System information available to Energy Absorption Systems at the time of printing. We reserve the right to make changes at any time.

Table of Contents

Customer Service Contacts

Energy Absorption Systems (a Trinity Industries, Inc. company.) is committed to the highest level of customer service. Feedback regarding the REACT 350® II System, its installation procedures, supporting documentation, and performance is always welcome. Additional information can be obtained by calling the telephone numbers below:

Energy Absorption Systems

Telephone:	(888) 323-6374
Fax:	(888) 770-6755
E-mail	customerservice@energyabsorption.com
Internet: Energy Absorption Systems Trinity Highway Products, LLC. Trinity Industries, Inc.	http://www.energyabsorption.com/ http://www.highwayguardrail.com/ http://www.trin.net/

Important Introductory Notes

Proper assembly of the REACT 350® II System is essential to achieve performance of the system under appropriate federal and state criteria. These instructions should be read in their entirety and understood before installing the REACT 350® II System. These instructions are to be used only in conjunction with the installation of the REACT 350® II System and are for standard installations only as specified by the applicable highway authority. In the event your system installation requires or involves special circumstances or, during the assembly process, a question arises regarding a particular step, contact Energy Absorption Systems before proceeding.

A manufacturer's drawing package will be supplied by Energy Absorption Systems. Each system will be supplied with a specific drawing package unique to that system. These drawings should be reviewed and studied thoroughly by a qualified individual before the start of any installation.

Only parts specified herein may be used in conjunction with the assembly or maintenance of this system. The use of parts not specified herein renders this system as one not accepted for use on the national highway system by the FHWA. Further, parts not specified herein have not been crash tested and the performance of the system using non-specified parts is unknown.

System Overview

The REACT 350® II System is a highly efficient, redirective, non-gating, potentially reusable crash cushion. When impacted under NCHRP 350* criteria this system is capable of shielding specified hazards up to 914 mm (3') wide. It consists of a series of "smart plastic" Cylinders attached to a steel Base Track. The term "smart plastic" refers to the memory characteristics of the Cylinders. After a head-on impact as described in NCHRP 350, the REACT 350® II System has the potential to recover a major portion of its shape, position and energy absorbing capability.

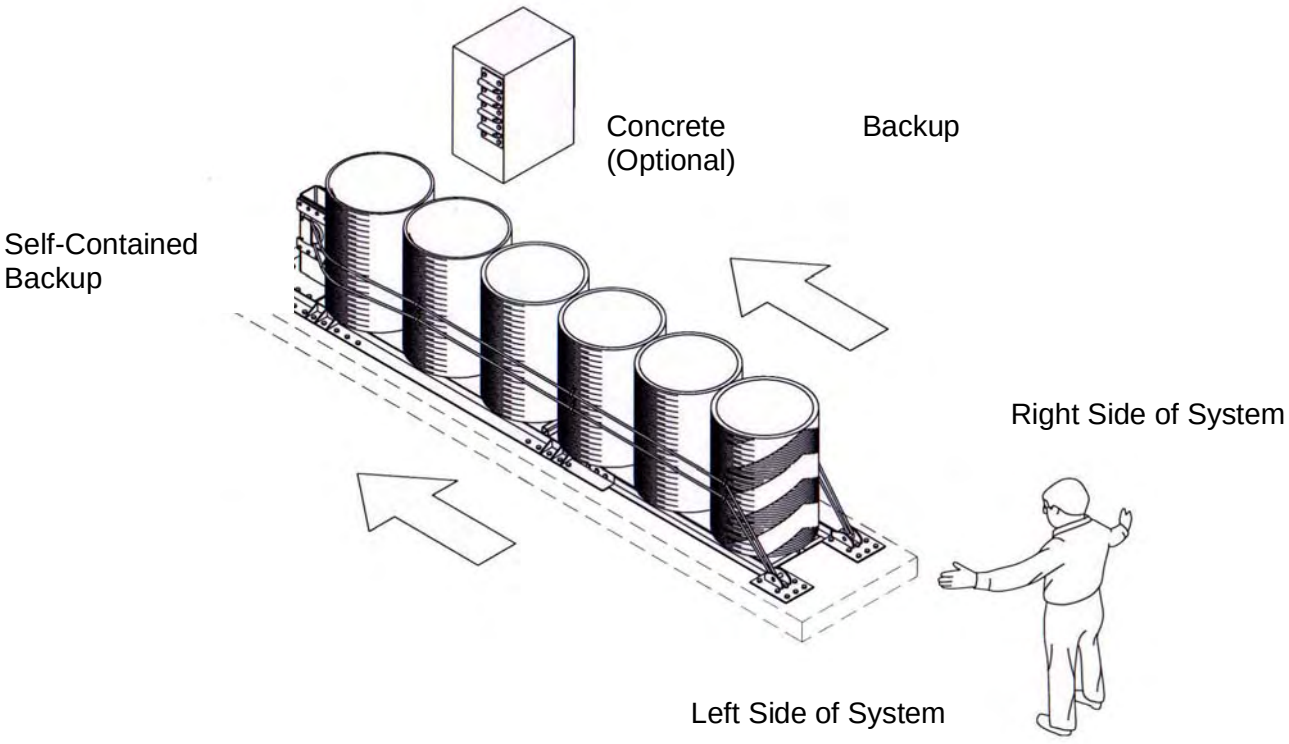
The REACT 350® II System utilizes various Cylinder wall thicknesses to accommodate both light cars and heavier, high-center-of-gravity vehicles.

Two backup options are available to further meet specific requirements of each location. A Self-Contained Backup is available, or the REACT 350® II System can be mounted to a new or existing Concrete Backup. In some locations, either backup type may be applicable.

*NCHRP Report 350 =
National Cooperative Highway Research Program Report 350

Copies may be obtained from:
Transportation Research Board
National Research Council
2101 Constitution Avenue, N.W.
Washington D.C., 24018

It is also available at
http://safety.fhwa.dot.gov/roadway_dept/policy_guide/road_hardware/



Important: Read safety instructions thoroughly and follow the assembly directions and suggested safe practices before assembling, installing, maintaining, or repairing the REACT 350® II System. Failure to follow this warning can result in serious injury or death to the worker and/or bystanders. It further compromises the acceptance of this system by the FHWA. Please keep these instructions for later use.

Warning: Ensure that all of the REACT 350® II System Warnings, Cautions, and Important statements within the REACT 350® II System Manual are completely followed. Use only the parts specified herein. Failure to follow this warning could result in serious injury or death in the event of a collision.

Recommended Safety Rules for Assembly and Installation

*** Important Safety Instructions ***

This Manual must be kept in a location where it is readily available to persons who install, maintain, or repair the REACT 350® II System. Additional copies of this Manual are available from Energy Absorption Systems by calling (888) 323-6374. Please contact Energy Absorption Systems if you have any questions concerning the information in this manual or about the REACT 350® II System.

Always use appropriate safety precautions when operating power equipment, mixing chemicals and when moving heavy equipment or the REACT 350® II System components. Gloves, safety goggles, and back protection should be used.

Safety measures incorporating traffic control devices must be used to provide safety for personnel while at the installation, maintenance, or repair site.

Safety Symbols

This section describes safety symbols that may appear in the REACT 350® II System Manual. Read the Manual for complete safety, assembly, operating, maintenance, repair, and service information.

Symbol	Meaning
	**Safety Alert Symbol** **Indicates Danger, Warning, or Caution**. Failure to read and follow the Danger, Warning, Safety, or Caution indicators could result in serious injury or death to the workers and/or bystanders.

Warning and Cautions

Read all instructions before installing, maintaining, or repairing the REACT 350® II System.

Warning: Do not assemble, install, maintain, or repair the REACT 350® II System until you have read this Manual thoroughly and completely understand it. Ensure that all Warnings, Cautions and Important statements within the Manual are completely followed. Please call Energy Absorption Systems at (888) 323-6374 if you do not understand these instructions. Failure to follow this warning could result in serious injury or death in the event of a collision.

Warning: Safety measures incorporating traffic control devices must be used to protect all personnel while at the installation, maintenance or repair site. Failure to follow this warning could result in serious injury or death in the event of a collision.

Warning: Be sure adequate time is available for complete installation, maintenance, or repair before beginning the installation, maintenance, or repair process. Failure to follow this warning could result in serious injury or death in the event of a collision.

Warning: Use only Energy Absorption Systems' parts for installing, maintaining, or repairing the REACT 350® II System. Installation, maintenance, or repairs using unauthorized accessories is strictly prohibited. Failure to follow this warning will compromise the acceptance of this system by the FHWA and could result in serious injury or death in the event of a vehicle impact with a NONAPPROVED system.

Warning: Do NOT modify the REACT 350® II System in any way. Failure to follow this warning could result in serious injury or death in the event of a collision.

Warning: Ensure that the REACT 350® II System and delineation used meet all federal, state, specifying agency, and local specifications. Failure to follow this warning could result in serious injury or death in the event of a collision..

Warning: Ensure that your installation meets all appropriate Manual on Uniform Traffic Control Devices (MUTCD) and local standards. Failure to follow this warning could result in serious injury or death in the event of a collision.

Warning: Ensure that there is proper site grading for REACT 350® II System placement as dictated by the state, specifying agency, pursuant to Federal Highway Administration (FHWA) acceptance. Failure to follow this warning could result in serious injury or death in the event of a collision.

Limitations and Warnings

Energy Absorption Systems, in compliance with the National Cooperative Research Highway Program 350 (NCHRP Report 350) "Recommended Procedures for the Safety Performance of Highway Safety Features", contracts with FHWA approved testing facilities to perform crash tests, evaluation of tests, and submittal of results to the Federal Highway Administration for review.

The REACT 350® II System was tested to meet the impact criteria, requirements and guidelines of NCHRP Report 350. These tests, specifically set forth by FHWA, evaluate product performance by simulating those impacts outlined by NCHRP Report 350 involving a typical range of vehicles on our roadways, from lightweight cars (approx. 820 kg [1800 lb.]) to full size pickup trucks (approx. 2000 kg [4400 lb.]) as specified by the FHWA. A product can be certified for various speed levels as shown below.

Level I: 50 km/h [31.10 mph]

Level II: 70 km/h [43.49 mph]

Level III: 100 km/h [62.13 mph]

These FHWA directed tests are not intended to represent the performance of systems when impacted by every vehicle type or every impact condition existing on the roadway. This system is tested only to the criteria of NCHRP 350 as approved by FHWA.

Energy Absorption Systems does not represent nor warrant that the results of these controlled tests show that vehicle impacts with the products in other conditions would necessarily avoid injury to person(s) or property. Impacts that exceed the specifications of the system may not result in acceptable crash performance as outlined in NCHRP Report 350, relative to structural adequacy, occupant risk and vehicle trajectory. Energy Absorption Systems expressly disclaims any warrant or liability for injury or damage to persons or property resulting from any impact, collision, or harmful contact with products, other vehicles, or nearby hazards or objects by any vehicle, object or person, whether or not the products were installed by or under the direction of Energy Absorption Systems or by third parties.

The REACT 350® II System is intended to be assembled, installed, delineated, and maintained in accordance with specific State and Federal guidelines. Energy Absorption Systems offers a reflective delineator panel and has reflective tabs for its REACT® line of products. However, the material is only intended to supplement delineation required by the Department of Transportation's "Manual on Uniform Traffic Control Devices" (MUTCD). Design tables are provided in the Product Manual to aid in selecting the most appropriate product configuration for proper application to the site. The appropriate highway authority approved engineer should be careful to properly select, install and maintain the product. Careful evaluation of the site geometry, vehicle population type, speed, traffic direction and visibility are some of the elements that require evaluation in

the proper selection of a safety appurtenance by the appropriate specifying highway authority. For example, curbs could cause unstable behavior by the vehicle.

After an impact occurs, the product must be restored to its original condition as soon as possible. When a potentially reusable safety product is impacted, it is still necessary for the highway authority to restore the product to its original length and inspect all the components for damage and repair and/or replace components as necessary.

The restorable capability of the cylinders provides for potential rebounding of an impacting vehicle into pathways beyond the reserve area. Field performance assessments reported indicate that secondary impacts have no observable problematic results.

Know Your REACT 350® II System

For specific installation, maintenance, or repair details, refer to the state or specifying agency's standard drawing(s) and/or Energy Absorption Systems standard layout drawings.

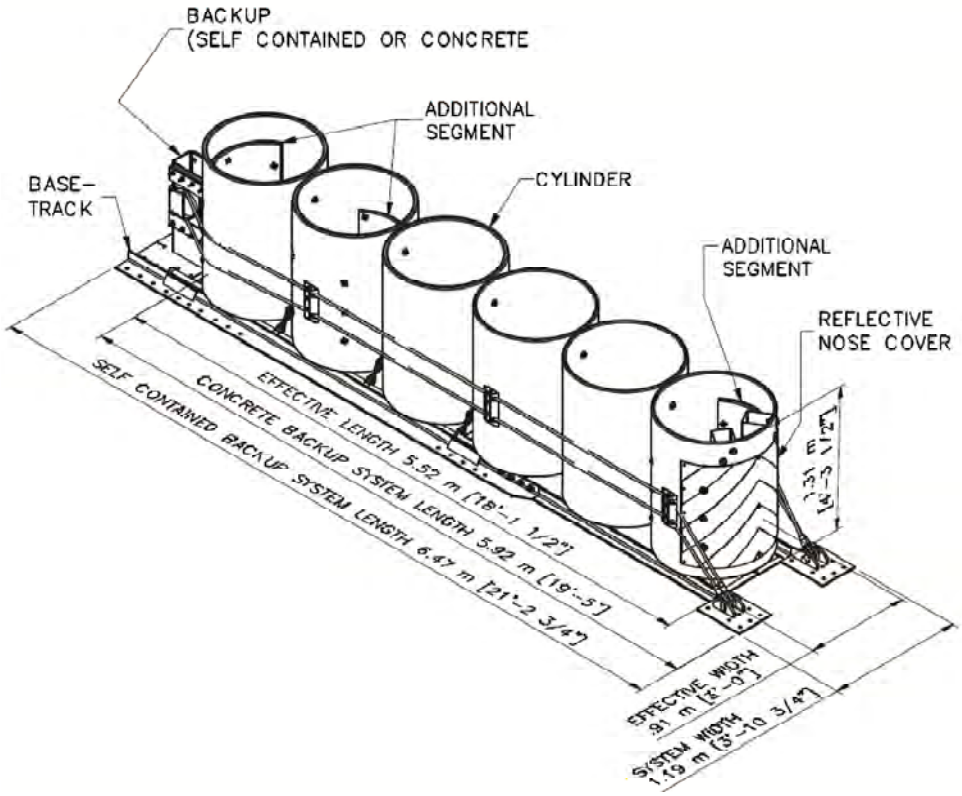


Figure 1

System Size

	Backup	
	Self Contained	**Concrete**
Effective Length	5.52 m [18'-1 1/2"]	5.52 m [18'-1 1/2"]
System Length	6.47 m [21'-2 3/4"]	5.92 m [19'-5"]
Effective Width	.91 m [3'-0"]	
System Width	1.19 m [3'-10 3/4"]	
Height	1.31 m [4'-3 1/2"]	

Model Number Description

B	C
Self-Contained steel backup	Concrete Backup with Side Mount Anchors
Typical hazard width *203 mm [8”]	Max. hazard width 914 mm [36”]

*See “Hazard Width”, Page 12, for wider hazards.

62 6 B 36

- 36 — Nominal system width in inches (width of the cylinders)
- B — Backup Type: B or C
- 6 — Number of Bays
- 62 — Maximum nominal speed in mph (62 mph [100 km/h])

Number of Bays

A Bay consists of one Cylinder. The terms Bay and Cylinder may be used interchangeably. The Cylinder at the front of the system (traffic end) is always Bay 1, and each subsequent bay is sequentially numbered to the rear of the system (hazard end).

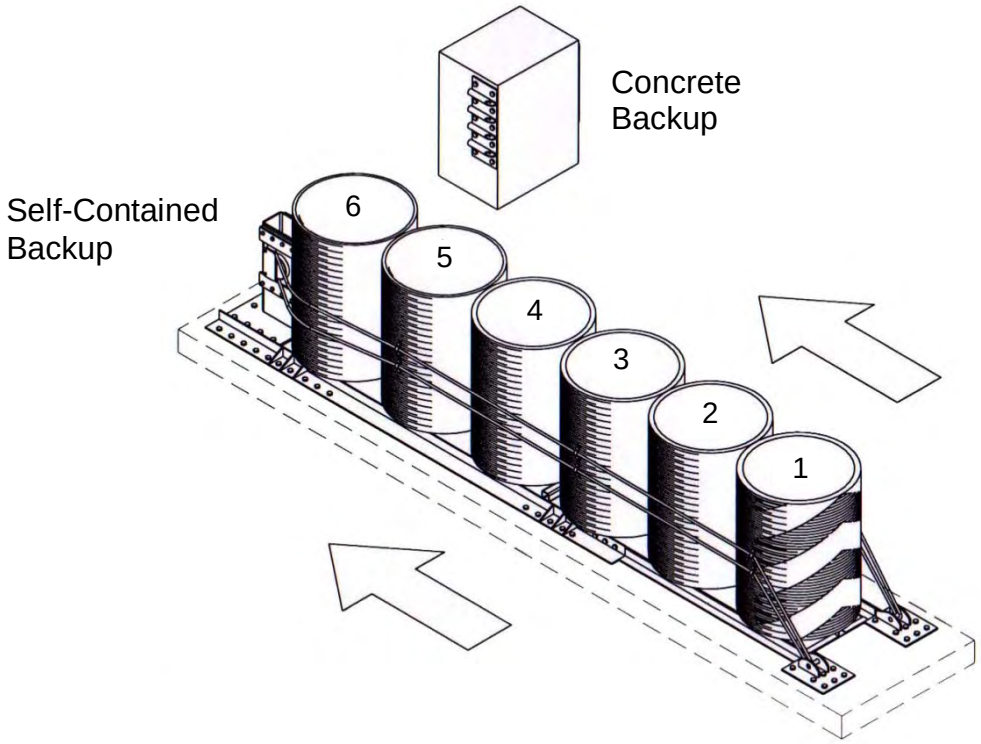


Figure 2

Number of Bays

Backup Type

It is important to fully understand the limitations of each backup type so the correct REACT 350® II System is chosen for each location.

The REACT 350® II System is available with a Self-Contained Backup or may be attached to a Concrete Backup. Refer to Figures 3 and 4 along with the backup assembly drawings to determine which type of backup is appropriate.

Self-Contained Backup

REACT 350® II System with a Self-Contained "steel tube" Backup require two cables, one cable on each side of the Cylinders. These cables begin at the front of the system, travel through the Cable Guides on the Cylinders, loop around the backup structure, travel back through the Cable Guides, and terminate at the front of the system.

Concrete Backup

REACT 350® II System with a Concrete Backup requires four cables. Two cables on each side of the Cylinders begin at the Side Anchor Plates, travel through the Cable Guides on the Cylinders, loop around the pin on the Front Anchor Plates, travel back through the Cable Guides, and terminate at the Side Anchor Plates.

Existing concrete structures may serve as backups for REACT 350® II System provided they meet specific size and strength requirements.

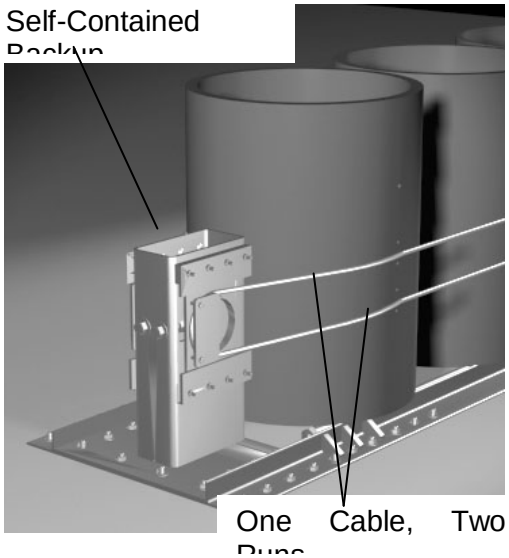


Figure 3

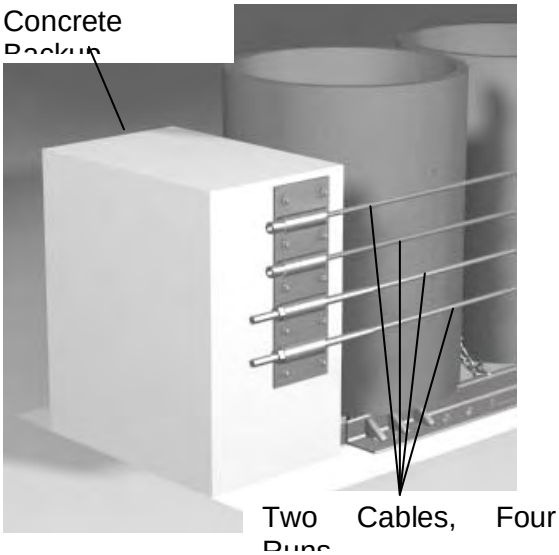


Figure 4

System Design

Self-Contained Backup

The REACT 350® II System with a Self-Contained Backup is intended to minimize installation time. This type of system arrives at the site fully assembled. The installation crew needs only to lift and place the system in front of the barrier, then drill and set the anchors. Refer to the “Assembly” section beginning on page 21, for a complete list of instructions.

Hazard Width

Generally, the REACT 350® II System with a Self-Contained Backup can shield obstacles to 203 mm [8”] wide in a gore application. This type of system can also shield wider hazards in non-gore and bidirectional traffic locations (See “Bidirectional Traffic” on page 13 and “Offsetting the System” on page 14).

When shielding median barriers (813 mm [32”] tall safety shape), a Self-Contained Backup may be used if the base or “toe” of the barrier is tapered to a total width of 330 mm [13”]. See Figure 5.

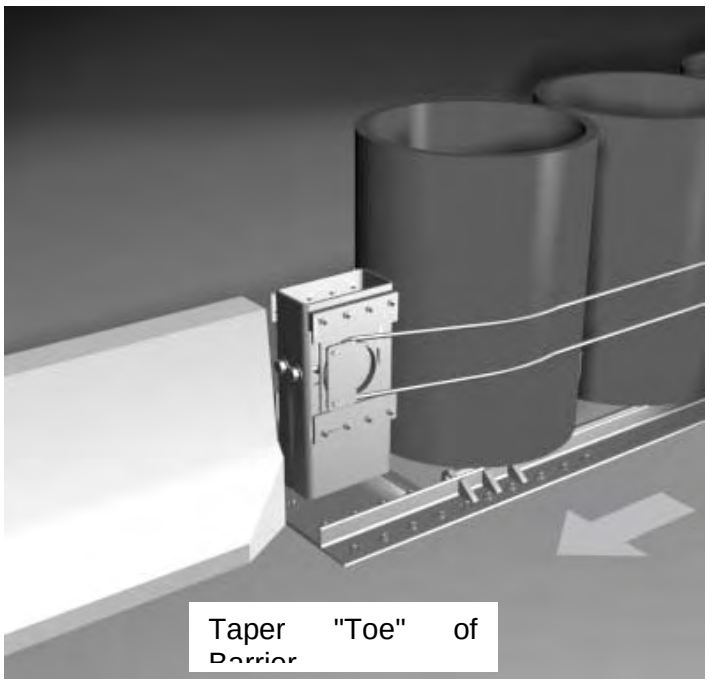


Figure 5

Tapered Barrier

Guardrail Attachment

Hardware is available to mount W-beam guardrail or a safety shaped barrier to the Self-Contained Backup of the REACT 350® II System. A folded Transition Plate and W-beam connector can mount to either or both sides of the backup assembly. See Figure 6. If bidirectional traffic is present, special post spacing, rail, and rubrail will be required for the guardrail.

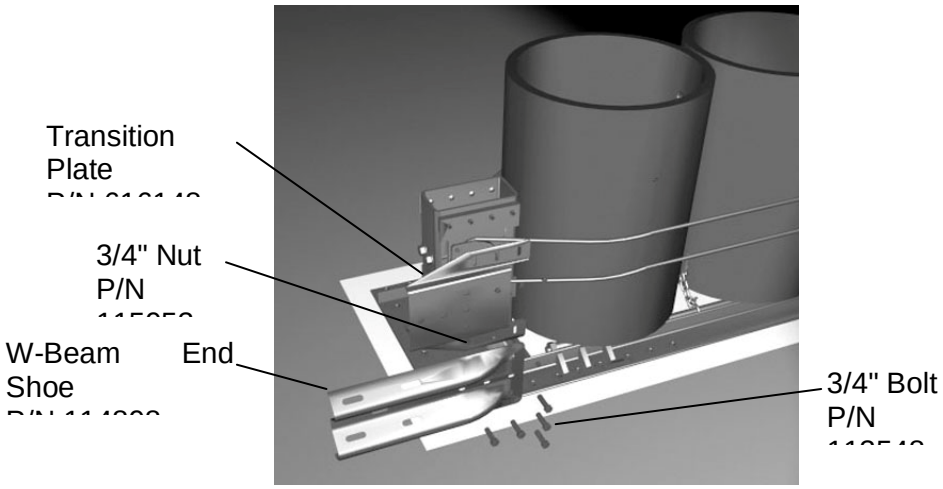


Figure 6

Guardrail Attachment Hardware

Bidirectional Traffic

If bidirectional traffic (vehicles traveling opposite directions on either side of the system) is present, special consideration needs to be taken when placing the system. It is important that the Self-Contained Backup does not become a hazard to the reverse direction traffic. If a system is placed in a location where traffic will be approaching from the rear of the system, transition hardware may be required.

Optionally, if space permits, the REACT 350® II System may be offset so that the backup structure is shielded by the hazard (See “Offsetting the System”, Page 14). Guardrail transition hardware may also be used.

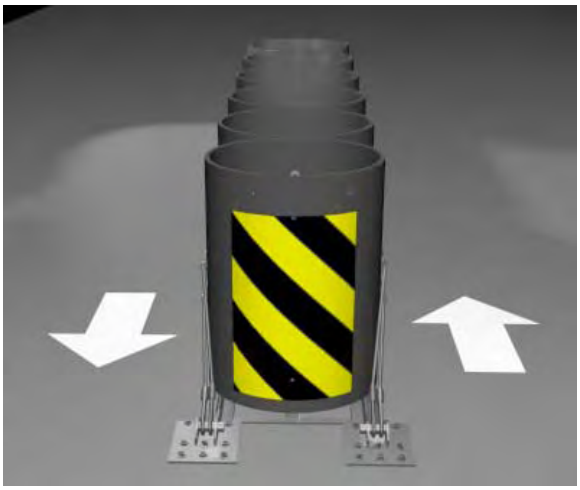


Figure 7

Bidirectional Traffic

Offsetting the System

If space permits, REACT 350® II System, with a Self-Contained Backup, may be offset from the center of the hazard. Offsetting may be necessary for two reasons:

1) To shield a hazard wider than 200 mm [8”]
2) If bidirectional traffic is present

When offsetting the system, align the vertical face of the Backup structure with the face of the barrier (See Figure 8). With this method, REACT 350® II System with Self-Contained Backup may shield hazards up to 610 mm [24”].

If a wider hazard is present or if bidirectional traffic is present, a Concrete Backup may be required. Contact Energy Absorption Systems Customer Service Department for further information.

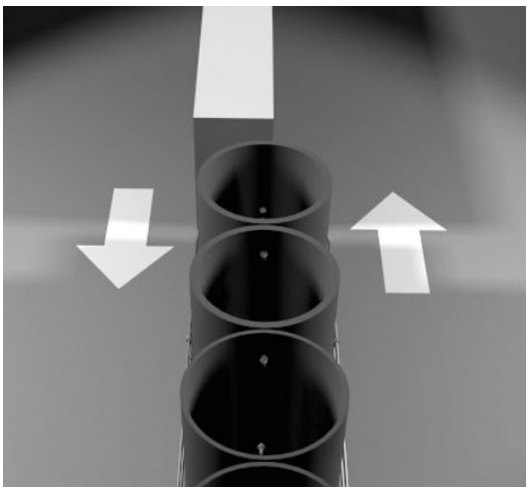


Figure 8

Offsetting the system

Concrete Backup

The REACT 350® II System is also intended to mount directly to a new or existing Concrete Backup. This type of system requires slightly more installation time, as the cables must be installed on site. Refer to the “Installation” section, “Systems with Concrete Backups”, page 26, for a complete list of instructions.

Existing Concrete Backups must be a minimum of 1 m [40”] high, 610 mm [24”] long, and 762 mm [30”] to 914 mm [36”] wide, with a 28-day strength of 28 MPa (4000 psi) and fully reinforced.

If your existing structure does not meet these minimums, special hardware and designs may be available for them. Contact Energy Absorption Systems Customer Service Department with your site information.

Hazard Width

The REACT 350® II System with a Concrete Backup may be specified to protect obstacles up to 914 mm [36”] wide. The backup must be 762 mm [30”] to 914 mm [36”] wide to use standard side anchor hardware.

Bidirectional Traffic

If bidirectional traffic (vehicles traveling opposite directions on either side of the system) is present, special consideration needs to be taken when placing the system.

It is important for the highway design engineer and the installer to ensure that the Concrete Backup itself does not become a hazard to the reverse direction traffic. If a system is placed in a location where traffic will be approaching from the rear of the system, the backup should not protrude beyond the hazard being shielded. Concrete tapering may be required.

Also, an additional standard Side Anchor Plate should be rotated 180 degrees and placed behind the first anchor plate (see Figure 9). In this case, the backup must be 762 mm [30”] long.

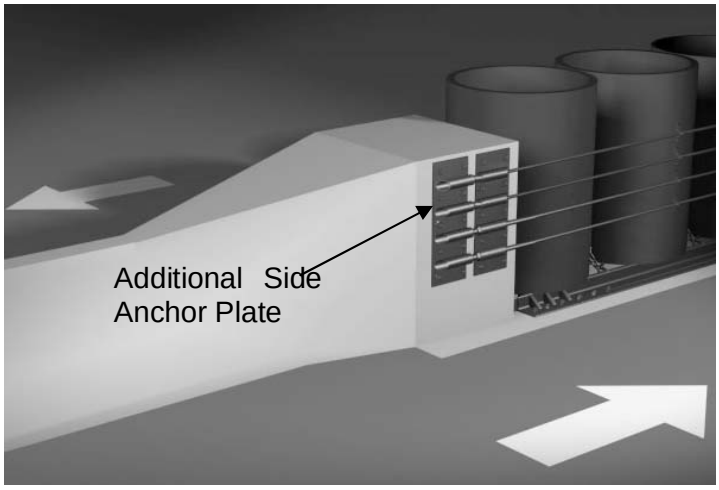


Figure 9

Standard Anchor Plate

Foundation/Anchoring

Permanent Installations

For permanent installations, the REACT 350® II System should be installed only on an existing or freshly placed and cured concrete base (28 MPa [4000 psi] minimum). Orientation of the concrete base and the attenuator must comply with the project plans or as otherwise determined by the resident project engineer or appropriate highway authority.

Recommended dimension and reinforcement specifications for new concrete pads can be found on the standard drawings.

Temporary Installations

For temporary installations in construction zones, REACT 350® II Systems may be installed on asphalt. Only systems with a Self-Contained Backup may be installed on asphalt. Provide a minimum of 76 mm [3”] layer of asphalt over a minimum of 76 mm [3”] layer of Portland Cement concrete, 152 mm [6”] layer of asphalt over 152 mm [6”] layer of subbase, or 203 mm [8”] layer of asphalt with no subbase. 460 mm [18”] threaded rods, installed with the two-part MP-3® grout must be used for these foundations.

Foundation Specifications for Permanent Installations

For an independent, soil-supported system, include a below-grade anchor block as part of the pad detail. See Figure 10a. The large block will keep the pad from sliding during an impact. If the system is to be placed against and supported by a rigid barrier or other structure, the below-grade anchor block may be omitted. See Figure 10b. Additional details can be found on the standard drawings.

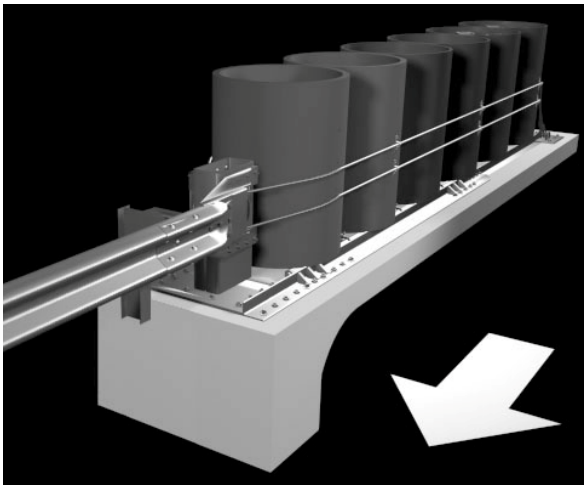


Figure 10a

Below-Grade Anchor Block

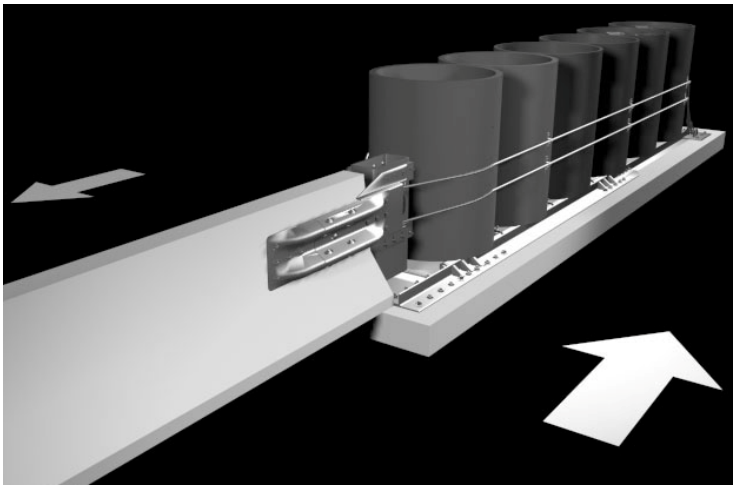


Figure 10b

Anchor Block Not Needed

The REACT 350® II System may be installed on any of the following foundations using the specified anchorage:

Foundation A: Concrete Pad or Roadway
Foundation: 150 mm [6"] minimum depth Portland Cement Concrete (P.C.C.)
Anchorage: MP-3® with 180 mm [7"] studs 140 mm [5.5"] embedment

Foundation B: Asphalt over P.C.C.
Foundation: Minimum anchor embedment depth is 140 mm [5.5"]
Anchorage: Length of anchor required is 180 mm [7"] stud + asphalt thickness.

Foundation C: Asphalt over Subbase
Foundation: 150 mm [6"] minimum (A.C.) over 150 mm [6"] minimum Compacted Subbase (C.S.)
Anchorage: MP-3 with 460 mm [18"] studs 420 mm [16.5"] embedment

Foundation D: Asphalt Only
Foundation: 200 mm [8"] minimum (A.C.)
Anchorage: MP-3 with 460 mm [18"] studs - 420 mm [16.5"] embedment

Foundation Specifications
for Foundations A, B, C and D mentioned above:

A. C. (Asphalt Concrete)
AR-4000 A. C. (per ASTM D3381 '83) .75" Maximum, Medium (Type A or B) aggregate

Sieve Size	Operating Range (%)Passing
1"	100
3/4"	95-100
3/8"	65-80
No. 4	49-54
No. 8	36-40
No. 30	18-21
No. 200	3-8

Walk-up inspections are recommended at least once every six months for installations on asphalt.

P.C.C. (Portland Cement Concrete)
Stone aggregate concrete mix
4000 psi minimum compressive strength
(Sampling per ASTM C31-84 or ASTM C42-84a, testing per ASTM C39-84)

C.S. (Compacted Subbase)

150 mm [6"] minimum depth 95% compaction

Class 2 aggregate

Sieve Size	Moving Average % Passing
3"	100
2 1/2"	90-100
No. 4	40-90
No. 200	0-25

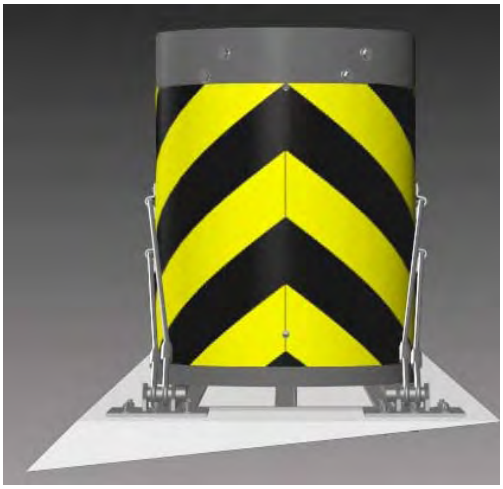
Foundation/Anchoring Assistance

Contact Energy Absorption Systems Customer Service Department if you would like input as to your specific application. Proper model selection is essential to the performance of the REACT 350® II System. You will need to answer the following questions:

1. Are curbs, islands, or elevated objects (delineators or signs) present at the site? What height and width are they? All curbs and elevated objects should be removed. Curbs should be removed from behind the backup to approximately 15 m [50'] in front of the REACT 350® II System. Any curbs that must remain should be 102 mm [4"] maximum and be mountable. Signs should not interfere with the system's ability to collapse. Generally, a vehicle should not interact with two appurtenances at the same time. Allow adequate spacing.
2. If the installation site is a gore area (place where two roads diverge), what is the angle of divergence?
3. What is the general geometry of the site? Include the roadway for 150 m [500'] in front of the hazard, so traffic patterns can be visualized.
4. Is there an existing guardrail or median barrier at the site?
5. What is the width of the hazard to be protected?
6. Will there be traffic approaching from the rear of the system? Is the system in a two-way traffic situation with traffic going in opposite directions on either side of the system? Or, is the system on the side of the road where cross over traffic is a concern? If so, a transition from the hazard to the rear of the system may be necessary to prevent a vehicle from interacting with the rear of the system. See "Bidirectional Traffic", pages 13 and 15.
7. Are there any other unique features at the site that may affect the positioning or performance of the REACT 350® II System? (See "Other Factors That May Affect Your Specification , page 19)

Other Factors That May Affect Your Specification:

1. The existence of drain inlets or buried culvert pipe.
2. Junction boxes or other appurtenances located near the hazard.
3. Insufficient space for the length of system preferred.
4. The location and movement of expansion joints.
5. Breaking cross-slopes under or near the proposed installation or severe cross-slope under the system. Provide leveling to 8% maximum.



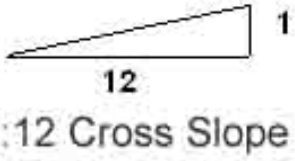


Figure 11

1:12 Cross-Slope

Warning: The existence of any cross slopes in excess of 8% or curbs may create an untested effect on the impacting vehicle.

Joints

The REACT 350® II System may span longitudinal joints; however custom hardware may be required.

The REACT 350® II System may also span a transverse joint if the joint falls under the front section of Base Track. In this case, the front section of Base Track should be cut after installation so as not to span the joint with structural steel. Never cut the rear section of Base Track. The joint movement must be limited to 38 mm [1.5”].

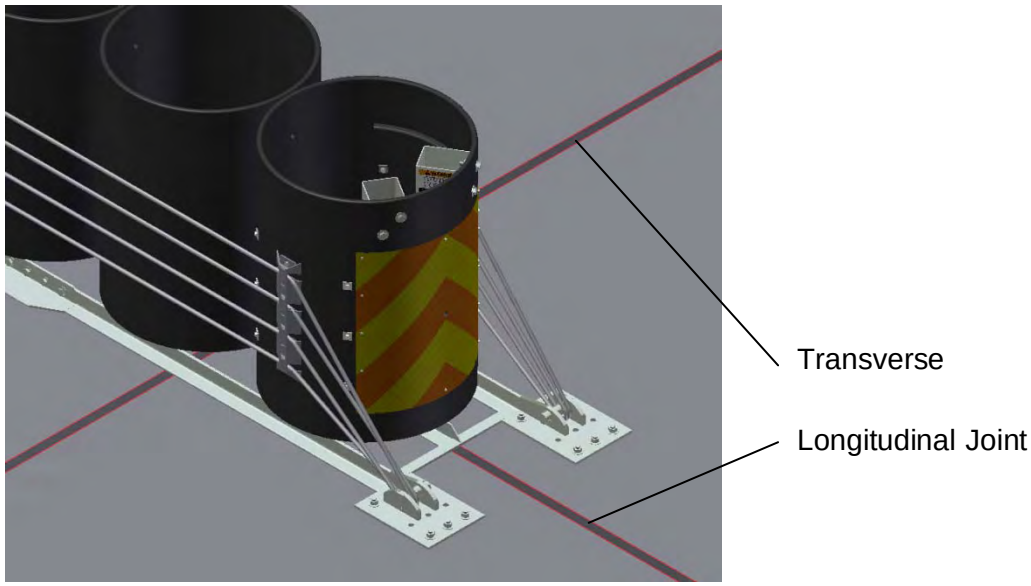


Figure 12

Longitudinal or Transverse Joints

Assembly

Required Tools

Documentation

- Manufacturer's Instructional Manual
- Manufacturer's Drawing Package

Cutting equipment

- Grinder/Hacksaw or Torch
- Rebar Cutting Bit
- 22 mm (7/8") x 178 mm (7") Concrete Drill Bit (*Two Fluted)
- 19 mm (3/4") x 178 mm (7") Concrete Drill Bit (*Two Fluted)

* Energy Absorption Systems recommends using two fluted drills to achieve optimum tensile strength when installing the MP-3® anchoring system.

Hammers

- Roto Hammer
- Sledgehammer

Wrenches

- Heavy Duty Impact Wrench
- 1/4", 5/16", 3/8", 3/4", 1 7/8" sockets
- 3/4", 1 1/16", 1 1/8", 1 1/4" Deep Hex-head Sockets
- Ratchet and Extensions for Above Sockets
- Standard Adjustable Wrench
- 1 1/16", 1 1/8", 1 1/4", 9/16", 5/8" Combination Wrenches
- Large Pipe Wrench

Screwdrivers

- Screw Gun or Standard Drill with Adapter Chuck for Small Screws/Bolts
- Flat Screwdriver
- Phillips Screwdriver

Personal protective equipment

- Safety Glasses
- Gloves

Miscellaneous

- Traffic Control Equipment

- Lifting and Moving Equipment (A lifting device is preferred although a forklift can be used.) Minimum 2722 kg [6,000 lb.] capacity required. Do not lift over head.
- Compressor (100 psi) and Generator (5 KW)
- Long Pry Bar
- Drift Pin
- Tape Measure 7.5 m (25')
- Chalk Line
- Nylon Bottle Brush for Cleaning Drilled Holes
- Rags, Water, and Solvent for Touch-up

Note: The above list of tools is a general recommendation. Depending on specific site conditions and the complexity of the installation specified by the appropriate highway authority, more or less tools may be required. The decision as to what tools are needed to perform the job, are entirely within the discretion of the specifying highway authority, and the authority's selected contractor performing the assembly of the system at the authority's specified installation site.

Inspect Shipment

Before assembling the REACT 350® II System at a specified location, check the received parts against the shipping list supplied with the System. Make sure all parts have been received. The System is shipped assembled. All installation hardware can be found in the last Cylinder. The Pullout Assembly should be stored for post impact use.

Assembly Procedures

Note: The drawing package provided with the REACT 350® II System must be used with these instructions for proper assembly and should take precedence over these general instructions.

1) Deploy Traffic Control

A traffic control plan appropriate to the complexity of the project should be prepared and understood by all parties before the REACT 350® II System is installed.

Deploy the appropriate work zone safety devices prior to beginning the installation and keep them present through all phases of the installation.

Warning: The correct safety equipment and traffic management system approved by the requisite highway authority must be used as required for any installation using the REACT 350® II System.

2) Determining the Base Point & Centerline

Typically the base point of the REACT 350® II System will be the midpoint of the hazard at its front face. This may change if bidirectional traffic or expansion joints are present. See “Offsetting the System” on page 14.

Extend a chalk line from the base point, perpendicular to the hazard face, or as determined by project engineer, to a distance greater than the maximum length of the REACT 350® II System (refer to the drawings provided). This chalk line will become the centerline for the REACT 350® II System. See Figure 13.

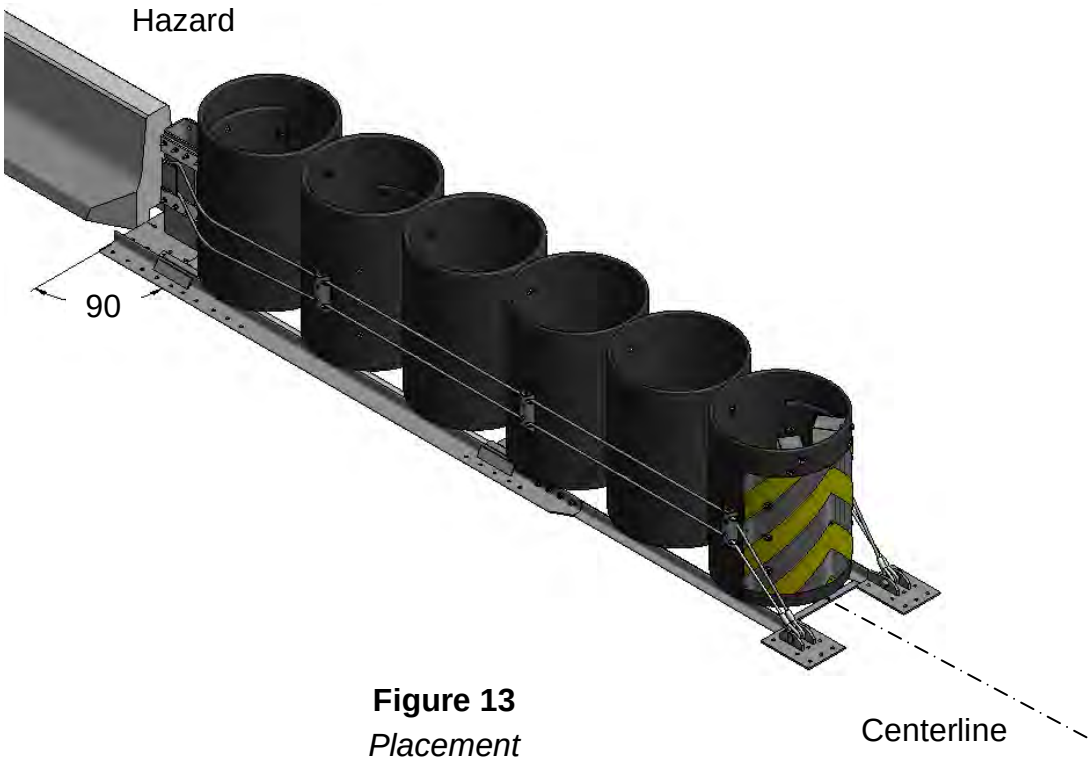


Figure 13
Placement

3) Lifting/Placing the System

Mark the centerline on the front and rear of the Base Track. Use the Lifting Eyes located on the middle rail of the Rear Base Track (look down into the cylinders) to lift the REACT 350® II System into place (see Figure 14).

Use fixed-length slings with a 2722 kg [6,000 lb.] minimum capacity. Fixed slings will prevent the System from tipping. Do not lift over head. Measure from the centerline to ensure that the REACT 350® II System is centered and at the proper angle. The steel Base Track will rest flush against the hazard face for installations that do not require transitions.

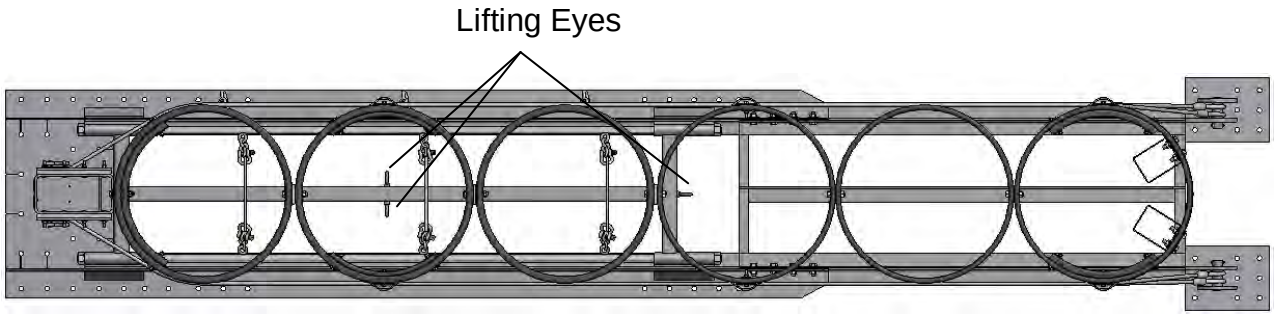


Figure 14
Lifting Eye Location

Warning: Ensure the hoist device is properly rated to lift the REACT 350® II System.

For Self-Contained Backup installations requiring transition hardware to concrete wall or safety shape barrier (P/N 616120), the steel Base Track should be 127 mm [5”] forward of the hazard face (see Figure 15).

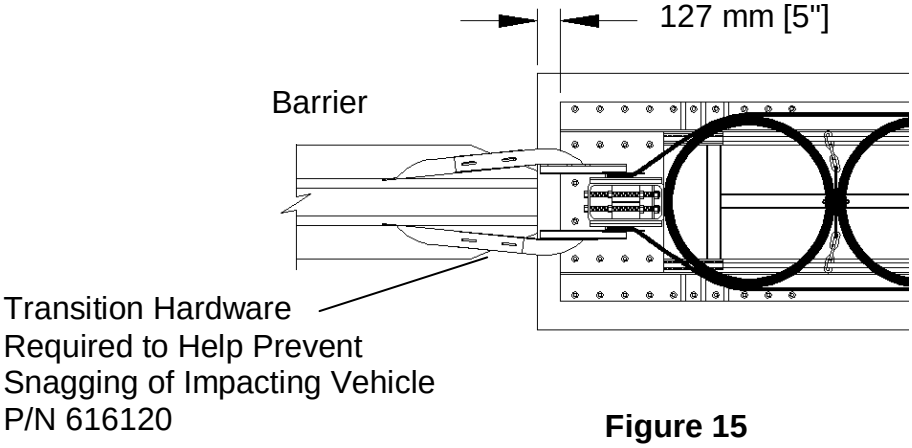


Figure 15
Transition Hardware

Systems with Self-Contained Backups

Note: For Systems with Concrete Backups, please skip to page 26.

4) Drill and Set Anchors

Use the holes in the Base Track as a template to locate and drill holes, 22 mm [7/8”] diameter x 140 mm [5 1/2”] deep into the concrete pad or roadway surface (see Figure 16). All holes in Base Plate must be used to anchor the REACT 350® II System to the foundation. Use vertical MP-3® kits to install 3/4” diameter x 7 1/2”

long studs using instructions included with kit. Refer to “MP-3® Polyester Anchoring System”, Page 35, for step-by-step instructions.

After grout has hardened, use 3/4” flat washers and nuts provided with kit to anchor base track to foundation.

Warning: All holes in Base Plate must be used to anchor the REACT 350® II System to the foundation.

Warning: Once the grout has hardened (refer to Table B on page 37 for hardening times), torque nuts to 165 Nm [120 ft-lbs].

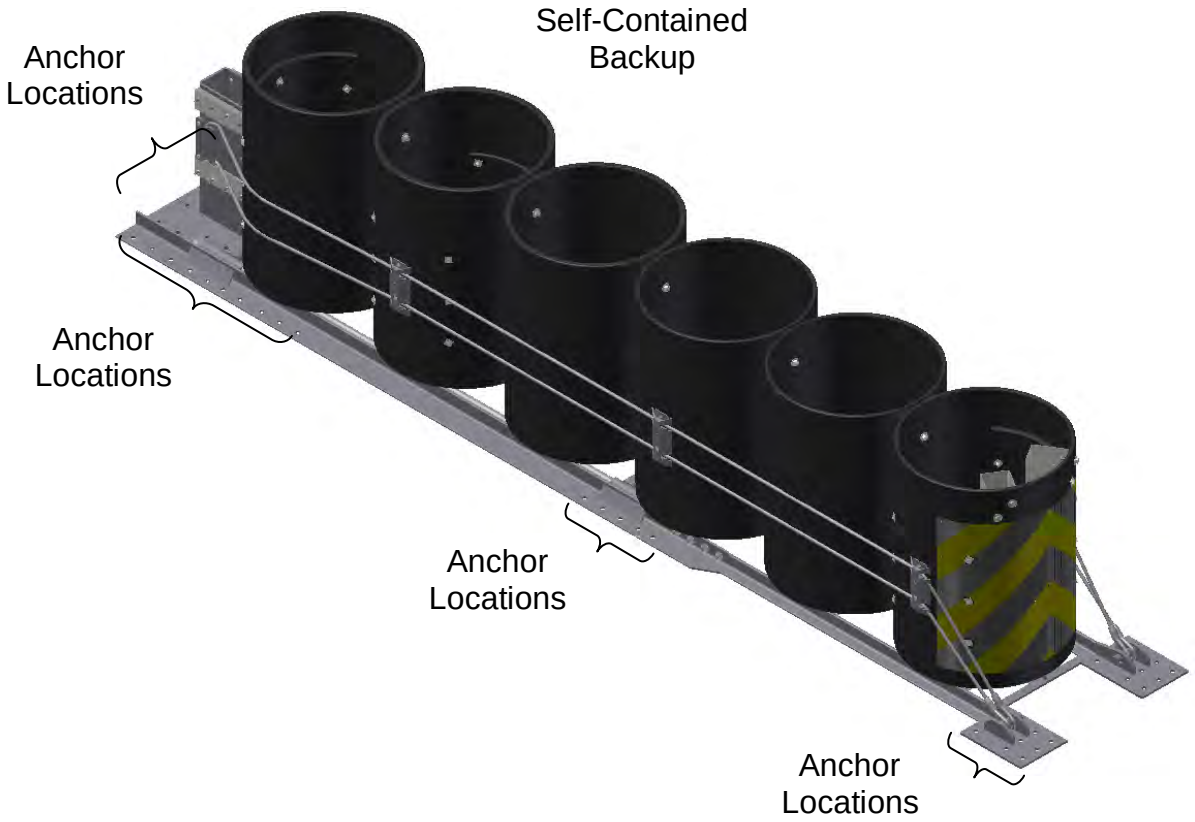


Figure 16
Anchoring the System - Self-Contained Backup

5) Tension Restraining Cables

Use the two adjusting nuts at the rear of the Backup to tension the cables. See Figure 17. When properly tensioned, the cables should not deflect more than 75 mm [3"] with 45 kg [100 lb.] downward pressure.

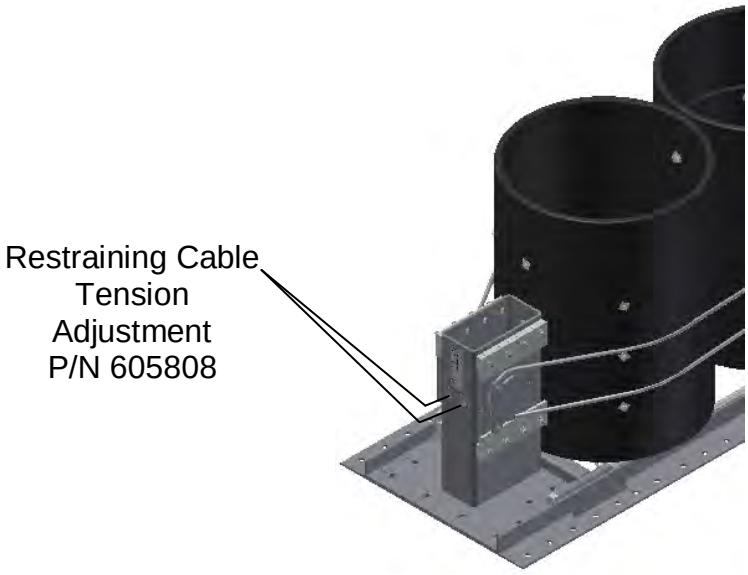


Figure 17

Tension Adjustment (Self-Contained Backup)

Systems with Concrete Backups

4) Rear Cylinder Attachment

Use the holes in the Rear Cylinder as a template to locate and drill two holes, 22 mm [7/8"] diameter x 140 mm [5 1/2"] deep into the Concrete Backup (see Figure 15). Use horizontal MP-3® kit to install 3/4" diameter x 7 1/2" long studs using instructions included with kit. Refer to "MP-3 Polyester Anchoring System, Page 35, for step-by-step instructions. After grout has hardened, use 3/4" nuts and flat washers included with MP-3® kits to attach Cylinder Assembly to Backup as shown in Figure 18.

5) Drill and Set Anchors

Use the holes in the Base Track as a template to locate and drill holes, 22 mm [7/8"] diameter x 140 mm [5 1/2"] deep into the concrete pad or roadway surface (see Figure 15). Use Vertical MP-3® kits to install 3/4" diameter x 7 1/2" long studs using instructions included with kit. Refer to "MP-3 Polyester Anchoring System, Page 35, for step-by-step instructions. After grout has hardened, use 3/4" flat washers and nuts provided with kit to anchor base track to foundation.

Warning: All holes in Base Plate must be used to anchor the REACT 350® II System to the foundation.

Warning: Once the grout has hardened (refer to Table B on page 37 for hardening times), torque nuts to 165 Nm [120 ft-lbs].

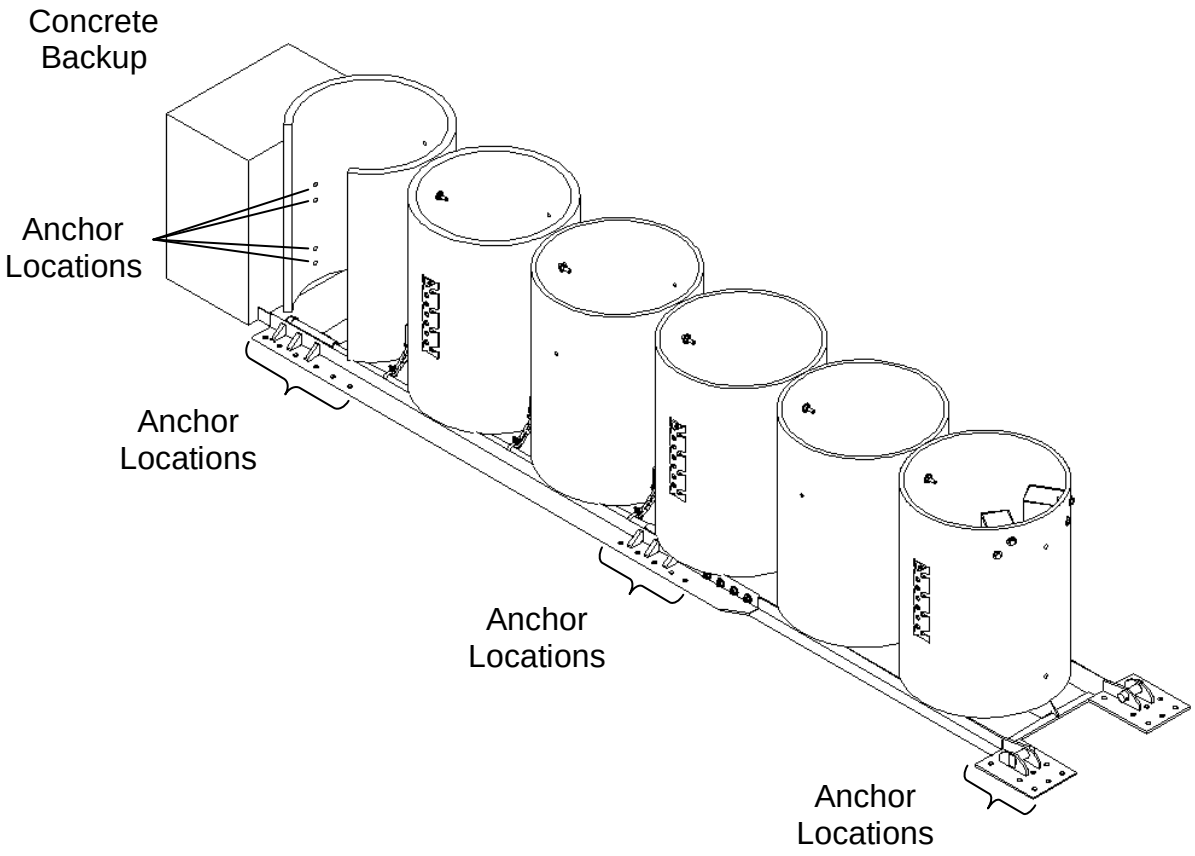


Figure 18

Anchoring the System - Concrete Backup

6) Drill and Set Side Anchor Plate Anchors

Warning: For REACT 350® II System with a Concrete Backup, Side Cable Anchor Plates must be installed.

Warning: The vertical placement of the Side Anchor Plates is critical to the performance of the REACT 350® II System. If an existing backup is not tall enough to fulfill these requirements, special brackets are available. Consult Energy Absorption Systems Customer Service for further information.

When correctly assembled, the top of the Side Cable Anchor Plates should be 991 mm (39”) from the road surface. The front edge of the Side Cable Anchor Plates should be 51 mm - 102 mm [2” - 4”] from the front face of the backup to avoid reinforcing steel. The tapered side of the Side Cable Anchor Plates should face the front of the System (see Figure 19). Use the holes in the Side Cable Anchor Plates as templates to match drill ten holes per side of backup, 22 mm [7/8”] diameter x 140 mm [51/2”] deep into the Concrete Backup. Use horizontal MP-3® kit to install twenty 3/4” diameter x 6 1/2” long studs using instructions included with kit. After grout has hardened, use 3/4” flat washers and nuts provided with kit to attach side cable anchor plates (one on each side) to Concrete Backup as shown in Figure 19.

Warning: Once the grout has hardened (refer to Table B on page 37 for hardening times), torque nuts to 165 Nm [120 ft-lbs -].

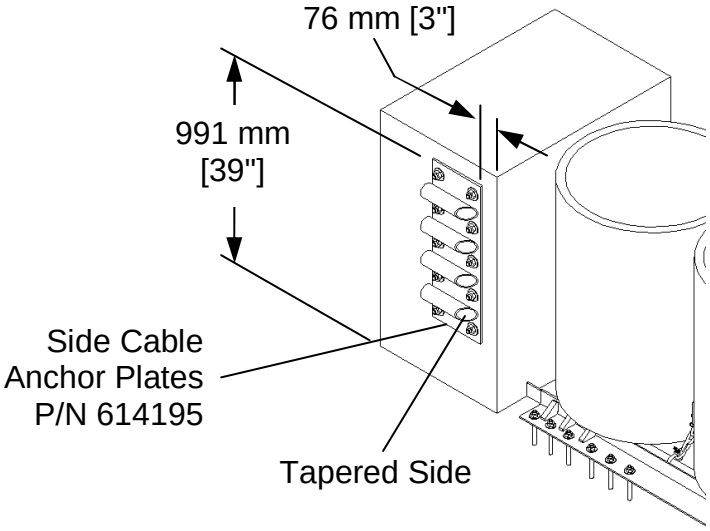


Figure 19

Side Cable Anchor Plates

7) Install Restraining Cables

Warning: Four Restraining Cables must be installed; two on each side of backup.

A. Slide the threaded end of a Restraining Cable through the third guide down and install flat washer and nut as shown in Figure 20. Tighten the nut so it is flush with the end of the threaded end of cable.

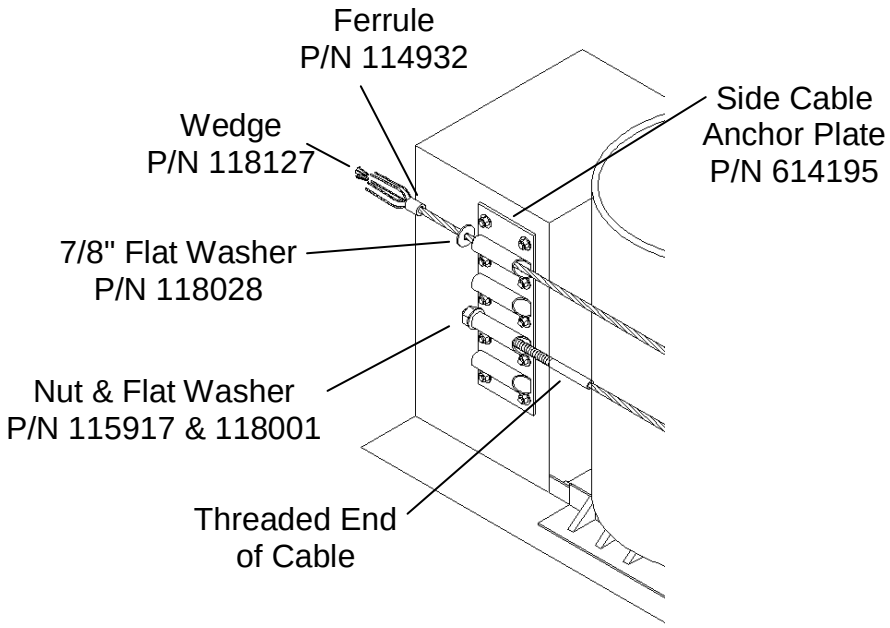


Figure 20
Routing First Cable

B. Route the Restraining Cable through the Cable Guides on the sides of the Cylinders, around the Restraining Cable Pin as shown in Figure 21, back through the Top Cable Guides on the Cylinders and through the Top Cable Guide of the Side Plate. See Figure 22.

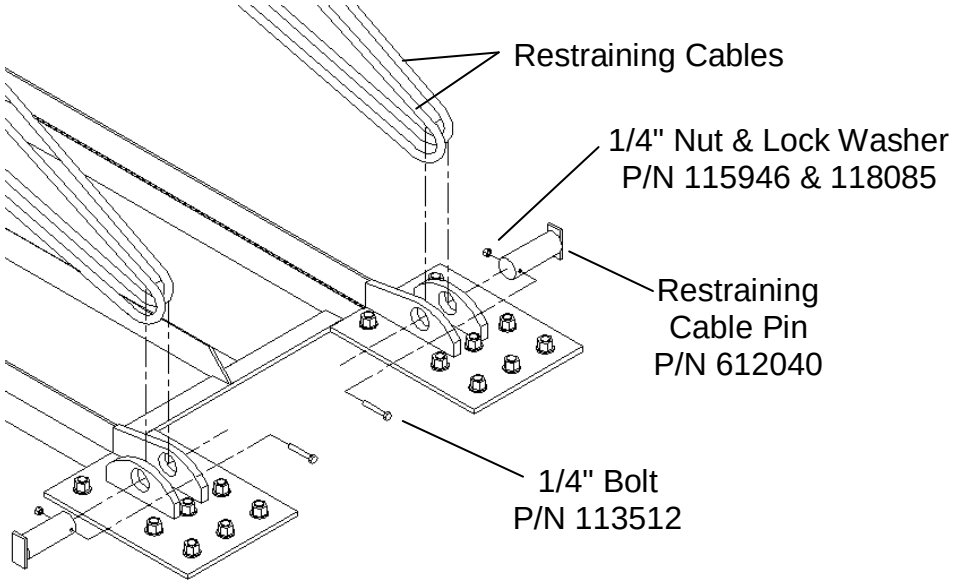


Figure 21
Front of System Cable Attachment (Concrete Backup)

3. Pull on the cut end of the cable removing all possible slack. Slide the 7/8” x 3” flat washer and the ferrule (in that order) over the end of the non-threaded end of the Restraining Cable. Mark the cable 2” back from the ferrule. Leaving the ferrule and washer in place, cut the cable at the mark with a grinder or hack saw. Do not use a torch to cut the cable. Un-braid end of cable and insert middle strand between the two halves of the wedge. Carefully wrap the remaining six strands into the two halves of the wedge. Carefully wrap the remaining six strands into the slots around the wedge then push into ferrule to tighten (see Figure 22 and Detail A). Use a drift pin and sledge hammer to seat the ferrule into the cable receptacles.

Repeat these steps for remaining three Restraining Cables ensuring that the threaded ends of the Restraining Cables are installed through the lower two guides as shown in Figure 22.

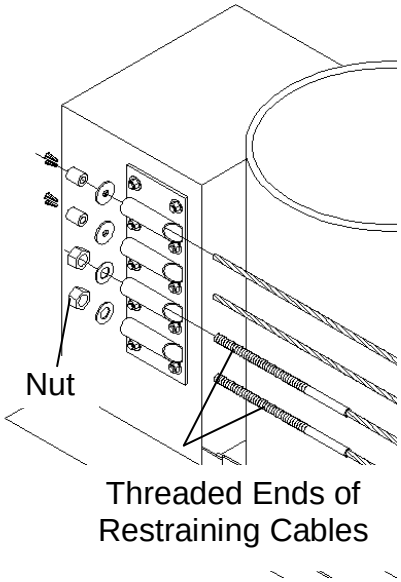


Figure 22
Rear Cable Attachment
Concrete Backup

Detail A
Cable Ferrule

8) Tension Restraining Cables

Use the nuts on the threaded end of the cables to tension the cables. See Figure 22.

When properly tensioned, the cables should not deflect more than 75 mm [3”] with 45 kg [100 lb.] downward pressure.

Install Nose Cover

1. Ensure that the Nose Cover suits the site, see Figure 23 - Nose Cover Selection below. Refer to local standards and “Manual on Uniform Traffic Control Devices” (MUTCD) for nose.

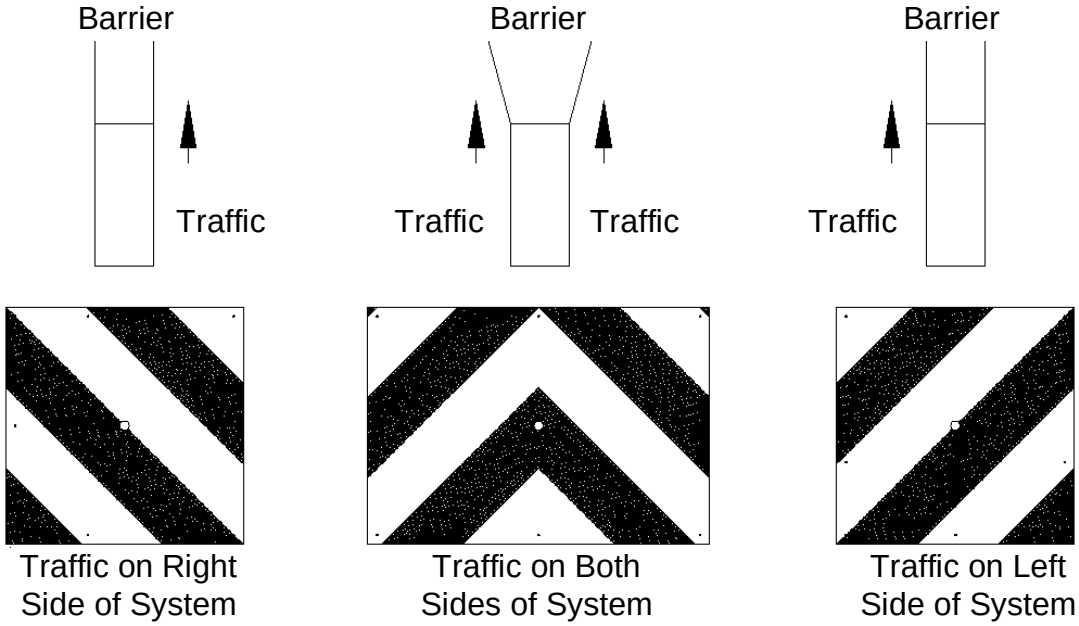


Figure 23

Nose Cover Selection

2. Align 1” diameter hole in Nose Cover with 1” diameter hole in cylinder, see Figure 24.
3. Screw 1/4" self-drilling screw into Cylinder punching through reflective tape and into the existing holes in Nose Cover until head of fastener is flush (10 places), see Detail B.

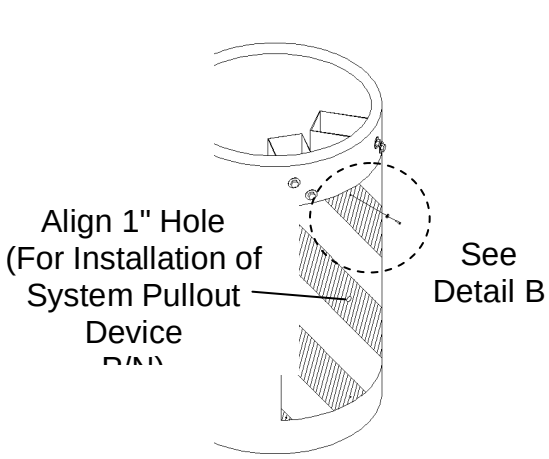
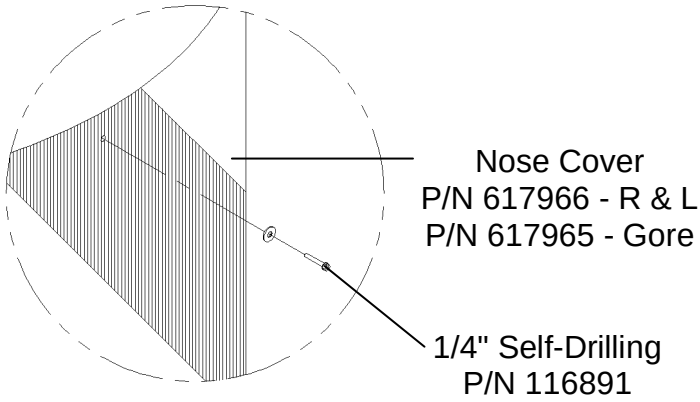


Figure 24

Nose Cover Installation



Detail B

Install Side Mount Reflectors

Refer to local standards and “Manual on Uniform Traffic Control Devices” (MUTCD) for reflectors.

For Side Mount Reflectors, attach to traffic side(s) of the System with the white side facing traffic by screwing #8 self-tapping screws through the reflector and into the Cylinder until head of fastener is flush (2 places per reflector), see Figure 25.

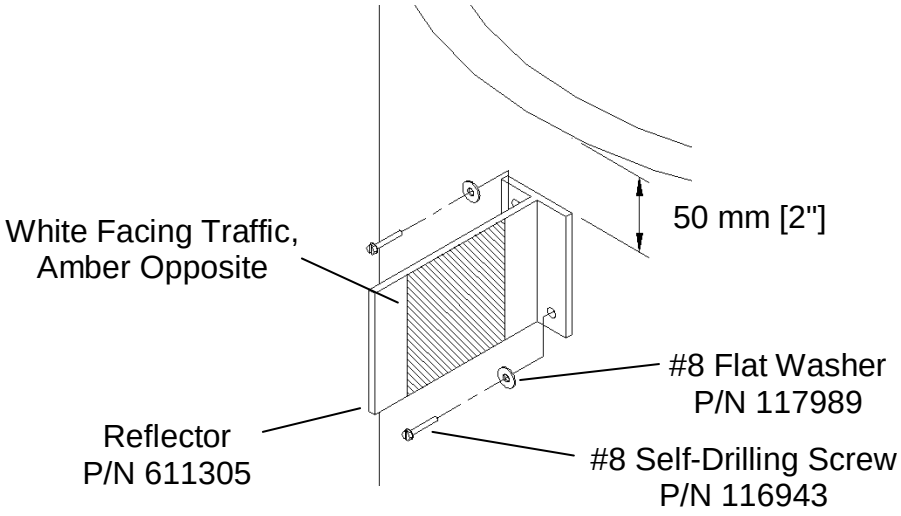


Figure 25

Side Mounted Reflector

Optional Debris Covers

To attach Optional Debris Covers, center a cover on Cylinder 1. Note the orientation of the grommets. The two grommets closest together should be located in the front or rear of the Cylinder. See figure 26.

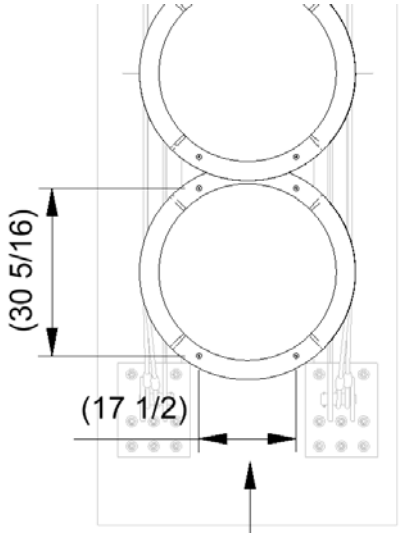


Figure 26

Next install the four #10 flat head screws and fender washers ensuring the screw is positioned in the middle of the Cylinder wall, see Figure 27.

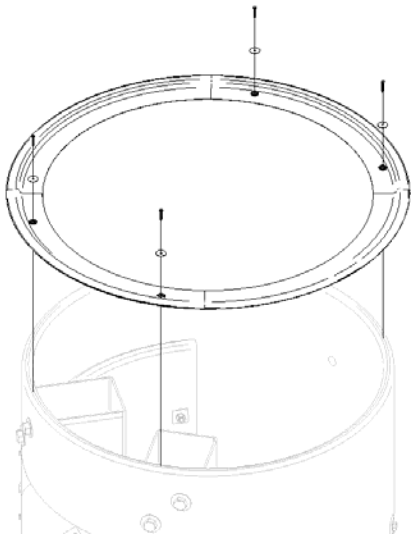


Figure 27

Continue to install the remaining covers as described above. Note the covers will overlap, however the overlap direction is not critical to system performance.

MP-3® Polyester Anchoring System

The MP-3® Polyester Anchoring System is a quick and easy way to securely anchor crash cushions and other common highway devices. MP-3® features high pullout strength, superior vibration resistance, and exceptional durability.

Each MP-3® kit contains a can of MP-3® resin, hardener, cold weather promoter, studs, washers, nuts and a complete safety sheet. The cold weather promoter shortens hardening time by as much as seven hours. Both vertical and horizontal installations are possible using the MP-3® System.

Warning: Read MP-3® Instructions before starting.

Warning: Do not allow the MP-3® Resin or Hardener to contact skin or eyes. See material safety data sheet supplied with the MP-3® kit for first aid procedures. Use only in well-ventilated area. Do not use near open flame.

Warning: Wear safety goggles and gloves during installation.

Vertical Installations

1) Prepare the concrete pad

The anchor bolts (studs) that anchor the REACT 350® II System to the concrete pad must be those shipped in the kit or of high strength steel (830 MPa [120,000 psi] minimum tensile strength or equal). These studs must be set in minimum 28 MPa [4000 psi] concrete. Allow the concrete to cure a minimum of seven days before installing MP-3®.

2) Drill holes

Note: Energy Absorption Systems recommends using two fluted drills to achieve optimum tensile strength when installing the MP-3® anchoring system. That decision must be confirmed with the highway authority authorizing the installation and confirming that it is installed to their specification.

Use the part that is to be anchored as a drilling template. Drill the holes 3 mm [1/8”] larger than the stud diameter to the recommended depth, using a rotary percussive drill. Full strength will not be achieved if a diamond drill is used. Refer to the MP-3® installation instructions provided with your kit. Check to be sure all the holes are drilled to the proper depth and aligned with the part to be anchored. Refer to Table A.

Table A: MP-3® Polyester Anchoring Information			
3/4"Ø Stud Length	Concrete Bit Size	Minimum Depth	Recommended Torque
6 1/2"	22 mm [7/8"]	125 mm [5"]	165 Nm [120 ft-lbs]
7" 7 1/2" 8 1/2"	22 mm [7/8"]	140 mm [5 1/2"]	165 Nm [120 ft-lbs]
18"	22 mm [7/8"]	420 mm [16 1/2"]	<15 Nm [<10 ft-lbs]

3) Clean the holes

Blow the concrete dust from the hole, using oil-free compressed air. Thoroughly brush it with a stiff-bristled brush, and then blow it out again. If the hole is wet, completely flush it with water while brushing, then blow it clean, using oil-free compressed air.

4) Mix the resin and hardener

Wearing gloves and safety goggles, remove the lids from the MP-3® Part A-Resin and Part B-Hardener containers. Pour Part B into Part A, then mix vigorously for 30 seconds to form MP-3® grout (an anchor stud may serve as a stirring rod).

5) Add cold weather promoter (in cold weather)

For faster hardening in cold weather, Promoter may be used. Add the entire contents of the partially filled Promoter container to the MP-3® grout; then mix for an additional 30 seconds. Use immediately because the MP-3® grout will thicken quickly. Refer to Table B, Page 38, for hardening times.

Warning: Do not use MP-3® Promoter when the temperature is above 15 degrees Celsius (60 degrees Fahrenheit). Grout will harden too quickly.

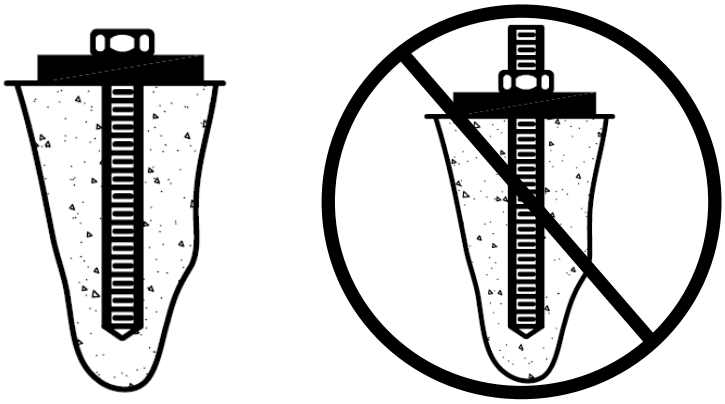
6) Pour grout into holes

Crimp the mouth of the can to form a spout, and pour the MP-3® grout mixture down into the hole through the part. Fill the hole 1/3 to 1/2 full.

Warning: Do not overfill or underfill the hole. If the hole is overfilled, there will not be enough grout to use all of the anchor studs per kit. If hole is underfilled the grout may not develop the required pull out strength.

7) Add the washers and nuts

Place a flat washer onto the stud; then thread a nut on until **1 or 2 threads of the NUT** are left exposed, see Figure 28.



Correct Incorrect

Figure 28
MP-3® Vertical Installation

8) Insert Studs in holes and wait for grout to harden

Push the stud down through the part to be anchored and into the hole. Give the stud several twists in the MP-3 to wet the threads.

Warning: Do not disturb or load the stud until the MP-3® material has hardened (see Table B).

Table B: Approximate Hardening Times

Temperature		No Promoter	With Promoter
(C)	(F)	(hrs)	
>26	>80	1/2	N/R*
22-26	70-79	1	N/R*
16-21	60-69	2	N/R*
10-15	50-59	4	3/4
4-9	40-49	8	1
-1 -3	30-39	N/R*	1 1/2
<-1	<30	N/R*	N/R*

9) Torque the nuts

Once the grout has hardened, torque the nut to the recommended values. (See Table A, Page 36)

Horizontal Installations

The Horizontal MP-3® kit is the same as the vertical kit except that a cartridge for a standard caulking gun is supplied in the horizontal kits and the resin for the horizontal kits is a Thixotropic (TX) Resin. The TX-Resin is a gelled resin designed to keep the grout in place in horizontal holes during installation.

When using the Horizontal MP-3® kits follow the vertical instructions with the following exceptions:

1) Thread dispensing tip onto dispenser

Prior to mixing the grout, carefully thread the dispensing tip onto the dispenser.

2) Pour mixed grout into dispenser

Once the grout is mixed crimp the mouth of the can to form a spout, and pour the MP-3® grout into the open end of the dispenser (use mixing stud to scrape out the portion remaining in the can). You may use the box to hold the dispenser upright. Close the box lid and poke the dispenser tip into the top of it. Seal the dispenser with the plunger provided.

3) Place dispenser in caulking gun and dispense grout

Cut off the small end of the dispenser tip. Place the dispenser into a caulking gun and dispense until MP-3® TX grout reaches the tip of the dispenser, then release pressure. Push the dispenser tip through the part to the bottom of the hole and dispense while slowly withdrawing the tip. Fill the hole 1/3 to 1/2 full.

Warning: Do not overfill or under fill the hole. If the hole is overfilled, there will not be enough grout to use all of the anchor studs per kit. If hole is under filled the grout may not develop the required pull out strength.

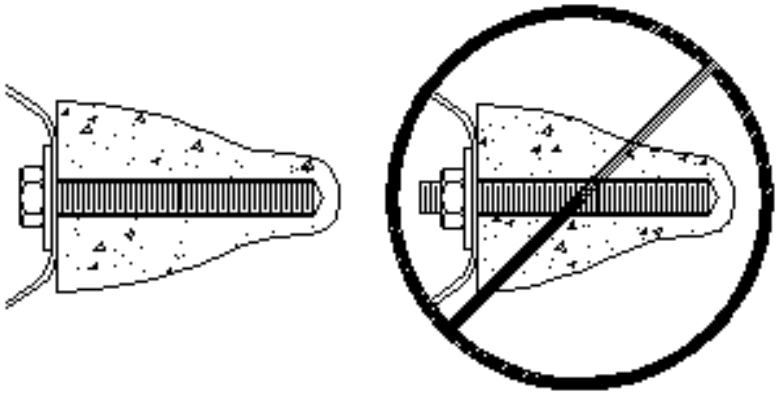
4) Add the washers and nuts

Put washer and nut on stud leaving nut flush with end of stud. See Figure 29.

5) Insert Studs into holes

Push stud through part to be anchored and into hole. Give the stud several twists in the MP-3® grout to wet the studs.

Note: In Horizontal applications the stud should be flush with the top of the nut. Torque to 165 Nm [120 ft-lbs.] after cured.



Correct Incorrect

Figure 29
MP-3® Horizontal Installation

MP-3 Installation Cautions

1) Shelf life

If the shelf life of the MP-3® has expired (see MP-3® kit for expiration information), mix a small amount of MP-3® in the proportions of one part A to two parts B by volume. If the material does not set according to the instructions, contact Energy Absorption Systems for guidance.

Warning: Do not use the MP-3 if: the material fails to set up, Part A-Resin has gelled (for vertical applications), or TX-Resin is NOT gelled (for horizontal applications).

2) Steel rebar

If steel rebar is encountered while drilling an MP-3® anchor bolt hole, apply one of the following solutions:

A. Using a diamond core drill or rebar drilling tool, drill through the rebar only, then switch back to the concrete bit and drill into the underlying concrete until the proper hole depth is reached.

Warning: Do not drill through rebar without first obtaining permission to do so from the local project engineer.

B. Drill a new hole down at an angle past the rebar to the proper depth. Anchor the stud by completely filling both holes with MP-3®.

Maintenance and Repair

The REACT 350® II System, through crash testing, has been shown to be a potentially reusable crash cushion. After those impacts observed within NCHRP 350 criteria it has been observed that, potentially, the bulk of the system can be reused.

Warning: After an impact, always follow the "Post-Impact Instructions", page 42.

Estimated Time for Maintenance

An experienced two person crew with the proper tools and spare parts should be able to complete the work in one to three hours depending on the damage done to the System.

Life Expectancy

Environment

It is anticipated, given typical environmental conditions that the plastic cylinders will survive in a highway environment for a period ranging from 5 to 15 years from the date of installation unless impact damage renders them otherwise.

Impacts

Potential life expectancy of the system is also dependent on the impacts. This includes:

1. The number of impacts to the system
2. The severity of the impacts
3. The temperature at the time of the impacts

The REACT 350® II System must be inspected after each impact. Depending on the impact, components may get damaged and need replacement. A cylinder requires replacement when the minor axis of the cylinder stays permanently at 460 mm [18"] or less, (See Figure 30) or the system does not reach 90% of the original length.

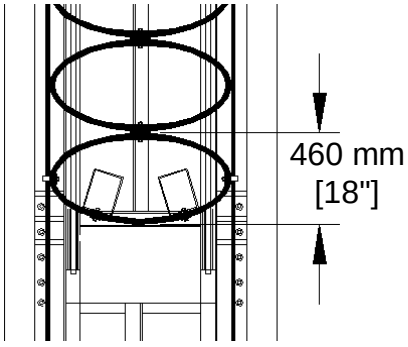


Figure 30
Measure Minor Axis

Recycling Information

When parts need to be replaced, it is recommended that the old parts be recycled as follows:

Steel should be sold as scrap to a local metal recycler.

HDPE plastic cylinders should be sold to a plastic recycler if available. If a recycler is unavailable, dispose of the material as plastic refuse.

Parts Ordering Procedure

1. Locate the Product Decal attached to the inside of the Rear Cylinder. Copy the sales order information from the decal.
2. Make a list of any damaged parts, using part numbers and descriptions found on the installation drawings included with the REACT 350® II System.
3. Only parts specified to be used in this system may be used during repair. The use of a part not specified in this system design renders this system as one that HAS NOT BEEN accepted by FHWA for use on the National Highway System and all observed crash testing to determine system performance is negated.

Inspections

Inspections by the appropriate highway authority are recommended as determined by that authority based upon volume of traffic and impact history. Visual drive-by inspections are recommended at least once every three months. Walk-up inspections are recommended at least twice a year.

Warning: After an impact, always follow the “Post-Impact Instructions”, page 42.

Visual Drive-By Inspection

1) Check to see if there is evidence of an impact. Check to verify that the REACT 350® II System is fully extended from the backup. If it is not, a walk-up inspection will be necessary to determine the cause.
2) Note the location and condition of the REACT 350® II System and the date of visual drive-by inspection on a log sheet.

Warning: Debris, snow, or ice inside the cylinders may prevent the REACT 350® II System from absorbing the impact of a crash as observed in NCHRP 350 compliant crash testing. Perform a walk-up inspection as needed to check for and dispose of any debris inside the cylinders. Failing to remove this debris or other material infringes upon the performance of the system observed in FHWA accepted crash testing.

Walk-Up Inspection

1) Check for any foreign matter that may interfere with the smooth operation of the REACT 350® II System. Check for and remove any debris found inside the Cylinders. Check for and remove any debris found under and around the REACT 350® II System.
2) Check for evidence of bent or damaged parts. Replace as soon as possible. See “Parts Ordering Procedure”, Page 41.
3) Verify that all nuts and bolts are tight and rust free.
4) Be sure MP-3® Concrete Anchor Bolts are securely anchored.
5) Verify that all Cylinders are in good condition and properly positioned on the Base Track. Any Cylinder that is cracked or otherwise damaged should be replaced. Measure the minor axis of the Cylinders. Cylinders require replacement when the minor axis of the cylinders measures 460 mm [18”] or less (see Figure 30).
7) Note the location and condition of the REACT 350® II System and any work done for the date of this inspection. If further repair is necessary, note the repair requested. Refer to the standard drawings and installation section of this manual for more information.

Warning: The correct safety equipment and approved traffic management must be used as required for walk-up inspections of the REACT 350® II System.

Post-Impact Instructions

1) Deploy the appropriate **traffic control** devices to protect your crew.

Warning: The correct safety equipment and approved traffic management must be used as required for walk-up inspections of the REACT 350® II System.

2) Check to see that all **anchor bolts** have remained firmly anchored in the roadway surface and in the Concrete Backup if the REACT 350® II System is so equipped. Replace any that are loose, broken, or pulled out.
3) Clear and dispose of any **debris** inside the cylinders and on the site.
4) Check the condition of the **Cylinders**. Any Cylinder that is cracked or otherwise damaged should be replaced. Measure the minor axis of the Cylinders. Cylinders require replacement when the minor axis of the Cylinders measures 460 mm [18”] or less (see Figure 30).

5) The REACT 350® System must be pulled out to its original length after each impact. The Pullout Assembly must be installed prior to this procedure and removed and stored when finished (see Figure 31).

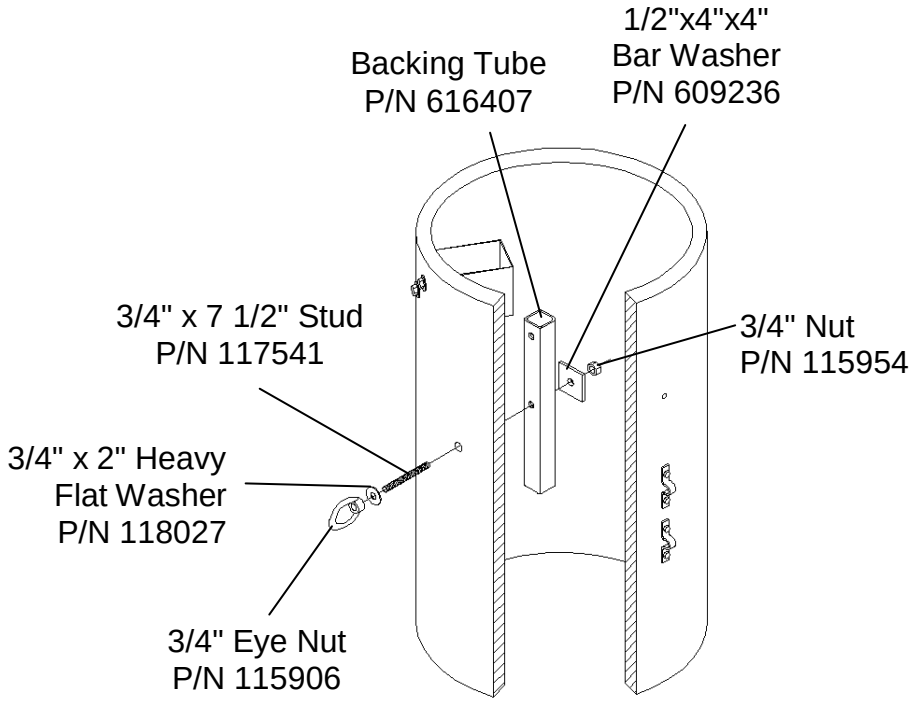


Figure 31

Pullout Assembly Installation

Standard Layout Drawings

CYLINDER SCHEDULE		
CYL. NO.	STOCK NO.	CYLINDER ASSY NO.
1	4130 / 4150	617962B
2	4130	606571B
3	4130	606600B
4	4150	606588B
5	4150 / 4130	617961B
6	4150 / 4150	617960B

NOTES:

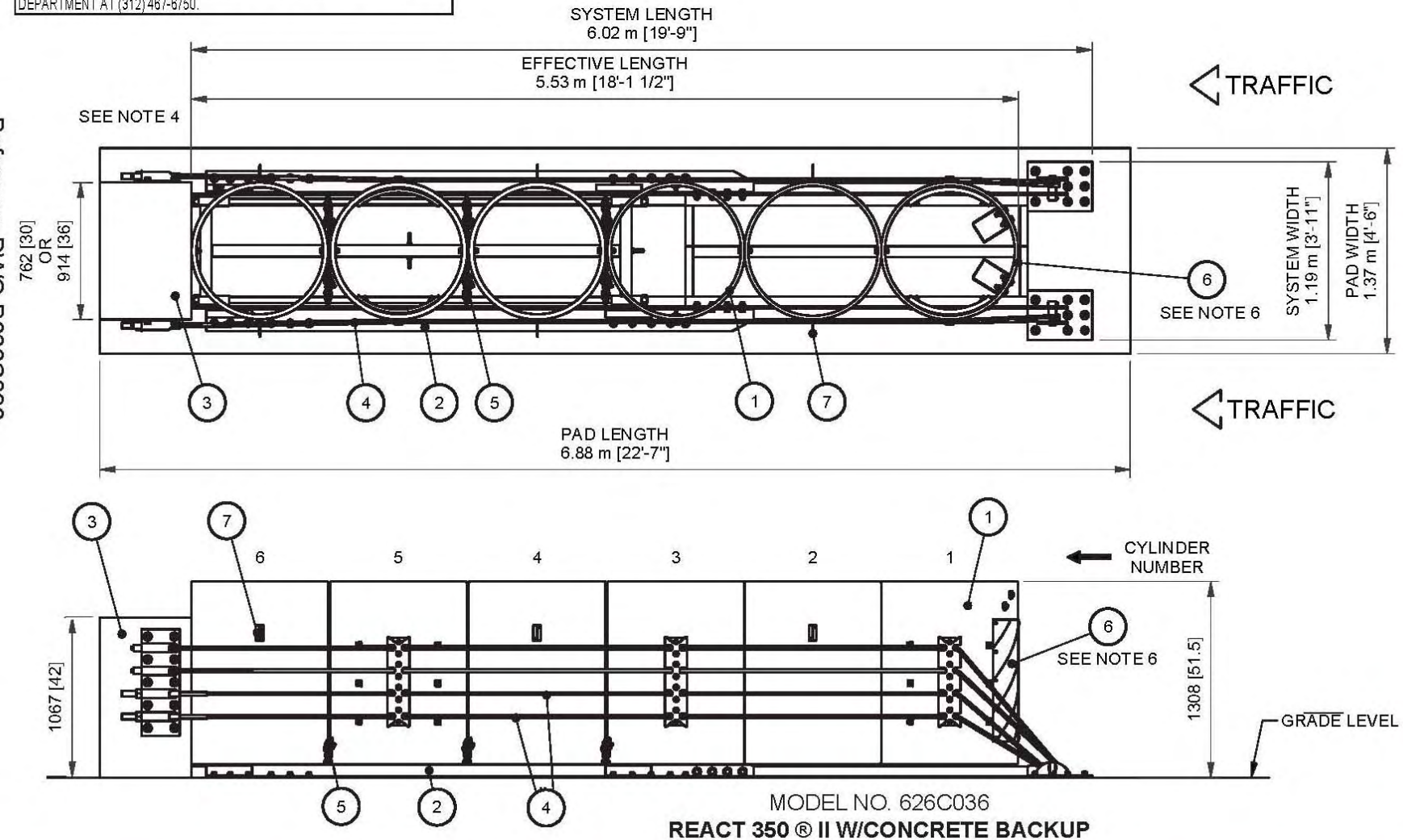
1. IN COMPLIANCE WITH THE AASHTO 2002 ROADSIDE DESIGN GUIDE, MANUFACTURER RECOMMENDS REMOVAL OF ALL CURBS AND ISLANDS TO ENSURE PROPER IMPACT PERFORMANCE.
2. 203 [8.00] MIN. REINFORCED 28 MPa [4000 PSI] P.C. CONCRETE PAD OR 203 [8.00] MIN. NON-REINFORCED 28 MPa [4000 PSI] P.C. CONCRETE ROADWAY MEASURING AT LEAST 3.66m [12'-0"] WIDE BY 15.24m [50'-0"] LONG.
3. SEE THE "REACT 350 PRODUCT MANUAL" FOR A DESCRIPTION OF ITS IMPACT PERFORMANCE CHARACTERISTICS AND DESIGN LIMITATIONS BEFORE PLACING A SYSTEM AT A GIVEN SITE. INFORMATION AND COPIES OF ABOVE MANUAL ARE AVAILABLE BY CALLING CUSTOMER SERVICE DEPARTMENT AT (312) 467-6750.
4. WHERE NECESSARY, THE CUSTOMER SHALL SUPPLY A TRANSITION FROM THE SYSTEM TO THE OBJECT BEING SHIELDED TO PREVENT SNAGGING OF VEHICLES. TRANSITION ASSEMBLIES ARE SUPPLIED AS ACCESSORIES AND MUST BE ORDERED SEPARATELY.
5. UNITS OF MESUREMENT ARE MILLIMETERS [INCHES] UNLESS OTHERWISE NOTED.
6. NOSE COVER NOT INCLUDED IN MODEL NUMBER. ORDER SEPARATELY.

Reference DWG R626B036U

NOTES:

1. IN COMPLIANCE WITH THE AASHTO 2002 ROADSIDE DESIGN GUIDE, MANUFACTURER RECOMMENDS REMOVAL OF ALL CURBS AND ISLANDS TO ENSURE PROPER IMPACT PERFORMANCE.
2. 203 [8.00] MIN. REINFORCED 28 MPa [4000 PSI] P.C. CONCRETE PAD OR 203 [8.00] MIN. NON-REINFORCED 28 MPa [4000 PSI] P.C. CONCRETE ROADWAY MEASURING AT LEAST 3.66m [12'-0"] WIDE BY 15.24m [50'-0"] LONG.
3. SEE THE "REACT 350 PRODUCT MANUAL" FOR A DESCRIPTION OF ITS IMPACT PERFORMANCE CHARACTERISTICS AND DESIGN LIMITATIONS BEFORE PLACING A SYSTEM AT A GIVEN SITE. INFORMATION AND COPIES OF ABOVE MANUAL ARE AVAILABLE BY CALLING CUSTOMER SERVICE DEPARTMENT AT (312) 467-6750.
4. WHERE NECESSARY, THE CUSTOMER SHALL SUPPLY A TRANSITION FROM THE SYSTEM TO THE OBJECT BEING SHIELDED TO PREVENT SNAGGING OF VEHICLES. TRANSITION ASSEMBLIES ARE SUPPLIED AS ACCESSORIES AND MUST BE ORDERED SEPARATELY.
5. UNITS OF MESUREMENT ARE MILLIMETERS [INCHES] UNLESS OTHERWISE NOTED.
6. NOSE COVER NOT INCLUDED IN MODEL NUMBER. ORDER SEPARATELY.

CYLINDER SCHEDULE		
CYL. NO.	STOCK NO.	CYLINDER ASSY NO.
1	613562B / 613564B	618031B
2	613562B	606571B
3	613562B	606599B
4	613564B	606588B
5	613564B / 613562B	617994B
6	613564B	606560B



MODEL NO. 626C036

REACT 350 ® II W/CONCRETE BACKUP

Reference DWG R626C036

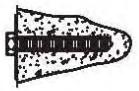
Revised Sept, 2011

NOTES:

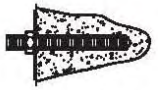
1. USE TRANSITION PANEL AS TEMPLATE FOR DRILLING.
2. IMPACT FORCES COULD BE TRANSFERRED INTO TERMINAL END OF THE BARRIER. ADEQUATE REINFORCING AND ANCHORAGE ARE REQUIRED FOR PROPER IMPACT PERFORMANCE.
3. ANCHOR STUD END SHOULD BE FLUSH WITH OUTSIDE SURFACE OF ANCHOR NUT, SEE DETAIL B.
4. TRANSITION ASSEMBLIES ARE SUPPLIED AS ACCESSORIES AND ARE ORDERED SEPARATELY.
5. END SHOES MUST BE LAPPED FOR TRAFFIC DIRECTION.
6. ITEMS 3 THROUGH 7 ARE STANDARD HIGHWAY HARDWARE & MAY BE SUPPLIED BY CUSTOMER. ORDER PART NUMBER 4720 TO RECEIVE ITEM 1 ONLY.
7. THIS TRANSITION ASSEMBLY MAY BE USED FOR NEW JERSEY BARRIER, F-SHAPED OR VERTICAL CONCRETE WALL.
8. EXISTING STUDS, WASHERS AND NUTS TO REMAIN. INSTALL TRANSITION PLATE ON TOP OF EXISTING HARDWARE.
9. TRIM BARRIER 5 1/2" DEEP X 14" LONG, AS SHOWN.

PARTS LIST

ITEM	STOCK NO.	DESCRIPTION	REQ'D
1	4720	TRANSITION PLATE ASSEMBLY	1.00
2	3525130-0000	ANCHOR,MP-3,PT KIT,3/4X6 1/2 HOR	1.00
3	2701811-0000	BOLT,RAIL,5/8X1 1/4,G	8.00
4	2704191-0000	NUT,HX,5/8,G,RAIL	8.00
5	2752171-0000	END SHOE,W-BEAM	2.00
6	2701641-0000	BOLT,HX,3/4X1 1/4,G2,G	5.00
7	2704091-0000	NUT,HX,3/4,G	5.00



CORRECT

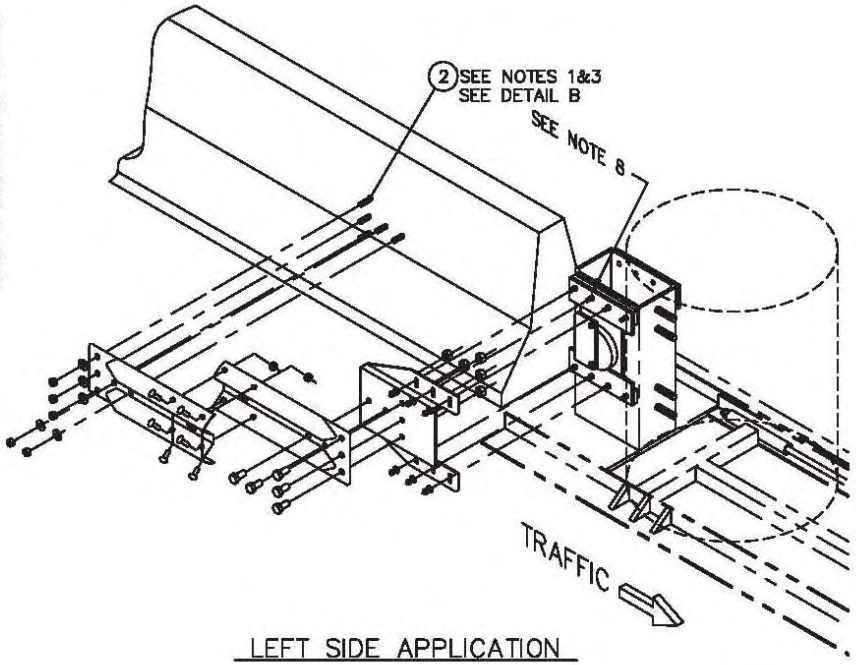


INCORRECT

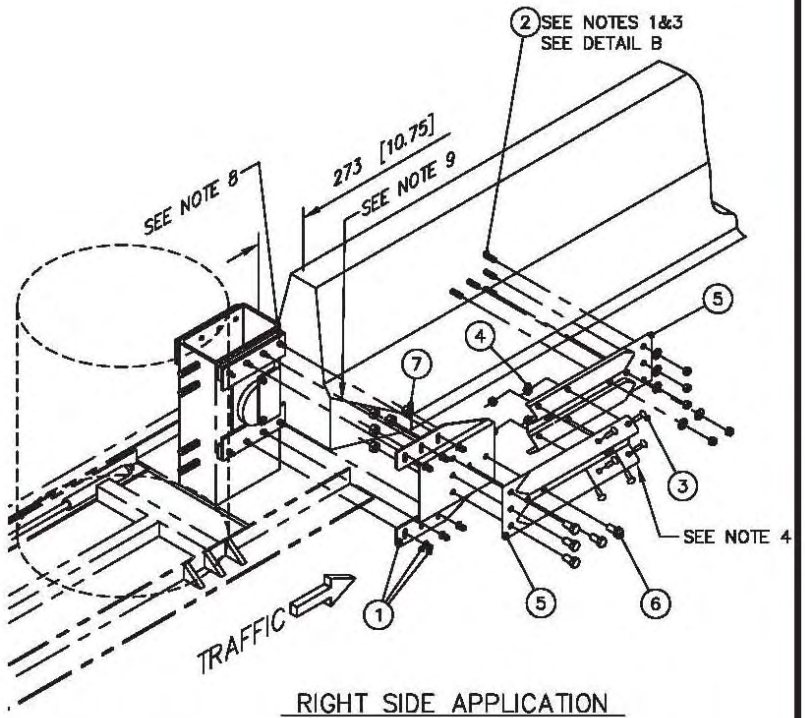
DETAIL B

NOT TO SCALE

Reference DWG 3535006-0000



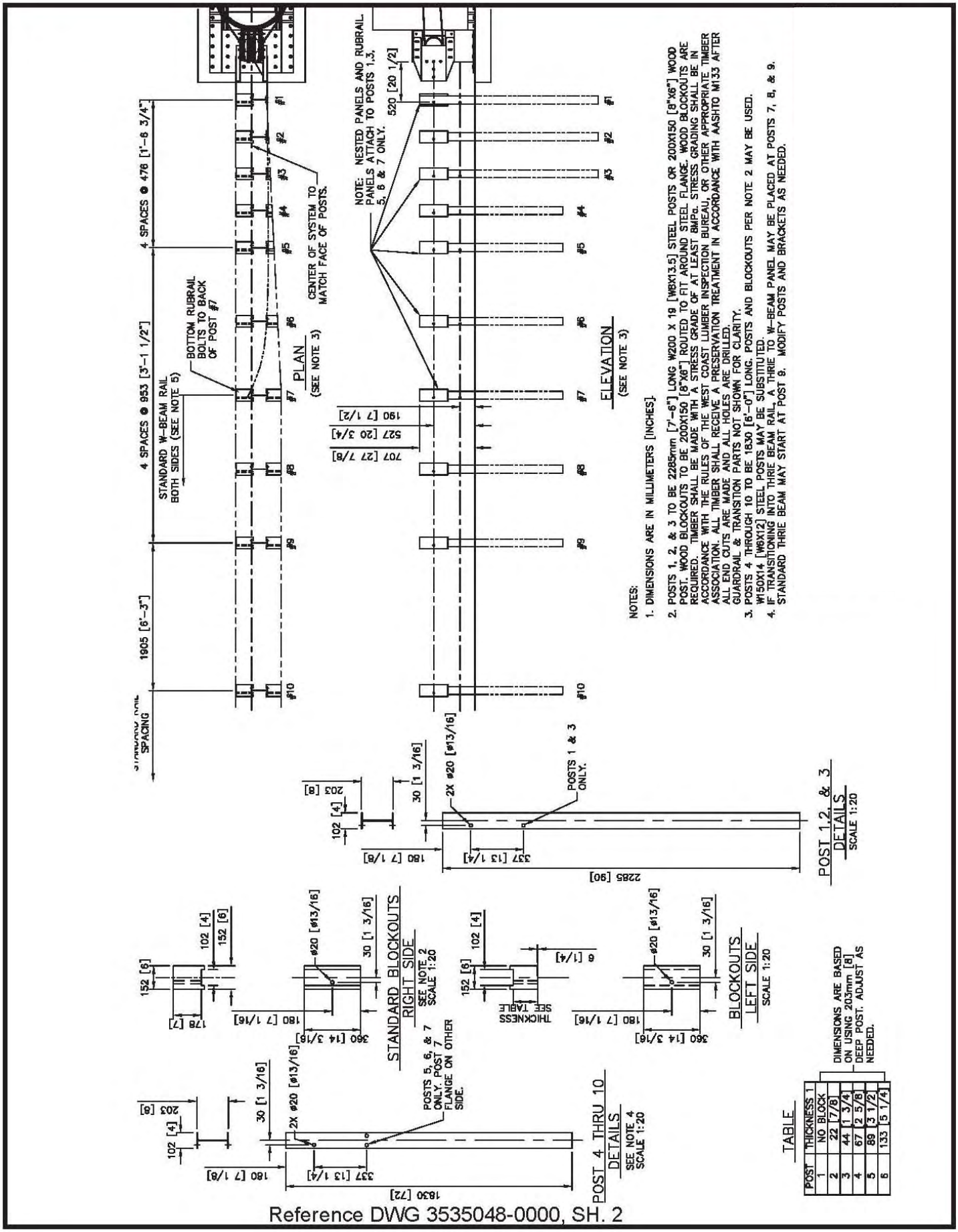
LEFT SIDE APPLICATION



RIGHT SIDE APPLICATION

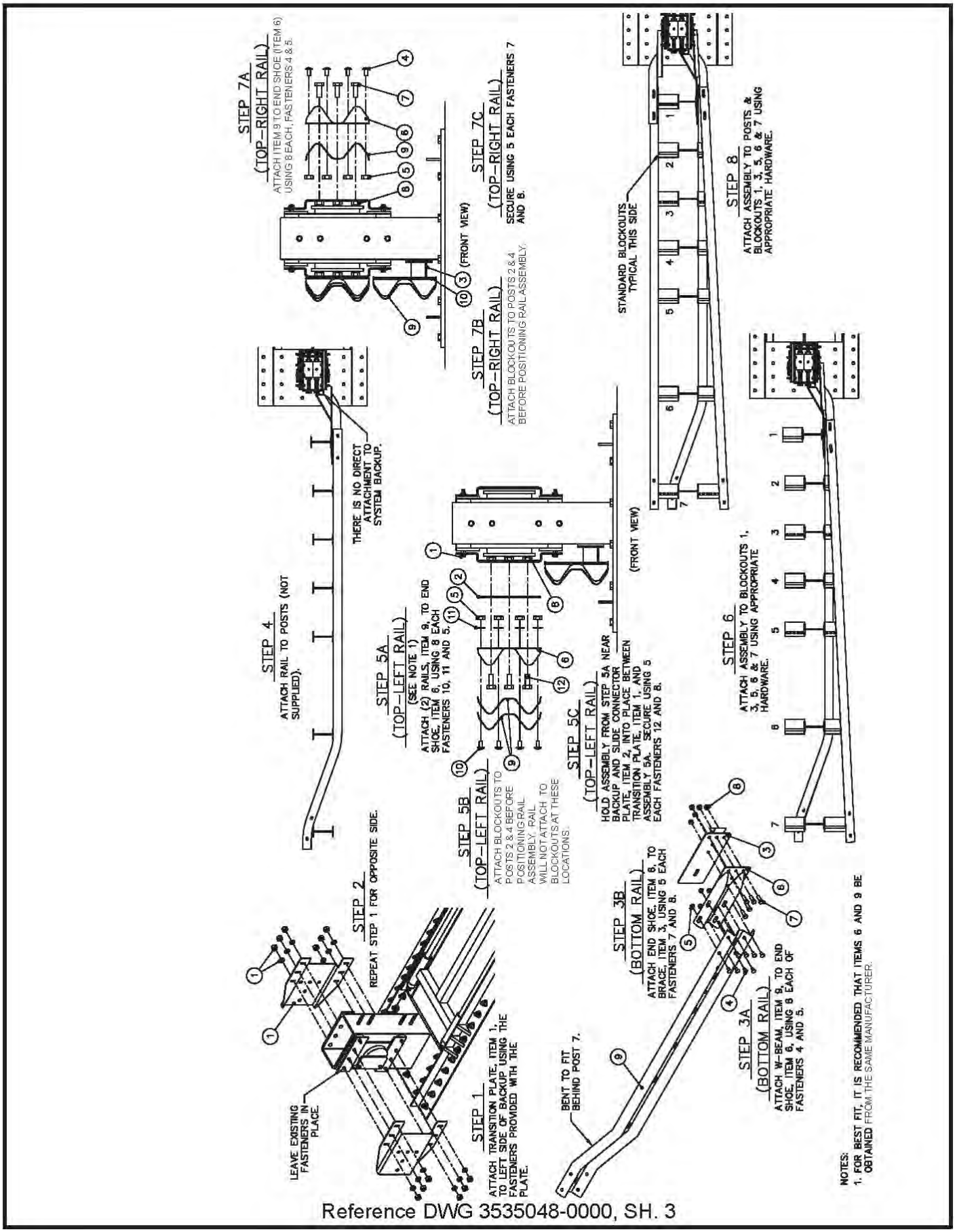
ASSEMBLY NO. 616120B

TRANSITION ASSY, SC B/U,N REACT 350



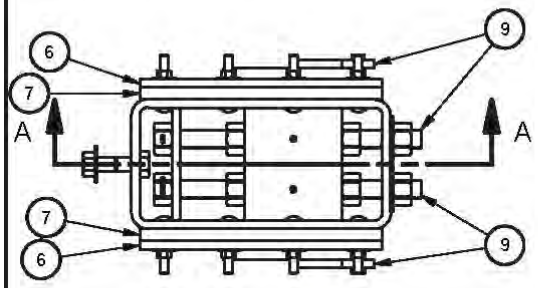
POST	THICKNESS 1
1	NO BLOCK
2	22 [7/8]
3	44 [1 3/4]
4	67 [2 5/8]
5	89 [3 1/2]
6	133 [5 1/4]

Reference DWG 3535048-0000, SH. 2

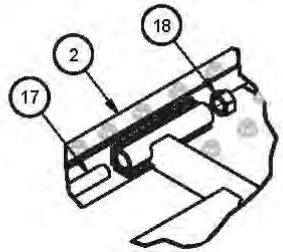


Reference DWG 3535048-0000, SH. 3

Reference DWG 605028, SH. 1



TOP VIEW

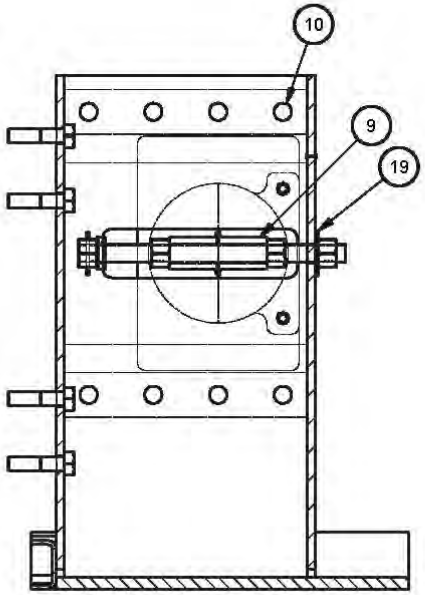


DETAIL B
(SOME ITEMS NOT SHOWN FOR CLARITY)

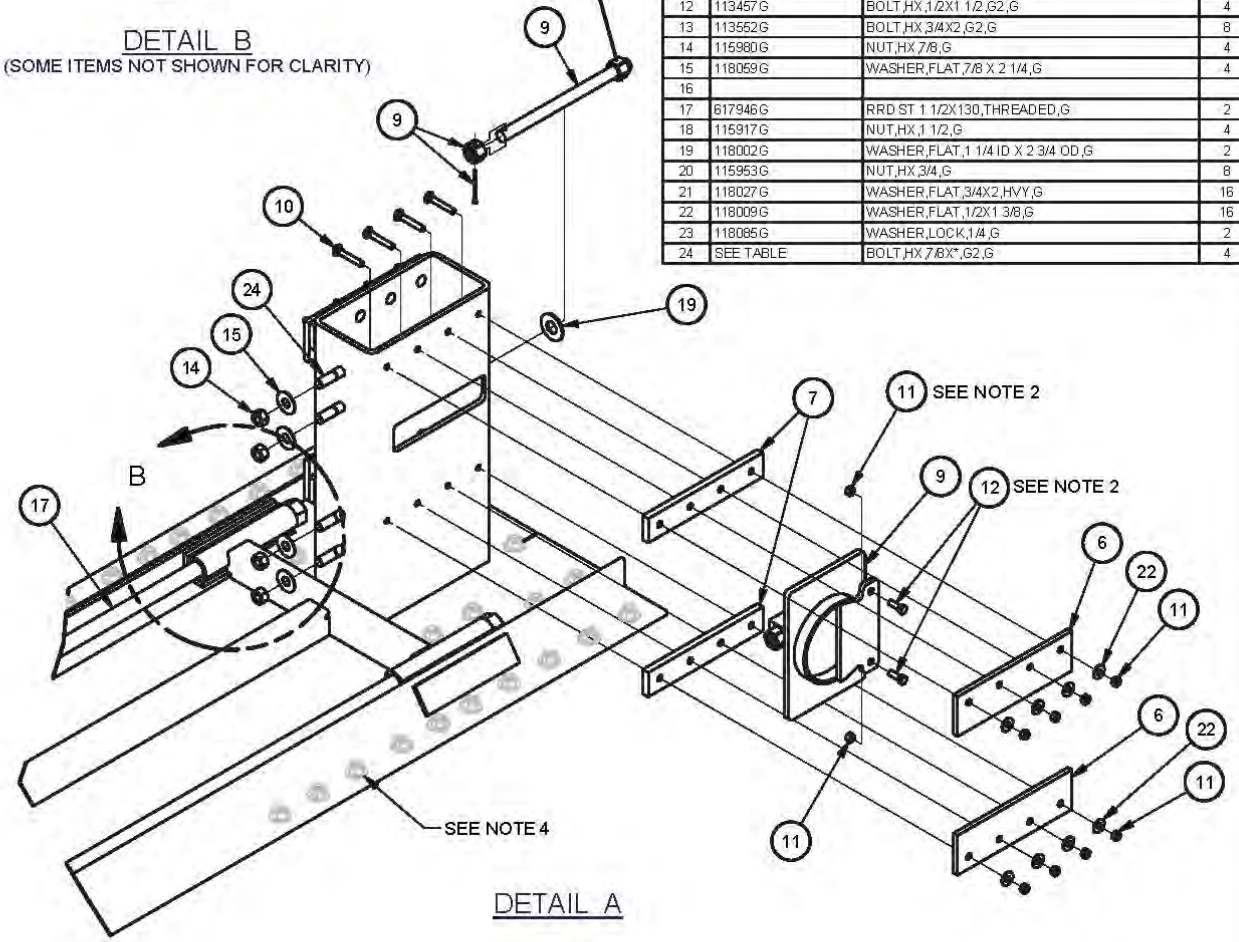
SEE SECTION A-A FOR PLACEMENT

PARTS LIST			
ITEM	STOCK NO.	DESCRIPTION	QTY.
1	SEE TABLE	FRONT BASETRACK,*,G	1
2	613621B	REAR BASETRACK,SCBU(REACT),G,W/DECAL	1
3	612040G	PIN,RESTRAINING CABLE,G	2
4	113512G	BOLT,HX,1/4X2 1/2,G2,G	2
5	115946G	NUT,HX,1/4,G	2
6	613734G	RETAINER,TENSIONER,G,(REACT)	4
7	614628G	STANDOFF,RETAINER,TENSIONER,G,(REACT)	4
8			
9	605808B	CABLE TENSIONER ASSY,L&R	2
10	113408G	BOLT,CR 1/2X3 1/4,W/RIBBED NECK,G	16
11	115939G	NUT,HX,1/2,G	20
12	113457G	BOLT,HX,1/2X1 1/2,G2,G	4
13	113552G	BOLT,HX 3/4X2,G2,G	8
14	115980G	NUT,HX,7/8,G	4
15	118059G	WASHER,FLAT,7/8 X 2 1/4,G	4
16			
17	617946G	RRD ST 1 1/2X130,THREADED,G	2
18	115917G	NUT,HX,1 1/2,G	4
19	118002G	WASHER,FLAT,1 1/4 ID X 2 3/4 OD,G	2
20	115953G	NUT,HX,3/4,G	8
21	118027G	WASHER,FLAT,3/4X2,HVY,G	16
22	118009G	WASHER,FLAT,1/2X1 3/8,G	16
23	118085G	WASHER,LOCK,1/4,G	2
24	SEE TABLE	BOLT,HX,7/8X*,G2,G	4

Reference DWG 605028, SH. 2



SECTION A-A
(SOME HIDDEN LINES NOT SHOWN FOR CLARITY)



DETAIL A

NOTES:
1. BEFORE INSTALLING CABLE TENSION ROD, W/ NUT, INTO CABLE TENSIONER ASSEMBLY. FILL WITH HEAVY GREASE USING GREASE FILTTING, LUBRICATE THREADS ON TENSION ROD.
2. ITEM 9 WILL NEED TO BE REMOVED TO INSTALL CABLE (DWG 605780 [3535005-0000]).
3. ITEMS 11 & 12 NEED TO BE REMOVED TO INSTALL REAR CYLINDER.
4. ANCHORS MUST BE ORDERED SEPARATELY, SEE ANCHOR TABLE OPTIONS SHEET 1.

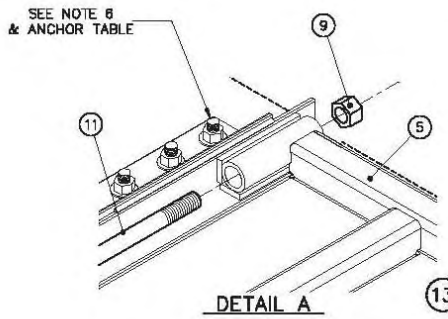
ASSEMBLY NO. (SEE TABLE, SHEET 1)

PARTS LIST

ITEM	STOCK NO.	DESCRIPTION	REQ'D
1	SEE TABLE	BASETRACK,FRONT	1.00
2	612040G	PIN,RESTRAINING CABLE	2.00
3	113512G	BOLT,HX,1/4X2 1/2,G2,G	2.00
4	115946G	NUT,HX,1/4,G	2.00
5	613615B	WELDMENT,REAR BASETRACK,CONC(REACT)	1.00
6	614195G	WELDMENT,CABLE ANCHOR,CONC,(REACT)	2.00
8	113552G	BOLT,HX,3/4X2,G2,G	8.00
9	118027G	WASHER,FLAT,3/4X2,HVY,G	18.00
10	115953G	NUT,HX,3/4,G	10.00
11	116823G	RRD ST 1 1/2X120,THREADED BOTH ENDS	2.00
12	115917G	NUT,HX,1 1/2,G	4.00
13	117543G	STUD,3/4X8 1/2,G5,G	2.00
14	611475B	MP-3,PINT PACKAGE	1.00
15	118085G	WASHER,LOCK,1/4,G	2.00

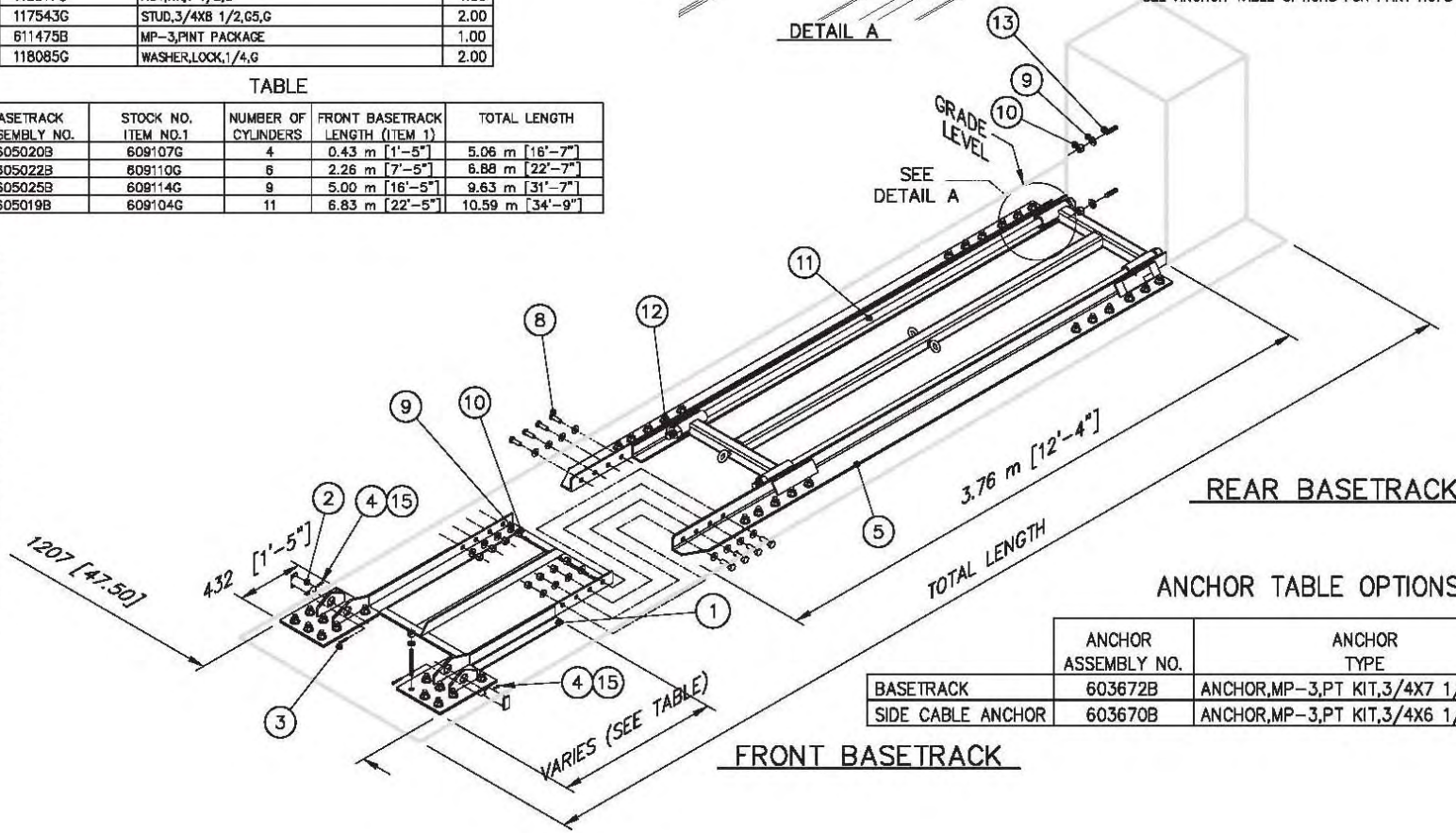
TABLE

BASETRACK ASSEMBLY NO.	STOCK NO. ITEM NO.1	NUMBER OF CYLINDERS	FRONT BASETRACK LENGTH (ITEM 1)	TOTAL LENGTH
605020B	609107G	4	0.43 m [1'-5"]	5.06 m [16'-7"]
605022B	609110G	6	2.26 m [7'-5"]	6.88 m [22'-7"]
605025B	609114G	9	5.00 m [16'-5"]	9.63 m [31'-7"]
605019B	609104G	11	6.83 m [22'-5"]	10.59 m [34'-9"]



NOTES:

1. BACKUP MUST BE ABLE TO WITHSTAND A MAXIMUM OVERTURNING MOMENT OF 226 kNm [2000 KIP-IN.] AT DECK LINE FOR DURATIONS 40± ms.
2. IMPACT FORCES COULD BE TRANSFERRED INTO STRUCTURE THROUGH SYSTEM. ADEQUATE ANCHORAGE IS REQUIRED FOR PROPER IMPACT PERFORMANCE.
3. USE ITEMS 1, 5 AND 6 AS TEMPLATES FOR DRILLING CONCRETE. INSTALL ITEM 13 USING MP-3 EPOXY ITEM 14 TO SECURE. USE NUTS AND WASHERS ITEMS 9 & 10.
4. ANCHOR STUD END SHOULD BE FLUSH WITH OUTSIDE SURFACE OF ANCHOR NUT, SEE DETAIL B SHEET 2.
5. UNITS ARE mm [INCHES] UNLESS OTHERWISE NOTED.
6. ANCHOR BOLTS MUST BE ORDERED SEPARATELY. SEE ANCHOR TABLE OPTIONS FOR PART NO.'S & QUANTITIES.



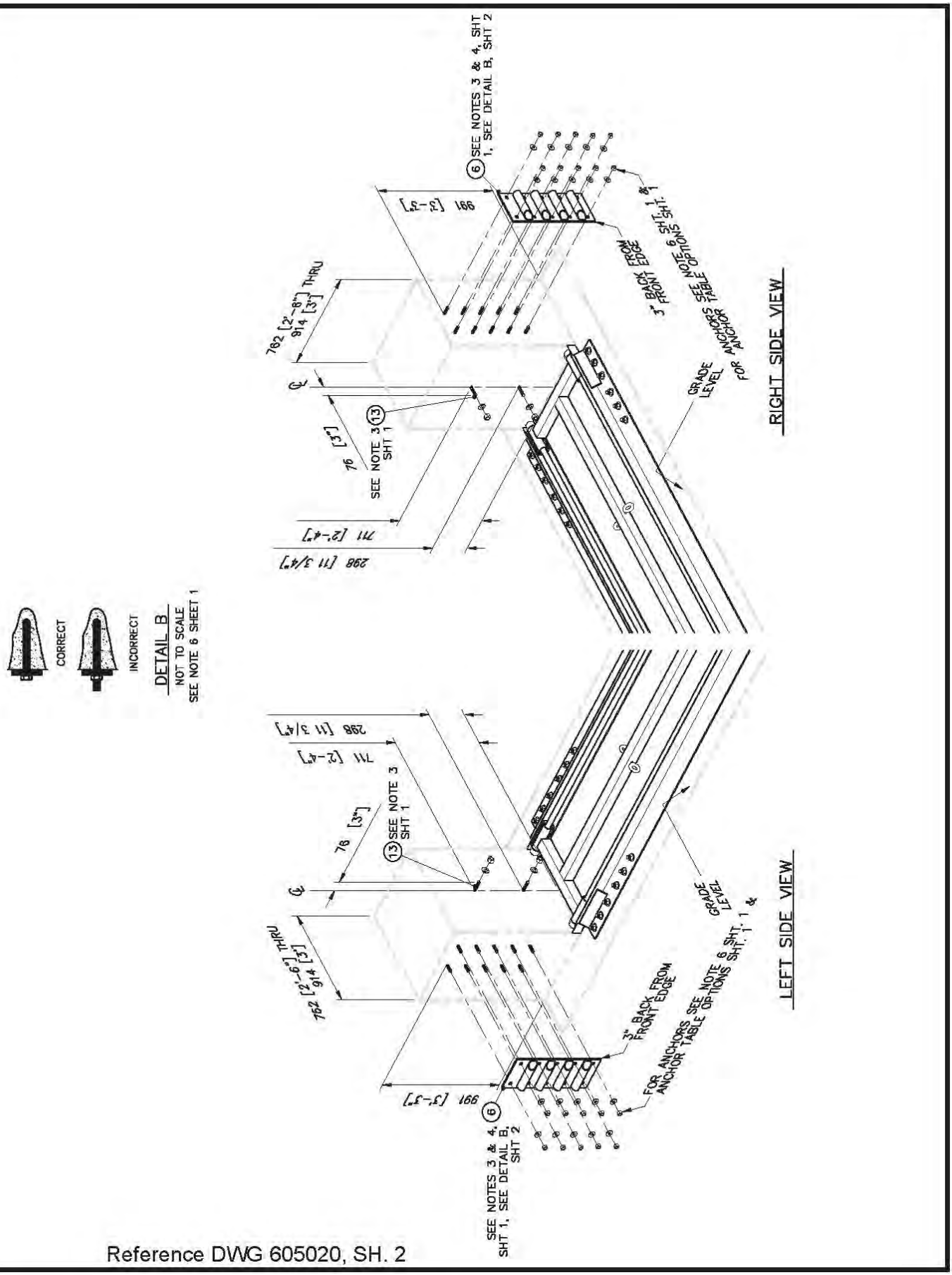
Reference DWG 605020, SH. 1

ANCHOR TABLE OPTIONS

	ANCHOR ASSEMBLY NO.	ANCHOR TYPE	QUANTITY REQUIRED
BASETRACK	603672B	ANCHOR,MP-3,PT KIT,3/4X7 1/2,VT	7.00
SIDE CABLE ANCHOR	603670B	ANCHOR,MP-3,PT KIT,3/4X6 1/2 HOR	4.00

ASSEMBLY NO. (SEE TABLE)

CONCRETE BACKUP BASETRACK ASSEMBLY FOR 36" WIDE SYSTEMS



Reference DWG 605020, SH. 2

NOTES:
1. CROSS SLOPE OF PAD SHALL NOT EXCEED 8%
   2% FROM FRONT TO BACK.
2. ALL CONCRETE TO BE 28 MPa [4000 PSI] P.C. CONCRETE.
3. FOR EXISTING APPROVED CONCRETE SURFACES:
   A) MIN 180 [7] DECK STRUCTURE,
   B) MIN 200 [8] NON-REINFORCED ROADWAY OR
   C) MIN 150 [6] REINFORCED ROADWAY.
   VERTICAL STEEL SHALL BE DOWELLED 140 [5.5] MIN. USING MP-3®
   ANCHORING SYSTEM GROUT OR EQUAL. ADJUST REBAR AND CONCRETE
   QUANTITIES AS NEEDED.
4. PAD AND BELOW GRADE ANCHOR BLOCK TO BE POURED MONOLITHICALLY.
5. DIMENSIONS ARE IN mm[inches] UNLESS OTHERWISE NOTED.

Reference DWG 605020, SH. 3

Reference DWG 114054, SH. 1

TABLE A		
NO. CYLINDERS	SYSTEM	LENGTH
4 CYLINDER	REACT-43B036	REACT-43C036	5.06 m	16'-7"
6 CYLINDER	REACT-55B036	REACT-55C036	6.88 m	22'-7"
9 CYLINDER	REACT-62B036	REACT-62C036	9.63 m	31'-7"
11 CYLINDER	REACT-75B036	REACT-75C036	11.46 m	37'-7"

CAST-IN-PLACE CONCRETE PAD FOR 36" WIDE SYSTEMS W,BELOW GRADE ANCHOR BLOCK

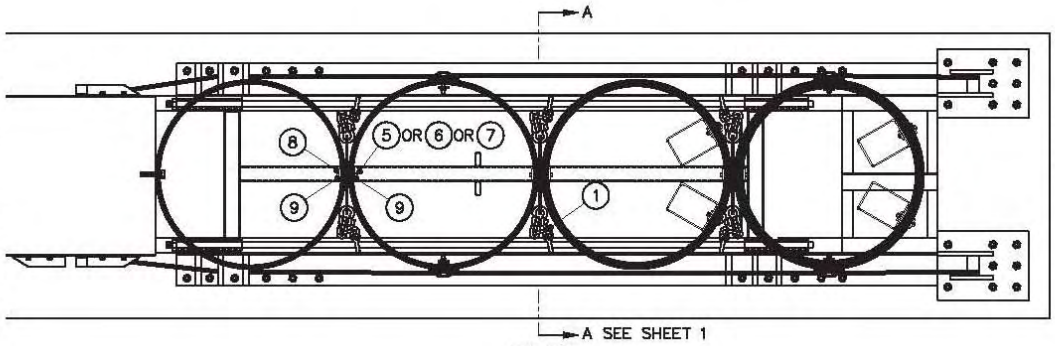
Reference DWG 114054, SH. 2

Reference DWG 617967

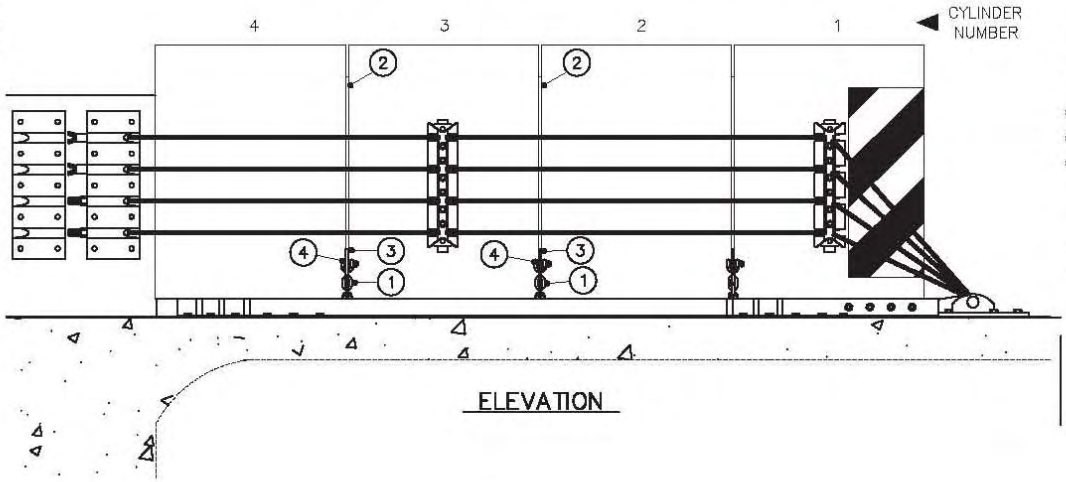
ASSEMBLY NO. 617999B

PARTS LIST (6 CYLINDER REACT 350) TL-3 (62 MPH)			
ITEM	STOCK NO.	DESCRIPTION	REQ'D
1	606177B	CHAIN, PROOF COIL,1/2,4 LINKS,REACT	6.00
2	609236G	FTB ST 1/2X4X4,W/HOLE,G,(REACT)	3.00
3	609256G	FTB ST 1/2X5X15,G,(REACT)	3.00
4	117071G	SHACKLE,ANCHOR,5/8,W/SCREW PIN	12.00
* 5	113563G	BOLT,HX,3/4X4 1/2,G2,G	4.00
* 6	113566G	BOLT,HX,3/4X4,G2,G	2.00
* 7	113561G	BOLT,HX,3/4X3,G2,G	4.00
8	115953G	NUT,HX,3/4,G	10.00
9	118027G	WASHER,FLAT,3/4,HVY,G	20.00

* ITEM 5 USED TO CONNECT CYLINDERS 4 & 5 AND 5 & 6.
* ITEM 6 USED TO CONNECT CYLINDERS 3 & 4.
* ITEM 7 USED TO CONNECT CYLINDERS 1 & 2 AND 2 & 3.



PLAN



ELEVATION

ASSEMBLY NO. 606182B

PARTS LIST (4 CYLINDER REACT 350) TL-2 (43 MPH)			
ITEM	STOCK NO.	DESCRIPTION	REQ'D
1	606177B	CHAIN, PROOF COIL,1/2,4 LINKS,REACT	6.00
2	609236G	FTB ST 1/2X4X4,W/HOLE,G,(REACT)	3.00
3	609256G	FTB ST 1/2X5X15,G,(REACT)	3.00
4	117071G	SHACKLE,ANCHOR,5/8,W/SCREW PIN	12.00
* 5	113563G	BOLT,HX,3/4X4 1/2,G2,G	4.00
* 6	113571G	BOLT,HX,3/4X5 1/2,G2,G	2.00
8	115953G	NUT,HX,3/4,G	6.00
9	118027G	WASHER,FLAT,3/4,HVY,G	12.00

* ITEM 5 USED TO CONNECT CYLINDERS 2 & 3 AND 3 & 4.
* ITEM 6 USED TO CONNECT CYLINDERS 1 & 2.

ASSEMBLY NO. 606183B

PARTS LIST (6 CYLINDER REACT 350) TL-2 (55 MPH)			
ITEM	STOCK NO.	DESCRIPTION	REQ'D
1	606177B	CHAIN, PROOF COIL,1/2,4 LINKS,REACT	6.00
2	609236G	FTB ST 1/2X4X4,W/HOLE,G,(REACT)	3.00
3	609256G	FTB ST 1/2X5X15,G,(REACT)	3.00
4	117071G	SHACKLE,ANCHOR,5/8,W/SCREW PIN	12.00
* 5	113563G	BOLT,HX,3/4X4 1/2,G2,G	4.00
* 6	113571G	BOLT,HX,3/4X5 1/2,G2,G	2.00
* 7	113557G	BOLT,HX,3/4X3 1/2,G2,G	4.00
8	115953G	NUT,HX,3/4,G	10.00
9	118027G	WASHER,FLAT,3/4,HVY,G	20.00

* ITEM 5 USED TO CONNECT CYLINDERS 3 & 4 AND 4 & 5.
* ITEM 6 USED TO CONNECT CYLINDERS 5 & 6.
* ITEM 7 USED TO CONNECT CYLINDERS 1 & 2 AND 2 & 3.

ASSEMBLY NO. 606185B

PARTS LIST (9 CYLINDER REACT 350) TL-3 (62 MPH)			
ITEM	STOCK NO.	DESCRIPTION	REQ'D
1	606177B	CHAIN, PROOF COIL,1/2,4 LINKS,REACT	6.00
2	609236G	FTB ST 1/2X4X4,W/HOLE,G,(REACT)	3.00
3	609256G	FTB ST 1/2X5X15,G,(REACT)	3.00
4	117071G	SHACKLE,ANCHOR,5/8,W/SCREW PIN	12.00
* 5	113563G	BOLT,HX,3/4X4 1/2,G2,G	2.00
* 6	113571G	BOLT,HX,3/4X5 1/2,G2,G	6.00
* 7	113557G	BOLT,HX,3/4X3 1/2,G2,G	8.00
8	115953G	NUT,HX,3/4,G	16.00
9	118027G	WASHER,FLAT,3/4,HVY,G	24.00

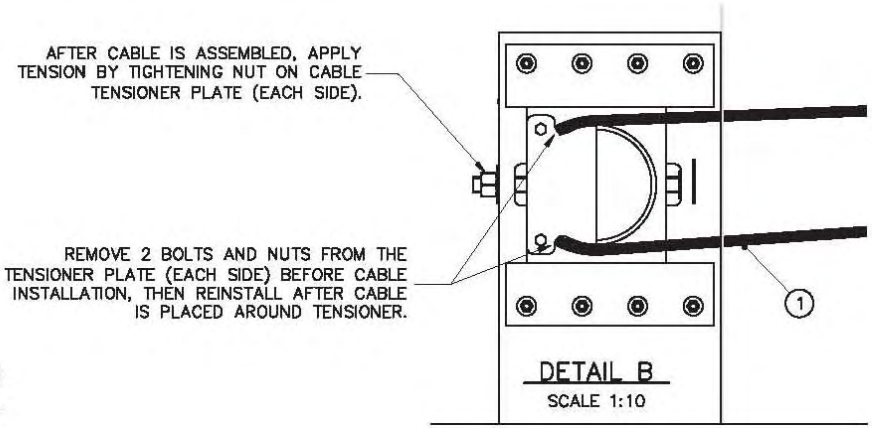
* ITEM 5 USED TO CONNECT CYLINDERS 5 & 6.
* ITEM 6 USED TO CONNECT CYLINDERS 6 & 7, 7 & 8 AND 8 & 9.
* ITEM 7 USED TO CONNECT CYLINDERS 1 & 2, 2 & 3, 3 & 4, 4 & 5

ASSEMBLY NO. (SEE TABLES)

Reference DWG 606182 SHEET 2

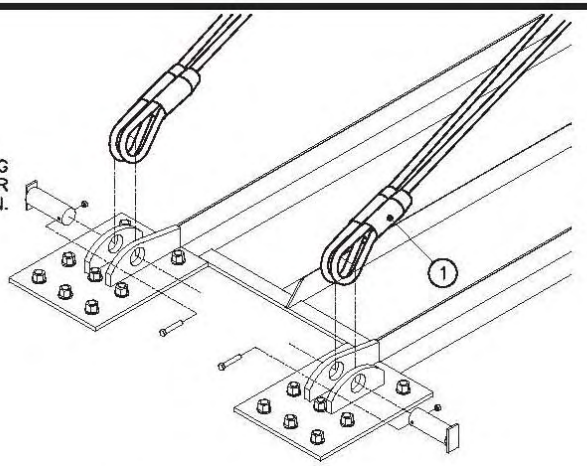
Revised Sept, 2011

Reference DWG 605780 SHEET 1

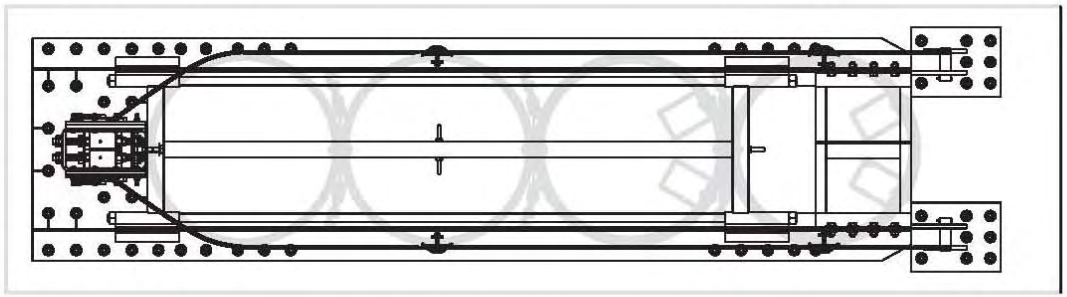


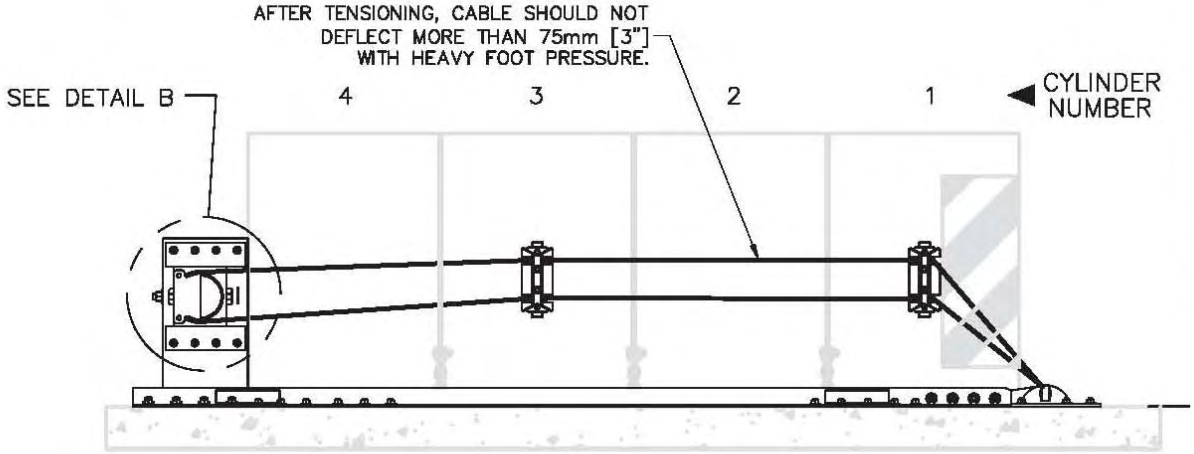
DETAIL B
SCALE 1:10

SEE ASSEMBLY DRAWING 605028 FOR RESTRAINING PIN.



FRONT CABLE ATTACHMENT DETAIL
FOR SELF CONTAINED BACKUP
SCALE 1:15





CABLE LENGTHS (SELF CONTAINED BACKUPS)		
NO. CYLINDERS	CABLE LENGTH	ITEM 1
4	9.12 m [29'–11"]	113924G
6	12.8 m [41'–11"]	113926G
9	18.3 m [59'–11"]	113929G
11	21.9 m [71'–11"]	113931G

CABLE ASSEMBLIES
SELF CONTAINED BACKUP

CABLE LENGTHS (SELF CONTAINED BACKUPS)		
NO. CYLINDERS	CABLE LENGTH	ITEM 1
4	9.12 m [29'-11"]	113924G
6	12.8 m [41'-11"]	113926G
9	18.3 m [59'-11"]	113929G
11	21.9 m [71'-11"]	113931G

Reference DWG 605780 SHEET 2

MISCELLANEOUS HARDWARE

ASSEMBLY NO. 3535043-0000

PARTS LIST

ITEM	STOCK NO.	DESCRIPTION	REQ'D
1	2765053-0000	STT ST 3X3X1/4X36,W/HOLES	1.00
2	2700911-0000	STUD,3/4X7 1/2,G5,G	1.00
3	2704175-0000	NUT,EYE,3/4,G	1.00
4	2765015-0000	FTB ST 1/2X4X4,W/HOLE,G	1.00
5	2704341-0000	NUT,HX,3/4,G,GR DH	1.00
6	2708081-0000	WASHER,FLAT,3/4X2,HVY,G	1.00
7	2750978-0000	INSTALLATION INSTRUCTIONS,REACT 350	1.00
8	2735831-3500	MATERIAL SAFETY INFORMATION NOTICE	1.00

ASSEMBLY 3535032-0000

ASSEMBLY 3535032-0000

ASSEMBLY 3535045-0000

2765105-0000
2698026-0000
2765032-0000
2704011-0000

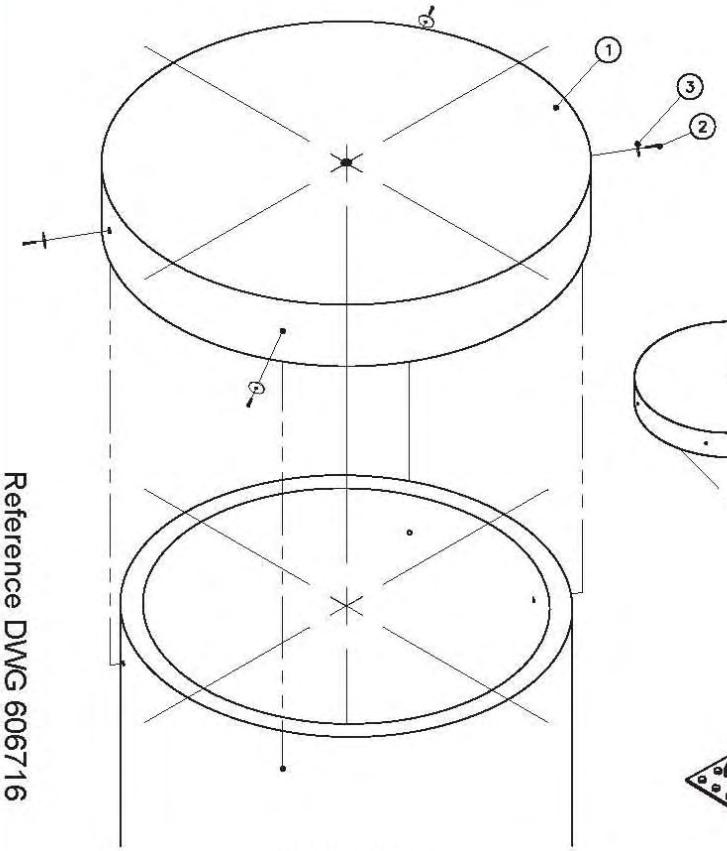
ASSEMBLY 3535044-0000

2765104-0000
2698026-0000
2765001-0000
2704011-0000

NOTE:
1. INSTALLER TO DELIVER PULLOUT BRACKET & ASSOCIATED HARDWARE, DRAWINGS & MANUAL TO AGENCY RESPONSIBLE FOR MAINTENANCE.

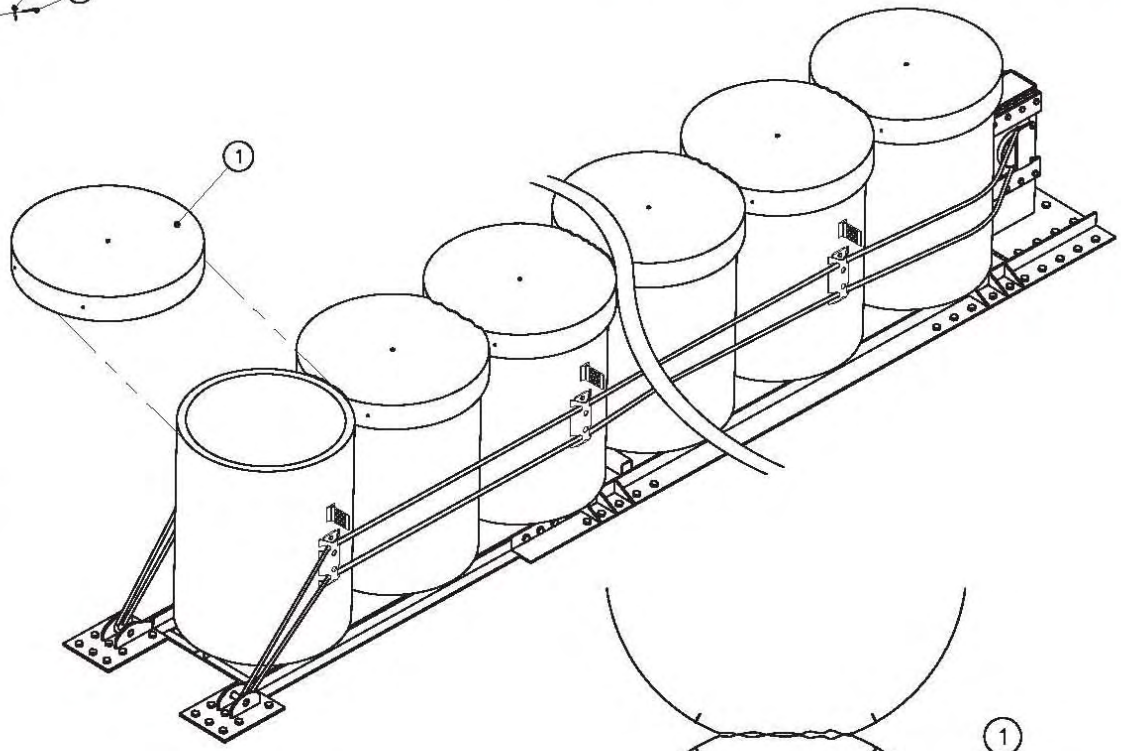
Reference DWG 3535043-0000

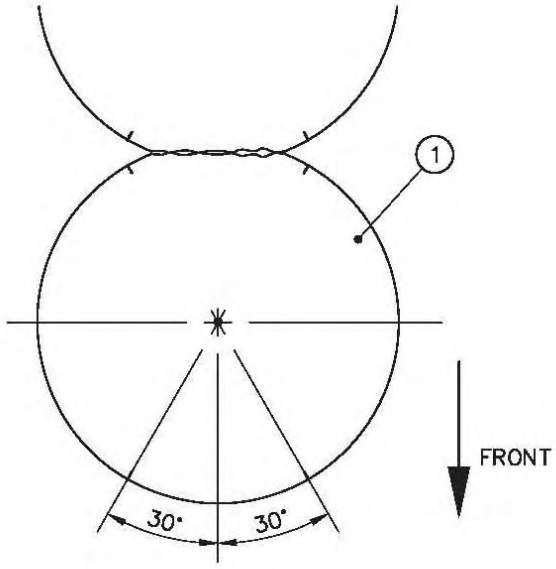
PARTS LIST			
ITEM	STOCK NO.	DESCRIPTION	REQ'D
1	114426B	DEBRIS COVER,36",REACT 350	1.00
2	116943G	SCREW,PN,#8X1,TAPPING,AB,S	4.00
3	117994G	WASHER,FLAT,.219 ID X 1.25 OD,G	4.00



DETAIL A

Reference DWG 606716





DETAIL B

NOTES:

1. STARTING AT THE FRONT, PLACE COVERS ON EVERY CYLINDER IN SYSTEM. ORIENT FASTENERS IN LINE WITH LENGTH OF SYSTEM AS SHOWN IN DETAIL B.
2. USE COVER AS A TEMPLATE FOR SCREW LOCATION. KEEP COVERS TIGHT ON SIDE OF SYSTEM.
3. COVERS WILL BUNCH UP BETWEEN CYLINDERS. FIT COVERS BETWEEN CYLINDERS AS BEST AS POSSIBLE.

ASSEMBLY NO. 606716B

DEBRIS COVER ASSY, 36, REACT 350

DRIVABLE PILE ANCHOR ASSY, REACT

ASSEMBLY NO. 3535113-0000

PARTS LIST

ITEM	STOCK NO.	DESCRIPTION	QTY.
1	2765101-0000	WING PLATE,FRONT,REACT,DPA	1
2	2765102-0000	WING PLATE,MID,REACT,DPA	1
3	2765103-0000	WING PLATE,REAR,REACT,DPA	1
4	2760126-0000	DRIVABLE POST,QG,CZ,DPA	8
5	2760124-0000	POST CAP,QG,CZ,DPA	8
6	2701012-0000	BOLT,HX,3/4X2 1/2,G8,G	32
7	2700011-0000	BOLT,HX,3/4X2,G5,G	50
8	2708081-0000	WASHER,FLAT,3/4X2,HVY,G	100
9	2704091-0000	NUT,HX,3/4,G	50
10	2750978-1000	INSTALLATION INSTRUCTIONS,DPA,REACT	1

Reference DWG 3535113-0000

NOTES:
1. CROSS SLOPE OF STRONG SOIL FOUNDATION SHALL NOT EXCEED 8% AND NOT VARY MORE THAN 2% FROM FRONT TO BACK OF SYSTEM.
2. USE THE WING PLATES AS A GUIDE FOR DRIVING POSTS.
3. CAUTION: THE REACT SYSTEM MUST BE CORRECTLY ANCHORED FOR PROPER IMPACT PERFORMANCE. DPA ASSEMBLY MAY BE USED TO ATTACH SYSTEM TO STRONG SOIL. ASHPALT OVERLAYS SHOULD BE 102 mm [4.00 in] THICK OR LESS.
4. USE ONLY DRIVABLE PILE ANCHOR SYSTEM SUPPLIED BY ENERGY ABSORPTION SYSTEMS, INC. REACT SYSTEMS INSTALLED ON SOIL MUST BE INSPECTED TO ENSURE THE ANCHORS ARE STILL PROPERLY SET FOLLOWING EACH IMPACT. RE-ANCHOR AS NECESSARY.
5. EVERY SQUARE HOLE IN THE WING PLATES MUST HAVE A DRIVABLE POST ANCHORING IT.
6. REFER TO REACT SYSTEM DRIVABLE PILE ANCHOR INSTALLATION ADDENDUM INSTRUCTIONS FOR FURTHER INFORMATION.

ASSEMBLY NO. 3535054-0000

INSTALLATION INSTRUCTIONS, SIGN POST, REACT

Reference DWG 3535054-0000

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