SCI70GM AND SCI100GM
DESIGN & INSTALLATION MANUAL

The World’s Only
Speed-Dependent
Crash Attenuators

SMART CUSHION INNOVATIONS®
NCHRP 350 APPROVED

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OVERVIEW

Product
The SMART CUSHION® impact attenuators are manufactured by Hill & Smith, Inc. They are NCHRP Report 350, Test Levels 2 and 3 (TL2 and TL3) compliant (Models SCI 70 GM and SCI 100 GM, respectively) and are fully redirective, non-gating, and bi-directional. SMART CUSHION® impact attenuators are used to help protect motorists from hazards in both permanent and temporary work zone locations. They can be attached to most types of median and roadside barriers.

The SMART CUSHION® attenuators use a patented system for stopping vehicles. The system is speed dependent and stops small and large vehicles by automatically regulating the stopping force exerted on a vehicle. Essentially, the system provides the necessary forces based on the speed of the vehicle automatically compensating for the mass of the vehicle.

The SMART CUSHION® attenuators are slightly tapered from front to rear. This allows the side panel sections to collapse over the next section without stress or damage. During collapse, the parts move freely past each other and do not become wedged during the impact.

Wide temperature variations and temperature extremes do not affect the performance of SMART CUSHION® impact attenuators. Temperature driven changes in viscosity of the fluid in the shock-arresting cylinder does not affect performance.

Maintenance
SMART CUSHION® impact attenuators are low-maintenance units. In a two-year in-service evaluation report submitted to the Federal Highway Administration, the average cost of parts to repair the SMART CUSHION® impact attenuator was $39, excluding two catastrophic impacts. More than four out of five of the reported repairs only required two shear bolts costing under $2. A trained, two-person maintenance crew can return most impacted SMART CUSHION® attenuators to full service within 30 minutes. This short repair time reduces the maintenance workers’ exposure to traffic and minimizes motorist inconvenience. Side impacts rarely require a repair which eliminates exposure and repair costs by 40%.

Crash Performance
The SMART CUSHION® broke new ground during NCHRP Report 350 crash testing. In the high-speed test, 100 kilometers per hour (63 miles per hour), the small vehicle’s deceleration rate was significantly lower than any previously recorded value (-9.8 G’s as compared to previous low of –13.4 G’s). This means less impact forces on the vehicle’s occupants and a reduced risk of injury and severity.

All the NCHRP 350 tests were conducted on the same SMART CUSHION® unit over four consecutive days with no damage to non-expendable parts. The only parts replaced after each crash test were the two shear bolts, costing less than $2 for each reset.
SPECIFICATIONS

Description
The SMART CUSHION® is a re-directive, non-gating crash attenuator that consists of a base, supporting frames, a sled, side panels, a wire rope cable, sheaves, and a shock-arresting cylinder. The base is anchored to the mounting surface and provides support for the frames that are mounted on it. The support frames hold the side panels that provide a flat outer re-directive surface for side impacts. The sled provides re-directive support for side impacts and deceleration force for frontal impacts. The SMART CUSHION® telescopes rearward upon frontal impact and can be reset with minimal repair parts. It is NCHRP 350 approved at Test Levels 2 and 3.

System Dimensions & Weight

<table>
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<tr>
<th></th>
<th>SCI 70 GM</th>
<th>SCI 100 GM</th>
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<tbody>
<tr>
<td>Width</td>
<td>24 inch (610 mm)</td>
<td>24 inch (610 mm)</td>
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<tr>
<td>Length</td>
<td>13 ½ feet (4115 mm)</td>
<td>21 ½ feet (6550 mm)</td>
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<td>Height</td>
<td>33 inch (840 mm)</td>
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<td>2465 lbs. (1120 kg)</td>
<td>3450 lbs. (1570 kg)</td>
</tr>
<tr>
<td>NCHRP 350, Test Level</td>
<td>2</td>
<td>3</td>
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</table>

DESIGN CRITERIA

General
SMART CUSHION® impact attenuators comply with NCHRP Report 350, TL2 and TL3, and are designed for temporary work zone and permanent applications.

Foundations
Foundations must be a flat surface with longitudinal and cross slopes of 10:1 (horizontal: vertical) or less. SMART CUSHION® impact attenuators should not be located over drainage basins or expansion joints. Portland cement concrete foundation pads are preferred for permanent installations; asphaltic concrete foundation pads are appropriate for temporary work zone installations. The following table describes the foundations that may be used. See Appendices for drawings.

<table>
<thead>
<tr>
<th>Pad Material and Thickness</th>
<th>Anchor Embedment</th>
</tr>
</thead>
<tbody>
<tr>
<td>6 inch (150 mm) reinforced PCC</td>
<td>5 ½ inch (140 mm)</td>
</tr>
<tr>
<td>8 inch (205 mm) non-reinforced PCC</td>
<td>5 ½ inch (140 mm)</td>
</tr>
<tr>
<td>3 inch (75 mm) AC over 3 inch (75 mm) non-reinforced PCC</td>
<td>16 ½ inch (420 mm)</td>
</tr>
<tr>
<td>6 inch (150 mm) AC over compacted subgrade</td>
<td>16 ½ inch (420 mm)</td>
</tr>
<tr>
<td>8 inch (205 mm) AC</td>
<td>16 ½ inch (420 mm)</td>
</tr>
</tbody>
</table>

Concrete compressive strength shall be 4000 psi (28 MPa) at 28 days.

Foundation lengths may vary when using wide transitions.

**Support Structure**
SMART CUSHION® impact attenuators are self-supporting and do not require an additional support structure.

**Location**
The SMART CUSHION® impact attenuator’s location determines its position and transition requirements.

1. **Approach Zone** – SMART CUSHION® impact attenuators should not be placed directly behind raised curbs that exceed 4 inches in height. The longitudinal and cross slopes in front of the device should not exceed 10:1 (horizontal: vertical).

2. **Barrier Width** – SMART CUSHION® impact attenuators are 24 inch (610 mm) wide at the rear. Barriers 24 inch (610 mm) wide, or less, can be shielded without using a transition if there is no reverse direction traffic. Barriers that are wider than 24 inch (610 mm) and/or have reverse direction traffic require a transition, available from Hill & Smith Inc.

3. **Barrier Height** – SMART CUSHION® impact attenuators are approximately 33 3/8 inch (848 mm) high.

4. **Barrier Shape** – SMART CUSHION® transitions allow for connection to many barrier shapes.

**Transition Design**
SMART CUSHION® impact attenuators can be attached to many different barrier shapes. The attenuators are designed for direct attachment to 24 in wide barriers and Jersey/F-Shape barriers. The **SMART CUSHION® side panels move rearward beyond the end of the attenuator up to 30 inch (760 mm) upon impact.** This area is known as the travel zone. SMART CUSHION® transitions provide this travel zone in front of wider barriers and obstacles.

See appendices for SMART CUSHION® transition drawings. Hill & Smith Inc. can design transitions for other frequently used applications. Contact us for details.
Transitions

Necessary Locations (see Figure 1 – Necessary Locations):

- There is reverse direction traffic within the clear zone.
- The barrier intrudes into the side panels’ travel zone.

![Figure 1 – Necessary Locations](image)

Examples are median applications with bidirectional traffic, two lane roads with crossover potential, etc.

Unnecessary Locations (see Figure 2 – Unnecessary Locations):

- No reverse direction traffic within the clear zone.
- The barrier does not intrude into the side panels’ travel zone.

![Figure 2 – Unnecessary Locations](image)

Examples are traffic splits, shoulder applications with no crossover potential, one-way roads, etc.

Determining Side of Transition

The transition’s side is determined by standing at the front of the attenuator looking rearward toward the barrier to choose between left and right.
Drawings
The following SMART CUSHION® transitions and layouts are available from Hill & Smith Inc. Diagrams are shown in the Appendices as follows:

- Layout – Wide Block (Gore) Assembly, Appendix F & F2 - Rigid design for wide obstacles
- Layout – Wide Block (Gore) Assembly Calculations, Appendix F3 - Used to calculate longitudinal distances and parts requirements
- Transition - Jersey/F Shape, Appendix G - Used on standard Jersey/F shaped barriers with a 24 inch Base
- Transition - Concrete Block, 24 Inch, Appendix H - Used on 24 inch Concrete Block that must be 30 inch longitudinal length for our travel zone
- Transition - Concrete Block, 30 Inch, Appendix I - Used on 30 inch Concrete Block and will extend our installation length 38 inches
- Transition - Concrete Block, 36 Inch, Appendix J - Used on 36 inch Concrete Block and will extend our installation length 52 inches
- Transition - Concrete Block, 30 Inch, Flared, Appendix K - Used on 30 inch Concrete Block/Pillars and will extend our installation length 52 inches
- Transition - Concrete Block, 36 Inch, Flared, Appendix L - Used on 36 inch Concrete Block/Pillars and will extend our installation length 71 inches
- Transition – Thrie-Beam Rigid Assembly, Appendix M - Rigid design for possible reverse direction impacts
- Transition – W-Beam Rigid Assembly, Appendix N - Rigid design for possible reverse direction impacts
- Transition – Jersey, Median Barrier Variable Width, Appendix O - Used on Jersey Shape barrier with base widths of 30 - 38 inches wide.
- Transition – Single Slope Median Barrier, Appendix P - Used on 42 inch and 48 inch Single Slope barrier up to 26 inches wide at the base
- Transition – W-Beam 28 Inch High, Appendix Q – Connection to 28 inch high W-Beam Guardrail with no reverse direction traffic
- Transition – W-Beam 32 Inch High, Appendix R – Connection to 32 inch high W-Beam Guardrail with no reverse direction traffic
- Transition – Wide Block Spanner, Appendix S – Connection to a wide Concrete Block for one sided protection
- Transition – Wide Block Offset, Appendix T – Connection where rear oncoming contact with the back side is not possible
- Transition – 36-44 Inch Flush Mount, Appendix U – Incremental widths for Bi-directional traffic.
- Transition – 46-48 Inch Flush Mount, Appendix V – Incremental widths for Bi-directional traffic.
**Installation and Performance Statements**

Proper performance within NCHRP 350 design limits depends on correct installation of the SMART CUSHION® on an approved foundation. Any SMART CUSHION® not installed according to the drawings and the requirements of this installation manual may present an unsafe condition and should be reinstalled accordingly.

Impacts with vehicles whose size or mass are outside of those tested according to NCHRP 350 or with vehicles traveling at speeds greater than those tested according to NCHRP 350 will not necessarily produce results within the test criteria. The crash cushion is in conformance with all requirements of NCHRP 350 Levels 2 & 3 but is not guaranteed to safely stop a vehicle in a situation not encompassed by the test conditions.

**Safety**

*All work during installation, repair and inspection of the SMART CUSHION® should be performed according to federal, state and local laws.*

**Equipment List**

See Appendix B

**Site Preparation**

Check to make sure there are no drains, expansion joints, or buried conduit, cables or utility lines in the footprint space where the attenuator will be placed. Remove any curbs >4 inch or obstacles in front of or beside where attenuator will be installed for a minimum distance of 12 feet from any edge of the attenuator. Be sure to set up proper traffic control before beginning any installation or repair work at the site.

**Foundations** – (reference Appendices E1 and E2)

New foundations should be installed according to Appendix E – Foundation Drawing. Concrete should reach full cure strength before use. The surface of the foundation must be cleaned of all debris, dirt, mud, sand, etc., as the crash cushion must sit on a level plane, although longitudinal and/or cross slope of up to 10:1 (horizontal:vertical) is allowed.

Any of the following foundations will meet the minimum requirements:

- 6 inch reinforced concrete pad
- 8 inch non-reinforced concrete pad
- 3 inch asphalt over 3 inch of concrete
- 6 inch asphalt over 6 inch of compacted sub base
- 8 inch asphalt

*Note: Concrete should be 28 MPa or 4000 psi minimum at full cure. The slope should not exceed 10:1.*
Installing the SMART CUSHION® on an existing foundation may result in anchor bolt locations corresponding to rebar positions in the foundation. It may be necessary to use more elaborate drilling equipment than simply an impact drill with standard concrete bits.

Prior to installing the SMART CUSHION® on an existing foundation, the concrete must be thoroughly inspected for slope, signs of cracking, surface wear, shifting from original position, undercut of earth below or to the sides supporting the foundation, settling, and any other signs of age or deterioration which may make the foundation unusable. If any of these signs are evident, the foundation must be removed and a new one must be installed according to requirements stated. If prior bolt patterns are present, use proper engineering calculations to assure adequate strength in the new holes.

**Placement of the SMART CUSHION®**

Measure the correct distance and offset of the SMART CUSHION® according to the type of object being shielded and the type of transition being used. The dimensions shown on the transition drawings may be used as a guide for this. System drawings are also available.

The crash cushion is shipped in one piece, fully assembled. Use a choked four-point attachment on panel support frames 3 & 4 behind the sled for the Test Level 3 unit. The lift points on the Test Level 2 unit are the 1st and 2nd frames behind the sled. Lift the SMART CUSHION® off the transporting vehicle with a boom or forklift of sufficient capacity and place it in the position marked on the foundation.

Once in place, double-check the measurements to be sure of the proper location of the SMART CUSHION®.

**Warning:** On a full collapse, the last set of side panels will telescope 30 inches beyond the last terminal brace at the rear of the crash cushion. All objects that may interfere with this motion can affect the performance of and cause undue damage to the crash cushion.

**Anchor Installation**

Embedment Requirements are as follows:

1. 6 inch reinforced concrete pad – anchor embedment of 5 ½ inch and a torque value of 125 ft-lbs
2. 8 inch non-reinforced concrete pad – anchor embedment of 5 ½ inch and a torque value of 125 ft-lbs
3. 3 inch asphalt over 3 inch of concrete – anchor embedment of 16 ½ inch and a torque value of less than 10 ft-lbs
4. 6 inch asphalt over 6 in of compacted sub base – anchor embedment of 16 ½ inch and a torque value of less than 10 ft-lbs
5. 8 inch asphalt – anchor embedment of 16 ½ inch and a torque value of less than 10 ft-lbs
Using the holes in the base as a template, drill 7/8 inch diameter holes to the proper depth as previously defined. If the SMART CUSHION® is being installed on an existing foundation and the drills are hitting rebar, use a core drill or rebar cutter to ensure that straight, vertical holes are made at each location. Take care that the holes do not break out the bottom of the foundation as this may result in loss of epoxy during anchor placement.

Once the holes are drilled, clean the hole of all debris using suitable means. To ensure epoxy adhesion, **concrete holes MUST be cleaned with a bottle brush to remove embedded dust**, and a final check conducted that all holes are clean of debris and dry. Inject the epoxy into each hole at an angle to avoid air entrapment. Use a sufficient amount of epoxy so that the hole will be filled when the bolt is inserted. Screw the nut on the anchor bolt flush with the end, put the washer on the stud, and immediately insert the anchor stud all the way to the bottom while turning the anchor. This method assures the anchor bolts are vertically plumb and the threads are coated with epoxy. **Stud locations should not project more than ½ inch above the nut after final torque is completed.**

There is a quantity of 48 anchors for the SCI 100 GM, TL-3 attenuator.
There is a quantity of 34 anchors for the SCI 70 GM, TL-2 attenuator.

The epoxy will be ready for bolt tightening after 30 minutes at 80 degrees F (27 degrees C). See the container label for other temperatures and bolt up times. Allow the epoxy to cure. Torque the anchor nuts to 170 N-m (125 ft-lbs). Substitute epoxy must match our specifications. Asphalt anchors are longer and should only be torqued to 10 ft-lbs. The SCI uses Redhead A7 Epoxy. Concrete TL2 and TL3 units require 3 and 4 tubes, respectively while Asphalt TL2 and TL3 units require 9 and 12 tubes, respectively.

**Delineator Panel Attachment**

Installation of the front delineation plate will be determined by the location of the attenuator and state regulations. A delineation plate is shipped with a yellow powder coat background and no striping. It is attached with four bolts. Applying the striping to the plate is easier while it is removed from the attenuator. Examples of the delineation plate are as follows:

![Right Shoulder](image)
![Chevron for Medians](image)
![Left Shoulder](image)

**Transition Installation**

Transitions may be required. Any use of a SMART CUSHION® with a possible reverse direction impact will require a transition. In all applications, be sure to install the transition anchors that are exposed to traffic, so that there is no extension of the studs beyond the outside face of the nut. Refer to the transition drawings for details of the required anchor locations. For horizontal stud installation in concrete use mechanical anchors, or if using studs repeat the same epoxy installation process as the anchor bolts using plugs to retain the epoxy to secure the transition to the barrier. Transition drawings and parts explosions are in the appendices.
Final Inspection
After the anchor bolts have been tightened to the proper torque value, check that the SMART CUSHION® is not distorted in any way as might happen if the unit is secured to a foundation which is not a flat plane. Check that the front section is pulled out to within 1 inch of the front stop bolts and that no part of the unit has been damaged by shipping and handling. Verify that all assembly bolts are tight and have not come loose during shipping or installation. Finally, check that no tools or other equipment have been left within the SMART CUSHION® structure.

Resetting SMART CUSHION® after Impact

In the event of any impact, the crash cushion will require a full evaluation to determine the necessary repairs to return it to service. To do this, proceed as follows:

Site Preparation
Do not begin work until the area is declared safe and accessible.

Re-Extension and Inspection after Frontal Impact

1. Remove the front delineator panel and attach pulling means to the bottom brace of the front sled.

2. Use wire or strap on the bottom brace at the front of the sled to hold the spelter socket up in the air while pulling out or it will catch on the base frame cross braces. (See Fig. 1)

3. Remove the front cable bracket that is located on the front sheave at the front of the attenuator. (See Fig. 2)

4. Attach a ½” Grade 100 chain to the bottom brace of the front sled.

5. Pull the sled forward one to two feet to give you slack on the cable.

6. If necessary, use Hill & Smith Inc.’s cable release tool to break cable loose from the sheave at the front of the attenuator if the zinc coating has attached the cable to the sheave. (See Fig. 3)
7. Pull out in two foot increments while helping the cable feed out of the front of the unit. (See Fig. 4)

8. Pull the sled out the rest of the way in **short smooth increments** so you can help feed the cable out the front of the attenuator. This will give you a cable loop in front of the attenuator. **When you are past the last cross brace, you will need to remove the strap or wire to allow the cable to follow the path into the front sheave.** The sled must be fully extended to replace the shear bolts. The sled should be approximately 1 inch from the stop bolts in the front.

**During any pullout, do not stand within the snap radius of the chain in case of failure**.

9. During frame pullout, inspect front part of the cable from the spelter socket, as it will be partially obscured after extension of the mobile frames and sheaves. See the cable inspection procedure.

10. Remove the front and rear sheave cover plates at each end of the cylinder by removing the two hex bolts that hold them down.

11. Remove the anti-rotation pins, which are the two outer pins, inserted through the holes in the sheaves from both the front and back sheaves. This will be easily done with Hill & Smith Inc.’s anti-rotation pin removal tool. **Caution: Do not remove the center pin. The rear pins are longer than the front sheave pins and cannot be intermixed so leave them by their locations.** (See Fig. 5)

12. Remove shear bolt remnants in the holes on both sides of the mobile sheaves. These are grade 8 bolts so they can be difficult to remove without a 90 degree pry bar with a claw to pry out. (See Fig. 6)

13. Attach a pulling means to the shackle on the mobile sheave assembly. (See Fig. 6)

14. Slowly pull out the mobile sheaves. **Do not stand inside the cable loop or be in the pulling strap danger zone.**
15. Finish pulling out the mobile sheaves until you can see through the shear bolt holes but do not put in the shear bolts yet.

16. If the cable passes inspection, release any tension on your pulling strap and reinstall the anti-rotation pins in the front and back sheave assemblies and reinstall the cover plates for those sheaves using marine grade anti-seize on the bolt threads. The sheaves may be aligned by inserting a pry bar into the sheave holes. Work your way from the bottom up.

17. Put tension on your chain and replace the two ¼ inch Grade 8 shear bolts in the front corners of the mobile sheaves.

18. Inspect the cylinder, anchor bolts and side panels according to the subsequent procedures listed.

**Side Impact Inspection and Repair**

1. Inspect and replace any damaged side panels.

2. Inspect and replace any damaged side keeper bolts on all panels. There are three styles of side keeper bolts. The winged style is for the panel connected to the sled and bolts through the first frame behind the sled. The center side keepers have a ½ inch shoulder while the last side keeper, which is bolted to the terminal frame, has a ¼ inch shoulder.

3. Inspect and repair any damaged side guides.

**Cable Inspection Procedure**

The cable should be visually inspected for damage. The most common sign of rope deterioration is broken wires. The wire must be clean and not under tension to perform a visual inspection. The visual inspection should include looking for broken wire strands, localized wear or crowns. A sharp awl or marlin spike can be used to separate wires to check if internal damage is present, indicated by loose wires or crowns. If internal inspection shows any damage to any core wires, remove the unit from service. If there are more than six random broken wires in one rope lay or three broken wires in one strand in one rope lay, remove the unit from service. A rope lay is the length along the rope in which one strand makes a complete revolution around the rope. *(See Fig. 7)*

Inspect the spelter socket for broken wires, damaged eyes or other fatigue. Any signs of broken wires at the spelter socket will require the unit to be removed from service.

Cable damage is the indication of an over-design impact. The unit must be inspected by an authorized manufacturers’ representative.
Cylinder Inspection
The cylinder should be inspected for:

- Dented or swollen tube jacket
- Visible cracks in any welds and fluid leakage from the welds
- Piston rod surface damage, bending or fluid leakage in seal area
- If fully collapsed or over design impact speed, disconnect piston rod from the mobile sheave after the unit is pulled out and push the piston rod in checking for free movement.

If any of these inspections are suspect, remove the unit from service. Current models have PTFE seals with an unlimited static life.

Anchor Bolt Inspection
Anchor bolts may come loose or be damaged upon impact. These bolts may be replaced by welding a nut or putting a double nut on them and backing them out of the hole. Drill out the old epoxy and reinstall new bolts with new epoxy following previous instructions on page 7.

Side Panel Inspection
Side Panels are designed to nest and collapse with minimal or no damage upon frontal impact. The side keepers sustain a shock upon impact. These side keepers should be replaced if there are any signs of fatigue, bending or other visible damage. Inspect the side panels for any bending or torn metal. If damage is found, any side panel is removable by removing four bolts. It may be necessary to remove the bolts on the panel upstream to slide out a panel located in the middle of the unit. The side keepers used to hold the large front sled panels are different than the side keepers on the center panels. Also, the side keeper used on the last terminal brace, which is the rearmost support, has a shorter shoulder (¼ inch vs. ½ inch), as it does not have a panel overlap. These shoulders must seat into the outer overlapping panel and pin the inside panel to the frames using a torque value of 270 N-m (200 ft-lbs). Be careful not to pin the edge of the outside panel as it will restrict free sliding of that panel.

Side Guide Inspection
At the bottom of each support frame, there are two guides to stabilize and guide collapse of the attenuator. Inspect each side guide for damage. These guide assemblies are very rugged. If the side guides are not damaged, they can be reused. The torque value for the side guides is 920 N-m (680 ft-lb). These side guides are stronger than the rail, so visually inspect the rail for crowns. Any crowning of the rail can be straightened.
**Final Inspection**
After the resetting of the SMART CUSHION® is complete, verify by visual inspection that all assembly bolts are tight and show no sign of damage. Finally, check that no tools and other equipment or debris have been left within the SMART CUSHION® structure. Verify that no other damage unrelated to the most recent impact has occurred and that no significant corrosion or other deterioration has taken place.

**Non-Repairable Impacts**
There can be instances where the impact is outside the scope of the SMART CUSHION® design. This may render the SMART CUSHION® unsafe to reuse and it should be replaced.

**Periodic Maintenance**
Maintenance is very site dependent. Small amounts of debris and trash will not affect the performance of the SMART CUSHION®. Accumulations of dirt/mud can impede the collapse of any system. We suggest an annual cleanout of the system in the fall of the year. If sites are in locations prone to heavy rain/mud runoff, a bi-annual cleaning may be required.
# APPENDIX A - SCI SMART CUSHION® PARTS LIST

<table>
<thead>
<tr>
<th>Prod No.</th>
<th>Part No.</th>
<th>Description</th>
<th>Qty Per Unit TL2/TL3</th>
<th>Unit of Measure</th>
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<td>270128</td>
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<td>Attenuator 24” wide w/Concrete Anchors TL3</td>
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<td>270667</td>
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<td>Bolt Concrete Anchor 3/4” X 7” TL3 * *(Included in P/N 9400)</td>
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### Transitions and Transition Parts

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***Additional transitions are available***

O = Optional    Revised 7-2015
The following tools and equipment will be required to install and repair the Crash Cushion:

- Standard roadside work area safety equipment
- Personal safety equipment (gloves, latex gloves for epoxy, eye/face protection, etc.)
- Means of safely unloading 3500 lbs.
- Compressed air source/vacuum
- 1 inch nylon bottle brush
- Safety goggles
- Four lifting slings or four-point sling
- Bosch rotary hammer drill 13 ½ amp #11263EVS Model 0 611 263 739 or equal
- 7/8 inch X 22 inch concrete drill bit for concrete installations or 7/8 inch X 28 inch drill bit for asphalt installations
- Relton rebar eater bit #RB-14 - 7/8 inch rebar cutter bit or equal
- 1 inch X 12 inch concrete drill bit for drop-in anchors on transitions
- Setting tool for drop in anchors
- ½ inch electric drill for rebar bit and bottle brush (cordless will work for bottle brush)
- Epoxy dispenser for 28 oz. dual cartridge system (should have spare in case of malfunction)
- Socket wrench and breaker bar
- Torque wrench (225 ft-lb capacity) with 3 ft extension
- Measuring and layout equipment (tape measure, chalk line, markers, etc.)
- Combination wrenches, deep sockets (Including 7/16 inch - 5/8 inch, 1 ¼ inch, 1 ½ inch, 1 5/8 inch) and 3+ inch extension
- 5 foot wedge and round-ended pry bar
- Loctite #34395 marine grade anti-seize
- Suitable pulling means – Chain 20’ x ½” Grade 100
- Misc. small tools (hammers, pliers, screw drivers, vise grips, etc.)
- Bear claw pry bar to remove ¾ inch shear bolt remnants
- Anti-rotation pin removal tool
- Cable release tool
- Piece of wire or bungee cord to hold up spelter socket during pullout

This list is adequate for general installation and repair. Depending on site conditions, additional tools and equipment may be required.
APPENDIX C - SMART CUSHION, TEST LEVEL II

PARTS LIST
01 - Front Sled
02 - Cable Assembly
05 - Sled Panel
07 - Terminal Brace
09 - Anchor Bolts
12 - Side Panels
14 - Mobile Sheave Asbly
17 - Cable Adjuster Bolt
18-20 - Mobile frames 4-6
28 - Cylinder
27 - Rear Panel
08 - Sled Side Keeper
06 - Center Side Keeper
29 - Rear Side Keeper
APPENDIX D - SMART CUSHION, TEST LEVEL III

PARTS LIST
01 - Front Sled
02 - Cable Assembly
05 - Sled Panel
07 - Terminal Brace
09 - Anchor Bolts
12 - Side Panels
14 - Mobile Sheave Asbly
17 - Cable Adjuster Bolt
16-23 - Mobile frames 1-6
26 - Cylinder
27 - Rear Panel
08 - Sled Side Keeper
06 - Center Side Keeper
29 - Rear Side Keeper
APPENDIX E1 - TEST LEVEL II FOUNDATION

Cross Slope at Top Surface not to Exceed 1 in 10
Foundation must be a Level Plane

*** Wide Hazards and Transitions may require the foundation to be longer. See Transition Drawings.

SPECIFICATIONS

All reinforcing steel - straight #4 ASTM A36
Embedment requirements:
- 6" reinforced concrete pad with anchor embedment of 5 1/2"
- 8" non-reinforced concrete pad with anchor embedment of 5 1/2"
- 3" asphalt over 3" concrete with anchor embedment of 16 1/2"
- 6" asphalt over 6" of compacted subbase with anchor embedment of 16 1/2"
- 8" asphalt with anchor embedment of 16 1/2"

The contractor shall furnish a certification for material installed to the following requirements:
- 6" reinforced concrete (PCC) sampling per ASTM C31-84, testing per ASTM C39-84
- 8" non-reinforced concrete (PCC) sampling per ASTM C31-84, testing per ASTM 39-84
- 3" asphalt over 3" concrete - Type SP 12.5 Level C or higher
- 6" asphalt over 6" of compacted subbase - same as above
- 8" asphalt (AC) - Type SP 12.5 Traffic Level C or higher

Front
SCI170GM
Level 2 System

PCC 4000 psi at full cure
Cross Slope at Top Surface not to Exceed 1 in 10
Foundation must be a Level Plane

**Wide Hazards and Transitions may require the foundation to be longer. See Transition Drawings.**

**SPECIFICATIONS**

All reinforcing steel - straight #4 ASTM-A36

Embedment requirements:
- 6" reinforced concrete pad with anchor embedment of 5 1/2"
- 8" non-reinforced concrete pad with anchor embedment of 5 1/2"
- 3" asphalt over 3" concrete with anchor embedment of 16 1/2"
- 6" asphalt over 6" of compacted subbase with anchor embedment of 16 1/2"
- 8" asphalt with anchor embedment of 16 1/2"

The contractor shall furnish a certification for material installed to the following requirements:
- 6" reinforced concrete (PCC) sampling per ASTM C31-84, testing per ASTM C39-84
- 8" non-reinforced concrete (PCC) sampling per ASTM C31-84, testing per ASTM C39-84
- 3" asphalt over 3" concrete - Type SP 12.5 Level C or higher
- 6" asphalt over 6" of compacted subbase - same as above
- 8" asphalt (AC) - Type SP 12.5 Traffic Level C or higher
APPENDIX F - TRANSITION, THRIE BEAM WIDE TAPER

Parts List:
Gore Assembly Complete to Brace #5 - #275288
01-Transition Thrie 10 Degree Flare Right #275304
02-Transition Thrie 10 Degree Flare Left #275306
02-Transition Concrete Spanner Brace #275291
03-Transition Concrete #1 Tapered Spanner Brace # 275290
04-Transition Gore Tapered #1 Spanner Brace #275292
05-Transition Gore Tapered #2 Spanner Brace #275293
06-Thrie Beam Concrete Leg Brace #270765
07-Thrie Beam Blockout AASHTO PWB02 #265244

***SPlice BOLTS AND GUARDRAILS BY OTHERS***

NOTES:
1) DIMENSIONS SHOWN ARE FOR 80" WIDTH
2) FOR EACH 1" OF WIDTH CHANGE, ADD OR SUBTRACT THE FOLLOWING:
   2.88" [73.15mm] TO LENGTH OF GUARDRAIL
   2.84" [72.13mm] TO OVERALL LENGTH
3) ADD OR SUBTRACT ADDITIONAL POST ON EACH SIDE FOR EACH 13" [330mm]
   CHANGE IN WIDTH.
4) GUARDRAIL TERMINATION - YOU MUST ADD THE GUARDRAIL OVERLAP LENGTH AND
   TERMINATE PER STATE REGULATIONS.

The use of the last brace will be determined by whether the Thrie Beam can be attached to the obstruction or not. If the Thrie Beam distance from the last brace is 40 inches or less and can be attached, you will not need a brace at the obstruction. If you cannot attach to the obstruction, you may need a brace and drill holes in the Thrie Beam at the furthest rearward location.
APPENDIX F(2) - TRANSITION, THRIE BEAM WIDE TAPER

***SPLICE BOLTS AND GUARDRAIL BY OTHERS.***

PARTS LIST
08 - Hex Bolt 3/4"-10NC x 2"
09 - Heavy Hex Nut 3/4"-10NC
10 - Lock Washer - 3/4"
11 - Flat Washer - 3/4"
12 - Guardrail Bolt (Rd Hd) ASSHTO spec FBB02
13 - Recessed Nut per ASSHTO spec FBB02
14 - Flat Washer per ASSHTO spec FWC16b
15 - Threaded Rod 3/4"-10NC x 7"
16 - Threaded Rod 3/4"-10NC x 18"
17 - Anchor Bolt Epoxy
18 - Hex Bolt per ASSHTO FBX16a
19 - Hex Nut per ASSHTO FBX16a

5.5" embedment at Concrete
16.5" embedment at Asphalt
40 pcs at braces

4 plcs each side
10 plcs each side
12 plcs each side
10 plcs each side

13
14
12
12 places where joining Thrie beam at each side.
THESE ITEMS SUPPLIED BY OTHERS
SCI GM WIDE TRANSITION CALCULATIONS

Guardrail

12.6" Splice overlap at Transition end

Must add length for barrier overlap and end termination per state specifications
Longitudinal distance increases 2.84" for each 1" increase in width Thrie Beam Length increases 2.88" for each 1" increase in width

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<td>Add 14-Thrie Beam Concrete Leg Brace #270765</td>
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APPENDIX G - TRANSITION, JERSEY/F SHAPE BARRIER

Parts List:
01 - Transition Jersey Barrier Right #275297 (shown)
01 - Transition Jersey Barrier Left #275294 (not shown)

Transition on one or both sides as required.
APPENDIX G(2) - TRANSITION, JERSEY/F SHAPE BARRIER

PARTS LIST
02 - Hex Bolt 3/4" -10NC x 2"
03 - Heavy Hex Nut 3/4"-10NC
04 - Lockwasher 3/4"
05 - Flat washer 3/4"
06 - Drop-In Anchor 3/4"-10NC x 3"

Drill 1" x 3 1/4" deep hole in barrier.
Set Drop-In Anchor with Setting Tool
or with punch.
Typical (4) places
APPENDIX H - TRANSITION, CONCRETE BLOCK, 24 INCH (610mm)

Parts List:
01 - Transition 24" Concrete Block Right & Left #275263

Transition on one or both sides as required.

PLANT VIEW

SIDE VIEW

24.00" [610mm]

33.38" (848mm)
APPENDIX H(2) - TRANSITION, CONCRETE BLOCK, 24 INCH (610mm)

PARTS LIST

02 - Hex Bolt 3/4"-10NC x 2"
03 - Heavy Hex Nut 3/4"-10NC
04 - Lockwasher 3/4"
05 - Flat washer 3/4"
06 - Drop-in Anchor 3/4"-10NC x 3"

Drill 1" x 3 1/4" deep hole in barrier. Set Drop-In Anchor with Setting Tool or with punch. Typical (4) places.
APPENDIX I - TRANSITION, CONCRETE BLOCK, 30 INCH (762mm)

Parts List:
Two-Sided Full Assembly #275279
01 - Transition 30" Concrete Straight Connection #275265
02 - Transition Concrete Spanner Brace #275291

PLAN VIEW

SIDE VIEW

USED FOR:
1. Unchamfered Concrete Block
2. Chamfered Concrete Block ***
***Chamfer limited to <4"
APPENDIX I(2) - TRANSITION, CONCRETE BLOCK, 30 INCH (762mm)

5.5" embedment for Concrete
16.5" embedment for Asphalt

4 pcs each side

01

02

04

09 or 10

03

02

07

05

08

4 pcs each side

Drill 1 x 3 1/4 deep hole in barrier, Set Drop-in Anchor with Setting Tool or punch. Typical (4) ea. side plus (4) on end.

2 pcs each side

05

07

08

01

04

01

01

04

PARTS LIST

01 - Hex bolt 3/4" -10NC X 2" long
02 - Heavy Hex Nut 3/4"-10NC
03 - Lockwasher 3/4"
04 - Flat Washer 3/4"
05 - Guardrail Bolt (Rd Hd)ASSHTO spec FBB02
06 - Recessed Nut per ASSHTO spec FBB02
07 - Flat Washer per ASSHTO spec FWC16b
08 - Drop-In Anchor 3/4"-10NC X 3
09 - Threaded Rod 3/4"-10NC X 7" long
10 - Threaded Rod 3/4" 10NC X 18" long
11 - Anchor bolt epoxy
APPENDIX J - TRANSITION, CONCRETE BLOCK, 36 INCH (915mm)

Parts List:
Two-Sided Full Assembly #275283
01 - Transition 36" Concrete Straight Connection #275267
02 - Transition Concrete Spanner Brace #275291
03 - Transition Concrete #1 Tapered Spanner Brace #275290

PLAN VIEW

SIDE VIEW

USED FOR:
1. Unchamfered Concrete Block
2. Chamfered Concrete Block ***
*** Chamfer limited to <4"
APPENDIX J(2) - TRANSITION, CONCRETE BLOCK, 36 INCH (915mm)

5.5" embedment for Concrete
16.5" embedment for Asphalt
12 pcs at Spanner Braces

4 pcs each side

Drill 1" x 3 1/4" deep hole in barrier.
Set Drop-in Anchor with Setting Tool or with punch.
Typical (4) ea. side plus (4) on end.

PARTS LIST
04 - Hex Bolt 3/4"-10NC x 2"
05 - Heavy Hex Nut 3/4"-10NC
06 - Lockwasher 3/4"
07 - Flat washer 3/4"
08 - Guardrail Bolt (Rd hd) ASSHTO spec FBB02
09 - Recessed Nut per ASSHTO spec FBB02
10 - Flat Washer per ASSHTO spec FWC16b
11 - Drop-in Anchor 3/4"-10NC x 3"
12 - Threaded Rod 3/4"-10NC x 7"
13 - Threaded Rod 3/4"-10NC X 18"
14 - Anchor Bolt Epoxy
APPENDIX K - TRANSITION, CONCRETE BLOCK, 30 INCH (762mm) FLARED

Parts List:
Two-Sided Full Assembly #275278
01 - Transition 30” Concrete Outside Connection #275266
02 - Transition Concrete Spanner Brace #275291
03 - Transition Concrete #1 Tapered Spanner Brace #275290

USED FOR:
1. Unchamfered Concrete Block
2. Chamfered Concrete Block ***
   ***Chamfer limited to <4"
APPENDIX K(2) - TRANSITION, CONCRETE BLOCK, 30 INCH (762mm) FLARED

5.5" embedment for Concrete
16.5" embedment for Asphalt
12 plcs at Spanner Braces

4 plcs each side

Drill 1" x 3 1/4" deep hole in barrier. Set Drop-in Anchor with Setting Tool or with punch. Typical (4) ea. side.

PARTS LIST
04 - Hex Bolt 3/4"-10NC x 2"
05 - Heavy Hex Nut 3/4"-10NC
06 - Lockwasher 3/4"
07 - Flat washer 3/4"
08 - Guardrail Bolt (Rd hd) ASSHTO spec FBB02
09 - Recessed Nut per ASSHTO spec FBB02
10 - Flat Washer per ASSHTO spec FWC16b
11 - Drop-in Anchor 3/4"-10NC x 3"
12 - Threaded Rod 3/4"-10NC x 7"
13 - Threaded Rod 3/4"-10NC x 18"
14 - Anchor Bolt Epoxy
APPENDIX L(2) - TRANSITION, CONCRETE BLOCK, 36 INCH (915mm) FLARED

PARTS LIST

05 - Hex Bolt 3/4"-10NC x 2"
06 - Heavy Hex Nut 3/4"-10NC
07 - Lockwasher 3/4"
08 - Flat washer 3/4"
09 - Guardrail Bolt (Rd hd) ASSHTO spec FBB02
10 - Recessed Nut per ASSHTO spec FBB02
11 - Flat Washer per ASSHTO spec FWC16b
12 - Drop-in Anchor 3/4"-10NC x 3"
13 - Threaded Rod 3/4"-10NC x 7"
14 - Threaded Rod 3/4"-10nc x 18"
15 - Anchor Bolt: Epoxy
APPENDIX M(2) - TRANSITION TO THRIE BEAM
** FOR USE WITH BIDIRECTIONAL TRAFFIC

***THIS DESIGN IS FOR BIDIRECTIONAL TRAFFIC. POST SPACING AND NESTED GUARDRAIL PER SPEC.***

***GUARDRAILS, POSTS, BLOCKOUTS AND CONNECTION BOLTS BY OTHERS.***

**PARTS LIST**

02 - Hex Bolt 3/4"-10NC x 2"
03 - Heavy Hex Nut 3/4"-10NC
04 - Lock Washer 3/4"
05 - Threaded Rod 5/8"-11NC x 11"
06 - Heavy Hex Nut 5/8"-11NC
07 - Lock Washer 5/8"
08 - Guardrail Bolt (Rd Ht) AASHTO spec FBB02
09 - Recessed Nut per AASHTO spec FBB02
10 - Flat Washer per AASHTO spec FWC16b

Guardrail splice bolts by others. Due to multiple layers, AASHTO FBB02 bolts will be required and a step drill may be required to correct hole alignment.
APPENDIX N - TRANSITION TO W BEAM

** FOR USE WITH BIDIRECTIONAL TRAFFIC

PLAN VIEW

Overlap rails such that exposed edges do not cause snagging with incoming traffic.

Parts List:
01 - Transition Thrie & W Beam - Right #275298
01 - Transition Thrie & W Beam - Left #232971
02 - Rectangular Tube Blockout #265580

***GUARDRAIL, POSTS, BLOCKOUTS AND CONNECTION BOLTS BY OTHERS.***

Start of standard w-beam guardrail

***THIS DESIGN IS FOR BIDIRECTIONAL TRAFFIC PATTERNS POST SPACING AND NESTED GUARDRAIL PER SPEC. ***

Blockouts for post 1 only:
Requires Guardrail bolt head to prevent snagging on rear panel during collapse.

**SC1100GM**

33.69” [856mm]

Blockouts for post 2:
PDB01 (each side), or use similar to Part 15 (figure 7) in original design.

1.25” [32mm]

33.25” [845mm]

Nested (2) thrie beam rails: RTM02a (12 gauge)

Thrie beam to w-beam transition section: RWT01a

Blockouts for posts 3 - 9: PD802

Blockouts for post 10: PDB02. Trim 2” from top and bottom of blockout.
APPENDIX N(2) - TRANSITION TO W BEAM
** FOR USE WITH BIDIRECTIONAL TRAFFIC

***THIS DESIGN IS FOR BIDIRECTIONAL TRAFFIC,
POST SPACING AND NESTED GUARDRAIL PER SPEC.

***GUARDRAILS, POSTS, BLOCKOUTS AND
CONNECTION BOLTS BY OTHERS.***

PARTS LIST
02 - Hex Bolt 3/4"-10NC x 2"
03 - Heavy Hex Nut 3/4"-10NC
04 - Lock Washer 3/4"
05 - Threaded Rod 5/8"-11NC x 11"
06 - Heavy Hex Nut 5/8"-11NC
07 - Lock Washer 5/8"
08 - Guardrail Bolt (Rd Hd) AASHTO spec FBB02
09 - Recessed Nut per AASHTO spec FBB02
10 - Flat Washer per AASHTO spec FWC16b

Guardrail splice bolts by others.
Due to multiple layers, AASHTO FBB02 bolts will be required and a step drill may be required to correct hole alignment.
APPENDIX O - TRANSITION, JERSEY/F SHAPE, VARIABLE WIDTH BASE

Parts List for Double Sided Median Barrier 30"-38" Base:
Two-Sided Full Assembly #239542 (with rub rail),
#239545 (without rub rail)
01 - Transition - Left #275272
02 - Transition - Right #275273
03 - Transition Rub Rail - Left #275270
04 - Transition Rub Rail - Right #275271
05 - Transition Support Bracket - Right #239471
06 - Transition Support Bracket - Left #239472

For use with barriers with base widths of 30"-38"
Rub rails only required for base widths > 34"
APPENDIX O(2) - TRANSITION, JERSEY/F SHAPE, VARIABLE WIDTH BASE

Drill 1" x 3 1/4" deep hole in barrier. Set Drop-In Anchor with Setting Tool or punch. Typical (6) places each side.

5.5" embedment for Concrete
16.5" embedment for Asphalt

PARTS LIST
06 - Hex Bolt 3/4"-10NC x 2"
07 - Heavy Hex Nut 3/4"-10NC
08 - Lock Washer 3/4"
09 - Flat Washer 3/4"
10 - Guardrail Bolt (Rd Hd) ASSHTO spec FBB02
11 - Recessed Nut per ASSHTO spec FBB02
12 - Flat Washer per ASSHTO spec FWC16b
13 - Drop-In Anchor 3/4"-10NC x 3"
14 - Threaded Rod 3/4"-10NC x 7"
15 - Threaded Rod 3/4"-10NC x 18"
16 - Anchor Bolt Epoxy
APPENDIX P - TRANSITION, MEDIAN BARRIER - SINGLE SLOPE 24 - 26.75 INCH BASE (610 - 679mm)

Parts List:
01 - Transition Single Slope Median Barrier - Right #275290 (shown)
01 - Transition Single Slope Median Barrier - Left #275302 (not shown)
APPENDIX P(2)-TRANSITION, MEDIAN BARRIER - SINGLE SLOPE 24 - 26.75 INCH BASE (610 - 679mm)

PARTS LIST

02 - Hex Bolt 3/4"-10NC x 2"
03 - Heavy Hex Nut 3/4"-10NC
04 - Lockwasher 3/4"
05 - Flat washer 3/4"
06 - Drop-In Anchor 3/4"-10NC x 3"

Drill 1" X 3 1/4" deep hole in barrier. Set Drop-in Anchor with Setting Tool or with punch. Typical (3) places.
APPENDIX Q - TRANSITION, W BEAM 28 INCH HIGH
** UNIDIRECTIONAL TRAFFIC ONLY

Parts List:
01 - Transition 28" W Beam - Right: #275309
01 - Transition 28" W Beam - Left: #275307
02 - Rectangular Tube Blockout #265580

***ALL POSTS, BLOCKOUTS, AND CONNECTION BOLTS BY OTHERS.***

Blockouts for post 1 only:
Requires Guardrail bolt head to prevent snagging on rear panel during collapse.

Blockouts for post 2:
PDB01 (each side), or use similar to Part 15 (figure 7) in original design.

Posts 1-4: PDE03 with the two optional holes, 78" length, 44 3/4" embedment

Standard W-Beam splice, typical both sides

Overlap rails such that exposed edges do not cause snagging with incoming traffic

Start of standard W-Beam Guardrail

PLAN VIEW

SIDE VIEW
APPENDIX R - TRANSITION, W BEAM 32 INCH HIGH
** UNIDIRECTIONAL TRAFFIC ONLY

Parts List:
01 - Transition 32" W Beam - Right #275311
01 - Transition 32" W Beam - Left #275310
02 - Rectangular Tube Blockout #265580

***ALL POSTS, BLOCKOUTS AND CONNECTION BOLTS SUPPLIED BY OTHERS.***

Blockouts for post 1 only:
Requires Guardrail bolt head to prevent snagging on rear panel during collapse.

Blockouts for post 2:
PDB01 (each side), or use similar to Part 15 (figure 7) in original design.

Start of standard W-Beam Guardrail

Plan View

SIDE VIEW

Blockouts for posts 3 & 4: PDB01

32 [813]

33 $\frac{3}{4}$ [845]

33.69" [856 mm]

Each Side

3 Spaces at 18.75" = 56.25"
[1429 mm]

24 [610]

78 $\frac{3}{8}$ [1993] END OF CUSHION TO END OF TRANSITION

Posts 1-4: PDE03 with the two optional holes, 78" length, 44 3/4" embedment

Overlap rails such that exposed edges do not cause snagging with incoming traffic
APPENDIX Q(2) & R(2) - TRANSITION, W BEAM 28 & 32 INCH HIGH

PARTS LIST
02 - Hex Bolt 3/4"-10NC x 2"
03 - Heavy Hex Nut 3/4"-10NC
04 - Lock Washer 3/4"
05 - Threaded Rod 5/8"-11NC x 11"
06 - Heavy Hex Nut 5/8"-11NC
07 - Lock Washer 5/8"
08 - Guardrail Bolt (Rd Ha) AASHTO spec FB802
09 - Recessed Nut per AASHTO spec FB802
10 - Flat Washer per AASHTO spec FWC18b

***GUARDRAILS, POSTS, BLOCKOUTS AND CONNECTION BOLTS BY OTHER***
APPENDIX S - TRANSITION, SPANNER FOR WIDE CONCRETE BLOCK

Plan View

Parts List:
01 - Spanner Transition to Wide Block Right (shown) & Left #251641 (opposite)

Transition on one side only.

33.38" [848mm]

30.00" [762mm]
APPENDIX S(2) - TRANSITION, SPANNER FOR WIDE CONCRETE BLOCK

PARTS LIST

02 - Hex Bolt 3/4"-10NC x 2"
03 - Heavy Hex Nut 3/4"-10NC
04 - Lock Washer 3/4"
05 - Flat Washer 3/4"
06 - Drop-in Anchor 3/4"-10NC x 3"

Drill 1" x 3 1/4" deep hole in barrier. Set Drop-in Anchor with Setting Tool or with punch. Typical (4) places.
APPENDIX T - TRANSITION, OFFSET WIDE CONCRETE BLOCK

Plan View

Parts List:
01 - Straight Panel #275265
02 - Offset Panel #255878

Minimum 31

37.75” [959mm]

33.38” [848mm]

SIDE VIEW

35.00” [889mm]

33.50” [850.98mm]
APPENDIX T(2) - TRANSITION, OFFSET WIDE CONCRETE BLOCK

Drill 1" x 3 1/4" deep hole in barrier. Set Drop- in Anchor with Setting Tool or with punch. Typical (10) places.

PARTS LIST
03 - Hex Bolt 3/4"-10NC x 2"
04 - Heavy Hex Nut 3/4"-10NC
05 - Lock Washer 3/4"
06 - Flat Washer 3/4"
07 - Drop-in Anchor 3/4"-10NC x 3"
### APPENDIX U - TRANSITION, CONCRETE BLOCK, 36-44 INCH (914-1118mm)

<table>
<thead>
<tr>
<th>BARRIER WIDTH</th>
<th>ASSEMBLY PART NO</th>
<th>PANEL ET-06-38 PART NO (ITEM 01)</th>
<th>STEEL POST ET-06-22 PART NO (ITEM 2)</th>
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</table>

**Plan View**

**Side View**
APPENDIX U(2) - TRANSITION, CONCRETE BLOCK, 36-44 INCH (914-1118mm)

Drill 1" x 3 1/4" deep hole in barrier, Set Drop-in Anchor with Setting Tool or with punch. Typical (4) ea. side plus (8) on end.

PARTS LIST
- 03 - Hex Bolt 3/4" -10NC x 2"
- 04 - Heavy Hex Nut 3/4"-10NC
- 05 - Lock Washer 3/4"
- 06 - Flat Washer 3/4"
- 07 - Guardrail Bolt (Rd Hd) AASHTO spec FBB02
- 08 - Recessed Nut per AASHTO spec FBB02
- 09 - Flat Washer per AASHTO spec FWC16b
- 10 - Drop-In Anchor 3/4"-10NC x 3"
- 11 - Threaded Rod 3/4"-10NC x 7"
- 12 - Anchor Bolt Epoxy
APPENDIX V - TRANSITION, CONCRETE BLOCK, 46-48 INCH (1168-1219mm)

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<tr>
<th>BARRIER WIDTH</th>
<th>BARRIER WIDTH</th>
<th>PANEL (RIGHT) PART NO (ITEM 01)</th>
<th>PANEL (LEFT) PART NO (ITEM 01)</th>
<th>END SHOE PART NO (ITEM 02)</th>
<th>STEEL POST PART NO (ITEM 03)</th>
<th>TAPERED POST PART NO (ITEM 04)</th>
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<td>255432</td>
<td>275291</td>
<td>275292</td>
<td>76 1/4&quot;</td>
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</tbody>
</table>

PLAN VIEW

SIDE VIEW

LENGTH 'A'
(48-INCH BARRIER)
SEE TABLE

LENGTH 'A'
(46-INCH BARRIER)
SEE TABLE
APPENDIX V(2) - TRANSITION, CONCRETE BLOCK, 46-48 INCH (1168-1219mm)

5.5" embedment for Concrete

4 pcs each side

12 pcs

05

4 pcs each side

06

4 pcs each side

07

4 pcs each side

08

4 pcs each side

09

4 pcs each side

10

4 pcs each side

11

4 pcs each side

12

8 pcs each side

06

07

08

09

10

11

12

PARTS LIST

05 - Hex Bolt 3/4"-10NC x 2"
06 - Heavy Hex Nut 3/4"-10NC
07 - Lock Washer 3/4"
08 - Flat Washer 3/4"
09 - Guardrail Bolt (Rd Hd) AASHTO spec FB802
10 - Recessed Nut per AASHTO spec FB802
11 - Flat Washer per AASHTO spec PWC16b
12 - Drop-In Anchor 3/4"-10NC x 3"
13 - Threaded Rod 3/4"-10NC x 7"
14 - Anchor Bolt: Epoxy

Drip 1" x 3 1/4" deep hole in barrier.
Set Drop-in Anchor with Setting Tool
or with punch.
Typical (4) ea. side plus (8) on end.

Splice Hardware
By Others
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