

SMART CUSHION INNOVATIONS

SCI100GM

General Specifications

DESCRIPTION:

The SCI100GM is a redirective, 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 an outer flat redirective surface for side impacts. The sled provides redirective support for side impacts and deceleration force for frontal impacts. It is designed for 24' applications. The SCI100GM telescopes rearward upon frontal impact and can be reset with minimal repair parts. It is NCHRP 350 Test Level 3 approved.

MATERIALS:

SCI100GM Impact Attenuator component parts shall meet the following requirements:

- A. Shock Arresting Cylinder.** The cylinder shall be specially designed for different Test Levels and filled with an environmentally friendly, fire-resistant hydraulic fluid that will perform to a minimum saturated pour point temperature of -37 degrees C. (-35 degrees F.). The Shock Arresting Cylinder shall be a metered hydraulic cylinder that has internal ports engineered to reduce the speed of the vehicle to a predefined rate that is dependent on a combination of speed and mass. It translates its resistance (force) to the cable that is attached to the sled.
- B. Cable.** The wire rope cable shall be a 28.6mm (1.125") 6 x 3 IWRC galvanized wire rope cable with a breaking strength of 58.96 metric tons (65 tons). It shall be attached to the sled with an Open Spelter Socket that has a 100% efficiency rating. It shall be reaved around the Shock Arresting Cylinder and terminated to the base with 4 wire rope clips.
- C. Base.** The base shall be manufactured from 20.5kg/m (13.8lb/ft) steel channel. It shall include all cross bracing necessary to sustain its design criteria impacts without damage.
- D. Side Panels.** The side panels shall be manufactured from ASTM A1011 Grade 60 Steel with an ASTM653 galvanized coating. The outer surface shall have four flat flutes to provide a substantial redirective bearing surface for side impacts. The outer trailing edge overlaps shall be formed to create a bend toward the inner panel to reduce snag potential on reverse side impacts. The angle of the outer flat surface to the flat side return wall shall be 19 – 22 degrees which provides an optimized angle for maximum rigidity to minimize damage and snag potential on side impacts. The outside trailing edge shall be longitudinally shorter than the inside trailing edge to produce a minimum of a 23 degree taper giving the attachment bolts more surface to hold the panels on the support frames with no overlap past the rear edge of the support frames to reduce snagging on reverse impacts.

- E. Support Frames.** The support frames shall be fabricated out of 63.5mm x 63.5mm x 4.7mm (2.5" x 2.5" x .187") tubular steel. The support frames provide a structure to mount and support the side panels. They will include outboard gussets to support the top and bottom panel flange to eliminate panel fold over at both locations caused by side impacts. They shall be attached to the base by the side guides using a 1" diameter Grade 8 bolt which allows the frames to slide longitudinally upon frontal impacts. The frames shall be designed to be individually replaced without removing other frames.
- F. Front Sled.** The front sled shall be fabricated out of 63.5mm x 63.5mm x 4.7mm (2.5" x 2.5" x .187") tubular steel. It shall have diagonal bracing to minimize distortion on angled hits, support impact of different vehicle heights, and transfer stopping force to the Spelter Socket attachment. The sled shall have four guide rollers to eliminate wedging on angled front impacts.
- G. Transition Panels.** The transition panels shall be manufactured from ASTM A1011 Grade 60 Steel with an ASTM123 galvanized coating. Three standard transition panels shall be available. These shall be: SCI100GM to Jersey Barrier, SCI100GM to Thrie Beam, and SCI100GM Concrete Transition (for vertical surfaces). Drawings are available for the Thrie Beam transition to be used with Thrie and W Beam Guardrail.
- H. Delineator Plate and Reflectorization.** The front delineator plate shall be supplied in the color specified by the state or, if no color is specified, it shall be yellow. Reflectorization shall be in accordance with state requirements.
- I. Metal Work.** All metal work, except side and transition panels, shall be fabricated from ASTM A36 steel. After fabrication, all metal work shall be hot dip galvanized in accordance with ASTM A123. Welding shall be performed by welders certified per AWS3G.
- J. Fasteners.** All bolts shall be American-made Standard Regular Bolts, unless indicated otherwise in the specification. Anchor bolts shall be anchored using an epoxy with an ultimate pullout load rating of 14,695kg (32,397 lbs) and ultimate shear load rating of 10,644 kg (23,467 lbs).

CONSTRUCTION DETAILS:

The SCI100GM shall be built either on existing concrete pad minimum 150 mm (6") deep or existing 150 mm (6") minimum asphalt (type 6 or 7) over 150 mm (6") minimum compacted subbase (minimum 95% of maximum theoretical density) or existing 150 mm (6") minimum asphalt (type 6 or 7) over 76 mm (3") minimum concrete. If new installation is necessary, then the preferred foundation would be a 150 mm (6") reinforced concrete pad per manufacturer's instructions.

Anchors shall be set into holes drilled with rotary impact drills, approved by the Engineer, of the sizes recommended by the manufacturer of the attenuator.

The SCI100GM shall be bolted in place in accordance with the attenuator manufacturer's instructions, but no sooner than seven days after placement of fresh concrete, without accelerators, and no sooner than three days after placement of concrete which has been batched with an approved accelerator.

If a transition is required, the appropriate manufacturer's standard transition shall be used.

Traffic protection devices, such as cones, drums, lights, signs, barricades, or other articles directed by the Engineer, shall be provided and maintained under their respective items. Those devices shall not be removed until the SCI100GM Impact Attenuator is fully operational and, in lighted areas or areas to be lighted, these articles shall also be maintained until the lighting system is operational.

QUALITY CONTROL:

1. All steel shall be fabricated from the specified material that is called out on the fabrication drawings.
2. All welding shall be performed by welders certified per AWS3G.
3. Material certifications shall be required from all vendors.
4. All attenuators shall be fabricated from the drawings of the NCHRP 350 tested unit.

TESTING AND CERTIFICATION:

The SCI100GM has passed all required tests and is certified for NCHRP 350 Test Level III. The letter of approval from the Federal Highway Administration is dated September 12, 2003 and has a designation of HSA-10/CC-85.

PERFORMANCE:

1. The SCI100GM is designed to meet the Test Level 3 performance criteria of the NCHRP 350 for redirective, non-gating crash cushions including, but not limited to, Occupant Risk Criteria and Redirective Criteria.
2. After impacts that are within the design parameters of vehicle mass and speed, the SCI100GM should not require the replacement of parts except for the Nose Plate and Mobile Sheave Shear Bolts. Side impacts may only require an inspection with no repair parts necessary.
3. Upon side impacts, vehicle exit angles should be <1 degree.

DIMENSIONS:

| | |
|-------------------------|------------------|
| Width (Effective) ----- | 24" (610mm) |
| Length ----- | 21.5' (6.55m) |
| Height ----- | 33" (838mm) |
| Weight ----- | 3450 lb (1565kg) |

SMART CUSHION INNOVATIONS

SCI70GM

General Specifications

DESCRIPTION:

The SCI70GM is a redirective, 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 an outer flat redirective surface for side impacts. The sled provides redirective support for side impacts and deceleration force for frontal impacts. It is designed for various width applications. The SCI70GM telescopes rearward upon frontal impact and can be reset with minimal repair parts. It is NCHRP 350 Test Level II approved.

MATERIALS:

SCI70GM Impact Attenuator component parts shall meet the following requirements:

- A. Shock Arresting Cylinder.** The cylinder shall be specially designed for different Test Levels and filled with an environmentally friendly, fire-resistant hydraulic fluid that will perform to a minimum saturated pour point temperature of -37 degrees C. (-35 degrees F.). The Shock Arresting Cylinder shall be a metered hydraulic cylinder that has internal ports engineered to reduce the speed of the vehicle to a predefined rate that is dependent on a combination of speed and mass. It translates its resistance (force) to the cable that is attached to the sled.
- B. Cable.** The wire rope cable shall be a 28.6mm (1.125") 6 x 3 IWRC galvanized wire rope cable with a breaking strength of 58.96 metric tons (65 tons). It shall be attached to the sled with an Open Spelter Socket that has a 100% efficiency rating. It shall be reaved around the Shock Arresting Cylinder and terminated to the base with 4 wire rope clips.
- C. Base.** The base shall be manufactured from 20.5kg/m (13.8lb/ft) steel channel. It shall include all cross bracing necessary to sustain its design criteria impacts without damage.
- D. Side Panels.** The side panels shall be manufactured from ASTM A1011 Grade 60 Steel with an ASTM653 galvanized coating. The outer surface shall have four flat flutes to provide a substantial redirective bearing surface for side impacts. The outer trailing edge overlaps shall be formed to create a bend toward the inner panel to reduce snag potential on reverse side impacts. The angle of the outer flat surface to the flat side return wall shall be 19 – 22 degrees which provides an optimized angle for maximum rigidity to minimize damage and snag potential on side impacts. The outside trailing edge shall be longitudinally shorter than the inside trailing edge to produce a minimum of a 23 degree taper giving the attachment bolts more surface to hold the panels on the support frames with no overlap past the rear edge of the support frames to reduce snagging on reverse impacts.

- E. Support Frames.** The support frames shall be fabricated out of 63.5mm x 63.5mm x 4.7mm (2.5" x 2.5" x .187") tubular steel. The support frames provide a structure to mount and support the side panels. They will include outboard gussets to support the top and bottom panel flange to eliminate panel fold over at both locations caused by side impacts. They shall be attached to the base by the side guides using a 1" diameter Grade 8 bolt which allows the frames to slide longitudinally upon frontal impacts. The frames shall be designed to be individually replaced without removing other frames.
- F. Front Sled.** The front sled shall be fabricated out of 63.5mm x 63.5mm x 4.7mm (2.5" x 2.5" x .187") tubular steel. It shall have diagonal bracing to minimize distortion on angled hits, support impact of different vehicle heights, and transfer stopping force to the Spelter Socket attachment. The sled shall have four guide rollers to eliminate wedging on angled front impacts.
- G. Transition Panels.** The transition panels shall be manufactured from ASTM A1011 Grade 60 Steel with an ASTM123 galvanized coating. Three standard transition panels shall be available. These shall be: SCI70GM to Jersey Barrier, SCI70GM to Thrie Beam, and SCI70GM Concrete Transition (for vertical surfaces). Drawings are available for the Thrie Beam transition to be used with Thrie and W Beam Guardrail.
- H. Delineator Plate and ReflectORIZATION.** The front delineator plate shall be supplied in the color specified by the state or, if no color is specified, it shall be yellow. ReflectORIZATION shall be in accordance with state requirements.
- I. Metal Work.** All metal work, except side and transition panels, shall be fabricated from ASTM A36 steel. After fabrication, all metal work shall be hot dip galvanized in accordance with ASTM A123. Welding shall be performed by welders certified per AWS3G.
- J. Fasteners.** All bolts shall be American-made Standard Regular Bolts, unless indicated otherwise in the specification. Anchor bolts shall be anchored using an epoxy with an ultimate pullout load rating of 14,695kg (32,397 lbs) and ultimate shear load rating of 10,644 kg (23,467 lbs).

CONSTRUCTION DETAILS:

The SCI70GM shall be built either on existing concrete pad minimum 150 mm (6") deep or existing 150 mm (6") minimum asphalt (type 6 or 7) over 150 mm (6") minimum compacted subbase (minimum 95% of maximum theoretical density) or existing 150 mm (6") minimum asphalt (type 6 or 7) over 76 mm (3") minimum concrete . If new installation is necessary, then the preferred foundation would be a 150 mm (6") reinforced concrete pad per manufacturer's instructions.

Anchors shall be set into holes drilled with rotary impact drills, approved by the Engineer, of the sizes recommended by the manufacturer of the attenuator.

The SCI70GM shall be bolted in place in accordance with the attenuator manufacturer's instructions, but no sooner than seven days after placement of fresh concrete, without accelerators, and no sooner than three days after placement of concrete which has been batched with an approved accelerator.

If a transition is required, the appropriate manufacturer's standard transition shall be used.

Traffic protection devices, such as cones, drums, lights, signs, barricades, or other articles directed by the Engineer, shall be provided and maintained under their respective items. Those

devices shall not be removed until the SCI70GM Impact Attenuator is fully operational and, in lighted areas or areas to be lighted, these articles shall also be maintained until the lighting system is operational.

QUALITY CONTROL:

1. All steel shall be fabricated from the specified material that is called out on the fabrication drawings.
2. All welding shall be performed by welders certified per AWS3G.
3. Material certifications shall be required from all vendors.
4. All attenuators shall be fabricated from the drawings of the NCHRP 350 tested unit.

TESTING AND CERTIFICATION:

The SCI70GM has passed all required tests and is certified for NCHRP 350 Test Level III. The letter of approval from the Federal Highway Administration is dated February 9, 2005 and has a designation of HSA-10/CC-85A.

PERFORMANCE:

1. The SCI70GM is designed to meet the Test Level 3 performance criteria of the NCHRP 350 for redirective, non-gating crash cushions including, but not limited to, Occupant Risk Criteria and Redirective Criteria.
2. After impacts that are within the design parameters of vehicle mass and speed, the SCI70GM should not require the replacement of parts except for the Nose Plate and Mobile Sheave Shear Bolts. Side impacts may only require an inspection with no repair parts necessary.
3. Upon side impacts, vehicle exit angles should be <1 degree.

DIMENSIONS:

| | |
|-------------------------|------------------|
| Width (Effective) ----- | 24" (610mm) |
| Length ----- | 13.5' (4.1m) |
| Height ----- | 33" (838mm) |
| Weight ----- | 2464 lb (1118kg) |