

# Product Specification

## Redirective, Non-Gating, Crash Cushion

### I. General

The system is a Redirective, Non-Gating Crash Cushion in accordance with the definitions in the National Cooperative Highway Research Program Report 350 (NCHRP 350). The system shall have been tested and perform in an acceptable manner in accordance with the guidelines of NCHRP 350 at Test Level 3.

### II. Performance

The TL-3 system when attached properly in accordance with the manufacturer's instructions, shall be capable of safely redirecting or stopping a 2000 kg (4400 lb) pick-up truck and an 820 kg (1800 lb) car impacting the system at 100 km/hr (62.1 mph).

- A. An eight bay narrow or seven bay wide system shall be able to meet the recommended criteria set forth in NCHRP 350 for Test Level 3, Redirective, Non-Gating Crash Cushions.

### III Performance Requirements

1. Products shall meet the following criteria to assure effectiveness, safety, reliability, and maintenance.
  - A. A benefit cost analysis shall be performed by the agency. Manufacture to supply test data from NCHRP 350 testing. This data shall include parts damaged and approximate cost for replacement parts in each test.
  - B. Units must be repairable on site from any NCHRP 350, Test Level 3 impact conditions in less than two hours.
  - C. Units shall be capable of on site modifications to accommodate future changes to the design speed of the road.
  - D. Units shall have an open architecture to prevent the accumulation of debris that could reduce performance. In colder climates closed architecture could render units inoperable.
  - E. Systems shall be designed so the parts are interchangeable on different size units.
  - F. Manufacture must be approved and supply all of the different widths and lengths used system wide so as to reduce parts inventory.
  - G. Units shall be designed to use friction and energy absorbing cartridges to decelerate vehicles. No mechanical moving parts that may be affected by, wear, damage, weather or roadside debris.

#### IV. Description of System

- A. The crash cushion is made up of independent collapsible bays that are guided and supported by high strength galvanized steel cables. The system's energy capacity is provided by an array of Energy Absorbing Cartridges. The systems shall be made up of the following components and shall be fabricated from materials conforming to the following specifications:
1. The Base of the system consists of two cables, a Back Support and Front Cable Anchor. The Front Cable anchor has (8) anchoring points. The Compact Back Support is secured with (13) anchor points and the PCB Back Support and Rear Cable Anchors are also secured with 13 anchor bolt when anchored into PCC..
    - a. All steel structural components of the Front Cable Anchor and Backstop assemblies shall be fabricated from mild steel in conformance with ASTM A-36 specifications. These components are hot dipped galvanized per ASTM A-123.
    - b. The steel cables shall be at least 25 mm (1 in) diameter and galvanized in accordance with ASTM A-603.
  2. Front and Middle Supports separate each independent collapsible bay. Cable Guides bolt to the Middle Supports, capturing the cables and connecting the bays to the Base.
    - a. All steel supports and cable guides shall be fabricated from mild steel in conformance with ASTM A-36 specifications. These components are hot dipped galvanized per ASTM A-123.
  3. Each Bay is enclosed on the sides with Sliding Panels. Sliding Bolts fasten the panels to the Front and Middle supports. End Panels are attached to the Back Support and the last bay's Sliding Panels through Pipe Panel Mounts and provide transition mounting points. The Pipe Panel Mounts are bolted to the back support.
    - a. Steel panels are to be fabricated from steel that conforms to the requirements of AASHTO M180 Class B.
    - b. Sliding Bolts are to be cast iron and galvanized per ASTM A-123.

- c. Steel Pipe Panel Mounts shall be fabricated from mild steel in conformance with ASTM A-36 specifications.
  4. Flexible Front Support Legs and a Nose Piece. The Nose Piece utilizes a bushing to provide proper clamping characteristics.
    - a. The front support legs shall be fabricated from synthetic or natural rubber or polyurethane.
    - b. The Nose Piece shall be fabricated from polyurethane.
  5. Two types of Energy Absorbing Cartridges provide the systems energy absorbing capacity.
    - a. All plastic parts shall be molded from High Density Cross-linked Polyethylene with a Brittle Temperature of less than  $-40$  degrees C, as per ASTM testing methods.
  6. All fasteners.
    - a. All fasteners shall be Class 5.8 (Grade2) or greater and Galvanized in accordance with ASTM 153. Washers shall be hardened and galvanized. All Stainless steel fasteners are class A2-50 or greater in accordance with ASTM F-738M.
- B. The system should be available in various capacities, each requiring a specific configuration of Energy Absorbing Cartridges (Types A and B).
- C. The system shall require attachment to a foundation. Anchoring of the system will require attachment in accordance with the manufacturer's drawings and instructions. Anchor capacity will require 12000 kg (25000 lb) pull out and 8500 kg (19000 lb) shear strength.
- D. The system shall be assembled, installed, and refurbished in accordance with the manufacturers instructions.
- E. Ensure that restoration and or repair from impacts falling within the range described in NCHRP 350, Test Level 3, can be accomplished without removing the unit from the original location.

- F. The attenuator supplied must be designed in a way that will take no longer than two hours to repair (including any traffic control) when damaged by a front end impact of a full sized vehicle or pick up truck as per NCHRP 350 Test Level 3. Furthermore, all repairs must be made on site without the use of specialized heavy equipment nor normally found at a standard maintenance yard.
- G. A minimum of two complete spare parts kits will be supplied for each system installed. The spare parts kit shall be recommended by the manufacture to restore the system to it's original condition after any NCHRP 350, Test Level 3 impact conditions.
- H. After side impacts, within the NCHRP 350 Test Level 3 design parameters, the unit must remain capable of sustaining an additional side impact or a head-on impact at full design velocity.