



U.S. Department  
of Transportation  
**Federal Highway  
Administration**

February 9, 2005

400 Seventh St., S.W.  
Washington, D.C. 20590

In Reply Refer To: HSA-10/CC-85A

Mr. Randy L. Warner  
Director, Product R&D  
SCI Products Incorporated  
635 Lucknow Road  
Harrisburg, Pennsylvania 17110-1635

Dear Mr. Warner:

Your December 22, 2004, letter requested formal Federal Highway Administration (FHWA) review and acceptance of a Test Level 2 (TL-2) version of your TL-3 crash cushion called the Smart Cushion Innovations – 100GM (SCI-100GM) that was previously accepted for use on the National Highway System (NHS). To support this request, you sent copies of test reports prepared by KARCO Engineering detailing the results of the full-scale crash tests you conducted on the new TL-2 attenuator called the SCI-70GM crash cushion. You later submitted information on the crash cushion design and identified changes from the TL-3 model. This information had not been included in the original KARCO test report.

The SCI-70GM is a redirective, non-gating crash cushion, 4118 mm long and 850 mm high. Its main components, as shown in Enclosure 1, are identical to the SCI-100GM design and include base and side frame assemblies fabricated of mild steel tubing, a front sled assembly, and a series of 10-gauge galvanized Grade 60 steel side panels mounted to collapsing steel frames, and a shock arresting cylinder. A 1.125-inch diameter steel cable is attached to the front sled assembly and is then routed around a front sheave to dual sheave assemblies located at the back of the attenuator (one at either end of the shock arresting cylinder). The SCI-70GM is 3 bays shorter than the TL-3 design and the cylinder stroke was reduced accordingly. The base unit is anchored to the mounting substrate with 34 bolts. Testing was performed on a unit mounted on a concrete pad with galvanized Grade B7 all-thread rods 0.75-inches in diameter and seven inches long. These rods were inserted into .875-inch diameter holes and set with epoxy.



You conducted two certification tests: National Cooperative Highway Research Program (NCHRP) Report 350 tests 3-31 and 3-32, the results of which are summarized in Enclosure 2. Staff members agreed beforehand that test 3-30 could be waived because test 3-32 is more demanding for the small car. It was also agreed that all redirective tests could be waived since the crash cushion design remained essentially unchanged along its sides and there was no concern that crash performance would be adversely affected in the lower speed TL-2 side impact tests.

Your SCI-70GM meets the evaluation criteria for an NCHRP Report 350 redirective, non-gating crash cushion at TL-2 and may be used on the NHS when such use is acceptable to the contracting authority. Requirements for transition designs remain as stated in acceptance letter CC-85 for your TL-3 unit.

Please note also that the following provisions apply to the FHWA letters of acceptance:

- This acceptance is limited to the crashworthiness characteristics of the device and does not cover its structural features, nor conformity with the Manual on Uniform Traffic Control Devices.
- Any design changes that may adversely influence the crashworthiness of the device will require a new acceptance letter.
- Should the FHWA discover that the qualification testing was flawed, that in-service performance reveals unacceptable safety problems, or that the device being marketed is significantly different from the version that was crash tested, it reserves the right to modify or revoke its acceptance.
- You will be expected to supply potential users with sufficient information on design and installation requirements to ensure proper performance.
- You will be expected to certify to potential users that the hardware furnished has essentially the same chemistry, mechanical properties, and geometry as that submitted for acceptance, and that it will meet the crashworthiness requirements of the NCHRP Report 350.
- To prevent misunderstanding by others, this letter of acceptance, designated as number CC-85A shall not be reproduced except in full. This letter, and the test documentation upon which this letter is based, is public information. All such letters and documentation may be reviewed at our office upon request.
- The SCI-70GM is a patented product and is considered proprietary. If proprietary devices are *specified by a highway agency* for use on Federal-aid projects, except exempt, non-NHS projects, they: (a) must be supplied through competitive bidding with equally suitable unpatented items; (b) the highway agency must certify that they are essential for synchronization with existing highway facilities or that no equally suitable alternative exists or; (c) they must be used for research or for a distinctive type of construction on

relatively short sections of road for experimental purposes. Our regulations concerning proprietary products are contained in Title 23, Code of Federal Regulations, Section 635.411.

Sincerely yours,

*/Original Signed by Harry W. Taylor/*

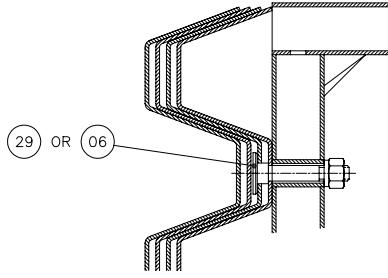
*~for~*

John R. Baxter, P.E.  
Director, Office of Safety Design  
Office of Safety

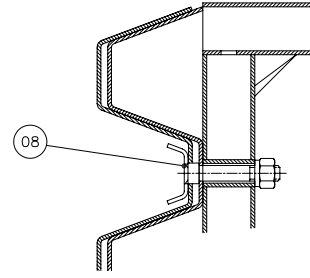
2 Enclosures

# APPENDIX - FIGURE 1A - TL2 ASSEMBLY DRAWING

DETAIL A



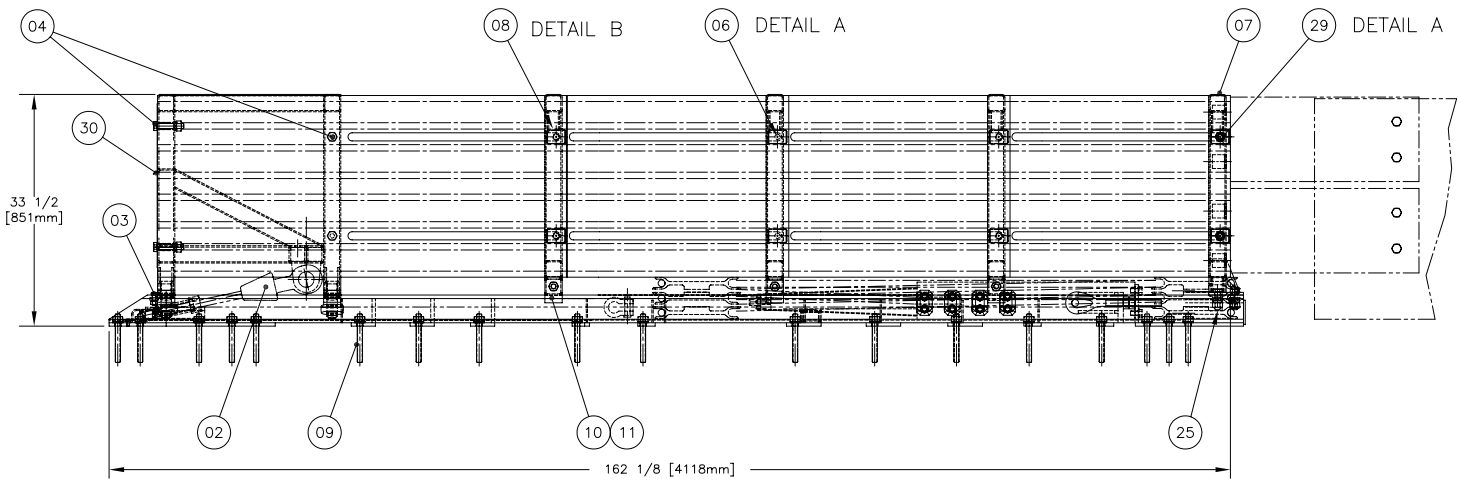
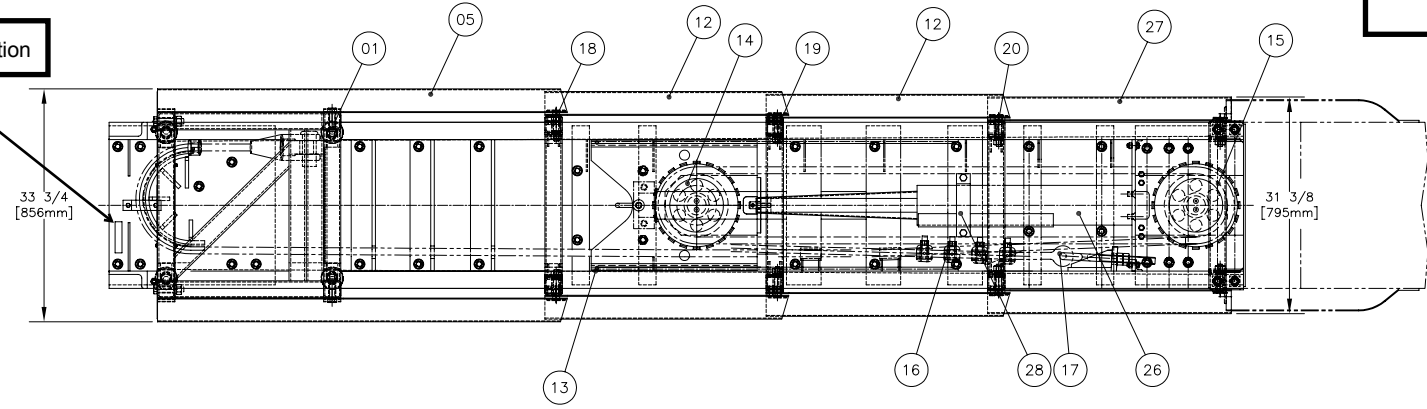
DETAIL B



## PARTS LIST

- 01 - Front Sled
- 02 - Cable Assembly
- 05 - Sled Panel
- 07 - Terminal Brace
- 09 - Anchor Bolts
- 12 - Side Panels
- 14 - Mobile Sheave Assembly
- 17 - Cable Adjuster Bolt
- 18-23 - Mobile Frames 1-6
- 26 - Cylinder
- 27 - Rear Panel
- 06,08,29 - Side Keepers

Serial number location



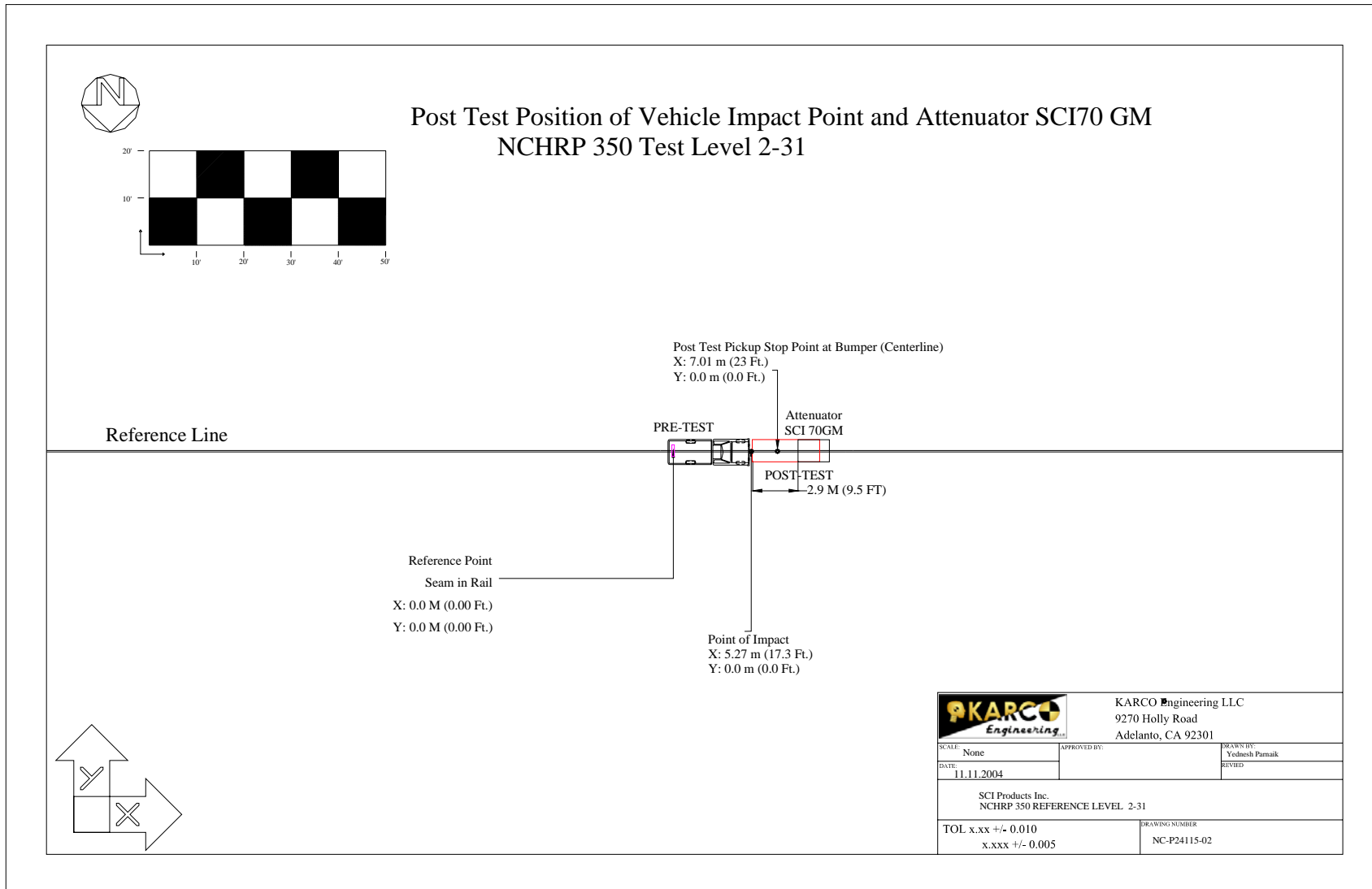
**DATA SHEET NO. 4**

**SUMMARY OF RESULTS FOR TEST NO. 2-31**



| GENERAL INFORMATION                   |                        | OCCUPANT RISK VALUES           |                     |
|---------------------------------------|------------------------|--------------------------------|---------------------|
| Test Agency                           | Karco Engineering, LLC | IMPACT VELOCITY (m/s)          |                     |
| Test No.                              | 2-31                   | X-Direction                    | 7.8                 |
| Date                                  | 11/11/04               | Y-Direction                    | 0.0                 |
| Test Article                          | SCI70GM                | THIV (optional)                | N/A                 |
| Type                                  | Crash Cushion          | RIDEDOWN ACCELERATION (g's)    |                     |
| Installation Length (m)               | 4.1 M (13ft 6in)       | X-Direction                    | -11.5               |
| Size And/Or Dimension Of Key Elements |                        | Y-Direction                    | -4.1                |
| Soil Type And Condition               | Concrete               | PHD (optional)                 | N/A                 |
| Test Vehicle                          | 2000p                  | ASI (optional)                 | 0.76                |
| Type                                  | Production             | TEST ARTICLE DEFLECTIONS (m)   |                     |
| Designation                           | 2-31                   | Dynamic Lateral                | 0                   |
| Model                                 | 1997 Chevrolet C2500   | Longitude                      | 2.9 M (9 Ft. 6 In.) |
| Mass (Curb)                           | 2116 Kg (4666 Lb)      | Permanent                      | 2.9 M (9 Ft. 6 In.) |
| Mass (Test Inertial)                  | 1962 Kg (4326 Lb.)     | VEHICLE DAMAGE                 |                     |
| Dummy(S) Mass                         | N/A                    | Exterior                       |                     |
| Gross Static Weight                   | 1962 Kg (4326 Lb.)     | VDS                            | 12-FD-2             |
| IMPACT CONDITIONS                     |                        | CDC                            | 12FCEW1             |
| Speed (Km/H)                          | 68.20                  | INTERIOR                       |                     |
| Angle (Deg.)                          | 0.0                    | OCDI                           | RF0001000           |
| Impact Severity (KJ)                  | 351.9                  | POST IMPACT VEHICULAR BEHAVIOR |                     |
| EXIT CONDITIONS                       |                        | Maximum Roll Angle (Deg.)      | Not Recorded        |
| Speed (Km/h)                          | -1.7                   | Maximum Pitch Angle (Deg.)     | -8.9                |
| Angle (Deg.)                          | 0                      | Maximum Yaw Angle (Deg.)       | -12.9               |

## SUMMARY OF RESULTS FOR TEST NO. 2-31



## DATA SHEET NO. 4

### SUMMARY OF RESULTS FOR TEST NO. 2-32



| GENERAL INFORMATION                   |                        | OCCUPANT RISK VALUES           |                 |
|---------------------------------------|------------------------|--------------------------------|-----------------|
| TEST AGENCY                           | KARCO ENGINEERING, LLC | IMPACT VELOCITY (m/sec)        |                 |
| TEST NO.                              | 2-32                   | X-DIRECTION                    | 8.3             |
| DATE                                  | 11/11/04               | Y-DIRECTION                    | 0.8             |
| TEST ARTICLE                          | SCI70GM                | THIV (optional)                | N/A             |
| TYPE                                  | CRASH CUSHION          | RIDEDOWN ACCELERATION (g's)    |                 |
| INSTALLATAION LENGTH (m)              | 4.1 m (13.5 ft.)       | X-DIRECTION                    | 12.4            |
| SIZE AND/OR DIMENSION OF KEY ELEMENTS |                        | Y-DIRECTION                    | 2.3             |
| SOIL TYPE AND CONDITION               | CONCRETE               | PHD (optional)                 | N/A             |
| TEST VEHICLE                          | 820C                   | ASI (optional)                 | 1.08            |
| TYPE                                  | PRODUCTION             | TEST ARTICLE DEFLECTIONS (m)   |                 |
| DESIGNATION                           | 2-32                   | DYNAMIC LATERAL                | 0               |
| MODEL                                 | 1998 Chevrolet Metro   | LONGITUDINAL                   | 2.0 m (6.7 ft.) |
| MASS (CURB)                           | 811 kg (1788 lb)       | PERMANENT                      | 2.0 m (6.7 ft.) |
| MASS (TEST INERTIAL)                  | 843 kg (1860 lb.)      | VEHICLE DAMAGE                 |                 |
| DUMMY(s) MASS                         | 75 Kg.                 | EXTERIOR                       |                 |
| GROSS STATIC WEIGHT                   | 918 kg (2024 lb.)      | VDS                            | 11-FD-6         |
| IMPACT CONDITIONS                     |                        | CDC                            | 111FYMW5        |
| SPEED (km/h)                          | 68.81                  | INTERIOR                       |                 |
| ANGLE (Deg.)                          | 15.0                   | OCDI                           | RF0000011       |
| IMPACT SEVERITY (kJ)                  | 145.4                  | POST IMPACT VEHICULAR BEHAVIOR |                 |
| EXIT CONDITIONS                       |                        | MAXIMUM ROLL ANGLE (Deg.)      | Not Recorded    |
| SPEED (km/h)                          | 4.4                    | MAXIMUM PITCH ANGLE (Deg.)     | -1.2            |
| ANGLE (Deg.)                          | -13.4                  | MAXIMUM YAW ANGLE (Deg.)       | -13.4           |

## SUMMARY OF RESULTS FOR TEST NO. 2-32

