



U.S. Department
of Transportation
Federal Highway

Administration

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

Refer to: HSA-10/SS-98

Mr. Mark Salman
Skidril Sign Support Systems
P.O. Box 8041
Greensboro, NC 27419

Dear Mr. Salman:

Thank you for your letter of July 10, 2001, requesting Federal Highway Administration (FHWA) acceptance of your company's Break-Out coupler as a breakaway device for small signs for use on the National Highway System (NHS). Accompanying your letter was a report from the Texas Transportation Institute and videos of the crash tests. You requested that we find Break-Out couplers acceptable for use on the NHS under the provisions of National Cooperative Highway Research Program (NCHRP) Report 350 "Recommended Procedures for the Safety Performance Evaluation of Highway Features."

Introduction

Testing of the supports was in compliance with the guidelines contained in NCHRP Report 350. Requirements for breakaway supports are those in the American Association of State Highway and Transportation Officials' (AASHTO) Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals.

The Skidril Break-Out is a cast-iron (ASTM A536 65-45-12 alloy) coupling with a shear section machined to a pre-set diameter to ensure breakaway performance of up to a maximum of 90 percent of the yield strength of the post it is used with. The pendulum crash tests were conducted using a 4.5 kg/m (3 pound-per-foot) Marion Steel U-Channel post and a 50.8 mm (2 in) Telespar 12 ga perforated square steel tube post.

Testing

Pendulum testing was conducted on your company's devices. The crushable honeycomb nose of the pendulum bogie is configured to replicate the front end of a 1979 Volkswagen Rabbit, which is known to be a practical worst-case vehicle for testing purposes. The mass of the test vehicle surrogate was 820 kg in all tests. The complete devices as tested are shown in the Enclosure 1.

For the first test, a 760 mm (30 in) long ground anchor of 50.8 mm (2 in) structural steel tubing, with 6.35 mm (0.25 in) wall thickness, was driven into NCHRP Report 350 standard soil using driving equipment supplied by Sign Support Systems. The Steel U-channel was attached to the coupler with 5/16 in diameter Grade 8 bolt and the lower wedge was torqued to 68 N-m (50 foot-pounds).

For the second test, Telespar 50.8 mm (2 in), 12-gage, 914 mm (36 in) long square telescoping tubing with an 457 mm (18 in) long sleeve was driven into standard soil. A Telespar post was bolted to the coupler using a bent 5/16 inch Grade 8 bolt and the lower wedge was torqued to 68 N-m (50 foot-pounds.)

A 914 x 914 mm (36 x 36 in) aluminum sign panel was mounted on each support post at a mounting height of 2.1 m (7 ft) from ground level to the bottom of the sign. Impact height of the pendulum was centered at 457 mm (18 in) above ground level.

Test #	NCHRP 350	Impact Speed	Version	Occup. Speed	Delta V.
SSS P1	3-60	35.2 km/h (21.9 mph)	U-Channel Post	2.5 m/s (8.2 fps)	0.50 m/s (1/64fps)
High-Speed extrapolation		100 km/h		(n/a)	1.18 fps
SSS P2	3-60	3.51 km/h (21.8 mph)	Perf. Square Steel Tube	2.4 m/s (7.9 fps)	0.91 m/s (2.99 fps)
High-Speed extrapolation		100 km/h		(n/a)	1.65 fps

Occup. Speed: Occupant Impact Speed: Speed at which a theoretical front seat occupant will contact the windshield. Maximum allowed is 5.0 m/s or 16 fps.

Findings

Velocity changes and accelerations were all within acceptable limits, and the remaining stub was essentially flush with the ground. Occupant impact speeds were much higher than the “vehicle” (actually the pendulum bogie) velocity change, something we don’t often see. These results were verified with the test agency. According to TTI, the theoretical occupant impact occurred well after the sign support lost contact with the pendulum bogie (the time at which the “Delta V” is measured.)

The results of the tests and the corresponding extrapolations met the FHWA requirements and, therefore, the devices described above and shown in the enclosed drawings for reference are acceptable for use as Test Level 3 devices on the NHS under the range of conditions tested, when proposed by a State.

You also requested that the Break-Out coupling be found acceptable for use with the following post types:

Post Type	Size	ASTM Steel Specification
12 Gage PSST*	1-3/4 in	A 570 Grade 50
“	2 in**	A 570 Grade 50
“	2-1/4 in	A 570 Grade 50
14 Gage PSST	1-3/4 in	A 570 Grade 50
“	2 in	A 570 Grade 50
“	2-1/4 in	A 570 Grade 50

U-Channel Post	2 Pound Per Foot	A-499 Grades 60 and 80
U-Channel Post	2.50 Pound Per Foot	A-499 Grades 60 and 80
U-Channel Post	2.75 Pound Per Foot	A-499 Grades 60 and 80
U-Channel Post	3 Pound Per Foot**	A-499 Grades 60 and 80
Round Steel Post 2.375" OD	10, 12, 13, 14, 16 ga	A-513 Grade A1008 "As Welded" 30 ksi
Round Steel Post 2.875" OD	10, 12, 13 ga	A-500 Grade C "Round" 46 ksi

* PSST: Perforated Square Steel Tube

** Tested Post

As the two tested posts had among the strongest cross sections, they can be considered "worst-case scenarios" and that the rest of the post sections in the table above, when used with Break-Out couplings designed to shear at 90 percent of the yield strength of the post, will be acceptable for use.

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

- Our acceptance is limited to the crashworthiness characteristics of the devices and does not cover their structural features, nor conformity with the Manual on Uniform Traffic Control Devices.
- Any 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 they will meet the crashworthiness requirements of FHWA and NCHRP Report 350.
- To prevent misunderstanding by others, this letter of acceptance, designated as number SS-98 shall not be reproduced except in full. As this letter and the supporting documentation which support it become public information, it will be available for inspection at our office by interested parties.

The Skidril Break-Out coupler is or will be a patented product and is considered "proprietary." The use of proprietary devices specified on Federal-aid projects, except exempt, non-NHS projects: (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, a copy of which is enclosed.

Sincerely yours,

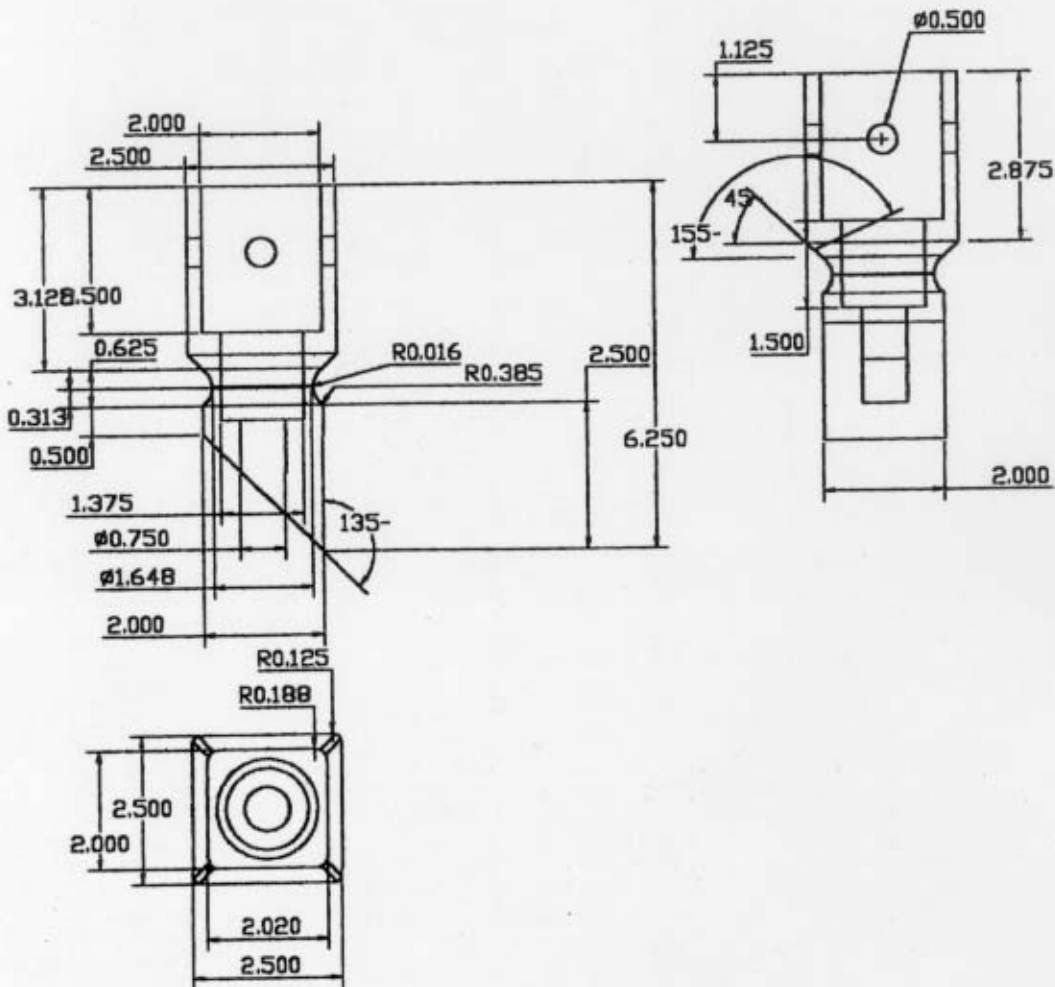
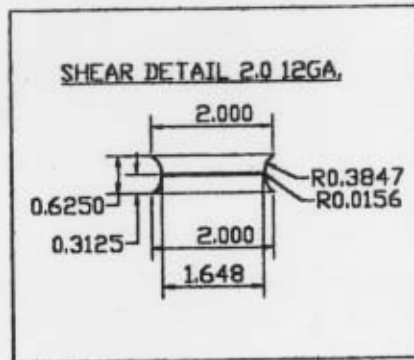
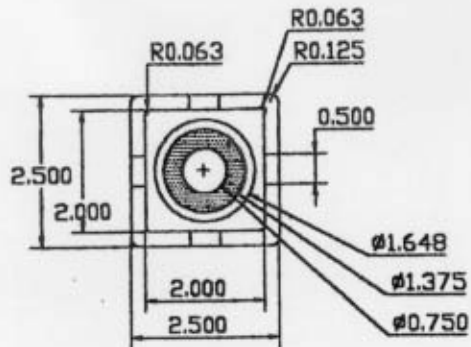
Frederick G. Wright, Jr.
Program Manager, Safety

Enclosure

FHWA:HSA-10:NArtimovich:tm:x61331:08/28/01

File: SkidrilFinSS98.wpd

cc: HSA-10 (Reader, HSA-1; Chron File, HSA-10;
N. Artimovich, HSA-10)



MATERIAL: DUCTILE IRON: 65-45-12 ASTM A536	THIS DRAWING IS THE PROPERTY OF BODIL INC., IT IS NOT INTENDED FOR DISTRIBUTION OR DUPLICATION WITHOUT APPROVAL OF THE CORPORATION.			
	SQUARE BREAK OUT (FLUSH MOUNT) FOR 2" SQUARE 12 GA. TUBING (ASTM A570-50) -UPPER PART-			
TOLERANCE +0.015-0.00	SIZE	FSCM NO.	DWG NO.	REV
DR: M.S DTE: 05-09-01	SCALE N/A		BOS2.0-12	5
			SHEET	

SHEAR DETAIL 2.0 12GA.

