

Refer to: HSA-10/SS-106

Mr. Charles R. Norton
Trinity Industries
950 West 400 South
Centerville, UT 84104

Dear Mr. Norton:

Thank you for your letter of January 30, 2002, requesting Federal Highway Administration (FHWA) acceptance of your company's Dent Type A Breakaway Bolts as breakaway couplings for use on the National Highway System (NHS). You requested that we find this system acceptable when two posts are needed to support a sign 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." The Dent system has been previously found acceptable for use in various single-post configurations, including signs, motorist-aid callboxes, and luminaire supports in FHWA Acceptance Letters beginning in 1995. These letters also covered couplings with various shear-neck diameters.

Introduction

Prior testing of the supports was in compliance with the guidelines contained in the NCHRP Report 350, Recommended Procedures for the Safety Performance Evaluation of Highway Features. Requirements for breakaway supports are those in the American Association of State Highway and Transportation Officials' Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals.

Testing

Pendulum testing was conducted on the Dent Type A Bolts, having a necked-down cross section area of 7.11 mm or 0.28 inch. A recap of those tests is presented below.

Test #	FHWA SS #	Speed	Bolt Circle	Post mass	Occup. Speed	Delta V
CD 4	SS-60	35.28 km/h	220 mm	70.8 kg	None	1.5 m/s
LP 1	SS-60B rev	35.28 km/h	381 mm	461 kg	n/r	3.1 m/s
SP 1	SS-60B rev	35.28 km/h	(1 bolt)	20 kg	n/r	0.5 m/s
CB 1	SS-60B rev	35.28 km/h	220 mm	88.5 kg	n/r	2.0 m/s

Occup. Speed: Occupant Impact Speed: Speed at which a theoretical front seat occupant will contact the windshield. In meters per second

Delta V: Speed change of the test vehicle. In meters per second.

Findings

Your request is to use the Dent Type A system on two structural posts, placed within a span of 7 feet, to support a traffic sign. From the testing that was conducted on single post supports using the Type A Dent Bolt it is clear that the mass of the support plays an important role. Of course, two luminaire supports would never be placed such that two would be struck at the same time, but the 3.1 m/s velocity change in test LP-1 of a single luminaire support is a strong indicator that a support system using two posts of that mass would not perform in an acceptable manner. On the other hand, the low velocity changes seen in CD-4 and CB-1 indicate that the system may work if the mass is limited.

There is no objective method of relating the results of a crash test of a single post support to the performance of a dual post support. However, in the one instance where FHWA has extrapolated a single post test using a breakaway coupling system to dual posts, both the mass of the supports and the velocity changes were comparable to those in CD-4 and CB-1. In addition, recent testing of dual post supports using breakaway couplings confirmed FHWA's earlier extrapolations.

Therefore, breakaway systems on one or two posts using the Type A Dent Breakaway Bolt are acceptable for use as Test Level 3 devices on the NHS under the range of conditions tested, when proposed by a State, subject to the following limitations:

1. Supports shall be mounted to a structural concrete foundation that will not move in the soil if the support is struck by a vehicle.
2. This extrapolation is limited to the Type A Dent bolt having a necked-down cross section area of 7.11 mm (0.28 inches) in a bolt circle of approximately 220 mm (8.6 inches).
3. The couplings may be used in three- or four-bolt slip bases, but may not be used on inclined slip bases.
4. The maximum mass per foot of sign post shall not exceed 27 kg/m (18 pounds per foot.) This is in agreement with the maximum post size that was found acceptable for dual slip base support installations discussed in FHWA acceptance letter SS-25 dated June 4, 1991.

Please note the following standard provisions, which 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-106 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 Dent Breakaway Bolts are patented products and 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,

A. George Ostensen
Program Manager, Safety

Enclosure

FHWA:HSA-10:NArtimovich:tb:x61331:3/11/02
File: SS106Dent2020fin.wpd
cc: HSA-10 (Reader, HSA-1; Chron File, HSA-10;
N. Artimovich, HSA-10)