



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

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

Refer to: HSA-10/SS-104

Ms. Linda Lee
MTC SAFE Project Manager
Joseph P. Bort MetroCenter
101 Eighth Street
Oakland, CA 94607-4700

Dear Ms. Lee:

Thank you for your letter of September 27, 2001, requesting Federal Highway Administration (FHWA) acceptance of the Modified F Call Box as a breakaway device for use behind dikes 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 the call box 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 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.

The Modified Type F Call Box was installed behind a 152 mm asphalt concrete dike in NCHRP 350 weak soil. A 2.4 m wide asphaltic approach was placed with a 5 percent cross slope leading to the dike to emulate a roadway shoulder with a curb and gutter section, as constructed in California. A Tele-Typewriter (TTY) motorist aid call box, support pole, sign panel, solar panel, and antenna from Comarco Wireless Technologies, Inc., (CWT) were used in the crash test. The call box was a TTY equipped Motorola/CWT model no. 6000-0100-15-M. The call box main housing was constructed of Lexan polycarbonate. The support pole was manufactured by A. B. Chance. The support pole was 102 mm outside diameter x 4267 mm long, schedule 40 galvanized steel pipe with a four bolt unidirectional slip base welded to the base of the pole. The pole was attached atop a 1118 mm long galvanized steel auger foundation. The auger foundation was placed in NCHRP Report 350 weak soil with a mechanically operated boring machine. The height from the ground surface to the top of the auger foundation was 76 mm. Four 16 mm x 76 mm (grade 2, 5/8 inch - 11 UNC x 3 1/4 inch) long bolts with nuts, lock washers and three SAE wide Type A flat washers (one washer between the slip planes) per bolt, torqued to 58 N·m (42.8 ft·pounds), were used to attach the support to the foundation stub. Prior to assembly the slip base surfaces, bolts, nuts and washers were coated with paraffin wax.

Testing

Full-scale automobile testing was conducted on these call boxes. The mass of the test vehicle was

820 kg in all tests. The complete devices as tested are shown in the enclosures.

A summary of the crash tests is presented in the following table.

Test #	474240/08-1	474240/08-2
NCHRP 350 Designation	3-60	3-61
Test Article Mass		
Pole	61.2 kg (135 pounds)	
Call Box	21.5 kg (47.3 pounds)	
Signs	8.6 kg (19 pounds)	
Solar Panel	2.9 kg (6.3 pounds)	
Foundation Auger	22.2 kg (49 pounds)	
Total Mass (above slip)	94.2 kg (207.6 pounds)	
Vehicle Mass	820 kg	820 kg
Vehicle Impact Speed	33.8 km/hr	99.5 km/hr
Soil Type	weak	weak
Impact Angle	20 degrees	20 degrees
Occupant Impact Speed	1.3 m/sec	2.2 m/sec
Vehicle Velocity Change	1.6 m/sec	3.4 m/sec
Stub Height	76 mm	76 mm

Vehicle damage in test 08-1 was minimal. The bumper was undamaged but the hood was crushed 130 mm because the pole landed on the vehicle. The radiator and the fan were also damaged. The windshield was cracked near the roof line and deformed downward 63 mm. Maximum occupant compartment deformation was 57 mm. Vehicle damage in test 08-2 was somewhat greater. The front bumper, hood, radiator, and radiator support were deformed, as were both front wheel rims. The two front tires deflated. Maximum exterior crush to the vehicle was 230 mm at the right front quarter point at bumper height. Maximum occupant compartment deformation was 27 mm due largely to the fact that the pole rotated over the vehicle almost immediately after the bumper impacted it. There was no windshield contact in the second test.

Findings

Damage occurred to the bumpers and hoods of both test vehicles, with windshield contact and roof damage occurring in the low-speed test only. Velocity changes were all within acceptable limits, and the only stub remaining was approximately 76 mm in both tests. The results of testing 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. This TTY callbox assembly will be considered acceptable when installed with or without an asphalt dike, or when installed in NCHRP Report 350 strong soil or in concrete foundations. As the paraffin coating may have improved the performance of the slip base it is recommended that the same coating be applied to all future slip base installations.

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-104 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.
- If the Modified F Call Box consists of patented products it would be 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,

Michael L. Halladay
Acting Program Manager, Safety

Enclosure

Sec. 635.411 Material or product selection.

(a) Federal funds shall not participate, directly or indirectly, in payment for any premium or royalty on any patented or proprietary material, specification, or process specifically set forth in the plans and specifications for a project, unless:

(1) Such patented or proprietary item is purchased or obtained through competitive bidding with equally suitable unpatented items; or

(2) The State highway agency certifies either that such patented or proprietary item is essential for synchronization with existing highway facilities, or that no equally suitable alternate exists; or

(3) Such patented or proprietary item is used for research or for a distinctive type of construction on relatively short sections of road for experimental purposes.

(b) When there is available for purchase more than one nonpatented, nonproprietary material, semifinished or finished article or product that will fulfill the requirements for an item of work of a project and these available materials or products are judged to be of satisfactory quality and equally acceptable on the basis of engineering analysis and the anticipated prices for the related item(s) of work are estimated to be approximately the same, the PS&E for the project shall either contain or include by reference the specifications for each such material or product that is considered acceptable for incorporation in the work. If the State highway agency wishes to substitute some other acceptable material or product for the material or product designated by the successful bidder or bid as the lowest alternate, and such substitution results in an increase in costs, there will not be Federal-aid participation in any increase in costs.

(c) A State highway agency may require a specific material or product when there are other acceptable materials and products, when such specific choice is approved by the Division Administrator as being in the public interest. When the Division Administrator's approval is not obtained, the item will be nonparticipating unless bidding procedures are used that establish the unit price of each acceptable alternative. In this case Federal-aid participation will be based on the lowest price so established.

(d) Appendix A sets forth the FHWA requirements regarding (1) the specification of alternative types of culvert pipes, and (2) the number and types of such alternatives which must be set forth in the specifications for various types of drainage installations.

(e) Reference in specifications and on plans to single trade name materials will not be approved on Federal-aid contracts.

ENCLOSURE 2