

Mr. Brian Bruce
President
Quickfix Sign Systems, Ltd.
9424-58 Avenue
Edmonton, Alberta, Canada T6E 0B6

Dear Mr. Bruce:

Thank you for your letter of October 4 requesting Federal Highway Administration (FHWA) acceptance of your company's sign support couplings as components of breakaway sign supports for use on the National Highway System (NHS). You provided information I had requested from the original petitioner, the late Mr. Perry Ruptash. Mr. Ruptash had provided me with a report from E-TECH Testing Services, Inc., drawings of the device, and videos of the crash tests. You requested that we find your company's Quickfix Couplers QF-001, QF-002, QF-003, QF-004, and QF-007 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 Quickfix couplers are cast of 380 Aluminum Alloy, and are affixed to a stub post installed in the ground with the sign post mounted above. The narrow circumference of the coupler, which is molded during the casting process, allows it to act as a fuse, breaking when the sign post is struck. Different models of couplers are available to support either 64 mm (2.5 inch) diameter round pipe and 45 mm (1 3/4 inch) square tube posts. The QF-003 Coupler was tested as being representative of the entire Quickfix product line since it has the largest cross sectional area and resistance to bending during a crash. The QF-003 is designed to adapt to 44.45 mm (1 3/4 inch) perforated square steel tube (PSST) upright posts and 57 mm (2 1/4 inch) ground support anchors. This coupling is shown in the enclosed drawing.

A two-post sign support was tested as a "worst case" scenario. The ground anchors were a 914 mm long by 51 mm square PSST inner post and 457 mm long by 57 mm square outer sleeves. Type QF-003 couplers were attached to the ground anchors such that the center of the couplers were a nominal 76 mm above surrounding grade. The couplers were in turn attached to upright post which were 3048 mm long by 45 mm square PSST. The ground anchors and sign

support were 2.7 mm wall (12 ga) PSST. An 1828 mm wide by 1524 mm high aluminum sign was affixed flush with the top of the support posts to represent the largest sign to be supported by Quickfix couplers. The test installations are shown in the drawing enclosed for reference.

Testing

Full-scale automobile testing was conducted on your company's devices. The crash tests are summarized in the table below:

Test Number	24-0105-002	24-0105-001
NCHRP Repot 350 Test #	3-60	3-61
Test Article	QF-003 (dual post) using 45 mm PSST	
Height to Bottom of Sign	1600 mm (5 ft, 3 in)	
Height to Top of Sign	3124 mm (10 ft, 3 in)	
Coupler Cross Section Area	1516 mm (2.35 in ²)	1516 mm (2.35 in ²)
Coupler Mass	1.25 kg (2.75 pounds)	1.25 kg (2.75 pounds)
Test Article Mass (each)	37.2 kg (81.9 pounds)	37.2 kg (81.9 pounds)
Vehicle Test Inertial Mass	831 kg	824 kg
Impact Speed, Head-on	34.5 km/hr	99.0 km/hr
Impact Angle	20 degrees	
Vehicle Velocity Change	4.6 km/hr, or 1.3 m/sec	3.1 km/hr or 0.9 m/sec
Occupant Impact Speed	1.2 m/sec	0.8 m/sec
Vehicle crush	Minor dents to bumper, roof	Cracked grill, hood dent
Occupant Compart. Intrusion	None	None
Windshield Damage	No contact	No Contact
Stub Height	76 mm	76 mm

There was slight bending of the posts before the couplings fractured. This behavior is expected, and may very well be necessary for the couplings to perform properly. Therefore, the manufacturer's recommendations for minimum and maximum post size should be followed to ensure that the posts to be used are of a similar stiffness to the tested posts.

Findings

Damage was limited to minor denting. The results of tests met the FHWA velocity change and stub height requirements and, therefore, the couplings described above and shown in the enclosed drawings for reference are acceptable for use in Test Level 3 breakaway sign support systems on the NHS under the range of conditions tested, when proposed by a State.

The enclosed chart summarizes the data on the various couplings accepted by this action, namely the following models, QF-001, QF-002, QF-003, QF-004, and the QF-007. English units are used in that table as the couplings are fabricated to these measurements.

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-91 shall not be reproduced except in full.
- Quickfix couplers are patented and are considered "proprietary." If proprietary devices are specified 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, a copy of which is enclosed.

Sincerely yours,

Harry W. Taylor
Acting Director, Office of Safety Design

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.

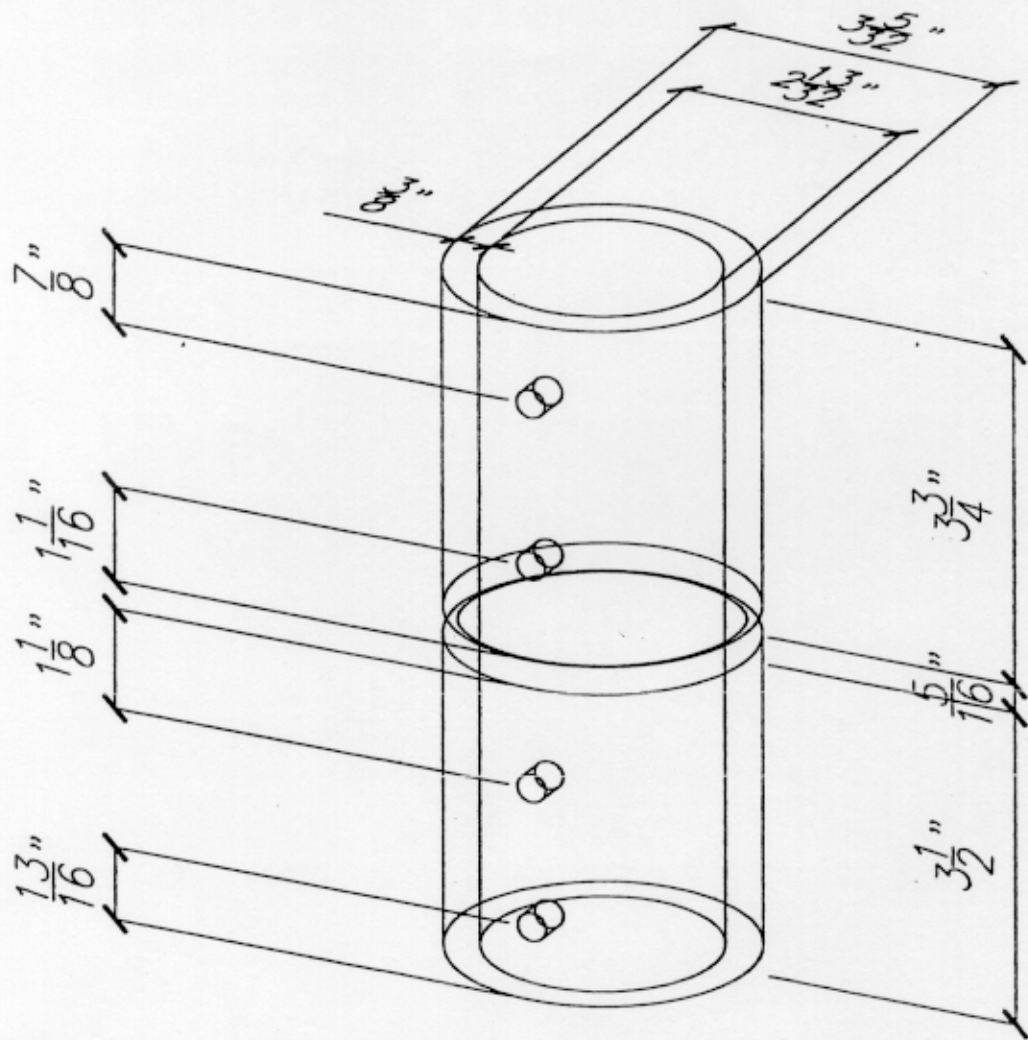
ENCLOSURE 2

Quickfix Sign Systems Ltd. Product Specifications

Coupler	Effective Area (Inches ²)	Moment of Inertia (Inches ⁴)	Aspect	Shape	Outside Diameter (Inches)	Inside Diameter (Inches)	Wall Thickness (Inches)	Post Outside Diameter (Inches)	Post Material
QF-001	2.84	0.78	Top / Sign Post	Round	3 5/32	2 13/32	3/8	2 3/8	RSP *
			Bottom / Anchor Post	Round	3 5/32	2 13/32	3/8	2 3/8	RSP *
QF-002	2.67	1.62	Top / Sign Post	Round	2 25/32	1 29/32	7/16	1 7/8	RSP *
			Bottom / Anchor Post	Round	3 5/32	2 13/32	3/8	2 3/8	RSP *
QF-003	2.35	1.05	Top / Sign Post	Square	2 17/32	1 25/32	3/8	1 3/4	PSST *
			Bottom / Anchor Post	Square	3 9/32	2 9/32	1/2	2 1/4	PSST *
QF-004	2.35	1.05	Top / Sign Post	Square	2 17/32	1 25/32	3/8	1 3/4	PSST *
			Bottom / Anchor Post	Round	3 5/32	2 13/32	3/8	2 3/8	RSP *
QF-007	2.55	1.33	Top / Sign Post	Round	2 25/32	1 29/32	7/16	1 7/8	RSP *
			Bottom / Anchor Post	Round	2 25/32	1 29/32	7/16	1 7/8	RSP *

* RSP = .109 inch (2.77 mm) Round Steel Tube

* PSST = .110 inch (2.79 mm) Perforated Square Steel Tube

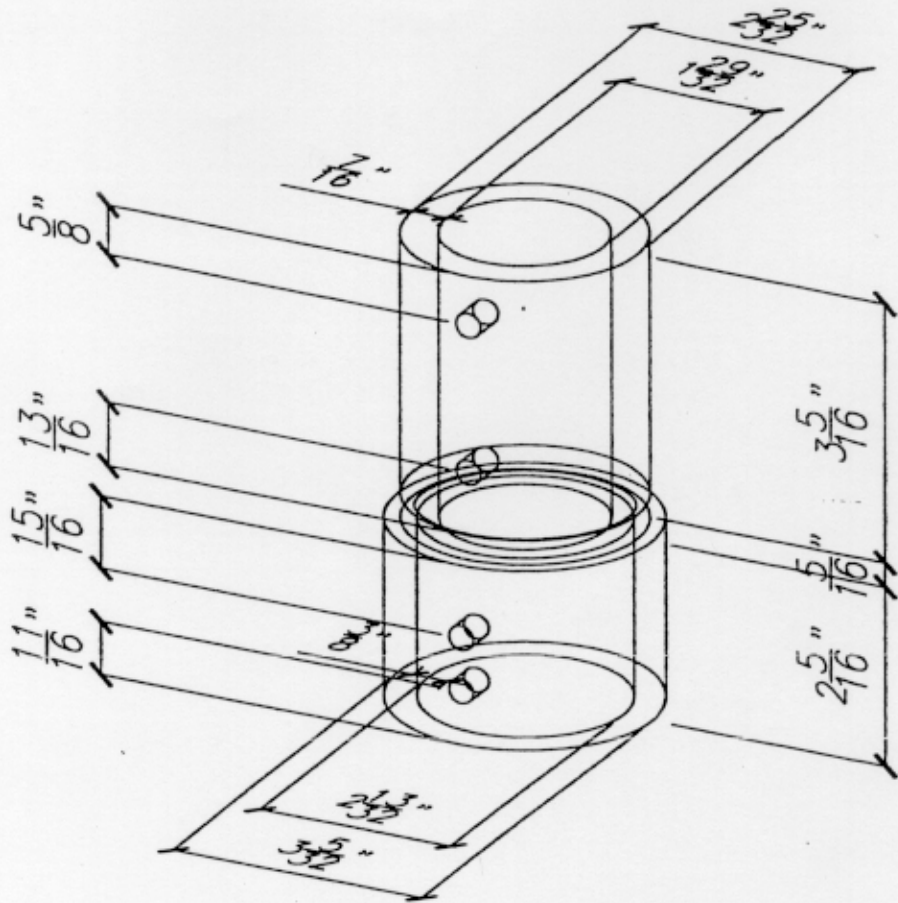


QUICK FIX 001
 (HLS = $\frac{5}{16}$ " \emptyset)

Project:	JOB No. 02-2330	QF-001
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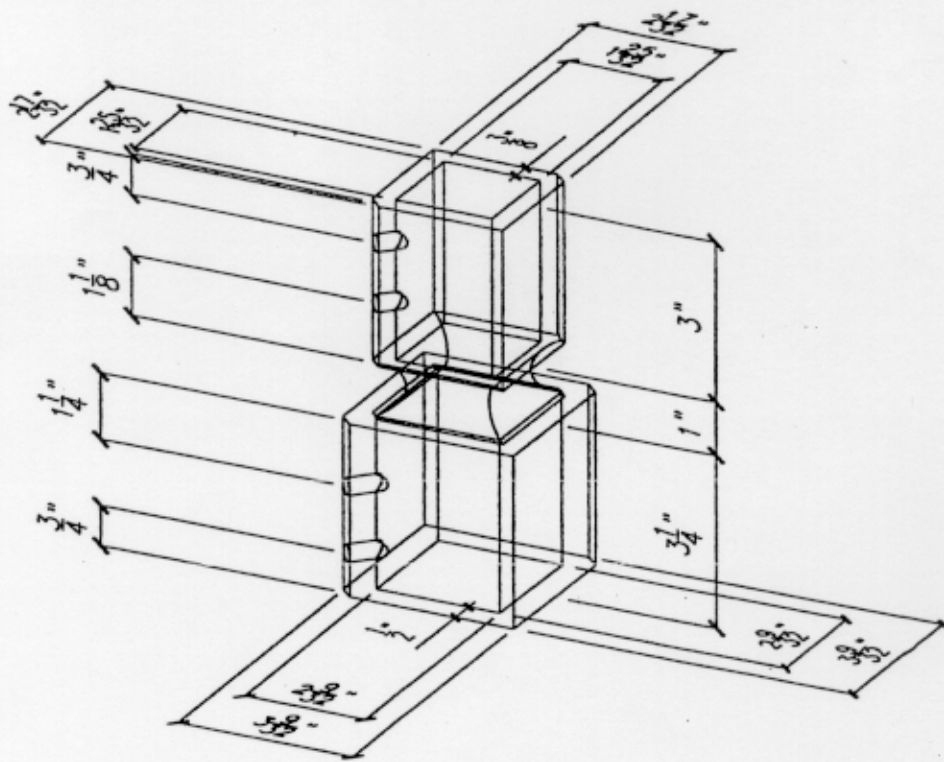


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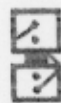
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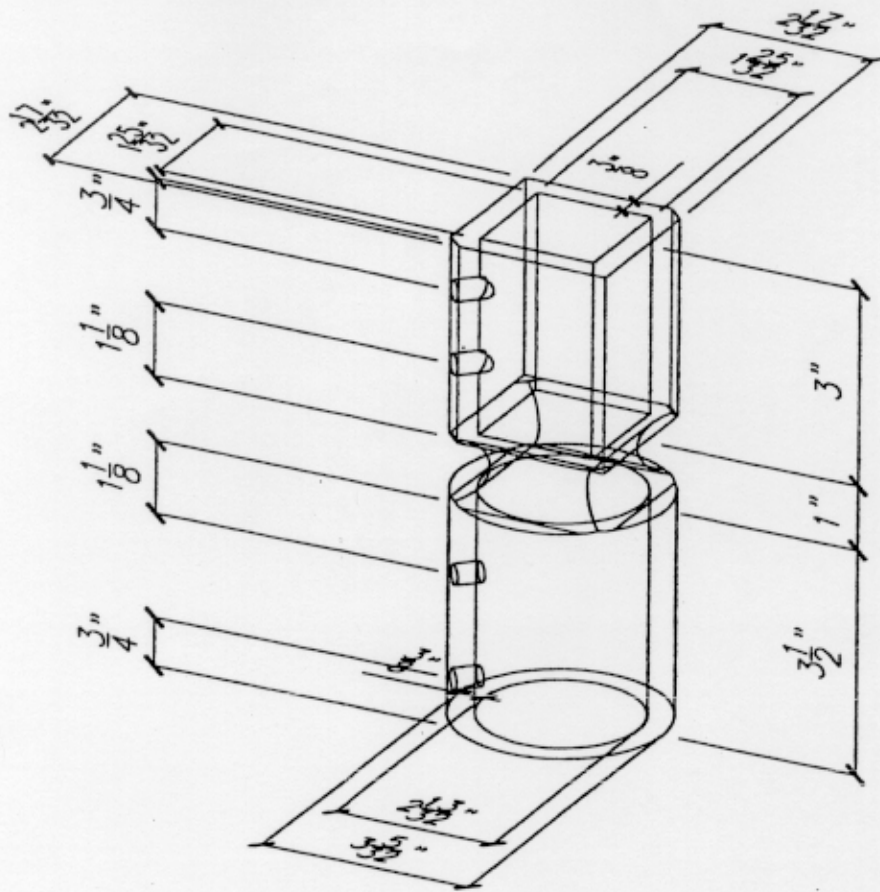
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QUICK FIX 003
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Project:	JOB No. 02-2330	QF-003
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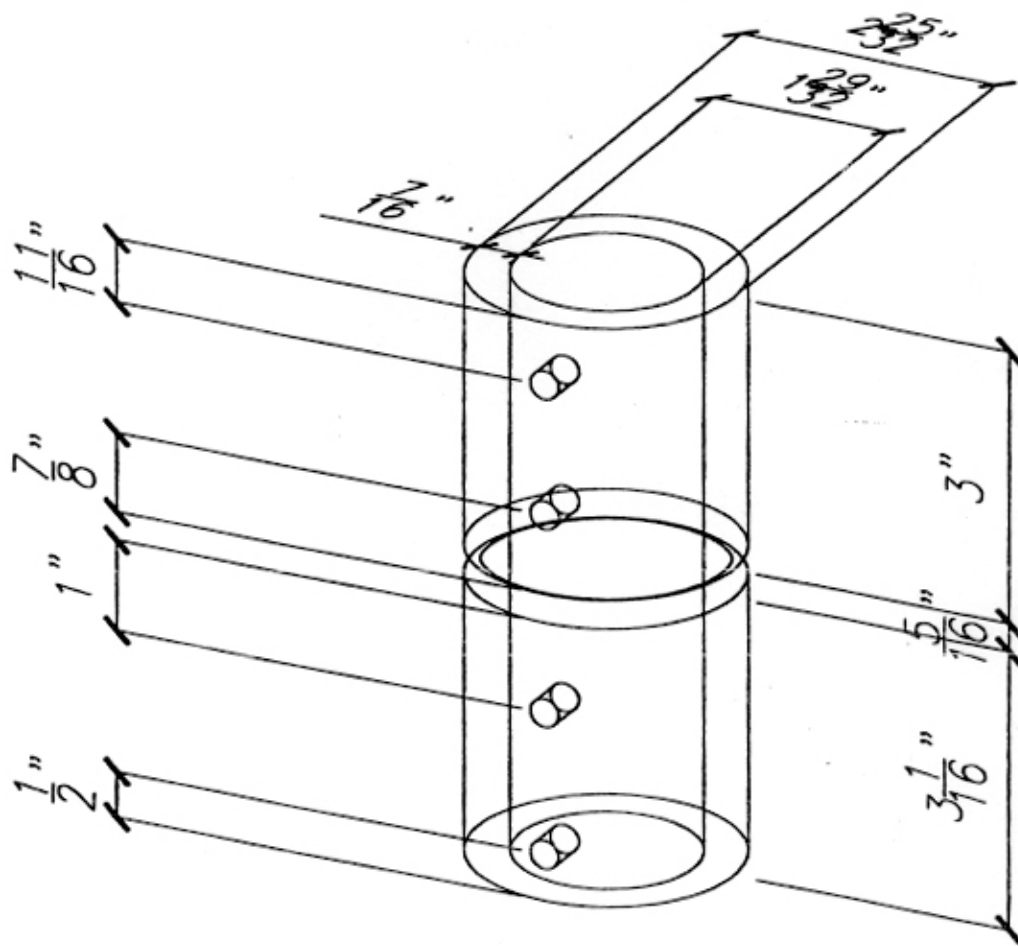


QUICK FIX 004
 (HLS = $\frac{5}{16}$ " \emptyset)

Project:	JOB No. 02-2330	QF-004
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Quickfix Sign Systems Ltd.



QUICK FIX 007
 (HLS = $\frac{5}{16}$ " \emptyset)

Project:	JOB No. 02-2330	QF-007
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