U.S. Department
of Transportation
Federal Highway Administration

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

In Reply Refer To: HSA-10/B-82C

May 26, 2005

Mr. Derek W. Muir
Group Managing Director
Hill & Smith Ltd.
Springvale Business and Industrial Park
Bilston, Wolverhampton, West Midlands, WV14 0QL

Dear Mr. Muir:

In your May 10 letter, you requested formal Federal Highway Administration acceptance of a three-cable version of your originally-accepted 4-strand Brifen Wire Rope Safety Fence (WRSF) as an National Cooperative Highway Research Program (NCHRP) Report 350 test level 3 (TL-3) traffic barrier. To support this request, you submitted a report entitled "Full-scale Crash Evaluation of a Wire Rope Safety Fence, NCHRP Report 350, Tests 3-10, 3-11, and 3-35, SwRI Test Nos. B-USA-C1, B-USA-C2, B-USA-C3, and B-USA-C4." This report detailed the four tests conducted by personnel from the Southwest Research Institute using a temporary site in Ardmore, Oklahoma. The test installation was 278-m long, including the anchors at each end. These anchors were the same design that was tested and accepted for the 4-cable barrier, but only three of the four cable slots were used in the 3-cable design. Rope tension was adjusted according to your specifications for the ambient temperatures immediately preceding each test and averaged 24-kN.

The three-cable TL-3 Brifen design consists of three separate cables, the bottom two of which are interwoven between posts. As with your 4-rope design, the top cable is set in a 101-mm deep x 22-mm wide slot cut into the top of each post. Cable heights measured from ground level are 460 mm, 600 mm, and 720 mm, respectively. The posts are S-shape posts, 100-mm x 55-mm x 4.55-mm thick, manufactured from ASTM A36 steel that is galvanized after fabrication. These details are shown in Enclosure 1. Standard post spacing is 3.2-m and was used in test C2. A 2.4-m spacing was used in test C3. For all tests, 1220-mm long posts were set 408 mm into tubular steel sockets contained in 305-mm diameter concrete footings 760-mm deep. The alternate designs accepted for the 4-cable system, i.e., driven posts or posts set in driven steel sleeves, may also be used with the 3-cable design.

A summary sheet for the four tests you conducted is shown in enclosure 2. When comparing dynamic deflections in tests C2 and C3, I noted that the reported dynamic deflection was predictably greater in both tests than the 2.4 m deflection noted in the 4-cable design, but that the 3-cable deflection was actually somewhat greater with the closer post spacing. This emphasizes the fact that the design deflections for all flexible and semi-rigid barriers are

approximations, usually based on a single test. As such, they should be used as guidelines for barrier design and placement rather than precise distances that will never vary. Test C4 was essentially a terminal test, intended to establish the barrier beginning length of need point and to verify the structural adequacy of the anchor. For the 3-cable system, the length of need point was determined to be the same as it was with the 4-cable design, beginning approximately 9.3 m from the anchor point, between the last anchor post and the first line post (post 5).

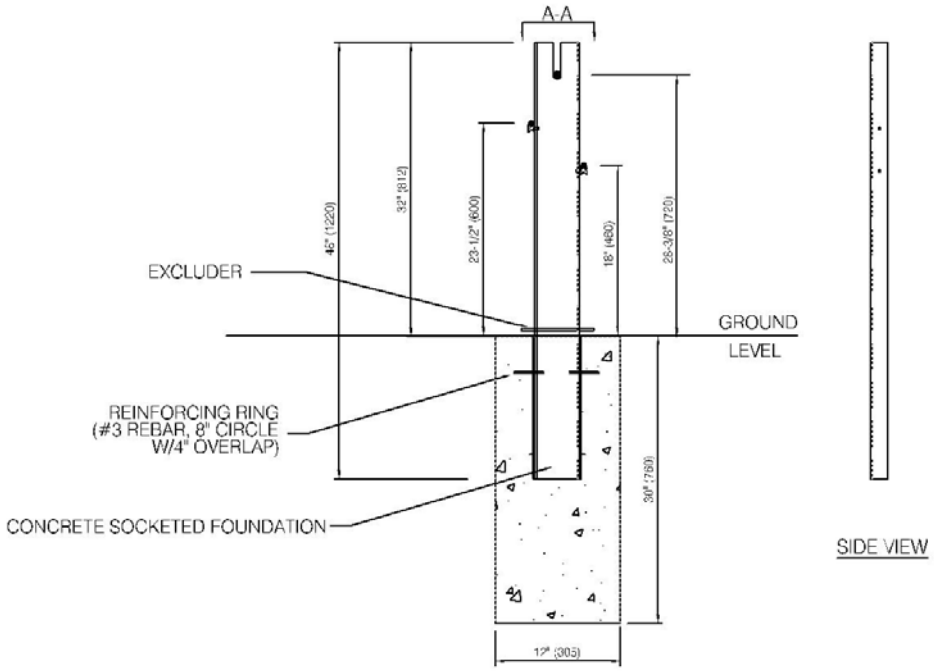
In summary, your Brifen 3-cable WRSF, as described above, remains acceptable as a TL-3 traffic barrier and may be used on the National Highway System when such use is specified by the contracting agency. I understand that all steel components used in any of the accepted Brifen systems are manufactured in the United States (U.S.) with U.S. steel and are not subject the Buy America provisions of Title 23, U.S. Code (USC), Section 635.410. However, your barrier designs are proprietary and, as such, their use on Federally-funded projects remains subject to the conditions listed in Title 23 USC, Section 635.411.

Sincerely yours,

/original signed by/

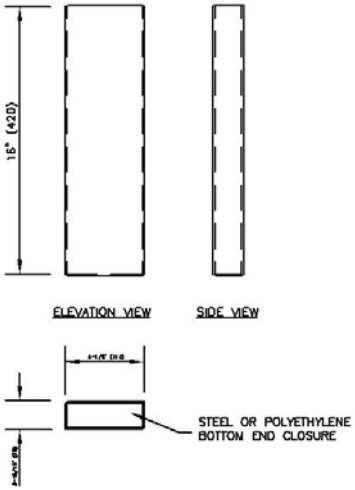
John R. Baxter, P.E.
Director, Office of Safety Design
Office of Safety

2 Enclosures

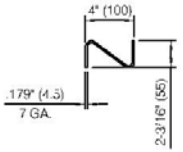


TL-3 LINE POST (3-ROPE)
WITH TL-3/TL-4 SOCKET

SIDE VIEW



TL-3/TL-4 LINE POST SOCKET



SECTION A-A

BRIFEN ★ USA INC.

Revisions		
No.	Date	By
1.		
2.		
3.		
4.		
5.		

Customer: Brifen USA Research, Ardmore, OK USA

Date	Drawn By	Scale
4.23.05	Aaron Wells	None

TL-3 Line Post (3-Rope) and TL-3/TL-4 Socket Detail

Dwg. No. test site-05-003a

Sheet No. 3 of 3

Table 4.1 – Summary of Test Results and Conditions

General Information				
Test Agency	Southwest Research Institute	Southwest Research Institute	Southwest Research Institute	Southwest Research Institute
Test Number	B-USA-C1	B-USA-C2	B-USA-C3	B-USA-C4
Test Date	04/11/2005	04/11/2005	04/12/2005	04/12/2005
Test Category	3-10	3-11	3-11	3-35
Test Article				
Type	Longitudinal Barrier	Longitudinal Barrier	Longitudinal Barrier	Longitudinal Barrier
Installation Length	912-ft (278-m)	912-ft (278-m)	912-ft (278-m)	912-ft (278-m)
Nom. Barrier Height	23.5-in (59.7-cm)	23.5-in (59.7-cm)	23.5-in (59.7-cm)	23.5-in (59.7-cm)
Type of Primary Barrier	Wire Rope Safety Fence, 3-Wire	Wire Rope Safety Fence, 3-Wire	Wire Rope Safety Fence, 3-Wire	Wire Rope Safety Fence, 3-Wire
Test Vehicle				
Type	Small car	¾ Ton Pickup	¾ Ton Pickup	¾ Ton Pickup
Designation	820C	2000P	2000P	2000P
Model	1998 Suzuki Swift	2000 Chevy C2500	1998 Chevy C2500	1998 Chevy C2500
Mass (kg)	907	2089	2089	2089
Inertial Mass(kg)	907	2089	2089	2089
Dummy Mass (kg)	75	NA	NA	NA
Gross Static Mass (kg)	982	2089	2089	2089
Vehicle Damage				
Exterior				
CDC	11FLLS5	11FLLS5	11LFLS5	11LFLS5
Interior				
OCDI	NA	NA	NA	NA
Impact Conditions				
Speed (km/hr)	100.3	98.0	99.3	98.8
Angle (degrees)	20.2	25.3	25.1	20.6
Exit Conditions				
Speed (km/hr)	74 (calculated)	62 (calculated)	67 (calculated)	80 (calculated)
Angle (degrees)	10	15	17	<5
Occupant Risk Values				
Impact Speed (m/s)				
x-direction	3.9	3.7	3.0	1.9
y-direction	-3.0	-2.2	-2.6	-2.7
Ridedown Accelerations (g's)				
x-direction	-8.6	-6.0	-6.3	-2.2
y-direction	5.4	6.0	5.8	4.4
Test Article Deflection				
Dynamic	33-in (0.84-m)	103-in (2.6-m)	108-in (2.7-m)	60-in (1.5-m)
Permanent	0	0	0	0
Post Impact Vehicular Behavior (limited to events <1.500 seconds)				
Maximum Roll Angle (degrees)	-9.1 @ 0.267 sec.	-13.8 @ 1.466 sec.	-9.3 @ 1.454 sec.	-8.1 @ 0.972 sec.
Maximum Pitch Angle (degrees)	-7.9 @ 1.151 sec.	-11.8 @ 1.500 sec.	-5.3 @ 1.473 sec.	-2.4 @ 1.273 sec.
Maximum Yaw Angle (degrees)	-19 @ 1.500 sec.	-25.3 @ 1.433 sec.	-29.2 @ 1.500 sec.	-17.9 @ 1.053 sec.