

July 16, 2004

In Reply Refer to: HSA-10/CC-69D

Mr. Kaddo Kothmann
President
Road Systems, Incorporated
3616 Howard County Airport Road
Big Spring, Texas 79720

Dear Mr. Kothmann:

In your May 19 letter, you requested acceptance of a modified version of your Box-Beam Burster Energy Absorbing Terminal Single-Sided Crash Cushion (BEAT-SSCC) as an National Cooperative Highway Research Program (NCHRP) Report 350 crash cushion at test level 3 (TL-3). This modified design, called the BEAT-SS-CM, consisted solely of a new breakaway post design, with the posts bolted to steel brackets mounted on either a 150-mm (6-inch) thick, reinforced concrete pad or a 200-mm (8-inch) thick non-reinforced pad, rather than set in soil. The brackets were formed from 13-mm (1/2-inch) thick steel plate and were bolted to the concrete with 19-mm diameter x 152-mm long Power Fasteners Wedge-Bolt anchors. The general layout of the BEAT-SSCC-CM is shown in the enclosure to this letter. To support your request, you submitted a copy of the Midwest Roadside Safety Facility's January 27 test report entitled "Performance Evaluation of the Concrete Mounted Single-Sided Crash Cushion – NCHRP 350 Test 3-38" and a videotape of the crash test that was conducted as well as drawings and photographs of the BEAT-SSCC-CM.

As noted in your letter, as many as seven tests (test numbers 3-30 through 3-35, and 3-39) are normally required to certify the crashworthiness of a gating terminal or crash cushion. Based on earlier tests conducted on the Wyoming DOT's box-beam terminal (WYBET), the BEAT/BEAT-MT box beam terminals, and the BEAT-SSCC and on the similarities of these designs to the BEAT-SSCC-CM, you concluded that tests 3-30, 3-31, 3-32, 3-33, 3-34, and 3-35 were not needed. My staff reviewed the information you provided and concurred with your analysis. Test 3-38, which is identified in the NCHRP Report 350 as being needed for a nongating device, was conducted to verify the lateral redirection capability of the concrete-mounted posts. In this test, the 2000-kg pickup truck impacted the side of the crash cushion 3.42 m downstream from the impact head, near post 3, at 102.1 km/h and at a 20.6-degree angle. Four posts were displaced in the test, but only two separated from the box-beam rail element. Dynamic deflection was reported to be 189 mm.

For the original ground-mounted design, test 3-38 was run twice, with one impact point at the beginning of the length of need (approximately 400 mm upstream from post 3) and the second 2.0 m upstream from the rigid New Jersey barrier. In the first test with soil-mounted posts, seven posts were displaced and failed at the ground line and the dynamic deflection was 750 mm.

Thus, for essentially the same test, the concrete-mounted design was shown to be a much stiffer system and a second test closer to the downstream concrete attachment can be presumed acceptable. However, since the front wheel of the pickup truck was torn from the vehicle in the earlier test of the BEAT-SSCC in test 3-38 when the impact point was only 2.0 m from the concrete barrier, both designs could be improved by the addition of a tapered curb that effectively blocks out the leading edge of the concrete barrier and reduces the likelihood of a wheel folding under the box-beam rail element and snagging on the concrete. A box-beam rubrail would serve the same function.

Based on the results of this test, the BEAT-SSCC-CM, as described above, may be considered an NCHRP Report 350 crash cushion at TL-3. Consequently, it may be used on the National Highway System (NHS) when such use is acceptable to the contracting authority. As with the BEAT-SSCC, the concrete-mounted design is not appropriate for use at locations where backside hits towards the rigid concrete barrier are possible, e.g., in gore areas, nor is it appropriate for use at emergency vehicle openings in an otherwise continuous run of median barrier where backside, opposite direction hits are possible. Since it is a proprietary product, its use on Federal-aid projects, except exempt non-NHS projects, remains subject to the provisions in Title 23, Code of Federal Regulations, Section 635.411.

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

- 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 tested and submitted for acceptance.
- To prevent misunderstanding by others, this letter of acceptance, designated as number CC-69D shall not be reproduced except in full. This letter, and the test documentation upon which this letter is based, is public information. All such letters and documentation may be reviewed at our office upon request.

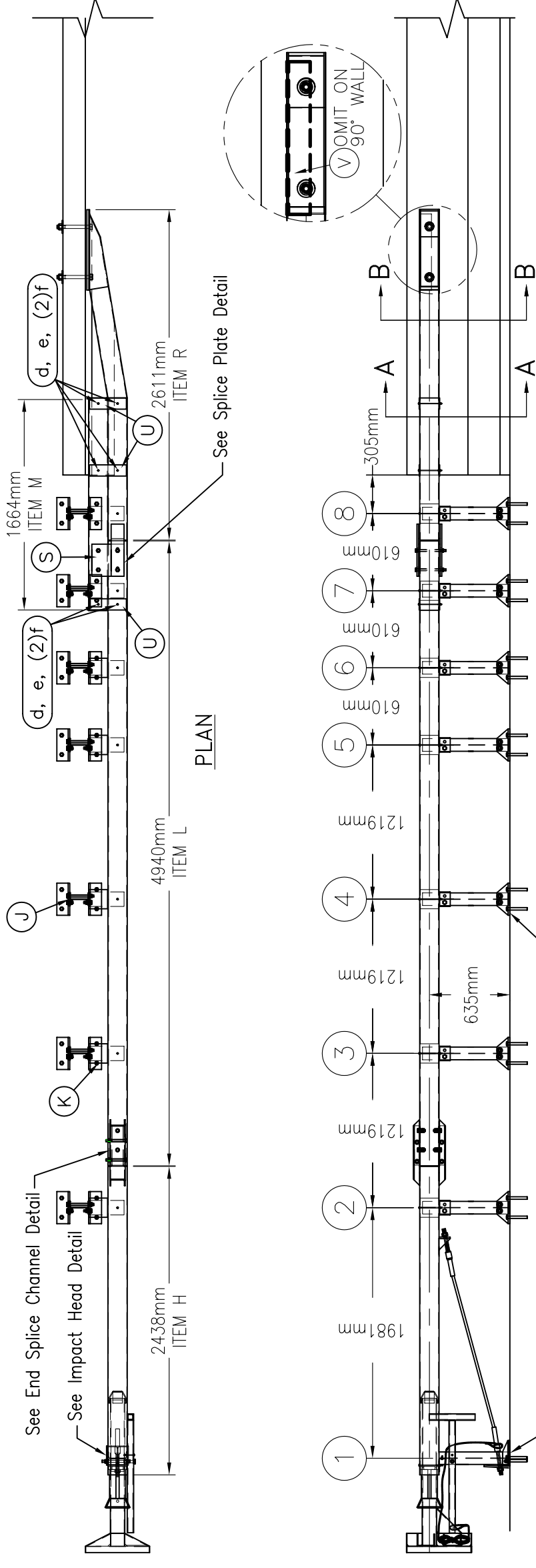
Sincerely yours,

/Original Signed by Richard Powers/

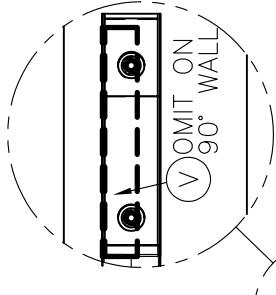
~for~

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

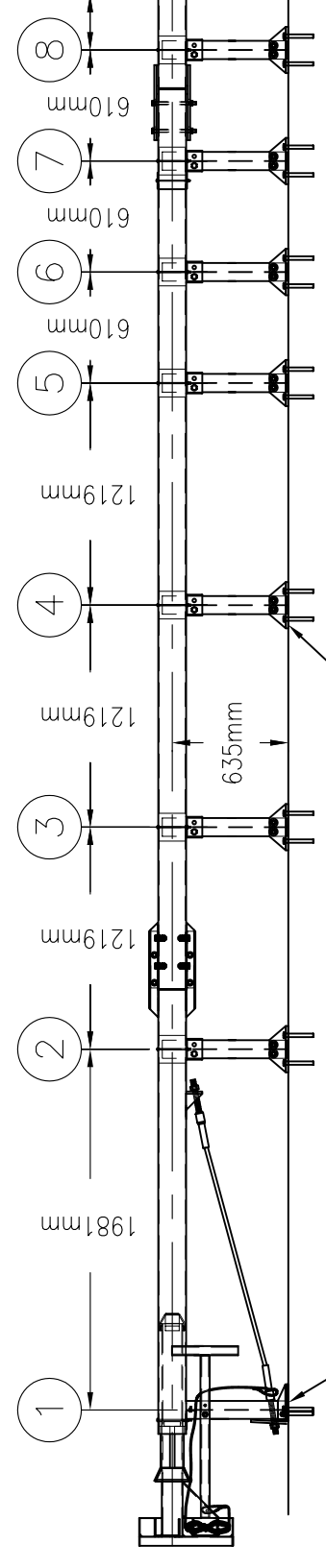
Enclosure



PLAN



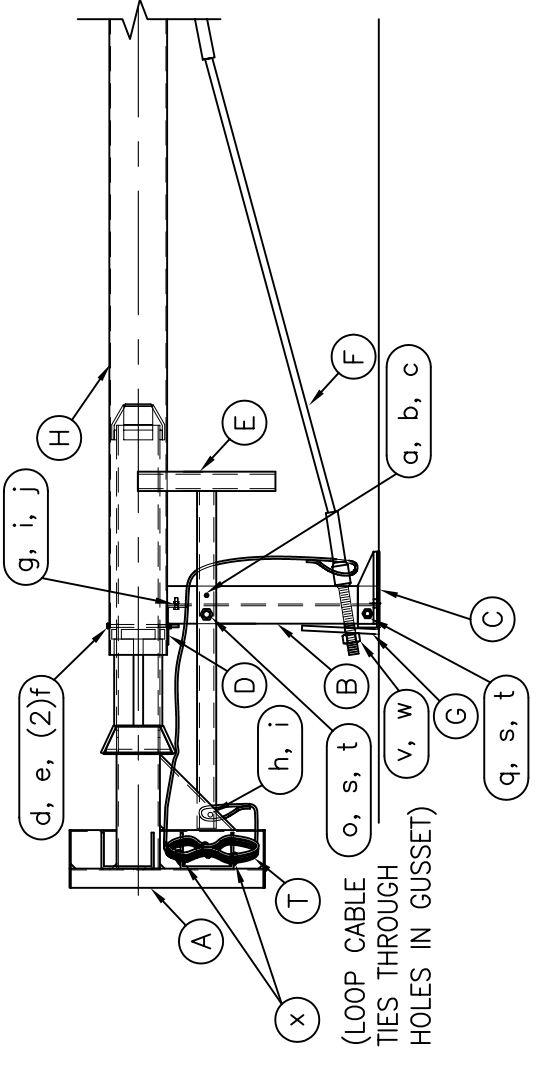
See Splice Plate Detail



ELEVATION

See Anchor Post Base Detail

See Line Post Base Detail

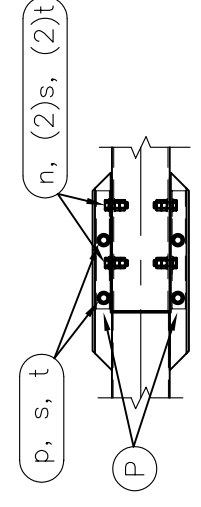


IMPACT HEAD DETAIL

Anchor Post Base Detail

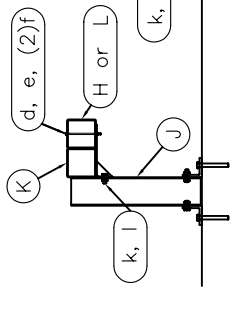
Line Post Base Detail

Note: Bolt q on downstream side of post only.

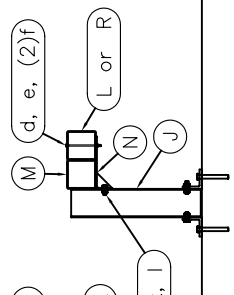


END SPLICE CHANNEL DETAIL

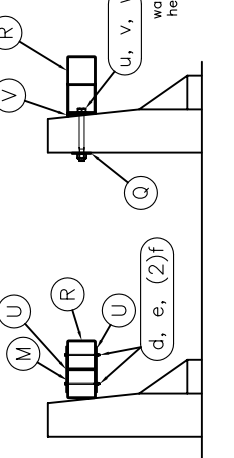
ITEM P SPLICE CHANNELS WILL SET ON THE TOP AND BOTTOM OF ITEM L SECOND RAIL. THE BENT PLATES WELDED TO THE END OF ITEM H END TUBE RAIL WILL SET ON TOP OF ITEM P SPLICE CHANNELS



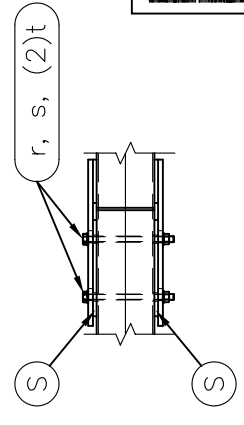
POSTS 2 THRU 6



POSTS 7 & 8



SECTION "A-A"



SPLICE PLATE DETAIL

ITEM	QTY	DESCRIPTION
A	1	Box-Beam Impact Head
B	1	Upper End Post W152x13.4 x 546 LG.
C	1	Concrete Base Assembly Post 1
D	1	Support Bracket L102x51x102 LG.
E	1	Post Breaker Welded TS51x51x6
F	1	Cable Anchor Assembly
G	1	Cable Anchor Bearing Plate
H	1	End Tube Rail x 2438 LG.
J	7	Steel Breakaway Line Post W152x13.4x552 LG.
K	5	Support Bracket w/ Blockout TS152x152 w/ Bent PL.
L	1	Second Rail x 4940 LG.
M	1	Transition Blockout x 1664 LG.
N	2	Trans. Support Bracket 5 Bent PL. w/ Gusset
P	2	Bent End Splice -- Detail Below
Q	2	25mm Square Washer PL. 102x102x6
R	1	Anchor Rail x 2611 LG.
S	2	Splice Plate 254x254x10
T	1	10mm GALV. Cable x 6,096mm
U	6	Tie Plate PL. 292x89x5
V	1	Spacer (OMIT ON 90° WALL)
Z	14	Concrete Base Angle Bracket Posts 2-8
HARDWARE		
a	1	6mm x 76mm Hex Bolt Grade 5
b	1	6mm Hex Nut
c	1	6mm Washer
d	14	8mm x 191mm Hex Bolt Grade 5
e	14	8mm Hex Nut
f	28	8mm Washer
g	1	13mm x 51mm Hex Bolt Grade 5
h	1	13mm x 127mm Hex Bolt Grade 5
i	2	13mm Hex Nut
j	1	13mm Washer
k	1	16mm x 38mm Guardrail Bolt
l	7	16mm Recess Nut
m	14	16mm x 51mm Hex Bolt Grade 5
n	4	16mm x 64mm Hex Bolt Grade 5
o	1	16mm x 76mm Hex Bolt Grade 5
p	4	16mm x 152mm Hex Bolt Grade 5
q	8	16mm x 203mm Hex Bolt Grade 5
r	4	16mm x 229mm Hex Bolt Grade 5
s	39	16mm Hex Nut
t	43	16mm Washer
u	2	25mm x 254mm Hex Bolt Grade 5 (Length Varies w/ Wall Sect.)
v	4	25mm Hex Nut Grade 5
w	4	25mm Washer Grade 5
x	2	Cable Tie
y	31	19mmx152mm Grade 5 Anchor (90kN Capacity)

- General Notes for the BEAT-SSCC-SM:
- 1.) Unless otherwise noted, all hardware, cable assemblies, tubing, posts, impact heads and other steel components shall be galvanized.
 - 2.) The breakaway cable assembly must be taut. A locking device (vice grips or channel locks) should be used to prevent the cable from twisting when tightening nuts.
 - 3.) An object marker meeting State specifications should be installed on the front of the impact head.
 - 4.) The approach area in front of the BEAT-SSCC-SM and the area within the system itself shall be free of fixed obstacles and have a fill slope of 10:1 or flatter.

Big Spring, TX
Phone: 432-263-2435
or Phone: 330-346-0721

BEAT-SSCC
Single Sided Crash Cushion
Surface Mounted
Assembly Drawing

Sheet: **A1**
Date: 02\06\04
By: JRR
Scale: NONE

SECTION "B-B"