US Department
of Transportation
**Federal Highway
Administration**

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

August 27, 1999

Refer to: HMHS-CC61

Mr. Kaddo Kothmann
President
ROAD SYSTEMS, INC.
P.O. Box 2163
Big Spring, Texas 79721

Dear Mr. Kothmann:

In your July 30 letter, you requested the Federal Highway Administration's (FHWA) acceptance of a steel breakaway post as an alternative to the weakened timber posts that are currently used in your SKT-350 and FLEAT-350 w-beam guardrail terminals. These breakaway posts are comprised of a lower stub post connected to an upper post by splice plates welded to the flanges of the stub post along the bottom and sides of the plates and connected to the upper post with two 31-mm diameter plug welds. This design causes the plug welds to yield at relatively low loads when the posts are struck head on and the welds are loaded in torsion, but the connection can sustain loads as high as 89 KN when loaded laterally in shear. Enclosure 1 shows the breakaway end posts, the breakaway line posts, and the splice weld details. All other features of the SKT-350 and the FLEAT-350 remain unchanged from the original designs.

To show that the steel breakaway posts functioned as desired, you ran three tests on the alternative design, and provided me with copies of the test reports for staff review. Summaries of each of the tests are shown in Enclosure 2.

We believe that the tests you ran satisfactorily demonstrate that the steel breakaway posts are an acceptable alternative to the original wood post designs for the SKT-350 and the FLEAT-350 and may be used as such on the National Highway System when requested by a transportation agency.

Sincerely yours,

Dwight A. Horne

Dwight A. Horne
Director, Office of Highway Safety Infrastructure

2 Enclosures

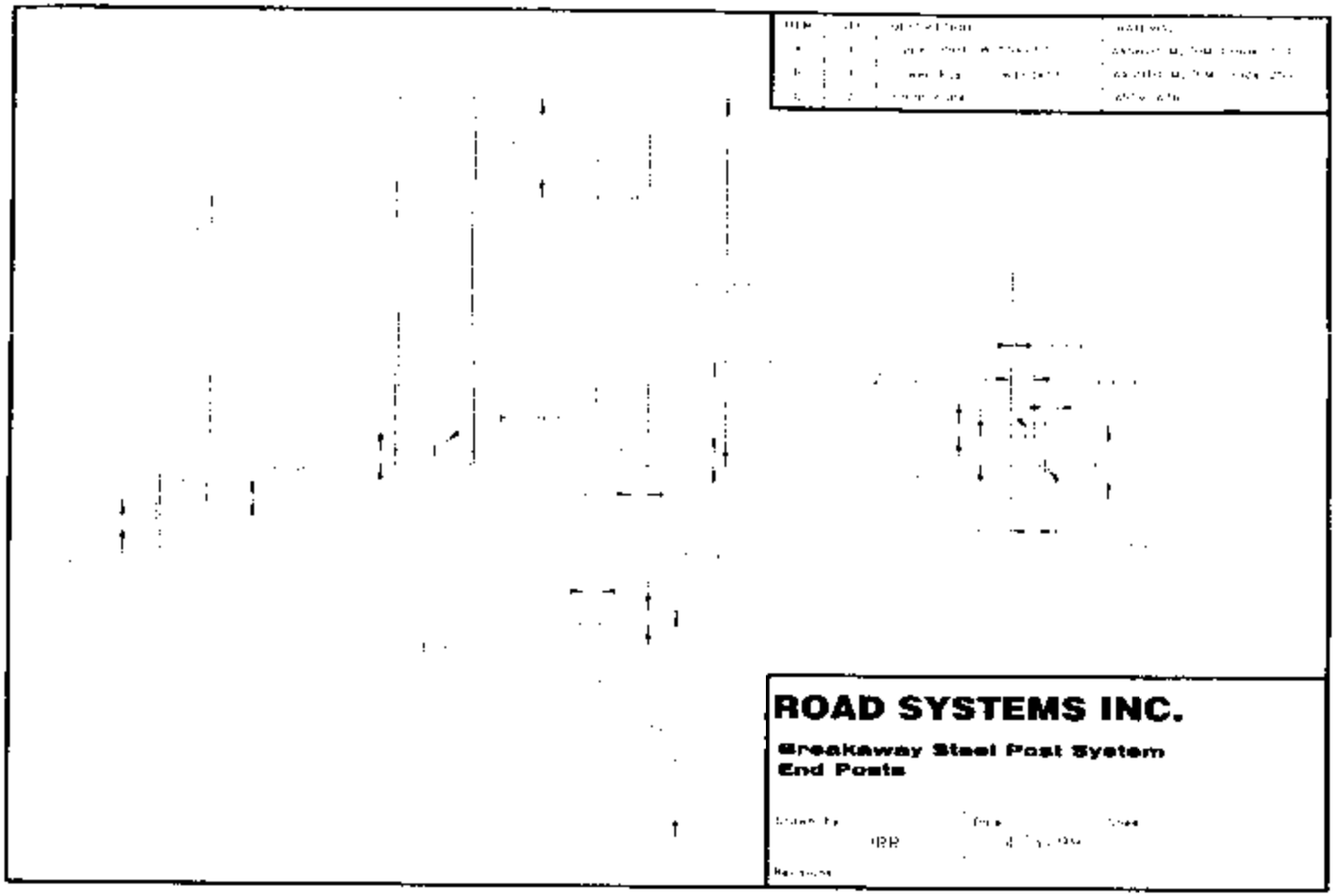


Figure 9. Steel Breakaway End Post.

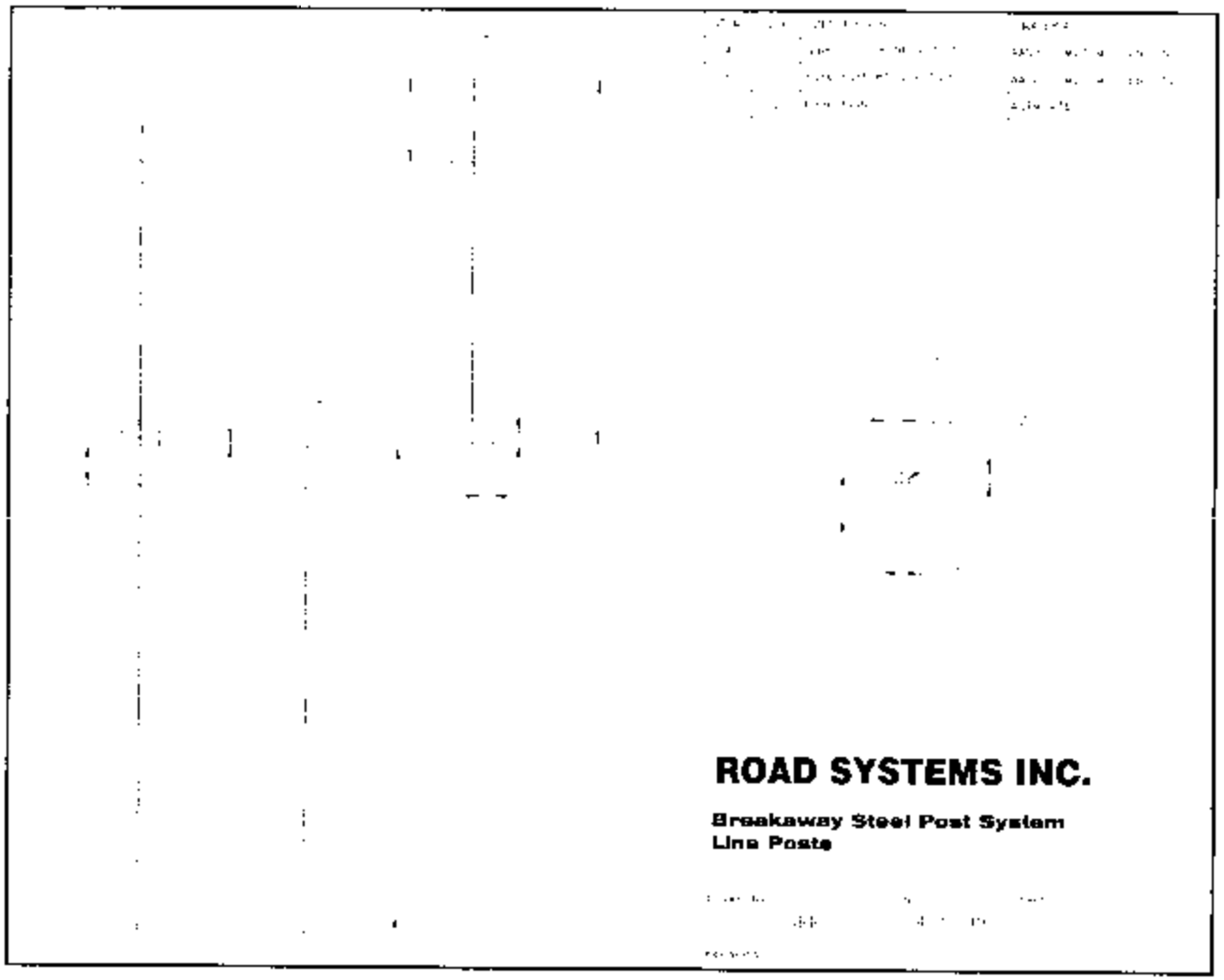
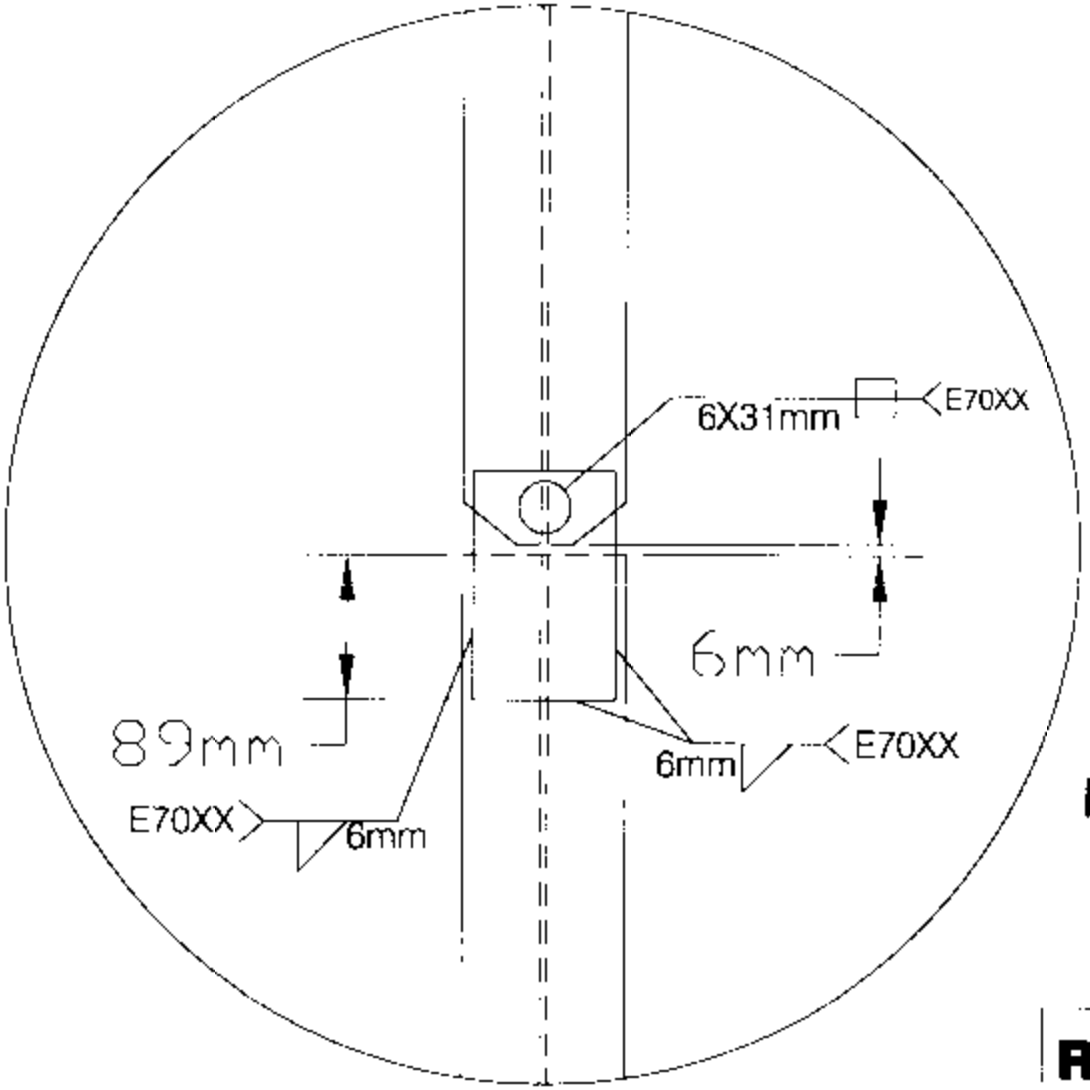


Figure 11. Steel Breakaway Line Post.



Note:
Weld typical on both flanges of post.

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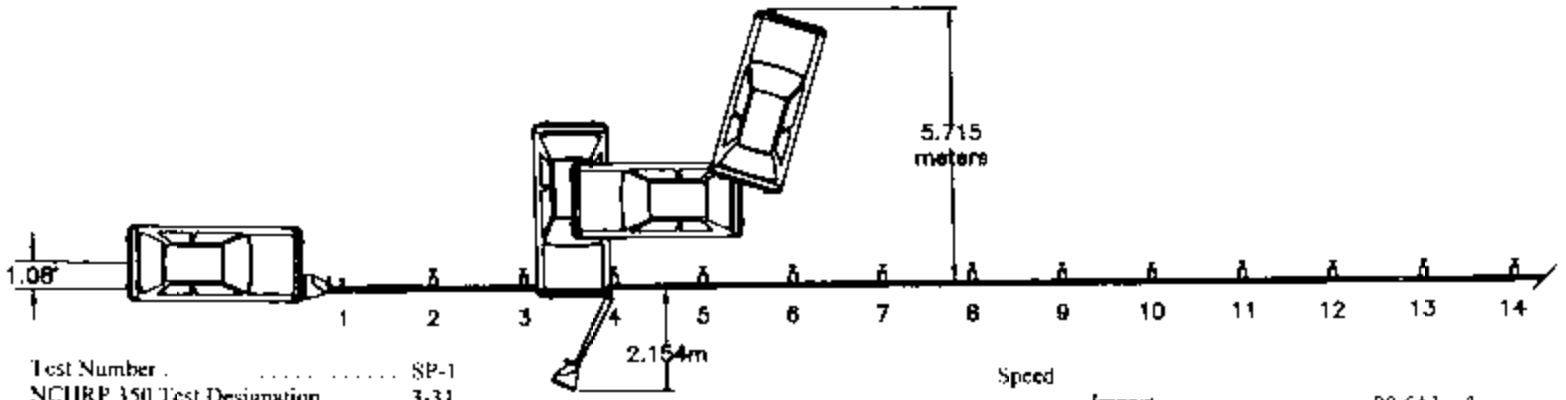
Steel Line Posts
Weld Details

Drawn by	Date	Sheet
JRR	6/29/99	

Revisions

Enclosure 1 (3 of 3)

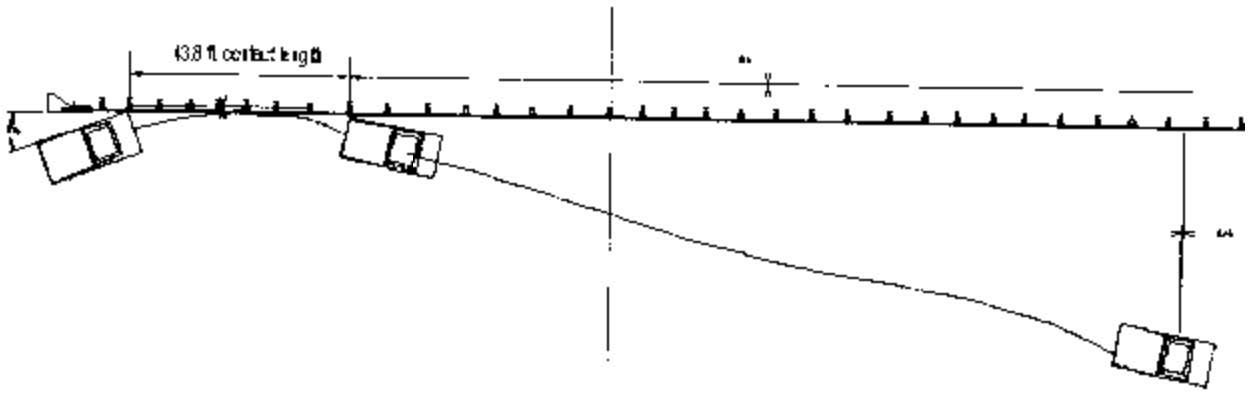


Test Number	SP-1
NCHRP 350 Test Designation	3-31
Date	2/2/98
Installation	Sequential Kinking Terminal
System length	41.91 m
Head Dimensions (LxWxH)	2104 mm x 508 mm x 508 mm
Face Angle	0.0 degrees
Guardrail	12-gauge W-beam
End Terminal Posts	
Number 1	W150x13.5 BCT steel post, 1080 mm long in SKT foundation tube w/ modified groundline strut to post 2
Number 2	W150x13.5 BCT steel post, 1830 mm long in SKT foundation tube w/ modifed groundline strut and 200x150x360 mm routered timber block
Numbers 3-8	W150x13.5 CRT steel posts, 1830 mm long w/ 200x150x360 mm routered timber block
Vehicle Model	1993 Ford Festiva Compact Car
Vehicle Weight	
Curb	795 kg
Test Inertia	819 kg
Gross Static	894 kg

Speed	
Impact	98.64 km/h
Exit	N.A.
Angle	
Impact	1.08 deg (on head)
Exit	N.A.
Occupant Impact Velocity	
Longitudinal	8.40 m/s
Lateral	3.51 m/s
Occupant Ridedown Deceleration	
Longitudinal	12.12 g's
Lateral	10.81 g's
Vehicle Damage	
TAD	12-FR-3
VDI	12FREN2
Vehicle Rebound Distance	5.7 meters (approx.)

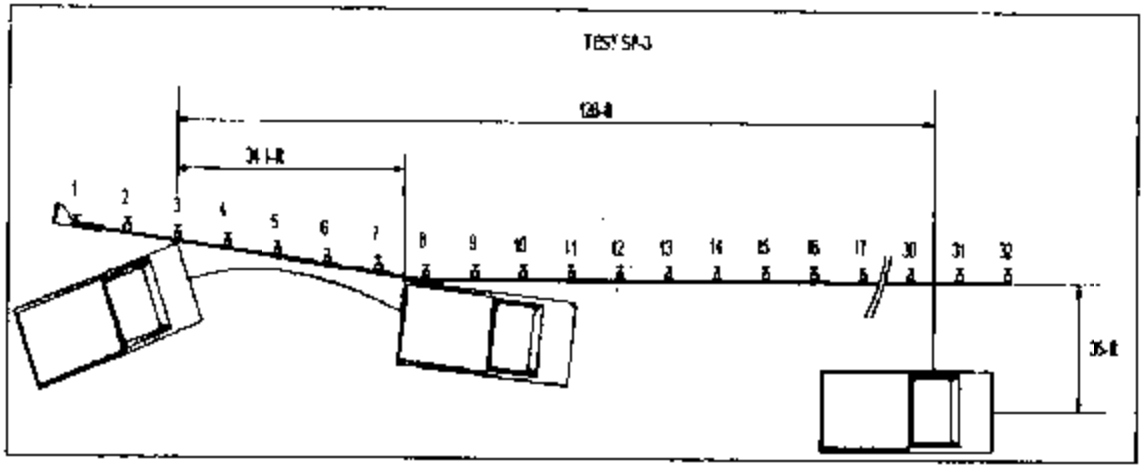
Conversion Factors: 1 in.= 2.54 cm, 1 lb= 0.454 kg

Figure 17. Summary of Test SP-1



General Information		Test Vehicle (continued)		Ridedown Accelerations (g's)	
Test Agency	Southwest Research Institute	Mass (kg) Dummy(s)	75.0	Y-direction	12.6
Test Number	SP-2	Mass (kg) Gross Static	2030.0	Test Article Deflection (mm)	
Test Date	Feb. 18, 1999	Impact Conditions		Dynamic	1169
Test Article	Guardrail End Terminal	Speed (km/h)	100.1	Permanent	935
Type	Sequential Kinking Terminal	Angle (deg)	20.0	Vehicle Damage	
Installation Length (m)	61	Exit Conditions		Exterior	
Barrier	W-beam	Speed (km/h)	64.9	VDS	11FQ
Soil Type and Condition	S1 Dry	Angle (deg)	15.8	DCDC	11FNEN
Test Vehicle		Occupant Risk Values		Interior	
Type	Standard Pickup	Impact Velocity (m/s)		OCDI	LF000000
Designation	2000P	X-direction	3.8	Post-Impact Vehicular Behavior	
Model	1993 Chevrolet C-20	Y direction	3.5	Maximum Roll Angle (deg)	7.3
Mass (kg) Curb	1925	Ridedown Accelerations (g's)		Maximum Pitch Angle (deg)	4.5
Mass (kg) Test Inertial	1925	X-direction	10.6	Maximum Yaw Angle (deg)	Not Available

Figure 13. Impact Description and Summary of Results, Test SP-2



General Information		Test Vehicle (continued)		Ridedown Accelerations (g's)	
Test Agency	Southwest Research Institute	Mass (kg) Dummy(s)	75.0	Y-direction	7.8
Test Number	SP-3	Mass (kg) Gross Static	2020.0	**Test Article Deflection (mm)**	
Test Date	13-Apr-99	**Impact Conditions**		Dynamic	1217
Test Article	4-ft Offset Guardrail End Terminal	Speed (km/h)	104.5	Permanent	1080
Type	Sequential Kinking Terminal	Angle (deg)	20.4	**Vehicle Damage**	
Installation Length (m)	51	**Exit Conditions**		Exterior	
Barrier	W-beam	Speed (km/h)	55.1	VDS	11FQ-2
Soil Type and Condition	S1-Dry	Angle (deg)	16.0	DCDC	11FNEN
Test Vehicle		**Occupant Risk Values**		Interior	
Type	Standard Pickup	Impact Velocity (m/s)		OCDI	LF000000
Designation	2000P	X-direction	5.5	**Post-Impact Vehicular Behavior**	
Model	1993 Chevrolet C-20	Y-direction	3.6	Maximum Roll Angle (deg)	5
Mass (kg) Curb	1945	**Ridedown Accelerations (g's)**		Maximum Pitch Angle (deg)	9.4
Mass (kg) Test Inertial	1945	X-direction	7.5	Maximum Yaw Angle (deg)	Not Available

Figure 14. Impact Description and Summary of Results, Test SP-3