



U.S. Department
of Transportation

**Federal Highway
Administration**

JAN 29 1996

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

Refer to: HNG-14

Mr. David E. Wasserstrom
President
Safety Barrier Systems
77 East Market Street
Wilkes-Barre, Pennsylvania 18701-3116

Dear Mr. Wasserstrom:

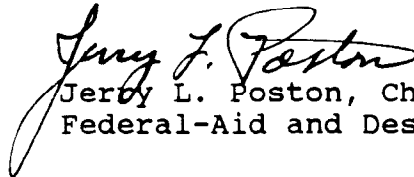
On December 13, 1995, you requested the Federal Highway Administration's acceptance of the Guardian Safety Barrier as a National Cooperative Highway Research Program (NCHRP) Report 350 test level 3 (TL-3) traffic barrier. This request was supported by crash test data contained in the Texas Transportation Institute December 1995 report, "NCHRP Report 350 Compliance Tests of the Guardian Water Filled Longitudinal Barrier." In my December 22, 1995, response to your letter I expressed concern about the failed upper joint resulting from test 270687 YEW 7 (NCHRP Report 350 test 3-11) and requested that the connection detail be redesigned to prevent this type of failure. On January 5 you replied that the bolts used to connect the pipes were changed from grade 5 to grade 8 with a resultant increase in tensile strength of 25 percent and they were lengthened from 4½ inches to 5 inches to ensure that the threaded portion of the bolt does not lie in the shear plane between the pipe and sleeve. However, no test was run to confirm better performance with this detail. Although it appears reasonable to assume that a stronger bolt will prevent the pipes from separating on impact, we believe that test 3-11 should be re-run on the new design to confirm its performance. However, inasmuch as the first tests passed the appropriate evaluation criteria, except for the subjective criterion on potential for occupant compartment intrusion, we will offer conditional acceptance of the Guardian as a TL-3 barrier for use on National Highway System projects, if proposed by the highway agency in charge, provided the following conditions are met:

1. The designed system is successfully tested with the 2000-kg pickup truck within 180 days from the date of this letter.

2. All pertinent specifications and installation manuals/instructions emphasize the need to use the longer and higher strength bolts with which the system is to be tested.

A copy of this letter, summaries of the tests that were run, and a copy of your revised design will be sent to FHWA field offices for information.

Sincerely yours,


Jerry L. Poston, Chief
Federal-Aid and Design Division

Geometric and Roadside Design Acceptance Letter Number B-34

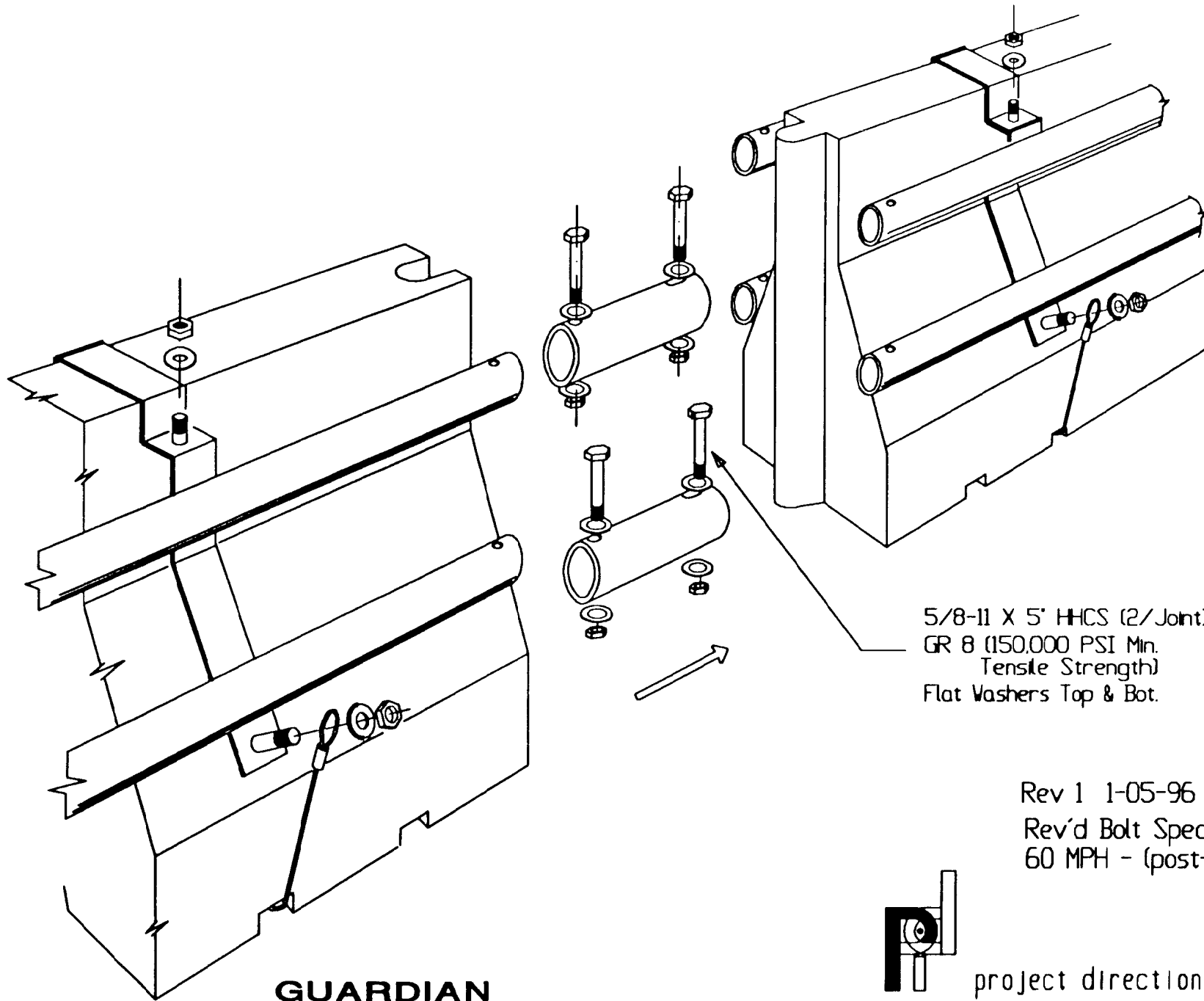
Table 1. Performance evaluation summary for test 270687-YEW7, NCHRP Report 350 Test 3-11.

Test Agency: Texas Transportation Institute		Test No.: 270687-YEW7	Test Date: 11/10/95
NCHRP Report 350 Evaluation Criteria		Test Results	Assessment
<u>Structural Adequacy</u>			
A.	Test article should contain and redirect the vehicle; the vehicle should not penetrate, underide, or override the installation although controlled lateral deflection of the test article is acceptable.	The test article contained the vehicle without penetration, underide, or override. Lateral deflection was 3.4 m.	Pass
<u>Occupant Risk</u>			
D.	Detached elements, fragments or other debris from the test article should not penetrate or show potential for penetrating the occupant compartment, or present an undue hazard to other traffic, pedestrians, or personnel in a work zone. Deformations of, or intrusions into, the occupant compartment that could cause serious injuries should not be permitted.	A bolt in one connection on the impact face was sheared. This allowed one segment of rail to extend upward over the displaced barrier and was judged to not present undue hazard to other traffic or pedestrians. Deformation into the occupant compartment was 50 mm on the driver's floor pan at the fire wall.	Pass
F.	The vehicle should remain upright during and after collision although moderate roll, pitching and yawing are acceptable.	The vehicle remained upright during and after the collision period.	Pass
<u>Vehicle Trajectory</u>			
K.	After collision it is preferable that the vehicle's trajectory not intrude into adjacent traffic lanes.	The vehicle did not intrude into adjacent traffic lanes.	Pass
L.	The occupant impact velocity in the longitudinal direction should not exceed 12 m/s and the occupant ridedown acceleration in the longitudinal direction should not exceed 20 G's.	Longitudinal occupant impact velocity = 10.1 m/s Longitudinal occupant ridedown acceleration = -11.2 g	Pass
M.	The exit angle from the test article preferably should be less than 60 percent of test impact angle, measured at time of vehicle loss of contact with test device.	The vehicle did not exit the installation. The vehicle yawed 73 degrees and came to rest with the front end touching the barrier.	Pass

Table 2. Performance evaluation summary for test 270687-YEW8, NCHRP Report 350 Test 3-10.

Test Agency: Texas Transportation Institute		Test No.: 270687-YEW8	Test Date: 11/11/95									
NCHRP Report 350 Evaluation Criteria		Test Results	Assessment									
<u>Structural Adequacy</u> A. Test article should contain and redirect the vehicle; the vehicle should not penetrate, underide, or override the installation although controlled lateral deflection of the test article is acceptable.		The Guardian water filled longitudinal barrier contained and redirected the vehicle. The vehicle did not penetrate, go over or under the barrier. Maximum lateral deflection was 1.1 m.	Pass									
<u>Occupant Risk</u> D. Detached elements, fragments or other debris from the test article should not penetrate or show potential for penetrating the occupant compartment, or present an undue hazard to other traffic, pedestrians, or personnel in a work zone. Deformations of, or intrusions into, the occupant compartment that could cause serious injuries should not be permitted.		There were no detached elements or debris to penetrate the occupant compartment or to present undue hazard to others in the area. Maximum deformation into the occupant compartment was 15 mm.	Pass									
F. The vehicle should remain upright during and after collision although moderate roll, pitching and yawing are acceptable.		The vehicle remained upright during and after the collision period.	Pass									
H. Occupant impact velocities should satisfy the following:		Longitudinal occupant impact velocity = 7.3 m/s Lateral occupant impact velocity = 1.5 m/s	Pass									
<table border="1"> <thead> <tr> <th colspan="3">Occupant Velocity Limits (m/s)</th> </tr> <tr> <th>Component</th> <th>Preferred</th> <th>Maximum</th> </tr> </thead> <tbody> <tr> <td>Longitudinal and lateral</td> <td>9</td> <td>12</td> </tr> </tbody> </table>				Occupant Velocity Limits (m/s)			Component	Preferred	Maximum	Longitudinal and lateral	9	12
Occupant Velocity Limits (m/s)												
Component	Preferred	Maximum										
Longitudinal and lateral	9	12										
I. Occupant ridedown accelerations should satisfy the following:												
<table border="1"> <thead> <tr> <th colspan="3">Occupant Ridedown Acceleration Limits (G's)</th> </tr> <tr> <th>Component</th> <th>Preferred</th> <th>Maximum</th> </tr> </thead> <tbody> <tr> <td>Longitudinal and lateral</td> <td>15</td> <td>20</td> </tr> </tbody> </table>		Occupant Ridedown Acceleration Limits (G's)			Component	Preferred	Maximum	Longitudinal and lateral	15	20	Longitudinal occupant ridedown acceleration = -3.9 g Lateral occupant ridedown acceleration = 5.2 g	Pass
Occupant Ridedown Acceleration Limits (G's)												
Component	Preferred	Maximum										
Longitudinal and lateral	15	20										
<u>Vehicle Trajectory</u> K. After collision it is preferable that the vehicle's trajectory not intrude into adjacent traffic lanes.		There was minimal intrusion of the vehicle into adjacent traffic lanes.	Pass									
M. The exit angle from the test article preferably should be less than 60 percent of test impact angle, measured at time of vehicle loss of contact with test device.		Exit angle at loss of contact with the barrier was 9.9 degrees which was less than 60 percent of the impact angle.	Pass									

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GUARDIAN
350 HIGHWAY KIT™ *LEVEL 3*

5/8-11 X 5' HHCS (2/Joint)
GR 8 (150,000 PSI Min.
Tensile Strength)
Flat Washers Top & Bot.

Rev 1 1-05-96
Rev'd Bolt Spec's for
60 MPH - (post-test)



project direction inc.
SBSKIT60.GCD