

August 24, 2001

Refer to: HSA-10/CC74

Mr. Matthew A. Gelfand
President, Universal Safety Response, Inc.
48 Arrandale Road
Rockville Centre, NY 11570

Dear Mr. Gelfand:

In your July 24 letter to Mr. Richard Powers of my staff, you requested the Federal Highway Administration's (FHWA) acceptance of your Ground Retractable Automobile Barrier (GRAB) for use on the National Highway System (NHS). To support your request, you included a copy of a Texas Transportation Institute June 2001 report entitled "Testing and Evaluation of the Ground Retractable Automobile Barrier (GRAB): Tests 3 and 4" and video tapes of the tests that were conducted.

The GRAB is an attenuating device designed to span a roadway or a traffic lane to prevent vehicle passage by bringing an encroaching vehicle to a controlled stop. Potential locations where the GRAB might be used include highway-railroad crossings, drawbridges, and closed HOV lanes. The system consists of a steel stanchion (anchor post) at each end, four hydraulic energy absorbers, and a cable/net assembly. The anchor posts were made from two sections of A36 steel pipe – a fixed inner pipe 25-mm thick with a 305-mm O.D. and a 19-mm thick, 381-mm O.D. outer pipe free to rotate around the anchor post. The reusable hydraulic cylinders, set between the anchor posts and the net (two at each end), are 2.9-m long with an effective stroke of 2.4 m. The net itself consists of upper and lower 19-mm diameter Extra High Strength (EHS) wire strands, with a 16-mm diameter wire rope in the center and 16-mm diameter wire rope woven up and down along the width of the net and attached to the top, middle and bottom cables with clamps. Enclosure 1 shows the general layout and dimensions of the GRAB.

The overall test installation width was 18.4 m between stanchions, with the net being 10.5-m wide. When tensioned to 27.5 kN, the top cable was 1 m above the ground. The bottom cable, tensioned to 17.5 kN, was 0.2 m above the ground.

The GRAB was tested to the National Cooperative Highway Research Program (NCHRP) Report 350 test level 2 (TL-2), with both the 820-kg car and the 2000-kg pickup truck impacting at the third point of the net at a nominal speed of 70 km/h. Both vehicles were stopped smoothly with no significant roll, pitch or yaw. Occupant impact velocities for the car and truck were 6.1 m/sec and 5.1 m/sec, respectively. The corresponding 10-millisecond ridedown accelerations were 5.4 and 7.2 g's. Maximum dynamic deflection of the GRAB was 6.3 m with the car and 6.6 m with the pickup truck. Summary results for the two tests are shown in Enclosures 2 and 3.

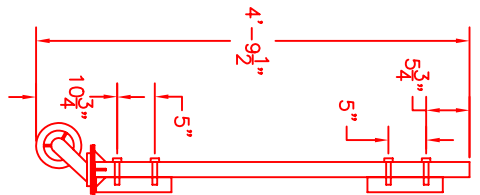
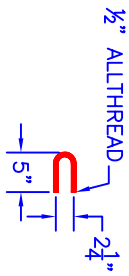
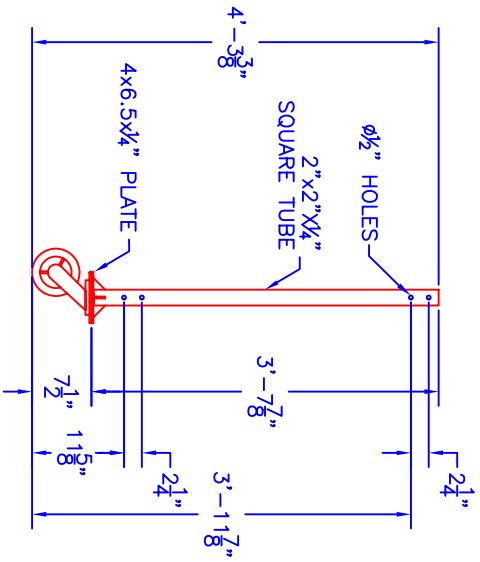
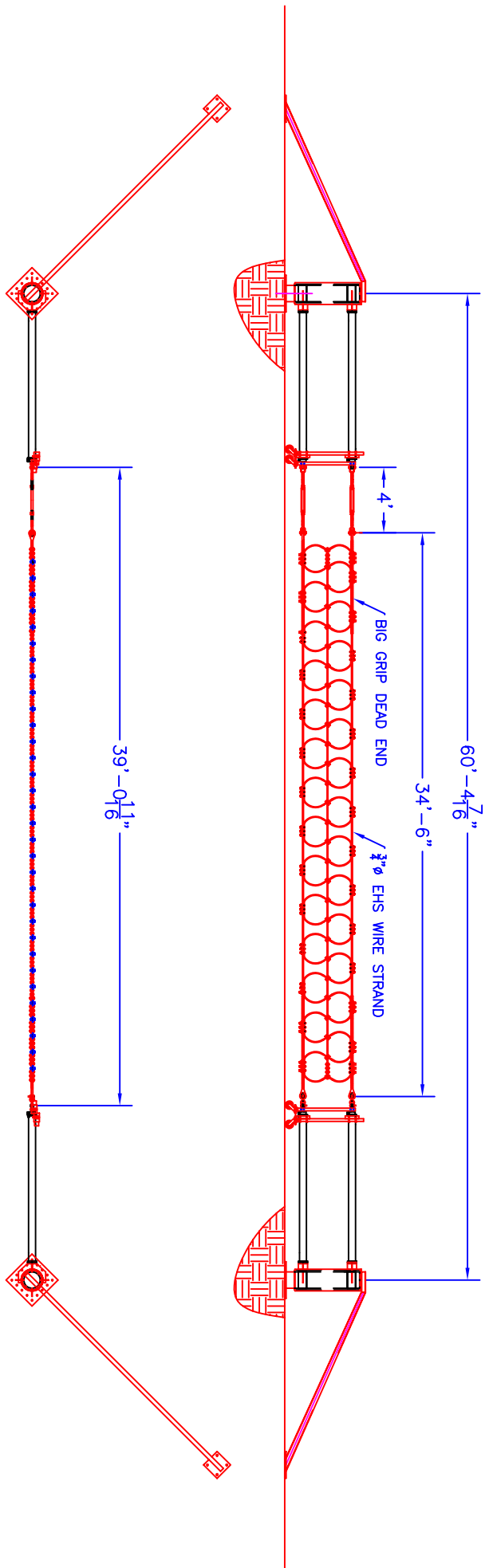
Based on staff review and recommendations, I concur that the GRAB, as tested, meets the evaluation criteria for a TL-2 traffic gate and may be used on the NHS when its use is acceptable to the contracting authorities. This acceptance pertains to the tested installation (which was fixed) and assumes that the retractable unit will have comparable anchorage strength and performance characteristics. To verify this assumption, I will need to see final drawings for the retractable design when they are available. My acceptance is based only on satisfactory crash performance and is not intended to address the electrical or mechanical functioning of the GRAB. The final design should also be appropriately delineated, as discussed between you and Mr. Powers in a recent telephone conversation. Since the GRAB is a proprietary product, the provisions of Title 23 Code of Federal Regulations, Section 635.411 are applicable. A copy of this regulation is enclosed (Enclosure 4) for your reference.

Sincerely yours,

(original signed by Frederick G. Wright)

**Frederick G. Wright, Jr.
Program Manager, Safety**

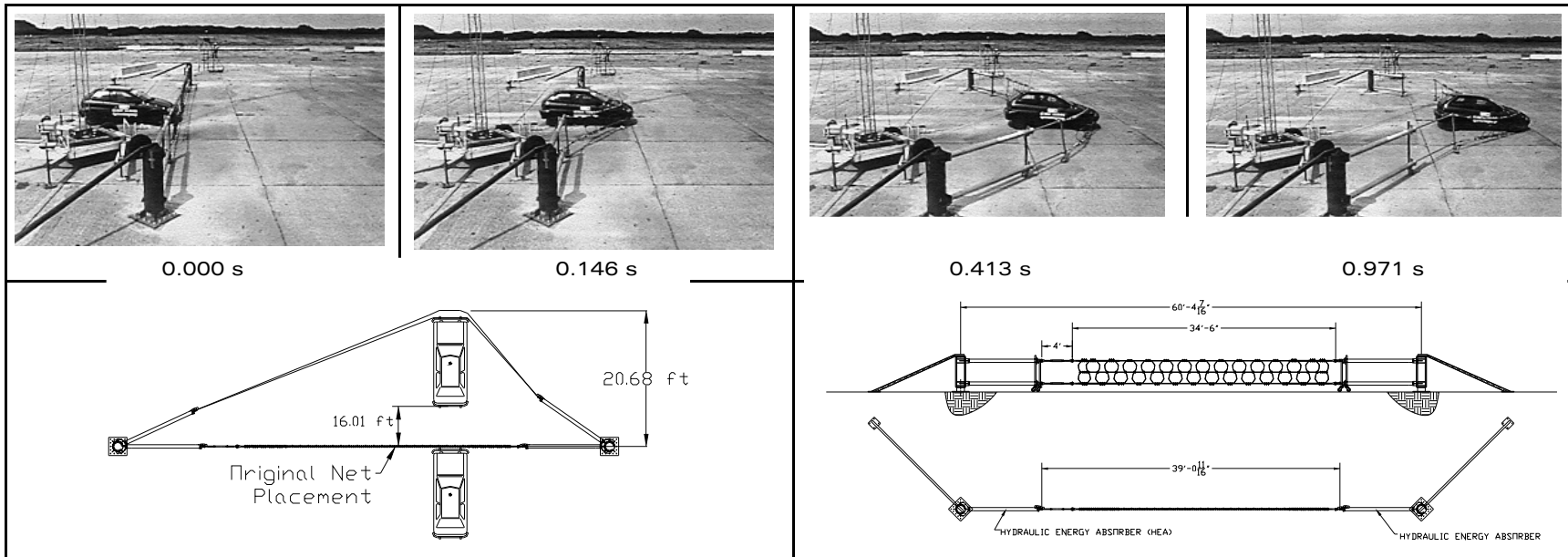
4 Enclosures



The Texas A&M University System				
Revisions		TEXAS TRANSPORTATION INSTITUTE		
No.	Date	By	Project No.	Date
1.			400001	3/01
2.				
3.				
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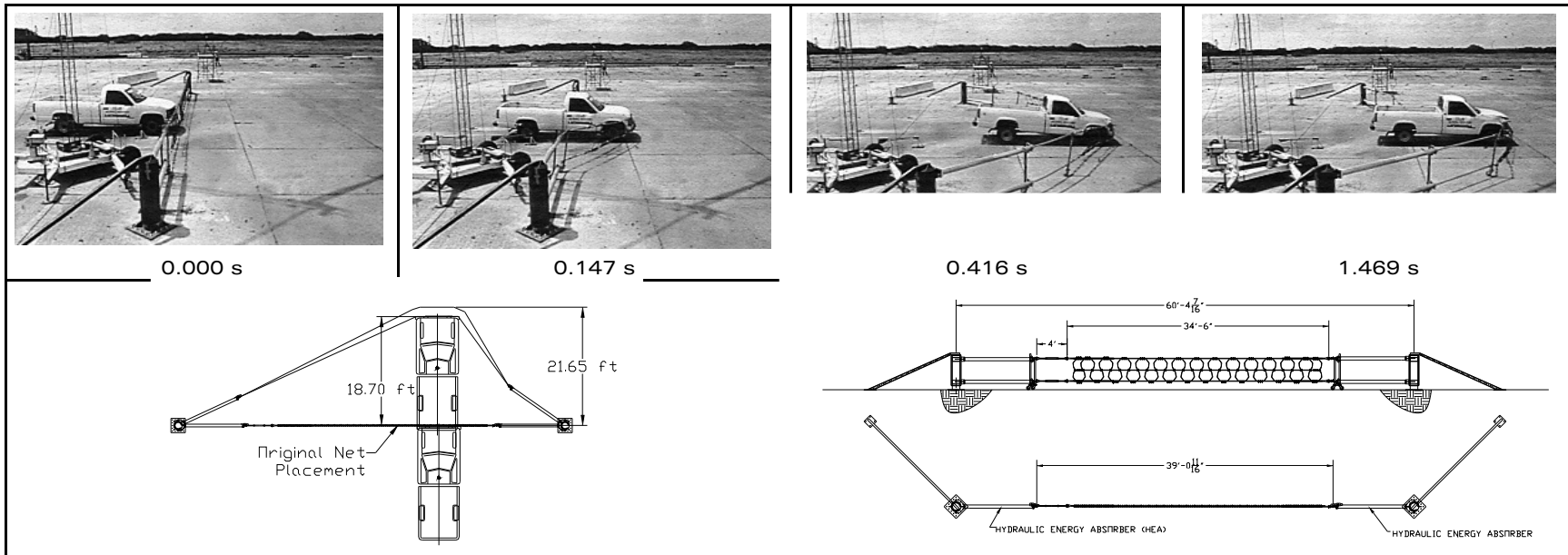
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TENSION SHOCK NET		BAS
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1	<p>General Information</p> <p>Test Agency Texas Transportation Institute</p> <p>Test No. 400001-USR3</p> <p>Date 04/09/01</p> <p>Test Article</p> <p>Type Crash Cushion</p> <p>Name Ground Retractable Automobile Barrier (GRAB)</p> <p>Installation Length (m) Net width: 10.5 m</p> <p>Material or Key Proprietary Hydraulic Cylinders</p> <p>Elements Concrete pavement, Dry</p> <p>Soil Type and Condition</p> <p>Test Vehicle</p> <p>Type Production</p> <p>Designation 820C</p> <p>Model 1996 Geo Metro</p> <p>Mass (kg)</p> <p> Curb 830</p> <p> Test Inertial 820</p> <p> Dummy 76</p> <p> Gross Static 896</p>	<p>Impact Conditions</p> <p>Speed (km/h) 69.5</p> <p>Angle (deg) 0</p> <p>Exit Conditions</p> <p>Speed (km/h) 0</p> <p>Angle (deg) 9.6</p> <p>Occupant Risk Values</p> <p>Impact Velocity (m/s)</p> <p> x-direction 6.1</p> <p> y-direction 0.0</p> <p>THIV (km/h) 22.0</p> <p>Ridedown Accelerations (g's)</p> <p> x-direction -5.4</p> <p> y-direction 2.6</p> <p> z-direction 5.4</p> <p>PHD (g s) 0.42</p> <p>ASI</p> <p>Max. 0.050-s Average (g's)</p> <p> x-direction -4.9</p> <p> y-direction 1.9</p> <p> z-direction -1.1</p>	<p>Test Article Deflections (m)</p> <p>Dynamic 6.3</p> <p>Permanent 5.9</p> <p>Working Width N/A</p> <p>Vehicle Damage</p> <p>Exterior</p> <p> VDS 12FD1</p> <p> CDC 12FDEW1</p> <p>Maximum Exterior</p> <p> Vehicle Crush (mm) nil</p> <p>Interior</p> <p> OCDI FS0000000</p> <p>Max. Occ. Compart. Deformation (mm) nil</p> <p>Post-Impact Behavior (during 1.0 s after impact)</p> <p>Max. Yaw Angle (deg) 5</p> <p>Max. Pitch Angle (deg) 1</p> <p>Max. Roll Angle (deg) -2</p>
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Figure 12. Summary of results for test 400001-USR3, *NCHRP Report 350* test 2-30.



<p>1</p> <p>General Information</p> <p>Test Agency Texas Transportation Institute</p> <p>Test No. 400001-USR4</p> <p>Date 04/10/01</p> <p>Test Article</p> <p>Type Crash Cushion</p> <p>Name Ground Retractable Automobile Barrier (GRAB)</p> <p>Installation Length (m) Net width: 10.5 m</p> <p>Material or Key Proprietary Hydraulic Cylinders</p> <p>Elements Concrete pavement, Dry</p> <p>Soil Type and Condition</p> <p>Test Vehicle</p> <p>Type Production</p> <p>Designation 2000P</p> <p>Model 1996 Chevrolet 2500 pickup truck</p> <p>Mass (kg)</p> <p>Curb 2155</p> <p>Test Inertial 2000</p> <p>Dummy No Dummy</p> <p>Gross Static 20000</p>	<p>Impact Conditions</p> <p>Speed (km/h) 73.1</p> <p>Angle (deg) 0</p> <p>Exit Conditions</p> <p>Speed (km/h) 0</p> <p>Angle (deg) 0.9</p> <p>Occupant Risk Values</p> <p>Impact Velocity (m/s)</p> <p>x-direction 5.1</p> <p>y-direction 0.2</p> <p>THIV (km/h) 18.4</p> <p>Ridedown Accelerations (g's)</p> <p>x-direction -7.2</p> <p>y-direction 2.6</p> <p>PHD (g s) 7.4</p> <p>ASI 0.49</p> <p>Max. 0.050-s Average (g's)</p> <p>x-direction -5.8</p> <p>y-direction 1.6</p> <p>z-direction 1.1</p>	<p>Test Article Deflections (m)</p> <p>Dynamic 6.6</p> <p>Permanent 5.7</p> <p>Working Width N/A</p> <p>Vehicle Damage</p> <p>Exterior</p> <p>VDS 12FD1</p> <p>CDC 12FDEW1</p> <p>Maximum Exterior</p> <p>Vehicle Crush (mm) 80</p> <p>Interior</p> <p>OCDI FS0000000</p> <p>Max. Occ. Compart. Deformation (mm) nil</p> <p>Post-Impact Behavior (during 1.0 s after impact)</p> <p>Max. Yaw Angle (deg) 3</p> <p>Max. Pitch Angle (deg) -2</p> <p>Max. Roll Angle (deg) 2</p>
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Figure 19. Summary of results for test 400001-USR4, NCHRP Report 350 test 2-31.

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.