



U.S. Department  
of Transportation

**Federal Highway  
Administration**

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

Refer to: HSA-CC66A

MAY 27 2000

Mr. Edwin M. Wood  
Vice President  
Barrier Systems, Inc.  
1100 E. William Street, Suite 206  
Carson City, NV 89701

Dear Mr. Wood:

My May 11 letter to you accepted the eight- and nine-element ABSORB 350 crash cushion as a National Cooperative Highway Research Program (NCHRP) Report 350 Test Level 3 (TL-3) attenuator for use with your Quickchange Median Barrier (QMB) and with permanent and temporary concrete barrier, respectively. Use with temporary barrier was limited to individual barrier segments of 6.1 m or longer. I also indicated that additional tests would be needed before the FHWA could consider a reduced-length array to be an acceptable TL-2 design.

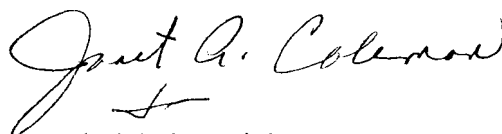
Your June 1 letter referenced the May 31 meeting during which Mr. Owen Denman provided members of my staff with a report on the additional tests that you conducted. In that letter, you requested acceptance of a modified TL-2 ABSORB 350 design for use on the National Highway System (NHS) as well as the acceptance of a modified TL-3 design for use with permanent concrete barrier and temporary concrete barrier with segments as short as 3 m.

The modified TL-2 design consists of the nosepiece assembly, five ABSORB 350 elements, and a special Attachment/Transition Assembly (for attachment to standard concrete barrier). Enclosure 1 shows this assembly. When attached to QMB barrier, the first QMB unit must be modified as noted in the May 11 acceptance letter. Summary sheets of the two tests that were run on the final TL-2 design are shown in Enclosure 2.

Based on staff review of the test results, as reported in Safe Technologies, Inc., May 2000 report entitled "NCHRP Report 350 Crash Test Results, ABSORB 350 Non-Redirective Crash Cushion, ADDENDUM II, Test Level - 2", the ABSORB 350 TL-2 design, as described above, is acceptable for use on the NHS when such use is requested by a transportation agency. Additionally, the nine-element TL-3 design may be used with temporary concrete barrier segments as short as 3 meters when the attachment/transition assembly shown in Enclosure 1 is used between the crash cushion and the concrete barrier. Based on discussions between my

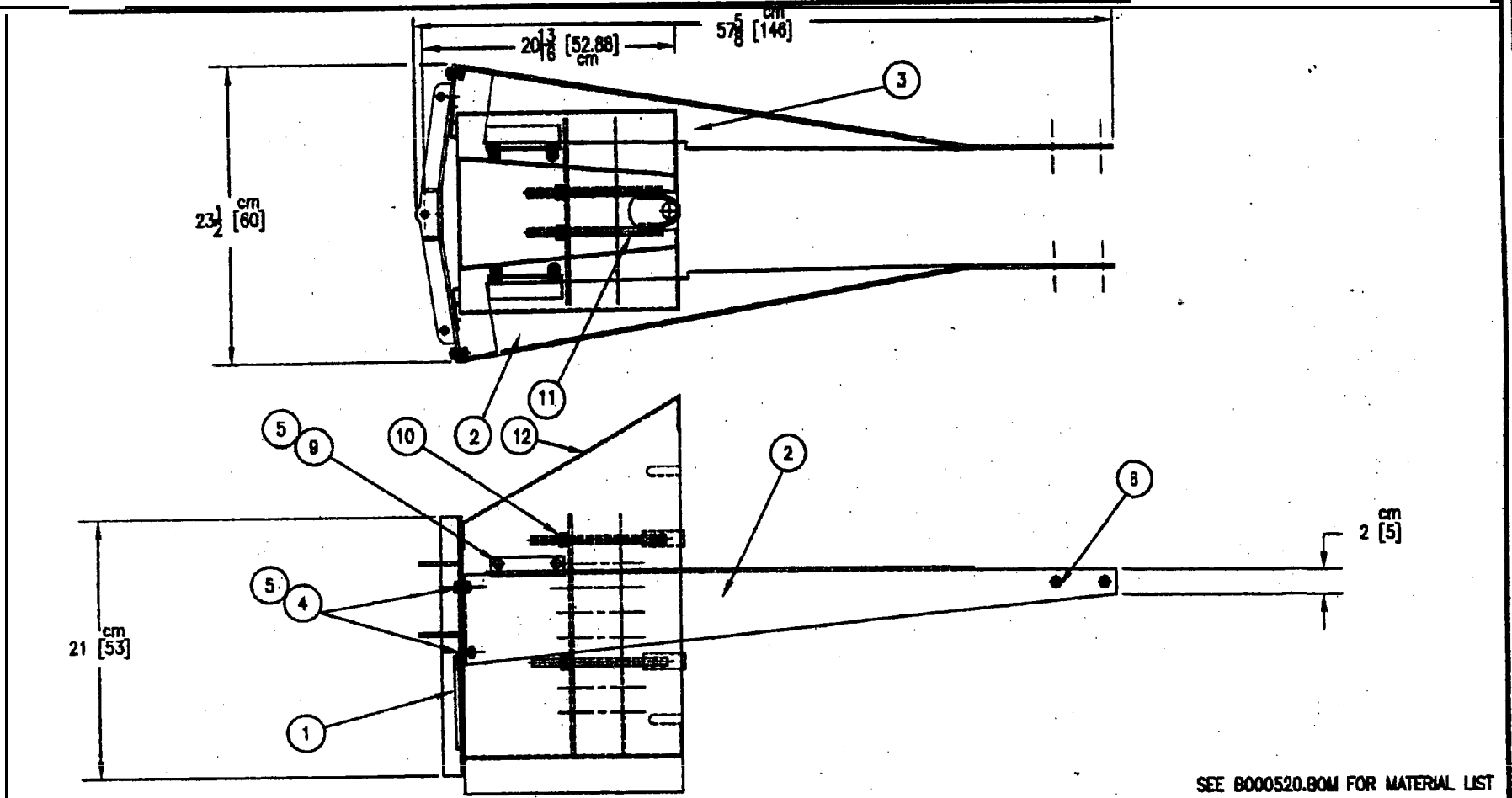
staff and Mr. Denman, you will also require the use of this assembly when connecting the ABSORB 350 to longer concrete segments and to permanent concrete barrier, As noted in both the test report and your letter, the ABSORB 350 performs well for a non-redirecting attenuator, but by design, it does not redirect vehicles striking the side of the unit. Under some impact conditions, vehicles can penetrate or vault the ABSORB 350 and intrude into the “shielded” area. It is of utmost importance that this device be used primarily in locations where such hits are expected to be rare and unlikely to compromise motorist or worker safety if they do occur. I assume that you will provide potential users with sufficient information on design and layout requirements to minimize the risks involved when this non-redirective attenuator is selected to shield the end of concrete barrier.

Sincerely yours,

A handwritten signature in black ink, appearing to read "Frederick G. Wright, Jr.", with a stylized flourish at the end.

Frederick G. Wright, Jr.  
Program Manager, Safety

2 Enclosures



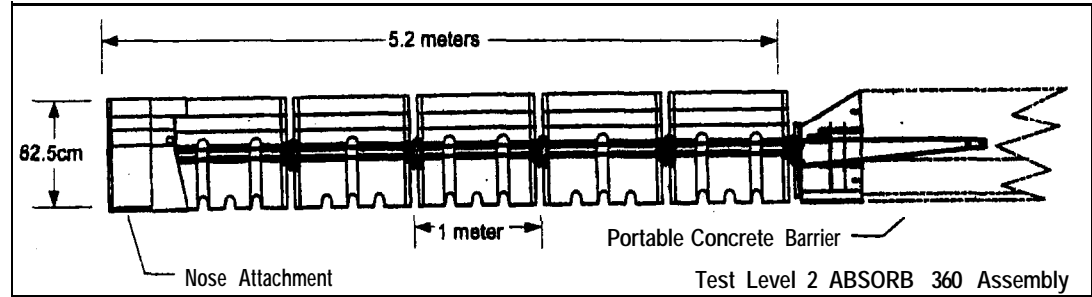
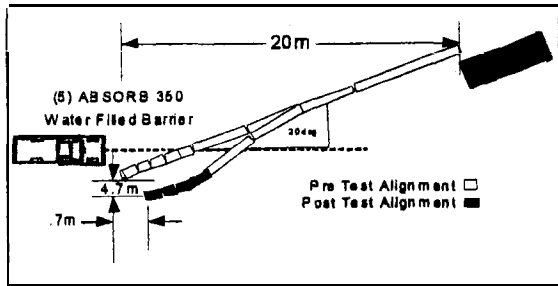
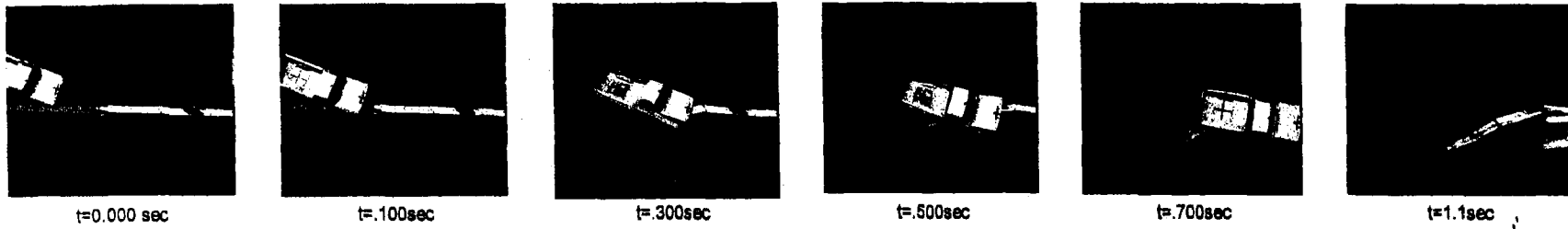
**NOTE:**  
 THICKNESS OF WELD TO BE EQUAL  
 TO THE THINNER OF 2 PIECES  
 BEING JOINED. WELD TO BE ALL  
 AROUND UNLESS OTHERWISE NOTED.

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REV.	CHANGES	DATE	BY	REVD	NEXT ASSY.	MEM
1				8000021	3	

SCALE: EIGHTH  
 TITL: ADAPTER,  
 ABSORB 350  
 P.C.B.

MODEL	DRAWING NUMBER	REV.
	B000520	



**General Information**

Test Agency... **SAFE TECHNOLOGIES, INC.**  
 Test Designation... **NCHRP 350 2-44 (modified)**  
 Test No... **ABSORB 350 / Test #AET15**  
 Date... **5/18/00**

Test Article  
 Type... **Barrier Systems, Inc.**  
**ABSORB 350 Non-Redirective Crash Cushion**

Installation Length... **5.2 m overall (5 ABSORB sections w / nose)**  
 Size and/or dimension and material  
 of key elements... **Section length 1000mm, height 813mm, width 610mm, mass 48kg empty/ 315kg Full**

Test Vehicle  
 Type... **Production Model**  
 Designation... **2000P**  
 Model... **1975, Chevrolet 34 TM Pickup**

**Mass (kg)**

Curb... **2099**  
 Test Inertial... **1976**  
 Dummy(s)... **n/a**  
 Gross Static... **1976**

**Impact Conditions**

Speed (km/h)... **71.2**  
 Angle (deg)... **20**  
 Impact Severity (kJ) ... **386**

**Exit Conditions**

Speed (km/h) ..... **73/4/6**  
 Angle (deg) ..... **Behind Article**

**Occupant risk Values**

**Impact Velocity (m/s)**  
 x-direction ..... **5.6**  
 y-direction ..... **-0.1**

**Roll-over Acceleration (g's)**  
 x-direction ..... **7.5**  
 y-direction... ..... **8.4**

**THIV (m/s) ..... 5.6**  
**PHD (g's) ..... 17.9**  
**ASI ..... 0.52**

**Vehicle Damage**

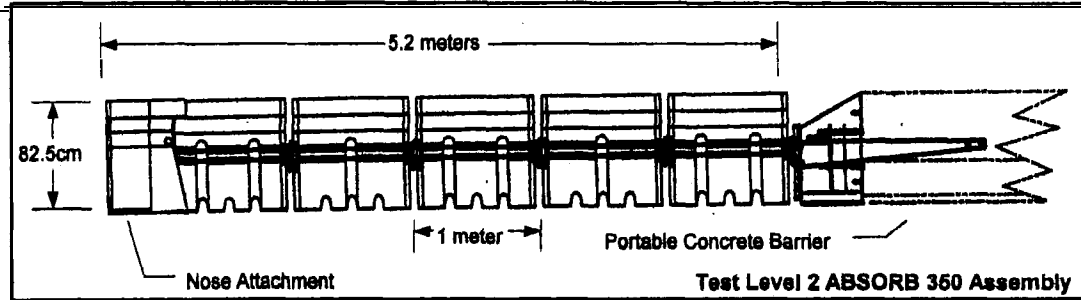
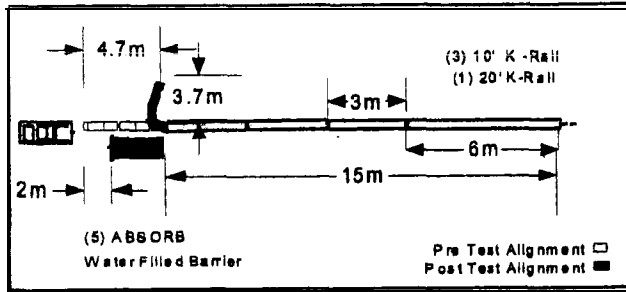
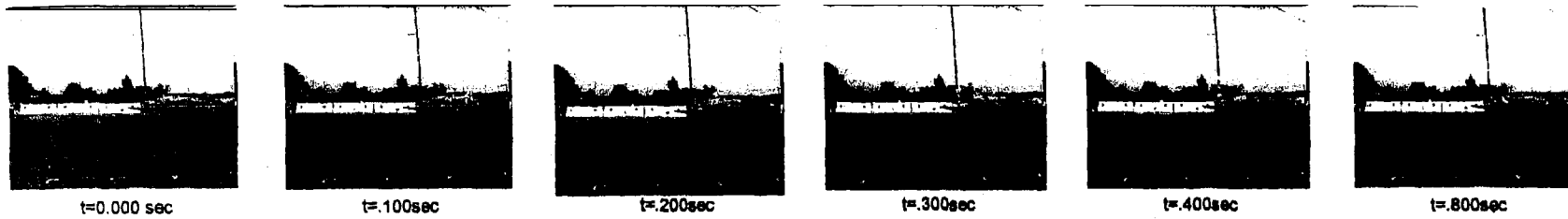
Exterior  
 VDS... **FR-2**  
 CDC... **12FREE2**

Interior  
 ODCI ..... **AS0000000**

**Post-Impact Vehicular behavior (deg + gyro @ c.g.)**

Maximum Roll Angle... **56.3**  
 Maximum Pitch Angle... **10.1**  
 Maximum Yaw Angle... **-40**

**Figure 1. Summary of Results Test #AET15**



**General Information**

Test Agency..... **SAFE TECHNOLOGIES, INC.**  
 Test Designation..... **NCHRP 350 2-40**  
 Test No..... **ABSORB 350 / Test #AET16**  
 Date..... **5/23/00**

**Test Article**

Type..... **Barrier Systems, Inc.**  
**ABSORB 350 Non-Redirective Crash Cushion**  
 Installation Length..... **5.2 m overall (5 ABSORB sections w / nose)**  
 Size and/or dimension and material  
 of key elements..... **Section length 1000mm, height 813mm,  
 width 810mm, mass 48kg empty / 315kg Full**

**Test Vehicle**

Type..... **Production Model**  
 Designation..... **820C**  
 Model..... **1988, Ford Festiva**

**Mass (kg)**

Curb..... **729**  
 Test Inertial..... **780**  
 Dummy(s)..... **75**  
 Gross Static..... **855**

**Impact Conditions**

Speed (km/h)..... **68.6**  
 Angle (deg)..... **0**  
 Impact Severity (kJ)..... **142**

**Exit Conditions**

Speed (km/h)..... **N/A**  
 Angle (deg)..... **N/A**

**Occupant risk Values**

Impact Velocity (m/s)  
 x-direction..... **8.6**  
 y-direction..... **0.1**  
 Ridedown Acceleration (g's)  
 x-direction..... **-4.8**  
 y-direction..... **-2.4**  
 THIV (m/s)..... **9.0**  
 PHD (g's)..... **5.1**  
 ASI..... **0.7**

**Vehicle Damage**

Exterior  
 VDS..... **FC-4**  
 CDC..... **12FZEWS**  
 Interior  
 OCDI..... **AS0000000**

**Post-Impact Vehicular behavior (deg - gyro @ c.g.)**

Maximum Roll Angle..... **7.0**  
 Maximum Pitch Angle..... **2.1**  
 Maximum Yaw Angle..... **-189**

**Figure 6. Summary of Results Test #AET16**