



U.S. Department
of Transportation
**Federal Highway
Administration**

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

May 26, 2005

In Reply Refer To: HSA-10/CC-73B

Mr. Barry D. Stephens, P.E.
Sr. Vice President Engineering
Energy Absorption Systems, Inc.
3617 Cincinnati Avenue
Rocklin, California 95678

Dear Mr. Stephens:

Mr. Douglas Bernard recently delivered your May 6 letter to Mr. Richard Powers of my staff. In this letter you requested the Federal Highway Administration (FHWA) acceptance of two new versions of a low speed test level 2 (TL-2) Wide REACT. These units are patterned after the TL-3 Wide REACTs previously accepted by our office (reference acceptance letters HSA-10/CC-73 and CC-73A). To support your request, you included a report ("NCHRP Report 350 Crash Test Results for the TL-2 Wide REACT 350 System – Revision A," dated May 2005) and videotapes prepared by E-Tech Testing Services that describes the TL-2 crash tests conducted into a 2440-mm wide TL-2 REACT. As a reference, you also included copies of reports for the previously accepted TL-3 Wide REACTs.

The TL-2 Wide REACTs are intended to be redirective, non-gating crash cushions having an effective length of 5.34 m and are designed to shield wide hazards. They can be configured with backup widths of 1524 mm (60") or 2440 mm (96"). These two designs are shown in Enclosure 1. Because these TL-2 REACTs have essentially the same framework and components as the previously accepted TL-3 Wide REACTs, we agree that the redirect capacity of the new TL-2 tests is validated by the successful results from your previous TL-3 tests. We also agree that the two tests you conducted into the new TL-2 unit, tests 2-31 and 2-32(modified), are the most critical to validate the frontal capacity of the TL-2 unit for light and heavy vehicles. Summary sheets for each of these tests are shown in Enclosure 2. Our review of the submitted test report confirms that the tested TL-2 REACT, with a width of 2440 mm (96"), met all the appropriate NCHRP 350 evaluation criteria for redirective, non-gating crash cushions. You state the 1534 mm (60") wide unit is essentially the same as the tested 2440 mm version and has the same energy dissipating elements. The primary difference is the width of the unit. As a consequence, we agree that the 1534 mm wide version will perform essentially the same as the 2440 mm wide version.



Based on our review, we agree that the tested 2440 mm wide REACT system meets the evaluation criteria for an NCHRP Report 350 redirective, non-gating crash cushion at TL-2 impact conditions and may be used on the National Highway System (NHS) when such use is acceptable to the contracting authority. We also agree that the similar 1534 mm wide REACT, made from essentially the same components, and any intermediate width design may also be considered a TL-2 crash cushion without need for additional testing.

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

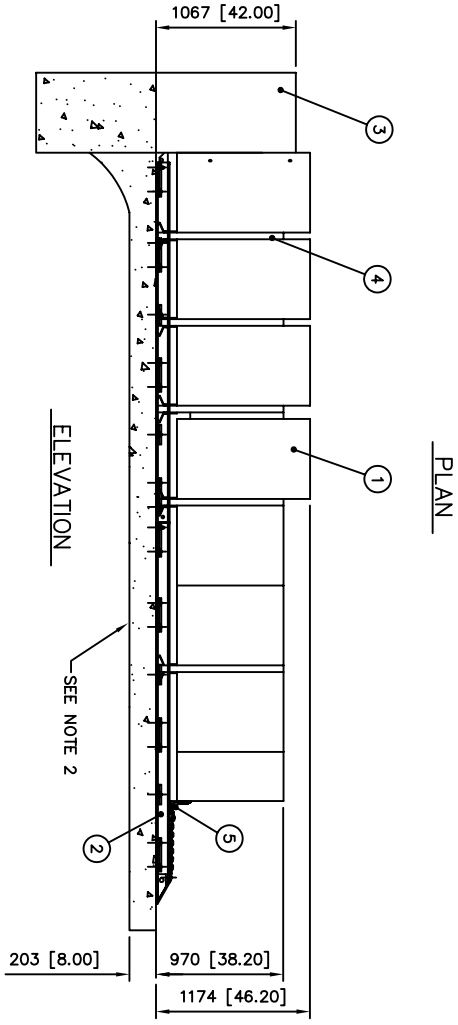
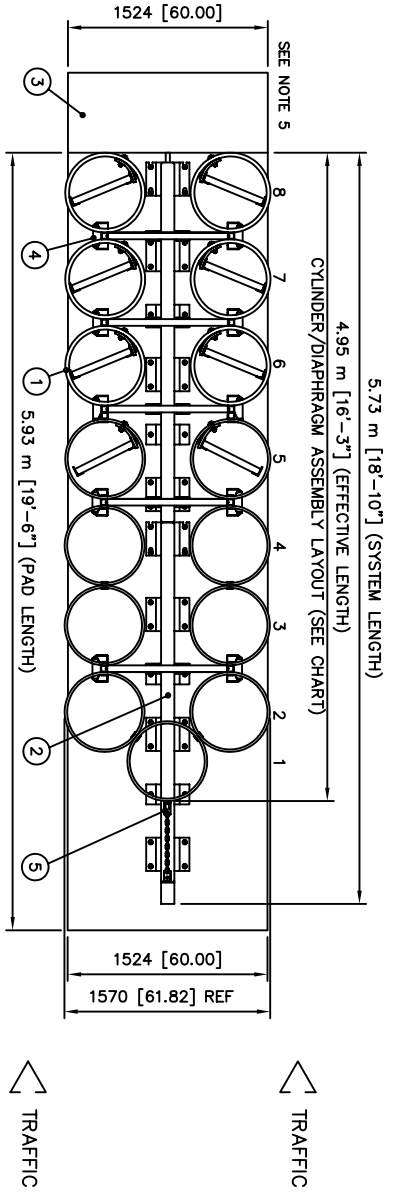
- This acceptance is limited to the crashworthiness characteristics of the device and does not cover its structural features.
- Any design changes that may adversely influence the crashworthiness of the device will require a new acceptance letter.
- Should the FHWA discover that the qualification testing was flawed, that any in-service performance evaluations reveal 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 submitted for acceptance, and that it will meet the crashworthiness requirements of the NCHRP Report 350.
- To prevent misunderstanding by others, this letter of acceptance, designated as number CC-73B, shall not be reproduced except in full. This letter, and test documentation upon which this letter is based, is public information. All such letters and documentation may be reviewed at our office upon request.
- The Wide REACT is a patented product and is considered proprietary. If proprietary devices are specified by a highway agency for use on a Federal-aid project, except exempt, non-NHS projects, they; (a) must be supplied through competitive bidding with equally suitable unpatented items; (b) the highway agency must certify that they are essential for synchronization with the existing highway facilities or that no equally suitable alternative exists or; (c) they must be used for research or for a distinctive type of construction on relatively short sections of road for experimental purposes. Our regulations concerning proprietary products are contained in Title 23, Code of Federal Regulations, Section 635.411.

Sincerely yours,

/original signed by/

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

CYLINDER/DIAPHRAGM CONFIGURATION		
ROW	TOTAL THICKNESS	CYLINDERS HEIGHT
1	28 MM	813 MM
2	28 MM	813 MM
3	28 MM	813 MM
4	28 MM	813 MM
5	28 MM	1016 MM
6	44 MM	1016 MM
7	44 MM	1016 MM
8	44 MM	1016 MM



- NOTES:
1. IN COMPLIANCE WITH THE AASHTO 1996 ROADSIDE DESIGN GUIDE, MANUFACTURER RECOMMENDS REMOVAL OF ALL CURBS AND ISLANDS TO ENSURE PROPER IMPACT PERFORMANCE.
 2. 203 [8.00] MIN. REINFORCED 28 MPa [4000 PSI] P.C. CONCRETE PAD OR 203 [8.00] MIN. NON-REINFORCED 28 MPa [4000 PSI] P.C. CONCRETE ROADWAY, MEASURING AT LEAST 3.6 m [12'-0"] WIDE BY 15.24 m [50'-0"] LONG.
 3. SEE THE "REACT 350 (60") PRODUCT MANUAL" FOR A DESCRIPTION OF ITS IMPACT PERFORMANCE CHARACTERISTICS AND DESIGN LIMITATIONS. BEFORE PLACING A SYSTEM AT A GIVEN SITE, INFORMATION AND COPIES OF ABOVE MANUAL ARE AVAILABLE BY CALLING CUSTOMER SERVICE DEPARTMENT AT (888) 323-6374.

4. UNITS OF MEASUREMENT ARE MILLIMETERS [INCHES] UNLESS OTHERWISE NOTED.
5. WHERE NECESSARY, THE CUSTOMER SHALL SUPPLY A TRANSITION FROM THE REACT SYSTEM TO THE OBJECT BEING SHIELDED.
6. NOSE COVER AND REFLECTORS SHALL BE ADDED PER MUTCD REQUIREMENTS. NOSE COVER TO BE ORDERED SEPARATELY.

Revisions	Date	Rev. By	Chkd App.
① CYLINDER ASSEMBLY (TRP.)			
② MONORAIL			
③ CONCRETE BACKUP			
④ DIAPHRAGM ASSEMBLY			
⑤ TRIGGER ASSEMBLY			

REFERENCES	
SERIAL#	BACKUP ASSEMBLY 3535064-0000
SALES ORDER#	CONCRETE PAD/BACKUP 3535069-0000
EH PROJECT#	REFLECTIVE NOSE ASSEMBLY 3535071-0000
DESIGN SPEED	DIAPHRAGM ASSEMBLY 3535058-0000
NOSE COLOR	MONORAIL ASSEMBLY 3535111-0000
NUMBER OF UNITS	MONORAIL HAVING ASSEMBLY 3535067-0000
REFLECTOR ASSEMBLY	SEE CHART
	REFLECTOR ASSEMBLY 3535055-0000

DESIGNED BY	DATE	CHECKED BY	DATE
D. Hoyes Jr.	3/7/05	K. Looney	3/4/05
K. Looney	3/10/05	K. Looney	3/10/05
F.J. Powell	3/10/05		

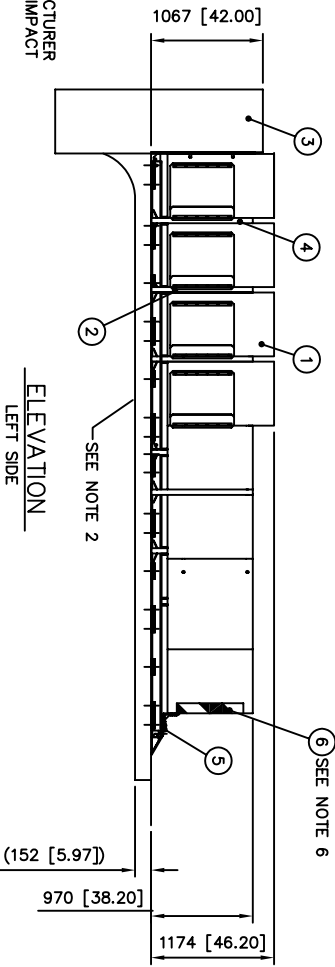
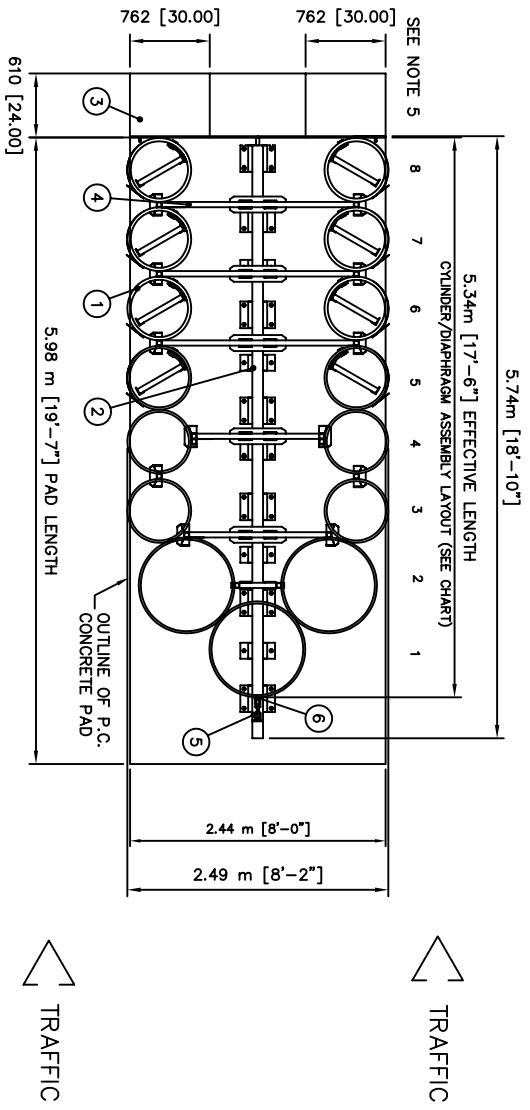
UNIDIRECTIONAL
MODEL NO. 43C060

ENERGY ABSORPTION SYSTEMS, INC.
ENGINEERING AND RESEARCH DEPARTMENT

REACT 350® (60") SYSTEM
60" SYSTEM W/CONCRETE BACKUP

SCALE: 1:40
PART: R43C060U
SHEET: 1 of 1

CYLINDER/DIAPHRAGM CONFIGURATION	
ROW	MIN. THICKNESS
1	28 mm 813 mm
2	28 mm 813 mm
3	28 mm 813 mm
4	28 mm 813 mm
5	28 mm 1016 mm
6	44 mm 1016 mm
7	44 mm 1016 mm
8	44 mm 1016 mm



- NOTES:
- IN COMPLIANCE WITH THE AASHTO 2002 ROADSIDE DESIGN GUIDE, MANUFACTURER RECOMMENDS REMOVAL OF ALL CURBS AND ISLANDS TO ENSURE PROPER IMPACT PERFORMANCE.
 - 152 [6.00] MIN. REINFORCED 28 MPa [4000 PSI] P.C. CONCRETE PAD OR 203 [8.00] MIN. NON-REINFORCED 28 MPa [4000 PSI] P.C. CONCRETE ROADWAY MEASURING AT LEAST 3.66 m [12'-0"] WIDE BY 15.24 m [50'-0"] LONG.
 - SEE THE "REACT 350 (96)" PRODUCT MANUAL FOR A DESCRIPTION OF ITS IMPACT PERFORMANCE CHARACTERISTICS AND DESIGN LIMITATIONS BEFORE PLACING A SYSTEM AT A GIVEN SITE. INFORMATION AND COPIES OF ABOVE MANUAL ARE AVAILABLE BY CALLING CUSTOMER SERVICE DEPARTMENT AT (888) 323-6374.
 - UNITS OF MEASUREMENT ARE MILLIMETERS [INCHES] UNLESS OTHERWISE NOTED.

- WHERE NECESSARY, THE CUSTOMER SHALL SUPPLY A TRANSITION FROM THE REACT SYSTEM TO THE OBJECT BEING SHIELDED.
- NOSE COVER & REFLECTORS SHALL BE ADDED PER MUTCD REQUIREMENTS. NOSE COVER & DEBRIS COVER TO BE ORDERED SEPARATELY.

<p>① CYLINDER ASSEMBLY (TRP)</p> <p>② MONORAIL</p> <p>③ CONCRETE BACKUP</p>	<p>④ DIAPHRAGM ASSEMBLY</p> <p>⑤ TRIGGER ASSEMBLY</p> <p>⑥ REFLECTIVE NOSE COVER</p>	<p>SERIAL #</p> <p>SALES ORDER #</p> <p>EH PROJECT #</p> <p>DESIGN SPEED</p> <p>NOSE COLOR</p> <p>NUMBER OF UNITS</p> <p>REFLECTOR ASSEMBLY</p>	<p>BACKUP ASSEMBLY</p> <p>CONCRETE PAD/BACKUP</p> <p>REFLECTIVE NOSE ASSEMBLY</p> <p>DIAPHRAGM ASSEMBLY</p> <p>MONORAIL ASSEMBLY</p> <p>MISC HARDWARE ASSEMBLY</p> <p>CYL/DIA ASSEMBLIES</p>	<p>DATE</p> <p>DATE</p> <p>DATE</p> <p>DATE</p> <p>DATE</p> <p>DATE</p> <p>DATE</p>	<p>DATE</p> <p>DATE</p> <p>DATE</p> <p>DATE</p> <p>DATE</p> <p>DATE</p>	<p>UNIDIRECTIONAL</p> <p>MODEL No. 43C096</p>
<p>REVISIONS</p> <p>Date</p> <p>Rev. By</p> <p>Cxld Appr.</p>	<p>DESIGN SPEED</p> <p>70 km/h [43 MPH]</p>	<p>REFERENCES</p> <p>3535097-0000</p> <p>3535106-0000</p> <p>3535071-0000</p> <p>3535095-0000</p> <p>3535111-0000</p> <p>3535067-0000</p> <p>SEE CHART</p>	<p>DATE</p> <p>01/25/05</p> <p>01/17/05</p> <p>3/9/05</p> <p>3/10/05</p>	<p>DATE</p> <p>01/17/05</p> <p>3/9/05</p> <p>3/10/05</p>	<p>DATE</p> <p>01/17/05</p> <p>3/9/05</p> <p>3/10/05</p>	<p>UNIDIRECTIONAL</p> <p>MODEL No. 43C096</p>
<p>ENERGY ABSORPTION SYSTEMS, INC.</p> <p>ENGINEERING AND RESEARCH DEPARTMENT</p> <p>REACT 350(96) SYSTEM</p> <p>W/ CONCRETE BACKUP</p>	<p>SCALE</p> <p>1 = 50</p>	<p>PROJECT</p> <p>R43C096U</p>	<p>SHEET</p> <p>1 of 1</p>	<p>REV</p> <p>-</p>		



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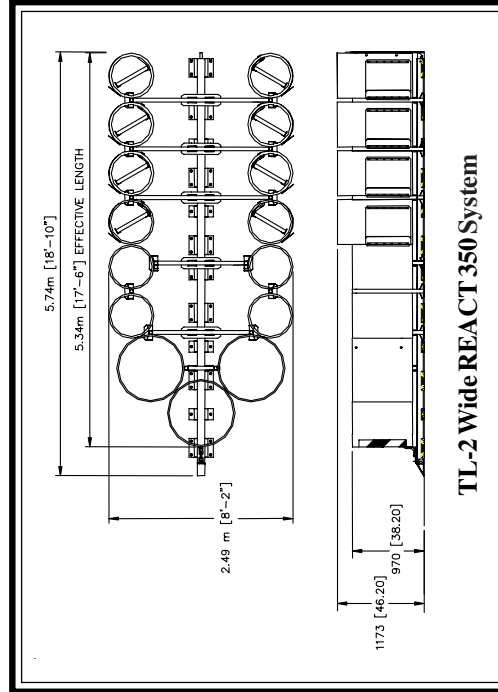
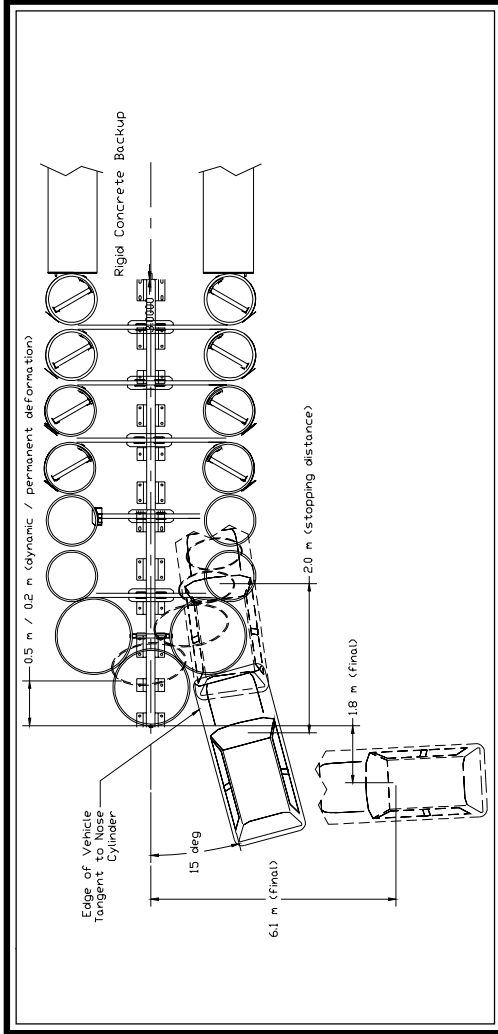
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General Information

Test Agency	E-TECH Testing Services, Inc.	Exit conditions	Speed (km/h)	N/A
Test Designation	NCHRP 350 Test 2-32 (Modified)	Angle (deg)	Angle (deg)	N/A
Test No.	01-4314-006	Occupant Risk Values	Impact Velocity (m/s)	
Date	4/7/05	x-direction	x-direction	11.5
Test Article		y-direction	y-direction	4.5
Type	Energy Absorption Systems, Inc.	Ridedown Acceleration (g's)	x-direction	-11.9
Installation Length, (mm)	2.49 m Wide TL-2 REACT 350	y-direction	y-direction	-5.5
Material and key elements	5.34 m (effective length)	European Committee for Normalization (CEN) Values	THIV (km/h)	44.8
.....	2 column, 8 row (15 tot.)	PHD (g/s)	PHD (g/s)	12.1
.....	610 mm OD HDPE energy	ASI	ASI	1.2
.....	absorbing cylinders	Test Article Deflections (m)	Dynamic	0.5
.....	Portland Cement Concrete,	Permanent	Permanent	0.2
.....	MP-3 Anchoring System	Vehicle Damage	Exterior	
Foundation Type and Anchoring		VDS	VDS	FD-2
Test Vehicle		CDC	CDC	12FDEW2
Type	Production Model	Interior	Interior	
Designation	820C Small Car	OCDI	OCDI	AS0000000
Model	1988 Ford Festiva	Post-Impact Vehicular Behavior (deg - rate gyro)	Maximum Roll Angle	-13.0
Mass (kg)		Maximum Pitch Angle	Maximum Pitch Angle	-9.5
Curb	760	Maximum Yaw Angle	Maximum Yaw Angle	-93.7
Test inertial	811			
Dummy	75			
Gross Static	886			
Impact Conditions				
Speed (km/h)	71.3			
Angle (deg)	15			
Impact Severity (kJ)	159.2			

Figure 6. Summary of Results - TL-2 Wide REACT 350 System Test 01-4314-006