U.S. Department of Transportation
Federal Highway Administration

1200 New Jersey Ave., S.E.
Washington, DC 20590

February 8, 2008

In Reply Refer To: HSSD/WZ-267

Mr. David Krahulec
Vice President/Chief Operating Officer
Horizon Signal Technologies, Inc.
216 Line Road
Malvern, PA 19355

Dear Mr. Krahulec:

In your January 2, 2008, letter you requested the Federal Highway Administration's (FHWA) acceptance of your company's SQ2 pedestal mount portable traffic signal system as a crashworthy traffic control device for use in work zones on the National Highway System (NHS). Accompanying your letter was a crash test report prepared by Transportation Research Center Inc., videos of the crash test conducted, and a drawing of the SQ2 system. You requested that we find this device acceptable for use on the NHS under the provisions of the National Cooperative Highway Research Program (NCHRP) Report 350 "Recommended Procedures for the Safety Performance Evaluation of Highway Features."

The FHWA guidance on crash testing of work zone traffic control devices is contained in two memoranda. The first, dated July 25, 1997, titled "INFORMATION: Identifying Acceptable Highway Safety Features," established four categories of work zone devices: Category I devices were those lightweight devices which could be self-certified by the vendor, Category II devices were other lightweight devices which needed individual crash testing, Category III devices were barriers and other fixed or massive devices also needing crash testing, and Category IV devices were trailer mounted lighted signs, arrow panels, etc. The second guidance memorandum was issued on August 28, 1998, and is titled "INFORMATION: Crash Tested Work Zone Traffic Control Devices." This later memorandum lists devices that are acceptable under Categories I, II, and III.

The SQ2 pedestal mount portable traffic signal system consists of three signal lights mounted on a retractable, manually operated boom, powered by two 12-volt batteries. The signal heads are cast aluminum and have three 12-inch (30.5 cm) diameter LED signal lamps. The signal heads are equipped with visors that extend a minimum of 10 inches (25.4 cm) beyond the signal head. The total mass of the system is approximately 385.8 pounds (175 kg). The overall extended height of each SQ2 system is 11.33 feet (3.45 m) and its width is 27.5 inches (0.70 m). A detailed drawing of the SQ2 pedestal mount portable traffic signal system is enclosed.

In coordination with the FHWA you conducted a crash test (Test 3-71) to verify the impact performance of your device at an impact speed of 62 mph (99.8 km/h) using a 820C passenger car test vehicle. The crash test set up was such that the test vehicle impacted a pair of the SQ2 signal systems simultaneously. One of the signal systems was oriented with the signal head facing the test vehicle and another signal system was rotated 90 degrees with the signal head facing the first signal system. The FHWA recommended test setup protocol typically requires that the second device be rotated or oriented 90 degrees from the first system and placed 20 feet (6.1 m) downstream from the first device. The test set up protocol concerning downstream placement was outside the recommendations but the FHWA does accept the results of the test as conducted and will not require a retest.

During the test, the vehicle bumper contacted the two signal systems simultaneously. Upon impact, the signal system supports rotated and both signal heads fully impacted the roof. The vehicle remained upright and maximum displacement of the signal systems was 273.3 feet (83.3 m) measured longitudinally from the point of impact. The maximum occupant compartment deformation was 2.67 inches (67 mm) at the passenger side of the roof. The maximum occupant impact velocity was 16.78 mph (7.5 m/s) and the maximum occupant ridedown acceleration was 2.9 g's.

In summary, the SQ2 pedestal mount portable traffic signal system, as described above, meets the appropriate evaluation criteria for NCHRP 350 Test Level 3 work zone traffic control devices and may be used at all appropriate locations on the NHS when selected by the contracting authority. This device is accepted by the FHWA for use under the range of conditions tested and is considered crashworthy when deployed at the fully extended height of 11.33 feet (3.45 m).

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

- This acceptance is limited to the crashworthiness characteristics of the devices and does not cover their structural features, nor conformity with the Manual on Uniform Traffic Control Devices.
- Any 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 in-service performance reveals 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 they will meet the crashworthiness requirements of the FHWA and the NCHRP Report 350.
- To prevent misunderstanding by others, this letter of acceptance, designated as number WZ-267, shall not be reproduced except in full. This letter, and the test documentation upon which this letter is based, is public information. All such letters and documentation may be reviewed at our office upon request.

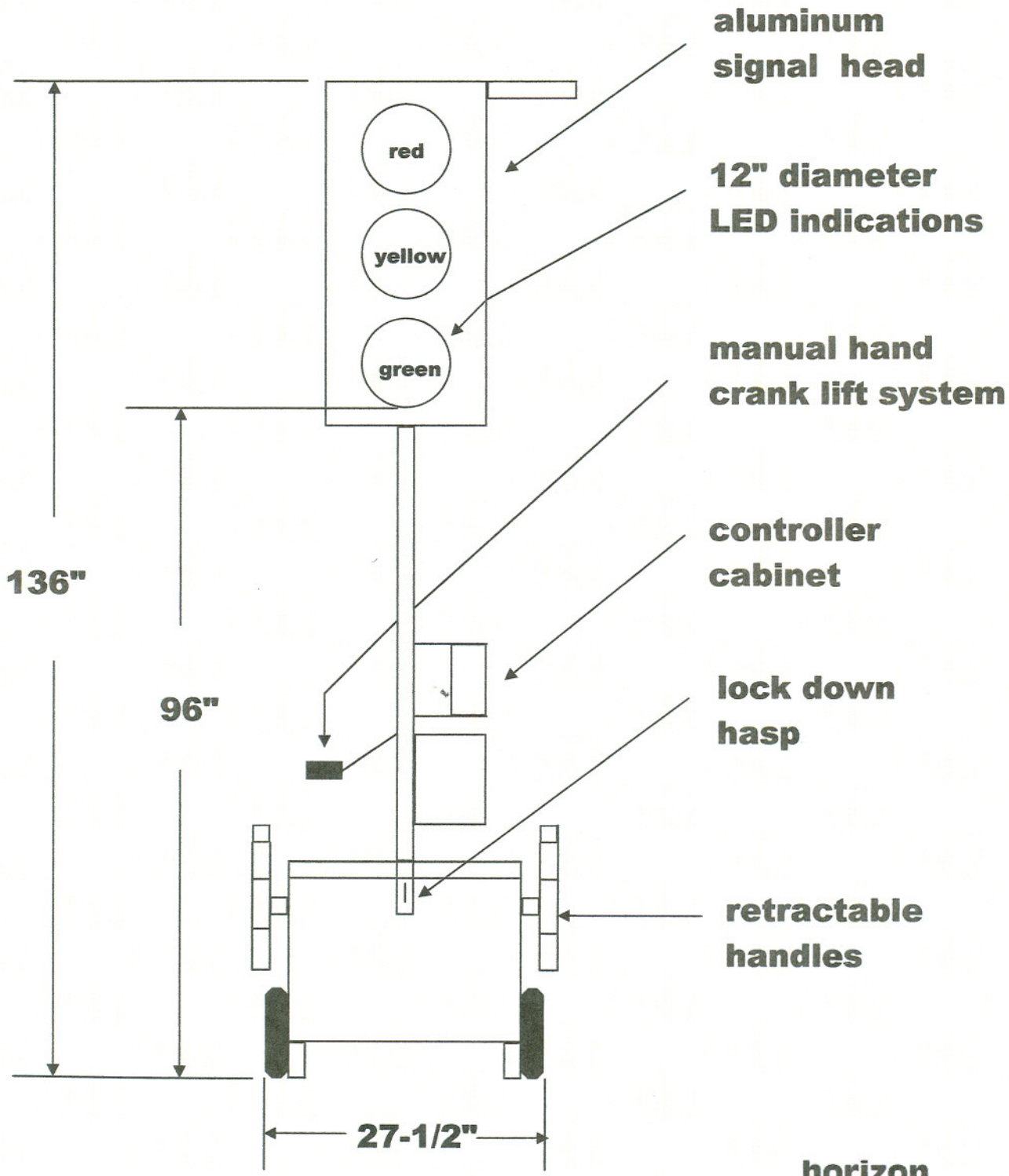
- The SQ2 pedestal mount portable traffic signal system is a patented product and considered proprietary. If proprietary devices are specified by a highway agency for use on Federal-aid projects, except exempt, non-NHS projects, they: (a) must be supplied through competitive bidding with equally suitable 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.
- This acceptance letter shall not be construed as authorization or consent by the FHWA to use, manufacture, or sell any patented device for which the applicant is not the patent holder. The acceptance letter is limited to the crashworthiness characteristics of the candidate device, and the FHWA is neither prepared nor required to become involved in issues concerning patent law. Patent issues, if any, are to be resolved by the applicant.

Sincerely yours,

David A. Nicol, P.E.
Director, Office of Safety Design
Office of Safety

Enclosures

SQ2 Cart Operating Position



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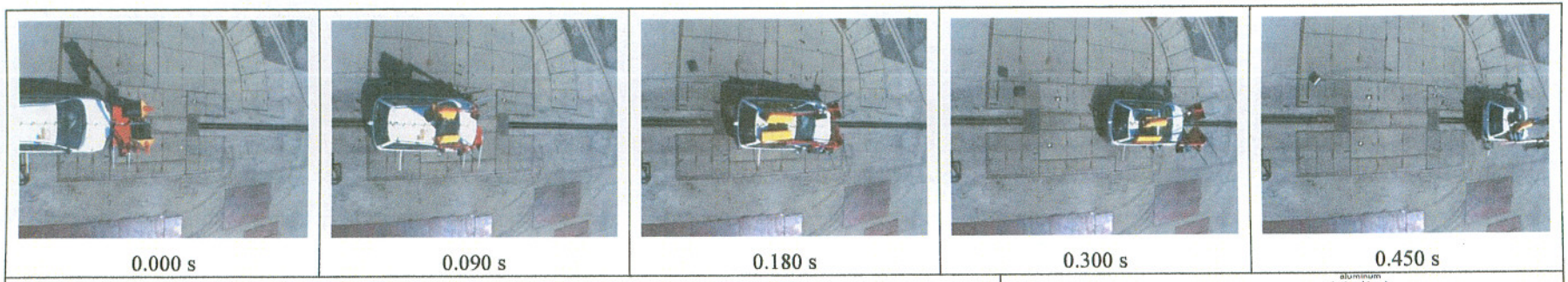
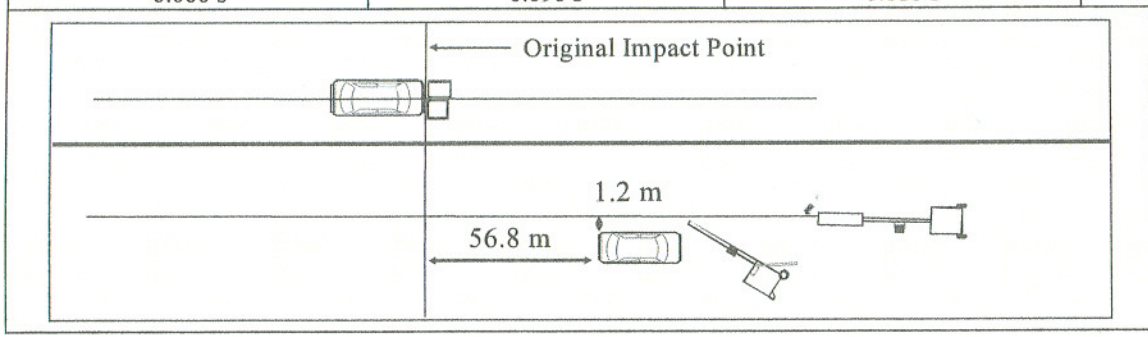
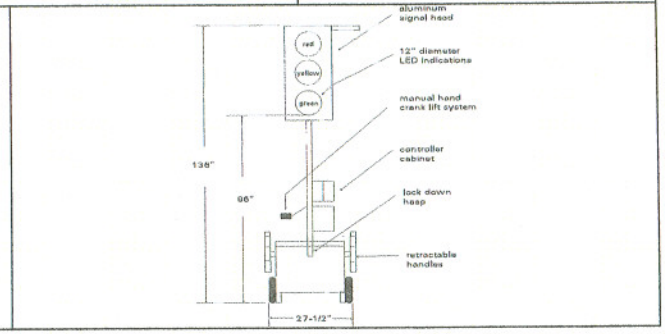
horizon SIGNAL TECHNOLOGIES

Summary Sheet for Crash Test Data







General Information	
Test Agency	Transportation Research Center Inc. (TRC Inc.)
Test No.	070905
Date	September 5, 2007
Test Article	
Type	Traffic Control System
Name or Manufacturer	SQ2 Portable Traffic Control System by Horizon Signal Technologies
Size and/or dimension and material of key elements	2 SQ2 portable traffic control systems each fully raised to maximum height of 345 cm (H) 70 cm (L) x 70 cm (W)
Soil Type and Condition	N/A
Test Vehicle	
Type	Production Model
Designation	820C
Model	2001 Suzuki Swift
Mass (kg)	
Curb	851.8
Test Inertial	829.2
Dummy(s)	74.8
Gross Static	904.4

Impact Conditions	
Speed (km/h)	100.5
Angle (deg)	0
Exit Conditions	
Speed (km/h)	N/A
Angle (deg)	N/A
Occupant Risk Values	
Impact Velocity (m/s)	
x-direction	7.5
y-direction	1.1
THIV (optional)	27.2
Ridedown Acceleration (g's)	
x-direction	2.9
y-direction	2.1
PHD (optional)	3.43 g
ASI (optional)	1.33
Max. 0.050 –s Average (g's)	
x-direction	-14.3 g
y-direction	2.5 g
z-direction	-6.3 g

Test Article Deflections (m)	
Dynamic	1.27
Permanent	1.27
Vehicle Damage	
Exterior	
VDS	N/A
CDC	12FZEW1
Interior	
OCDI	LF0100000
Maximum Exterior	
Vehicle Crush (mm)	73
Max. Occ. Compart.	
Deformation (mm)	67
Post-Impact Vehicular Behavior	
Maximum Roll Angle (deg)	9.68
Maximum Pitch Angle (deg)	2.46
Maximum Yaw Angle (deg)	6.39

Vehicle Trajectory Post Test

The impacting vehicle's final most outer left trajectory stayed within twelve feet of the barrier. Assuming that the barrier was at the edge of the lane, the vehicle would have stayed within a 12-foot lane width.