



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

August 23, 2007

In Reply Refer To:
HSSD/SS-152

Mr. Raymond Kisiel
Northwest Pipe Company
6307 Toledo Street
P.O. Box 2002
Houston, TX 77252-2002

Dear Mr. Kisiel:

Thank you for your letter of June 1, 2007, requesting the Federal Highway Administration's (FHWA) acceptance of your company's 30 inch anchors used with perforated square steel tube (PSST) posts as crashworthy sign supports for use on the National Highway System (NHS). Accompanying your letter was a report from the Texas Transportation Institute of the crash tests conducted. You requested that we find your company's PSST sign supports 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."

Introduction

Testing of the device was in compliance with the guidelines contained in the NCHRP Report 350, Recommended Procedures for the Safety Performance Evaluation of Highway Features. Requirements for breakaway supports are those in the American Association of State Highway and Transportation Officials' Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals.

Testing

Bogie pendulum testing was recently conducted on your company's various anchor lengths for PSST supports, ranging in length from 30 inches to 56 inches. The mass of the bogie pendulum was 820 kg. The tests were conducted at the typical 18 inch bumper height for small cars. Although pendulum tests are not routinely accepted for use with base bending or yielding supports, the crash behavior and post impact vehicle trajectory is fairly well known for PSST supports. Of the five tests conducted, the defining test was conducted on a 2-1/4 inch, 12 gauge PSST post inserted into a 2-1/2 inch by 30 inch, 12 gauge PSST anchor embedded 28 inches into standard soil. The summary of results from this test is enclosed. The post was inserted one foot into the anchor and secured in place with one 5/16 inch corner bolt and nut. A 48 by 36 inch by 5/8 inch thick plywood sign panel was attached to the post at a height of 7 feet from ground level. Detailed drawings of the sign support assembly are enclosed.



Findings

The pendulum bogie, traveling at a speed of 21.5 mph (35 km/hr), impacted the sign support at 18 inches above ground level. Upon impact, the support yielded at the impact point, pulled out of the ground, and came to rest 63 feet downstream of the impact point. The total crush to the pendulum nose (surrogate bumper) was 3.6 inches. The pendulum bogie test impact displayed a low potential for intrusion into the occupant compartment, measured a maximum acceleration of -0.6 g's, and a velocity change of -2.9 m/s. The measured velocity and acceleration changes were well within acceptable limits, and because the support pulled out of the ground there was no remaining stub to measure. The results of testing met the FHWA requirements and, therefore, the device described above and shown in the enclosed drawings for reference are acceptable for use as test level 3 devices on the NHS under the range of conditions tested, when proposed by a State.

Additionally, you requested this PSST system to be considered acceptable for the following configurations:

- A 2-1/4 inch, 14 gauge post inserted in a 2-1/2 inch by 30 inch, 12 gauge anchor.
- A 2 inch, 12 gauge post inserted in a 2-1/4 inch by 30 inch, 12 gauge anchor.
- A 2 inch, 14 gauge post inserted in a 2-1/4 inch by 30 inch, 12 gauge anchor.
- A 1-3/4 inch, 12 gauge post inserted in a 2 inch by 30 inch, 12 gauge anchor.
- A 1-3/4 inch, 14 gauge post inserted in a 2 inch by 30 inch, 12 gauge anchor.

The additional requests listed above are acceptable based on the test conducted on the 2-1/4 inch 12 gauge PSST post inserted into a 2-1/2 inch by 30 inch, 12 gauge PSST anchor embedded 28 inches into standard soil. The additional configurations requested are slightly less rigid systems and are likely to yield in the same manner while producing similar or less severe impact results. This acceptance is based on the reported crash performance of your device and is not meant to address the limitations of testing or the systems' installation, maintenance, or repair characteristics.

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.

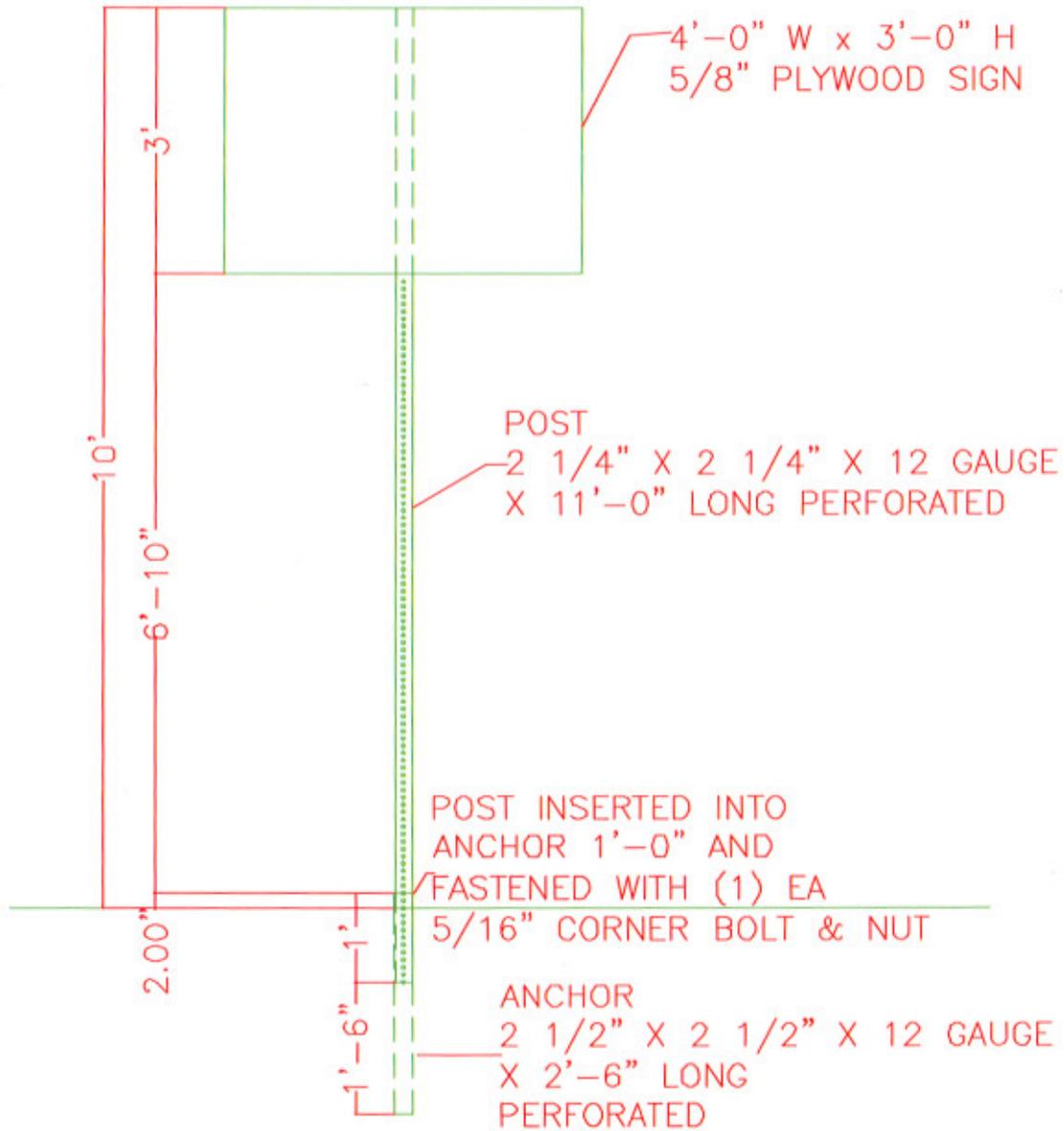
- You will be expected to certify to potential users that the hardware furnished has essentially the same chemistry, mechanical properties, and geometry as that submitted for acceptance, and that they will meet the crashworthiness requirements of the FHWA and the NCHRP Report 350.
- To prevent misunderstanding by others, this letter of acceptance designated as number SS-152 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 device 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,

A handwritten signature in blue ink that reads "George E. Rice, Jr." with a stylized flourish at the end.

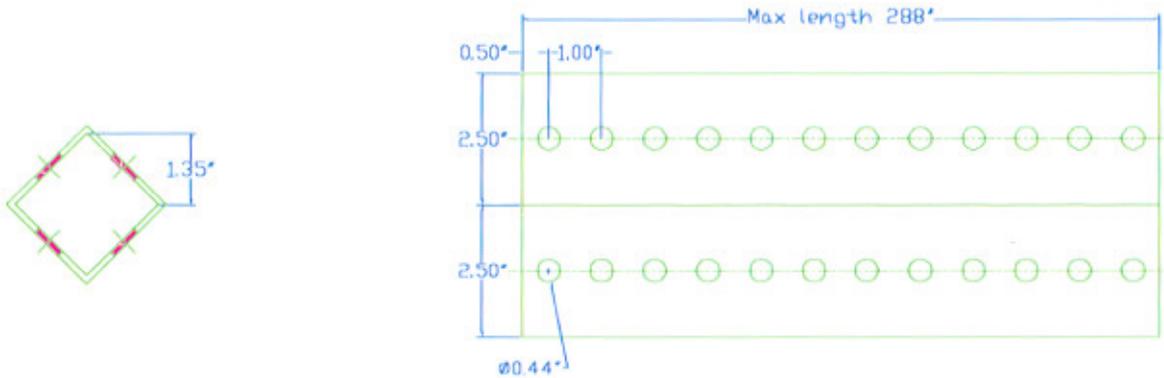
George E. Rice, Jr.
Acting Director, Office of Safety Design
Office of Safety

Enclosures



Unless Noted: Tolerancias per ASTM A-536	Northwest Pipe Co.		
	30" Anchor		
JLP	REV A	FROM NO.	DATE ISS.
11/30/06	SCALE NTS		DRW

APPENDIX C. DETAILS OF TEST ARTICLES



Notes:

- Material: Steel posts furnished shall conform to ASTM A653 Grade 50, Standard Specification for Steel Sheet, Zinc Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvanneated) by the Hot-Dip Process.
- Shape: The cross section of the post shall be carbon steel tube formed to square and welded directly in the corner by high frequency electric resistance welding and externally scarfed to match the corner radii.
- Finish: The galvanized part will conform to ASTM A653, G90, Structural quality, Grade 50. The corner weld is zinc coated after scarfing. The galvanized post has a minimum of 0.5 mil of clear acrylic polymer coating applied as a rust preventative.
- Holes: All four sides feature holes that shall be 7/16" diameter, (+/- 1/64") on one-inch centers through the entire length of the post. Holes shall be on the centerline of each side, in alignment with and opposite each other directly and diagonally.
- Telescoping Properties: The finished post shall be straight and have a smooth, uniform finish. All consecutive sizes of square tubes shall telescope freely and for not less than ten feet of their length without the need to match any particular face to any other face. All holes and ends shall be free from burrs.
- Squareness Tolerance: +/- .015"
- Permissible twist .02" per foot, maximum .060" per 3 feet.
- Outside Tolerances at corners (all sides): +/- .010"
- Outside Dimensions: Measurements are made at least 2" from the end of the tube.
- Wall Thickness: Permissible variation in wall thickness is +.011", -.005".
- Length: The length of each post shall have a permissible length tolerance of +/- 1/4"
- Convexity and Concavity: As measure in the center of the flat sides, shall not exceed +/- .010" determined at corner.
- Corner Radii: Standard outside radii shall be 5/32", with variation of +/- 1/32".
- Straightness: Permissible variation in straightness is 3/16" in a 10 foot section.

Tolerance Unless Specified x = +/- .125 X/XX = +/- 1/16" x.xxx = +/- .010	Northwest Pipe Company		
	2 1/2" 12 Gage Perforated Square		
JLP	FILE: Form No.	DWG. NO.: SQP-1.5/12	REV:
01/04/06	SCALE: NTS	SHEET: 1 of 1	

Table D5. Summary of results for pendulum test 400001-NWP P14.

<p>0.000 s</p>	<p>General Information Test Agency..... Texas Transportation Institute Test No. 400001-NWP P14 Date 02-20-2007</p> <p>Test Article Type..... Single Sign Support Name Northwest Pipe Sign Support Installation Height (m)..... 2.1 m (7 ft) Material of Key Element Perforated Square Steel Tube with 2.25-inch x 30-inch x 1/2-gauge anchor</p>
<p>0.096 s</p>	<p>Soil Type..... Standard Soil</p> <p>Test Vehicle Type..... Bogie Designation..... Pendulum Test Inertia Mass 839 kg</p> <p>Impact Conditions Speed 35.0 km/h Angle 90 deg</p>
<p>0.194 s</p>	<p>Occupant Risk Values Impact Velocity Longitudinal direction..... 2.9 m/s Ridedown Accelerations Longitudinal direction..... -0.6 g's Maximum change in Velocity 2.9 m/s</p>
<p>0.288 s</p>	