



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

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

May 11, 1994

Refer to: HNG-14/SS-45

Mr. David S. Gendell
Regional Federal Highway Administrator (HRA-03)

Dear Mr. Gendell:

This is in response to the correspondence from the Pennsylvania Division transmitted with your memorandum of April 20. Pennsylvania Department of Transportation (PennDOT) wished to use five wood post small sign support systems with concrete foundations on the National Highway System where breakaway supports are required. The particular size, number, and/or hole details of each support have not been crash tested to date, but they are similar to many that have been tested. Each support has the following similarities:

- Posts are embedded 760 mm into 610 mm diameter concrete foundations.
- Foundations are to be used in NCHRP Report 350 "standard" soil (the "S-1", "strong", soil in NCHRP report 230.)
- Holes are drilled perpendicular to the direction of adjacent traffic at heights of 100 mm and 450 mm above the ground.

The five Pennsylvania support systems are discussed below. They are compared to southern yellow pine sign supports tested under the Pooled-Fund Study. "Testing of Small and Large Sign Supports", between 1989 and 1992. These supports were tested for compliance with FHWA, AASHTO, and NCHRP breakaway criteria. Concrete foundations for the tested posts were 460 mm in diameter and embedded 760 mm deep into weak soil for all wood posts. Posts directly embedded into soil were buried to a depth of 910 mm except for the 140 mm x 200 mm posts which were embedded 1220 mm. Weakening holes, when used, were drilled at the same heights specified by Pennsylvania.

1. Single 89-mm x 89-mm post with two 25-mm holes, and
2. Dual 89-mm x 89-mm post with two 25-mm holes.

Dual undrilled 89 x 89 wood posts were tested in both "strong" and "weak" soils and in concrete foundations. Dual post supports successfully passes testing when

buried directly in soil, but failed when placed in 460-mm diameter x 760-mm deep foundations in weak soil. In the low-speed test the concrete foundations rotated in the weak soil and the posts did not break. Because Pennsylvania's design includes the holes and uses a larger diameter foundation, we consider their single and dual drilled 89-mm square wood posts acceptable

3. Dual 89-mm x 140-mm post with two 38-mm holes.

Dual undrilled 89 x 140 wood posts embedded in concrete were tested under the Pooled-Fund study. The foundations rotated in the weak soil and the posts failed to breakaway. A single undrilled 89 x 140 wood post embedded in a concrete foundation did pass when tested in the weak soil. Dual 89 x 140 wood posts with 38-mm holes directly buried in both strong and weak soil successfully passed testing. Because Pennsylvania's design uses the larger diameter foundation in standard soil we consider their dual (and single) drilled 89-mm x 140-mm square wood posts acceptable.

4. Single 140-mm x 140-mm post with two 50-mm holes.

No posts of this size were tested under the Pooled-Fund study. However, a larger post, the single 140-mm x 200-mm with 75-mm holes (two posts supported sign, only one hit) successfully passed testing when directly buried in soil as well as when mounted in a concrete foundation. Because Pennsylvania's smaller and weaker post uses the larger foundation in standard soil, we consider their single drilled 140-mm square post acceptable.

5. Dual 140-mm x 140-mm post with two 50-mm holes.

No posts of this size were tested under the Pooled-Fund study, nor were any dual posts larger than 89 x 140 tested. The nearest support tested was dual 89 x 140 undrilled posts in concrete, which failed. Although the cross-section area of a drilled 140 x 140 wood post is the same as an undrilled 89 x 140 post. The section modulus is 50 percent larger. We do not believe we have a sound basis for accepting this dual support unless crash tested. Therefore, the dual 140-mm wood posts with two 50-mm holes, embedded in a concrete foundation, will not be acceptable if spaced less than 2.1 m apart.

Those wood post small sign support systems found acceptable above may be used on the National Highway System when requested by a State. Our acceptance is limited to the breakaway characteristics of the posts and does not cover the structural features. Presumably, the State's specifications will provide sufficient information on structural design and installation requirements to ensure proper performance.

Sincerely yours,

Jerry L. Poston, Acting Chief
Federal-Aid and Design Division

FHWA:HNG-14:Artimovich:sr:61331:5-5-94

Cc: Files HNG-14 HNG-1 HNG-10

Geometric and Roadside Design Acceptance Letter SS-45