



STATE OF NORTH CAROLINA  
DEPARTMENT OF TRANSPORTATION  
P.O. BOX 25201  
RALEIGH 27611-5201

JAMES G. MARTIN  
GOVERNOR

DIVISION OF HIGHWAYS

August 9, 1991

THOMAS J. HARRELSON  
SECRETARY

WILLIAM G. MARLEY, JR., P.E.  
STATE HIGHWAY ADMINISTRATOR

MEMORANDUM

TO: Division Traffic Engineers  
FROM: J. M. Lynch, P.E., State Traffic Engineer  
SUBJECT: Breakaway Highway Sign Supports

In July, 1990, a National pooled-fund study, "Testing of Small and Large Sign Supports" was begun at the FHWA Turner-Fairbanks Research Lab in McLean, Virginia. To date 27 crash tests have been conducted on numerous sign support systems in order to validate supports using the new requirement for testing with a 1800 pound vehicle. Several systems in wide use in the United States have failed the tests. Others can remain in use with minor design changes. For your information, I will outline below the impact on supports in use in North Carolina.

Wood Supports: Using Grade 2 Southern Yellow Pine dressed posts, the following are considered breakaway supports under the following conditions:

- 4" x 4" posts are acceptable undrilled, and can be used as dual supports spaced closer than 7 feet;
- 4" x 6" posts are acceptable when drilled with 1 1/2" holes, perpendicular to the direction of travel, located 4" and 18" above the ground, but dual supports must be at least 7 feet apart;
- 6" x 6" posts are acceptable when drilled with 2" holes, perpendicular to the direction of travel, located 4" and 18" above the ground, but dual supports must be at least 7 feet apart, and
- 6" x 8" posts are acceptable when drilled with 3" holes, perpendicular to the direction of travel, located 4" and 18" above the ground, but dual supports must be at least 7 feet apart.

Larger or undrilled timber supports are considered non-breakaway. If used, they must be protected by guardrail or located where vehicles could not hit the supports.

It has been noted that some Divisions have installed wood supports with the larger dimensioned face parallel to the sign face. Supports installed this way would not be considered breakaway, and this type of installation wastes the strength of larger supports.

"U" Channel Supports: Unspliced "U" Channel sign supports have been tested, and the following are considered breakaway:

2 #/ft. "U" Channel and lighter sections are considered breakaway, and dual supports may be used spaced closer than 7 feet, and

3 #/ft. "U" Channel sections are considered breakaway and dual supports may be used spaced closer than 7 feet (subject to future crash test results).

Larger unspliced or all back-to-back "U" channel supports are considered to be non-breakaway. If used, they must be protected by guardrail or located where vehicles could not hit the supports.

4 #/ft. "U" Channel sections with Franklin Steel EZE ERECT splice connection installed with the top of the base support located 4" above the ground is an acceptable breakaway support. Dual supports must be at least 7 feet apart.

3 #/ft. "U" Channel sections and lighter sections are considered breakaway, if spliced as outlined below. Other splices are unacceptable at this time. If spliced, the "U" channel splice must be above the ground with a splice lap of approximately 18 inches. It is fastened with four 5/16-inch diameter galvanized A449 bolts or galvanized A325 bolts (two bolts at both ends of the splice, through the holes nearest to the ends of the splice). No splice can extend past a theoretical bumper that occupies a space 16 to 20 inches above the ground. The portion of the post extending upward from the splice is located on the back side of the lower portion of the post.

Division Traffic Engineers

August 8, 1991

Page Three (3)

Splices above the bumper height are not disallowed, but they are discouraged, and if used, they should be above 5 feet in order to reduce the chance of broken splices penetrating vehicle windshields upon impact.

2" Schedule 40 Steel Pipe: This is no longer considered breakaway when direct buried. However, it can be used with several commercially available bases such as POZ-LOC anchor system, which allows the base to pull out of the ground upon impact.

Slip Base Supports: The "S" sections and "WF" sections in use in North Carolina are still acceptable as breakaway supports. However, recent crash testing has resulted in a restriction of supports installed closer than 7 feet to a combined weight per foot of 36 pounds, which limits our use in this situation to supports no larger than "6W15".

As additional support crash tests are conducted, other support systems may be accepted or rejected as breakaway. Most notably, the use of dual 3 #/ft. "U" Channel supports within a 7 foot spacing may be eliminated as a suitable breakaway system. Crash testing of 4 #/ft "U" Channel supports with a weak splice at ground level may prove acceptable, and offer a system stronger than the 3 #/ft supports.

Attached is a listing from the Federal Highway Administration of all breakaway systems currently acceptable as breakaway, along with the some test results.

Revisions have been made to the "SUPPORTS.WK1" spreadsheet to design sign supports incorporating these changes. Please provide Mr. G. G. Grigg, Jr., P.E., Signing Engineer, or my staff with a formatted high density 5 1/4" floppy disk for a copy of this, as well as the latest versions of our sign design software.

If you have questions about these or other support systems or if we can be of further service to you, please advise.

JML/GGGjr:ply

Att.

cc: Mr. J. T. Peacock, Jr., P.E., att.  
Mr. D. W. Bailey, P.E., att.  
Mr. D. W. Campbell, P.E., att.  
Division Engineers, att.  
Area Traffic Engineers, att.  
Mr. C. C. Sessoms, P.E., att.  
Mr. N. C. Crowe, P.E., att.  
Mr. G. G. Grigg, Jr., P.E., att.