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

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

July 2, 1996

Refer to: HNG-14/SS-63

Mr. Richard Schaefer
President
S-Square Tube Products 5495 East 69th Avenue
Commerce City, Colorado 8002

Dear Mr. Schaefer:

This is in response to your March 22 and May 17 letters transmitting additional information on your company's perforated square steel tube posts. These letters were in support of your earlier request for Federal Highway Administration's (FHWA) acceptance of perforated square steel tube sign posts fabricated by your company as breakaway. In your May 17 letter you indicated that you intend to purchase galvanized square tubes of ASTM A653 steel (formerly designated A446) and punch holes of the same size and spacing and using the same process used by the manufactures of previously accepted breakaway supports. The steel to be used in your proposed supports will meet the mechanical properties of ASTM A653 SQ Grade 40, which is the same as that found acceptable in some other breakaway perforated square tube supports.

Material properties of perforated square tube sign supports will significantly influence their breakaway performance. Therefore, we have indicated to others that we believe it would be unwith for a supplier of perforated steel tube sign posts to certify that their posts met breakaway criteria without confirming crash tests, if the mill test reports for the steel used show ultimate tensile strengths greater than 550 Mpa (79, 800 psi) or elongations over 50 mm (2 inches) greater than 20 percent. The data you supplied on the mechanical properties of the material to be used in your posts indicated likely tensile strengths around 450 Mpa (65,000 psi) and elongations ranging up to 24 percent. We consider this combination of strength and ductility to be within, but near, the limit of acceptability for the perforated square tube sizes and numbers we have found acceptable. Therefore, we would recommend that you obtain for use in highway sign supports and use those with low ductility as much as possible, avoiding materials with ductility's greater that 24 percent where tensile strengths are below 450 Mpa, and require even lower ductility in materials with tensile strengths over 450 Mps.

Subject to the foregoing, your company's proposed perforated square steel tube sign supports are acceptable for use on the National Highway System, when requested by a

State, in the sizes, spacing, and foundation conditions shown in the enclosed table. Our acceptance is limited to the breakaway characteristics of the sign supports their structural features. Presumably you will supply potential users with sufficient information on structural design and installation requirements to ensure proper performance. We anticipate that the States will require certification from S-Square Tube Products that the hardware furnished has essentially the same chemistry, mechanical properties, and geometry as those you have described to us, and that they will meet the Federal Highway Administration change in velocity requirements.

Sincerely yours,

Seppo I. Sillan, Acting Chief
Federal-Aid and Design Division

Enclosure

# Acceptable Uses of Perforated Square Steel Tube Sign Posts Made of ASTM A653 SQ Grade 40 Steel[1] as requested by S-Square Tube Products

| Post Size mm x mm (in x in) | One Post in a 2.1-m Path | | | | | | | | Two Posts in a 2.1-m Path | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Standard Soil | | | | Weak Soil | | | | Standard Soil | | | | Weak Soil | | | |
| | With Anchor Base[2] | | Direct Burial | | With Anchor Base[2] | | Direct Burial | | With Anchor Base[2] | | Direct Burial | | With Anchor Base[2] | | Direct Burial | |
| | 1.90 mm[3] | 2.66 mm[3] | 1.90 mm[3] | 2.66 mm[3] | 1.90 mm[3] | 2.66 mm[3] | 1.90 mm[3] | 2.66 mm[3] | 1.90 mm[3] | 2.66 mm[3] | 1.90 mm[3] | 2.66 mm[3] | 1.90 mm[3] | 2.66 mm[3] | 1.90 mm[3] | 2.66 mm[3] |
| 63.5x63.5 (2.5x2.5) | yes | yes | — | — | — | — | — | — | — | — | — | — | — | — | — | — |
| 57.6x57.6 (2.25x2.25) | " | " | yes | yes | yes | yes | yes | yes | — | — | — | — | — | — | — | — |
| 55.6x55.6 (2.188x2.188) | " | " | " | " | " | " | " | " | — | — | — | — | — | — | — | — |
| 50.8x50.8 (2.0x2.0) | " | " | " | " | " | " | " | " | yes | yes | yes | — | yes | yes | yes | — |
| 44.6x44.6 (1.75x1.75) | " | " | " | " | " | " | " | " | " | " | " | yes | " | " | " | yes |
| 38.1x38.1 (1.5x1.5) | " | " | " | " | " | " | " | " | " | " | " | " | " | " | " | " |

1. S-Square Tube Products supplied data on tests of three samples taken from three sizes of formed tubes made from the same heat of steel (one sample from each size). The average results from the three tests were: yield strength, 395.3 MPa (57,333 psi); tensile strength, 442.2 MPa (64,100 psi); and elongation, 22.3%. See comments on material properties in the July 2, 1996, FHWA letter to S-Square Tube Products to which this table is attached.

2. The anchor base may or may not have a strengthening sleeve at groundline. The anchor bases shall be sized to fit closely around the post. For 63.5x63.5 posts of both wall thicknesses and 57.6x57.6x2.66 posts the anchor bases shall be made of steel comparable to that of the posts and have wall thicknesses equal 4.55 mm (7 ga) or greater. For 57.6x57.6x1.90 posts and all 55.6x55.6 and smaller posts the anchor bases shall be made of steel comparable to that of the posts and have wall thicknesses equal 2.66 mm (12 ga) or greater.

3. The dimension shown is the wall thickness of the post. 1.90 mm = 14 ga and 2.66 mm = 12 ga.