May 1, 1991

Refer to:  HNG-14/SS-24

Mr. Ellwood Irish
Chief Engineer
Unistrut Corporation
35660 Clinton Street
Wayne, Michigan 48184

Dear Mr. Irish:

Thank you for your letter of February 19 requesting the Federal Highway Administration’s (FHWA) acceptance of your company’s slip-base assemblies for breakaway small sign supports. You enclosed pages from the Arizona Department of Transportation’s (AZDOT) Report Number FHWA-AZ88-202-II, which covered the results from full-scale crash tests performed by the Texas Transportation Institute (TTI). Your March 26 letter in response to our request contained information on bolt torque values and the section moduli of posts.

Two tests were conducted to assess the compliance of the Unistrut slip-base assembly with the breakaway requirements of the 1985 American Association of State Highway and Transportation Officials (AASHTO) Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals. These specifications have been adopted, with minor modifications, by the FHWA. The test article is illustrated in the enclosed drawings.

In both tests, three supports were used to mount a 30-square foot plywood sign panel 5 feet above the ground. The sign support posts were Arizona Type P-2 which consist of two perforated square steel tube post sections, a 1 ¾-inch square tube inside a 2-inch square tube, both 12 gage. The lower slip-base attachments were bolted into 2 ¾-inch square by 8 ½-inch long 12 gage tube collars. The foundation tubes and their reinforcement collars were set in 8-inch diameter, 30-inch deep concrete footings in National Cooperative Highway Research Program Report 230 strong soil. The footings were spaced 21 inches on center. The top of the foundation tubes and their collars projected 2 ½ inches above the concrete footings. The Teflon gaskets were used between the slip-bases attached to the sign supports and the anchored slip-bases. The support slip-bases were attached to the anchored slip-bases with ½-inch, grade five bolts, nuts, and
flat washers. The bolts were torqued to 40 foot-pounds. The test results are summarized here:

<table>
<thead>
<tr>
<th>Test Number</th>
<th>7024-29</th>
<th>7024-30</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vehicle Weight, Pounds</td>
<td>1,800</td>
<td>1,800</td>
</tr>
<tr>
<td>Impact Speed, m.p.h.</td>
<td>18.7</td>
<td>61.5</td>
</tr>
<tr>
<td>Vehicle Velocity Change, f.p.s.</td>
<td>10.4</td>
<td>6.0</td>
</tr>
<tr>
<td>Occupant Impact Velocity, f.p.s.</td>
<td>8.86</td>
<td>*</td>
</tr>
<tr>
<td>Stub Height</td>
<td>**</td>
<td>**</td>
</tr>
</tbody>
</table>

*Theoretical occupant did not impact the vehicle interior.

**Stub height was not measure after the test, but stub consisted only of bottom sub-assembly, which was to be installed at a height of 2 ¼ inches.

These results meet the change in velocity and stub height requirements adopted by AASHTO and the FHWA. Therefore, your company’s slip-base assembly described above is acceptable for use on Federal-aid highway projects, within the range of conditions tested, if proposed by a State. Up to three supports within a 7-foot distance are permissible. All sign posts must consist of the two concentric perforated square steel tube sections as tested, or they may consist of the following members or combinations, which have section moduli close to or exceeding that of the tested post system:

<table>
<thead>
<tr>
<th>Post Member</th>
<th>Gross Section Modulus, In 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>24H12 (2 ½” sq. 10 ga.)</td>
<td>.783</td>
</tr>
<tr>
<td>21H12 (2 3/16” sq. 10 ga.)</td>
<td>.590</td>
</tr>
<tr>
<td>24F12 (2 ⅜” sq. 12 ga.)</td>
<td>.643</td>
</tr>
<tr>
<td>16F12 plus 20F12 (crash tested system)</td>
<td>.636</td>
</tr>
<tr>
<td>20F12 plus 22F12 (2” 12 ga. Plus 2 ¼” 12 ga.)</td>
<td>.871</td>
</tr>
</tbody>
</table>

Because of the possibility of the post bending and “locking up” the slip-base, the use of a ssF12 post (2 ¼-inch square, 12 gage, gross section modulus of .499in3) with the slip-base is not acceptable without further crash testing.

Your letter requested acceptance for slip-base assemblies to be used with posts larger than the 2-inch square (outside dimension) posts tested in the AZDOT study. Because of the low velocity changes observed in the crash tests, and the increased stiffness that we would expect of a larger, comparable gage posts, your slip-base assemblies up to TL200 T3 B4 will also be acceptable when used with compatible post members cited as acceptable above and a foundation comparable to that tested. Specifically, the assemblies listed below and described in the enclosure are acceptable:

TL200 T1 B1  TL200 T2 B1  TL200 T3 B1
TL200 T1 B2  TL200 T2 B2  TL200 T3 B2
TL200 T1 B3  TL200 T2 B3  TL200 T3 B3
TL200 T1 B4  TL200 T2 B4  TL200 T3 B4
Our acceptance is limited to breakaway characteristics of the system and does not cover 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 Unistrut Corporation that the hardware furnished has essentially the same chemistry, mechanical properties, and geometry as that used in the tests, and that it will meet the FHWA change in velocity requirements. There are numerous features in your company’s design that are critical to proper performance including the bushings around the attachment bolts, and the Teflon keeper plate. We assume you will alert customers to the importance of these features.

Unistrut slip-base assemblies are proprietary. Thus, to be used in a Federal-aid highway project they: (a) they must be supplied through competitive bidding with equally suitable unpatented items; (b) the State highway agency certifies that they are essential for synchronization with existing highway facilities or that no equally suitable alternate exists; or (c) they are 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, a copy of which is enclosed.

Sincerely yours,

L.A. Staron, Chief
Federal-Aid and Design Division

Enclosures
FIGURE 7.23A. DETAILS OF SIGN INSTALLATION FOR TEST 7024-29 AND 7024-30
SECTION 'A-A'

SECTION 'B-B'

SECTION 'C-C'

FIGURE 7.23B. DETAILS OF SIGN INSTALLATION FOR TEST 7024-29 AND 7024-30
SLIP BASE ANCHOR

Top Subassembly

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Finish</th>
<th>Post Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>TL 198-T1</td>
<td>HG</td>
<td>2&quot;</td>
</tr>
<tr>
<td>TL 198-T2</td>
<td>HG</td>
<td>2 ¼&quot;</td>
</tr>
<tr>
<td>TL 198-T3</td>
<td>HG</td>
<td>2 ½&quot;</td>
</tr>
</tbody>
</table>

Note: Sign post must fit inside subassembly anchor.

Bottom Subassembly

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Finish</th>
<th>Post Anchor Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>TL 199-B1</td>
<td>HG</td>
<td>2&quot;</td>
</tr>
<tr>
<td>TL 199-B2</td>
<td>HG</td>
<td>2 ¼&quot;</td>
</tr>
<tr>
<td>TL 199-B3</td>
<td>HG</td>
<td>2 ½&quot;</td>
</tr>
<tr>
<td>TL 199-B4</td>
<td>HG</td>
<td>3&quot;</td>
</tr>
</tbody>
</table>

Note: Bottom assembly must fit inside ground anchor.

Each Slip Base Assembly Consists Of:

<table>
<thead>
<tr>
<th>Description</th>
<th>Part Number</th>
<th>Finish</th>
<th>Number of Pieces</th>
</tr>
</thead>
<tbody>
<tr>
<td>One Top Subassembly</td>
<td>(See Above)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>One Bottom Subassembly</td>
<td>(See Above)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Retainer Gasket</td>
<td>TL 189</td>
<td></td>
<td>1 pc</td>
</tr>
<tr>
<td>Flange Head Bolt</td>
<td>HHFB 0505250</td>
<td>EG</td>
<td>3 pcs</td>
</tr>
<tr>
<td>Flange Head Hex Nut-½&quot;</td>
<td>HHFN 050</td>
<td>EG</td>
<td>3 pcs</td>
</tr>
<tr>
<td>Flat Washer-½&quot;</td>
<td>HFLW 050</td>
<td>EG</td>
<td>6 pcs</td>
</tr>
<tr>
<td>Release Bushing</td>
<td>TL 168</td>
<td>SS</td>
<td>6 pcs</td>
</tr>
</tbody>
</table>

To order a complete Slip Base Assembly use the part number TL 200. In addition, indicate the top and bottom subassembly part numbers to complete your ordering process.

Example: 2" top subassembly & 2 ½" bottom subassembly

Part #: TL 200-T1B3

Note: When ordering separate components, please use the individual part numbers.
FRONT WIND LOAD
4 VEHICLE APPROACH

2 7/8" DIA. HOLE & R. E. &
TO BE PARALLEL ± 1°

NOTE:
Surface A₁ To Be 90° To
Surface A₂ & Surface A₃
Within ±1°

UNISTRUT CORP.
UNISTRUT METAL FRAMING
WAYNE, MICHIGAN

TELESPAR SHEAR BASE
FITTING (BOTTOM) FOR
2" POST ANCHOR BASE

STD. FIN.: FS-105
PROD. CODE: 12.08

Wt. Ea.: 8.740#
$\frac{3}{8}$ Dia. Hole C and R C
To Be Parallel $\pm 1^\circ$

FRONT WIND LOAD
AND VEHICLE APPROACH

NOTE:
When Hot Dip Galvanizing
Part This Surface Must
Be Wiped Clean. No Drips
Allowed.

$\frac{3}{8}$ Dia. 2 Holes

NOTE:
Surface A, To Be $90^\circ$ To Surface A,
& Surface A, Within $\pm 1^\circ$

WT. EA.: 2.44 lb (1.06 kg)
STD. FIN.: FS-105
PROD. CODE: 1208

UNISTRUT CORP.
UNISTRUT METAL FRAMING
WAYNE, MICHIGAN

TELESPAR SHEAR BASE
FITTING (BOTTOM) FOR
2 1/4" POST & ANCHOR BASE

TL-199 B2
ITEM  
NO.  
FRONT WIND LOAD  
VEHICLE APPROACH  

* 7/16" DIA. HOLE & 1 R. C  
TO BE PARALLEL ±1°  

NOTE:  
0.  
WHEN HOT DIP GALVANIZING PART  
THIS SURFACE MUST  
BE WIPED CLEAN.  
NO Drips ALLOWED.  

7/16" DIA. 2 HOLES  
SURFACE A 2  
SURFACE A 3  

Wt. Ea.: 12.097#  

UNISTRUT CORP.  
UNISTRUT METAL FRAMING  
WAYNE, MICHIGAN  

TITLE  
TELESPAR SHEAR BASE  
FITTING (BOTTOM) FOR  
2½" POST ANCHOR BASE  

UNISTRUT METAL FRAMING  
WAYNE, MICHIGAN  

PROD. CODE: 1208  
DRAWING NO.  

TL-199-B3  
SCALE: 1" = 1'-0"  
DATE: 4-12-90
FRENT WIND LOAD
4 VEHICLE APPROACH

NOTE:
SURFACES A1 & A2 TO BE PARALLEL TO PLATE C WITHIN ±1°

SURFACE A2
11/16" 11/16"
2 PLACES

SURFACE A1
3/8" DIA. 4 Holes

WELD MUST CLEAR 1.250" DIA. WASHER TYP. 2 PLACES

30110

30116

30110

UNISTRUT CORP.
UNISTRUT METAL FRAMING
WAYNE, MICHIGAN

TELESPAR SHEAR BASE FITTING
(TOP) 2" POST

STD. FIN.: FS-103
WT: 6.852# (0.307 KG)

TL-198-71
Front Wind Load & Vehicle Approach

Note:
Surfaces A & A to be parallel to plate C within ±1°

Surface A,
Surface A

Weld must clear 1.250" dia. washer Type 2 Places

3/16" Dia. 4 Holes

30110

61/2"

19/32"

19/32"

2 Places

9/32"

3/16"

30110

61/2"

1/2"

1"

1/2"

UNISTRUT CORP.
UNISTRUT METAL FABRICATION
WAYNE, MICHIGAN

TELESPAR SHEAR BASE FITTING (TOP) 2 1/4 POST

Wt. Ea. = 2.405# (0.395 kg)

STD. FIN. = F3-105

PROD. CODE = 1208

TL-198-TZ
FRT WIND LOAD
VEHICLE APPROACH

SURFACES A, & A, TO BE
PARALLEL TO PLATE C
WITHIN ±1°

WELD MUST
CLEAR 1.250" DIA.
WASHER. TYP. 2 PLACES

SURFACE A,

SURFACE A,

1" 1" 1/8" 3 3/4" 1 1/8" 6 1/2"

UNISTRUT CORP.
UNISTRUT METAL FRAMING
WAYNE, MICHIGAN

TELESPO SHEAR BASE
FITTING (TOP) 2 1/2" POST

STD. FIN. • FS-105
WT. EA. • 8.155#