U.S. Department
Of Transportation
Federal Highway
Administration

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

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 ¼-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:

Test Number	7024-29	7024-30
Vehicle Weight, Pounds	1,800	1,800
Impact Speed, m.p.h.	18.7	61.5
Vehicle Velocity Change, f.p.s.	10.4	6.0
Occupant Impact Velocity, f.p.s.	8.86	*
Stub Height	**	**

*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:

Post Member	Gross Section Modulus, In 3
24H12 (2 ½" sq. 10 ga.)	.783
21H12 (2 3/16" sq. 10 ga.)	.590
24F12 (2 ½" sq. 12 ga.)	.643
16F12 plus 20F12 (crash tested system)	.636
20F12 plus 22F12 (2" 12 ga. Plus 2 ¼" 12 ga.)	.871

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 assembles 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.

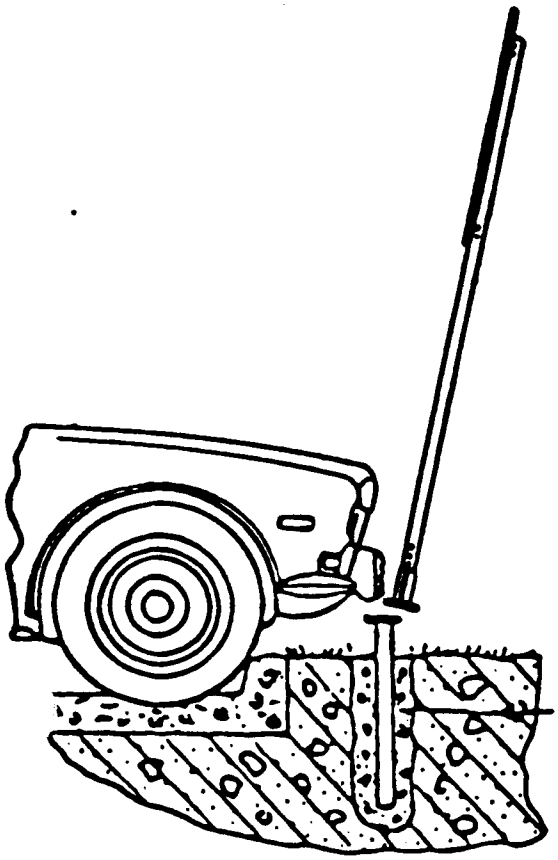
Unistrut slip-base assemblies are proprietary. Thus, to be used in a Federal-aid highway project they: (a) they must be supplied through competitive bidding with equally suitable unpatented items; (b) the State highway agency certifies that they are essential for synchronization with existing highway 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.

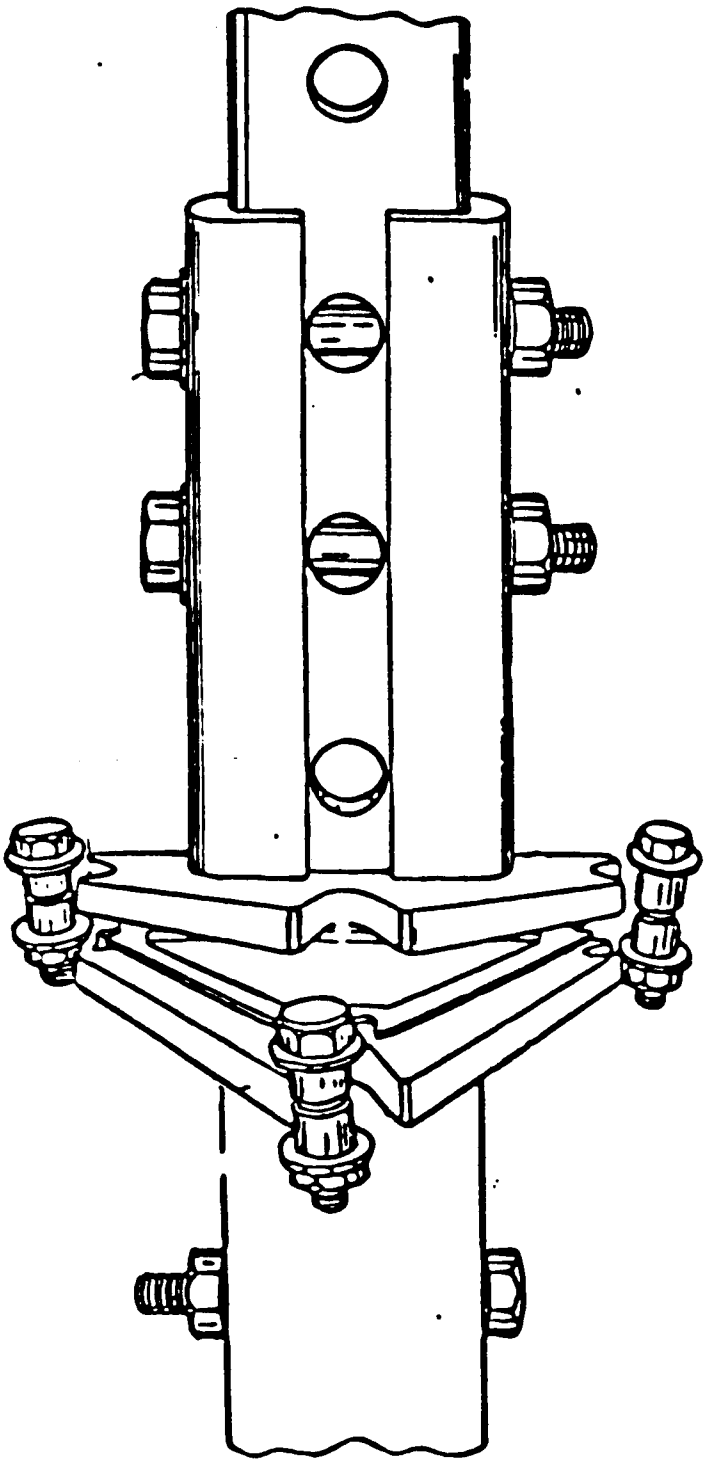
Sincerely yours,

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

Enclosures

Federal Highway Administration
HNG-14:Nartimovich:gm:4-23-91:61331
Copies to:
HPD-1 HNG-1 HNG-10 HNG-14 Reader 3212
Reader, 3128 Reader, 3206 File, 3128
Geometric and Roadside Design Acceptance
Letter Number SS-24





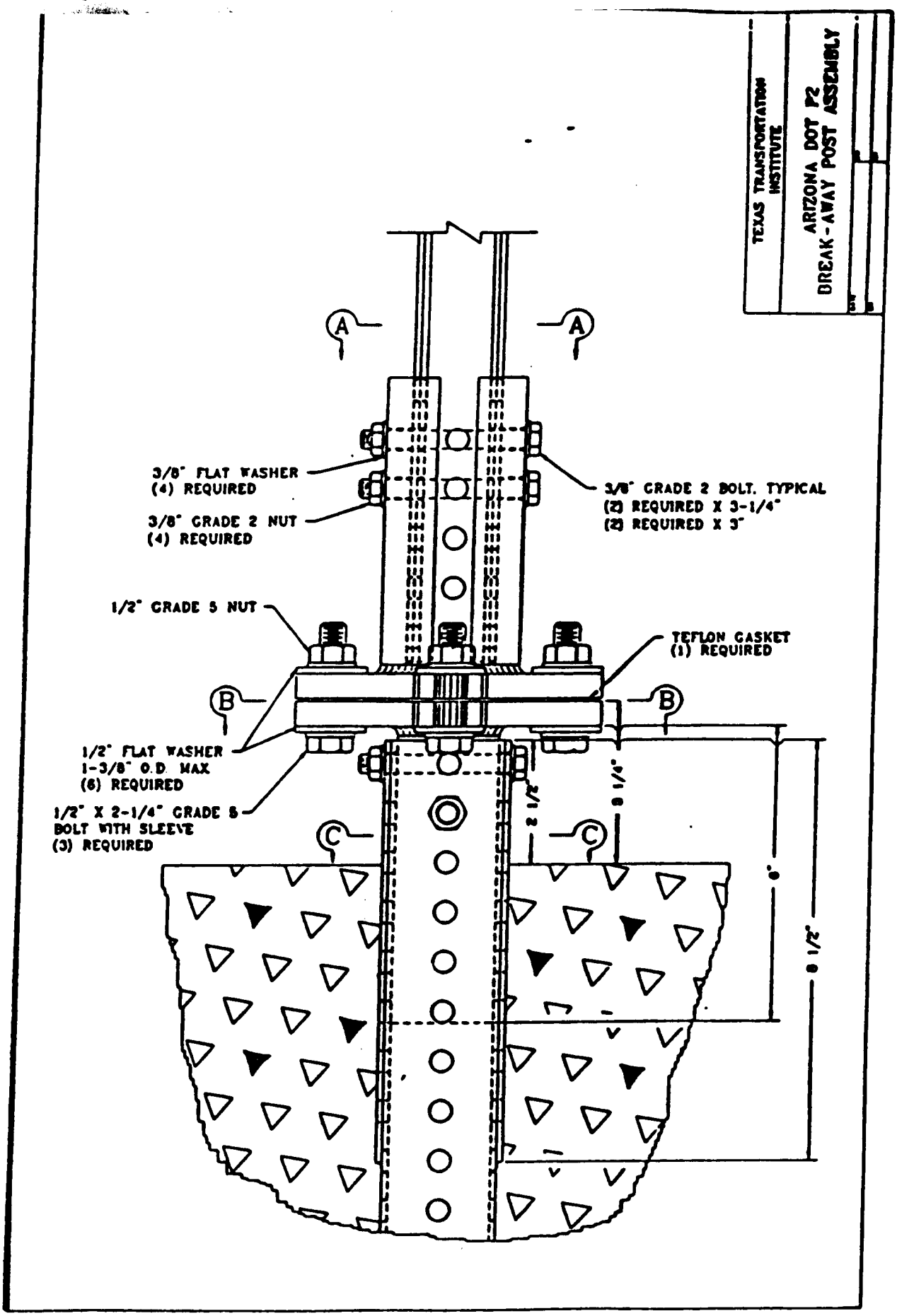


FIGURE 7.23A. *DETAILS OF SIGN INSTALLATION FOR TEST 7024-29 AND 7024-30*

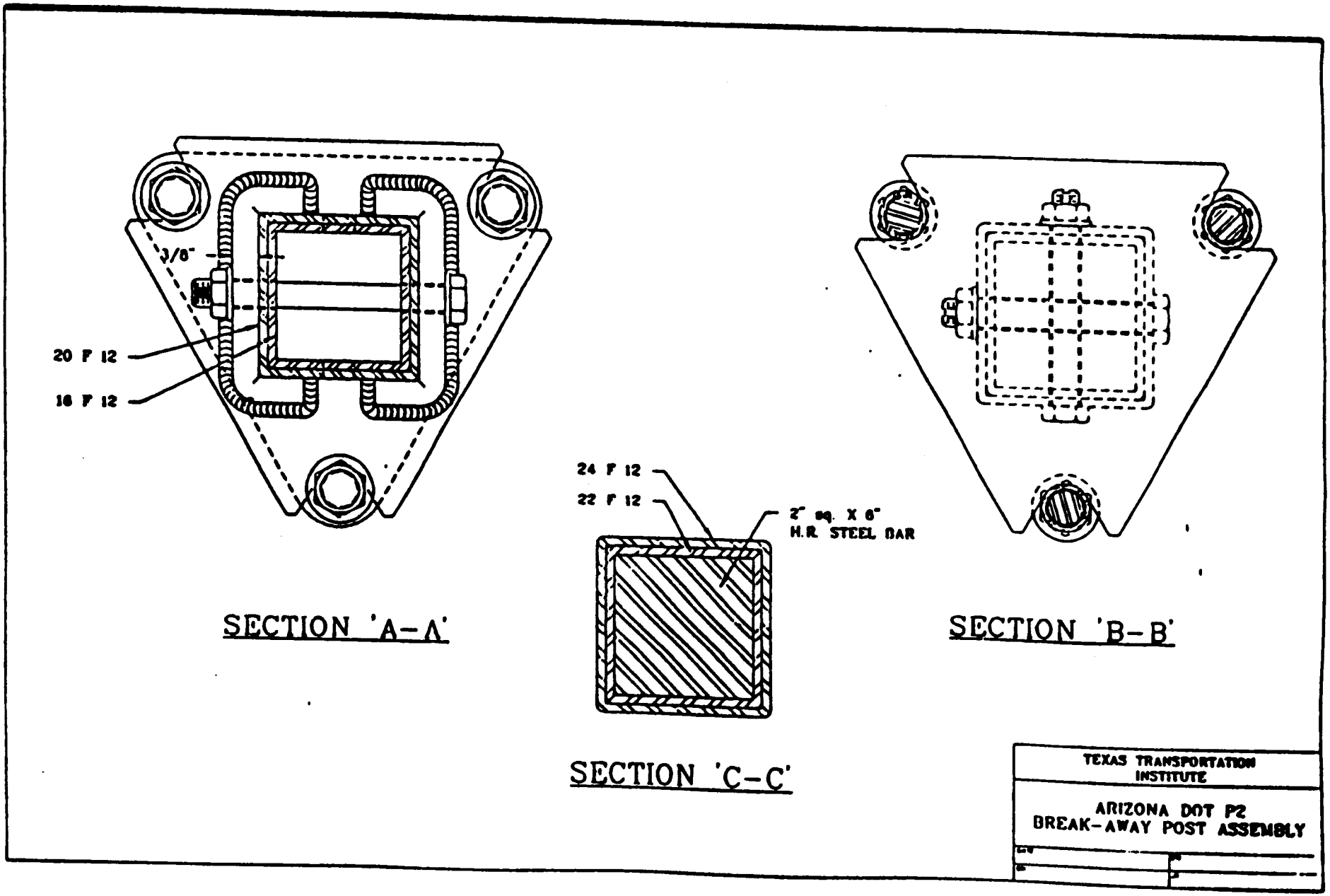
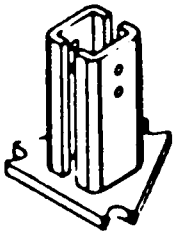


FIGURE 7.23B. *DETAILS OF SIGN INSTALLATION FOR TEST 7024-29 AND 7024-30*

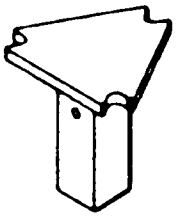
SLIP BASE ANCHOR

	Part Number	Finish	Post Size
Top Subassembly	TL 198-T1	HG	2"
	TL 198-T2	HG	2 ¼"
	TL 198-T3	HG	2 ½"



Note Sign post must fit inside subassembly anchor.

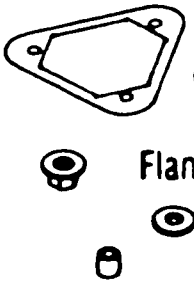
	Part Number	Finish	Post Anchor Size
Bottom Subassembly	TL 199-B1	HG	2"
	TL 199-B2	HG	2 ¼"
	TL 199-B3	HG	2 ½"
	TL 199-B4	HG	3"



Note Bottom assembly must fit inside ground anchor.

Each Slip Base Assembly Consists Of:

Description	Part Number	Finish	Number of Pieces
One Top Subassembly	(See Above)		
One Bottom Subassembly	(See Above)		
Retainer Gasket	TL 189		1 pc
Flange Head Bolt -½" x 2 ¼"	HHFB 0505250	EG	3 pcs
Flange Head Hex Nut-½"	HHFN 050	EG	3 pcs
Flat Washer-½"	HFLW 050	EG	6 pcs
Release Bushing	TL 168	SS	6 pcs

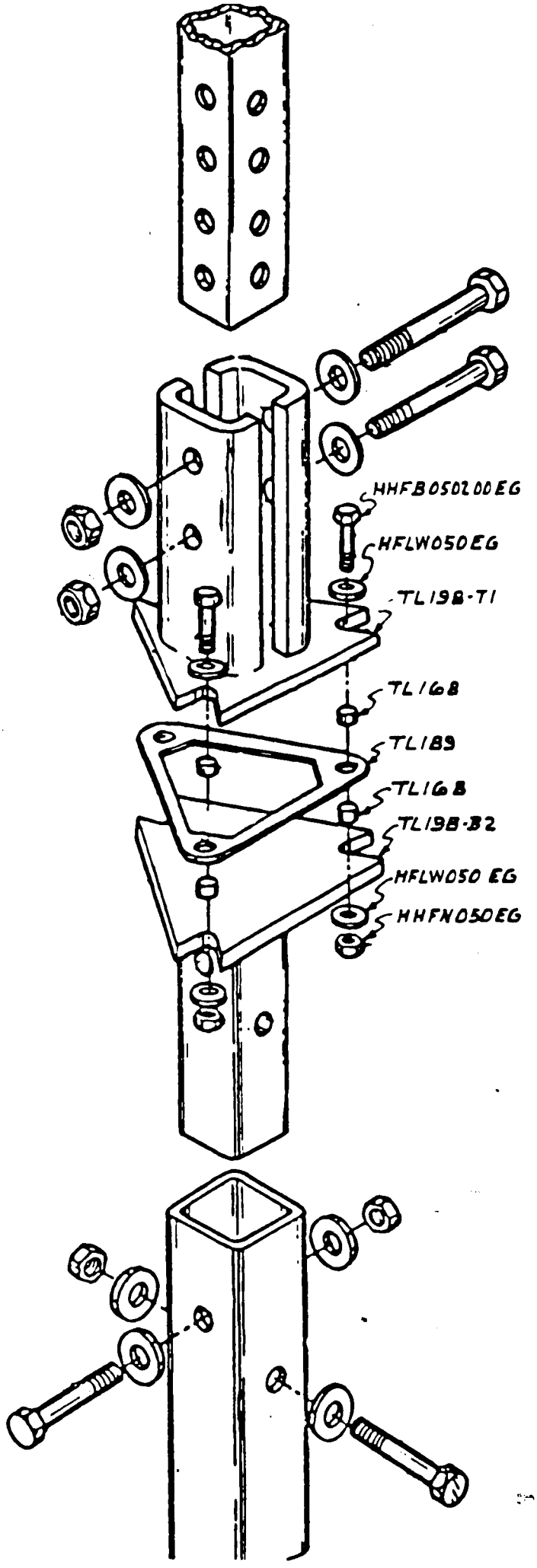


To order a complete Slip Base Assembly use the part number **TL 200**. In addition, indicate the top and bottom subassembly part numbers to complete your ordering process.

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

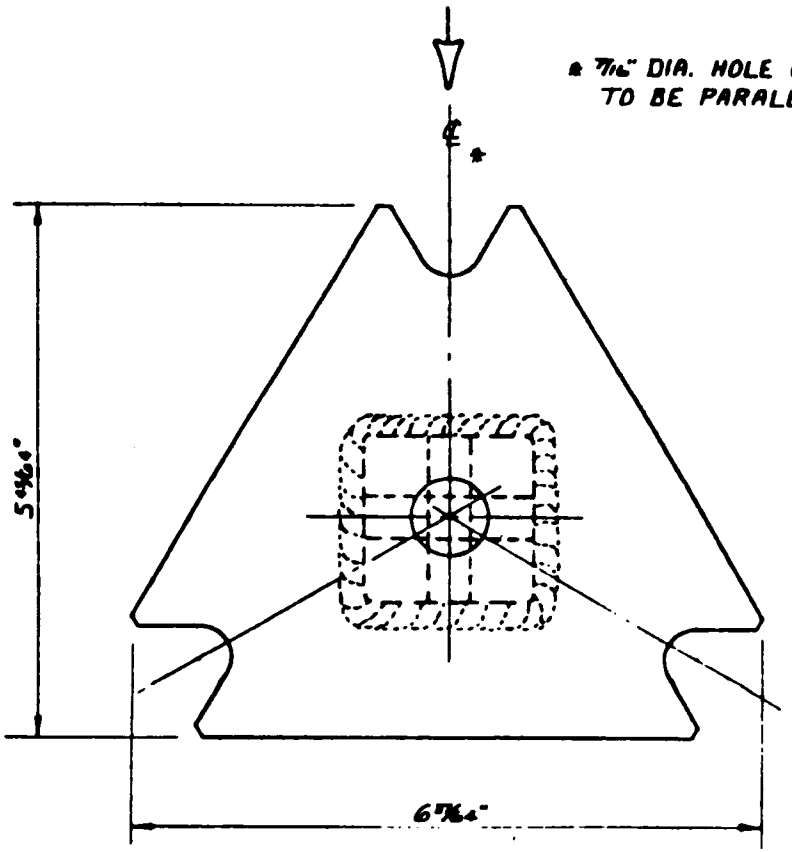
Part #: **TL 200-T1B3**

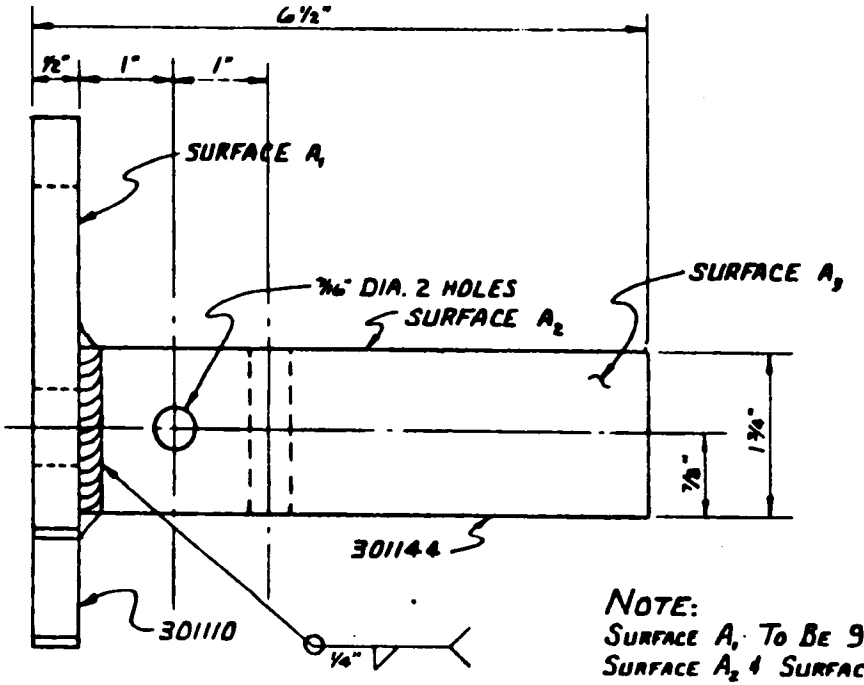
Note: When ordering separate components, please use the individual part numbers.


HHFB050200EG
HFLW050EG
TL198-T1
TL168
TL189
TL168
TL198-B2
HFLW050 EG
HHFN050EG

ITEM NO.	PART NO.	QUAN.	DESCRIPTION
1	301110	1	½" THK. TRIANGULAR B
2	301144	1	1¾"x1¾"x6" LG. BAR
3			
4			

FRONT WIND LOAD
& VEHICLE APPROACH





NOTE:
SURFACE A_1 TO BE 90° TO SURFACE A_2 & SURFACE A_3 WITHIN ±1°

WT. EA. = 8.740# STD. FIN. = FS-105 PROD. CODE = 1208

UNISTRUT CORP.
UNISTRUT METAL FRAMING
WAYNE, MICHIGAN

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

JOB NO.

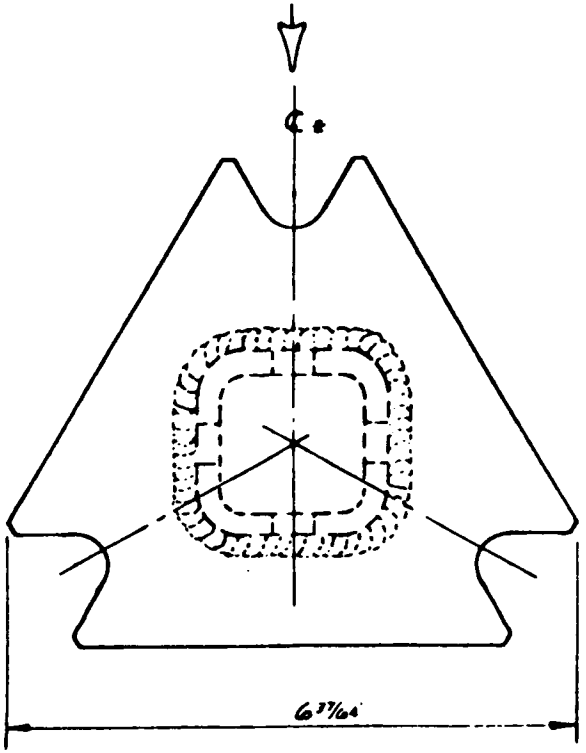
DRAWING NO.
TL-199-B1

SCALE ¾" SIZE DR. RBM CHD. DATE 4-12-90

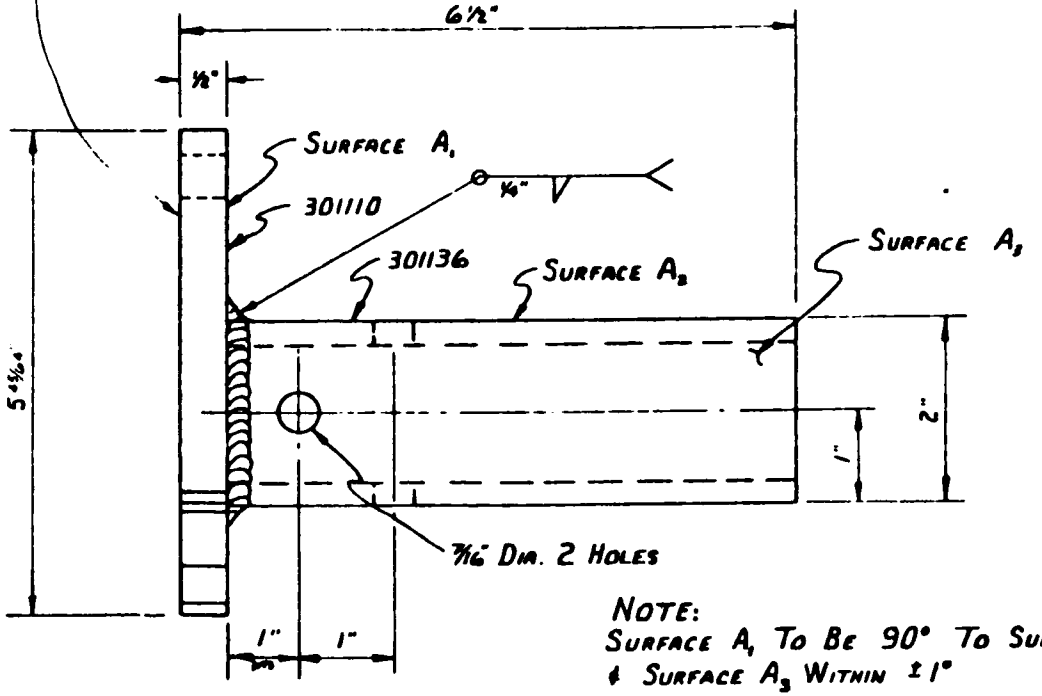
ITEM NO.	PART NO.	QUAN.	DESCRIPTION
1	301136	1	2"x2"x¼"x6"Lg Tube
2	301110	1	Triangular PL ½" Thick
3			
4			

* 7/16" Dia. Hole ℄ And PL ℄ To Be Parallel ± 1°

FRONT WIND LOAD AND VEHICLE APPROACH



① NOTE: When Hot Dip Galvanizing Part This Surface Must Be Wiped Clean. No Drips Allowed.



NOTE:
Surface A_1 To Be 90° To Surface A_2 & Surface A_3 Within ± 1°

NO.	DATE	DESCRIPTION
2	8-9-90 3784	ADDED "FOR 2¼" POST TO TITLE BLOCK
1	7-9-90 (3776)	ADDED NOTE

WT. EA. = 2.448# (4.286 #) STD. FIN. = FS-105 PROD. CODE 1208

UNISTRUT CORP.
UNISTRUT METAL FRAMING
WAYNE, MICHIGAN

TITLE: TELESPAR SHEAR BASE FITTING (BOTTOM) FOR 2¼" POST ② ANCHOR BASE

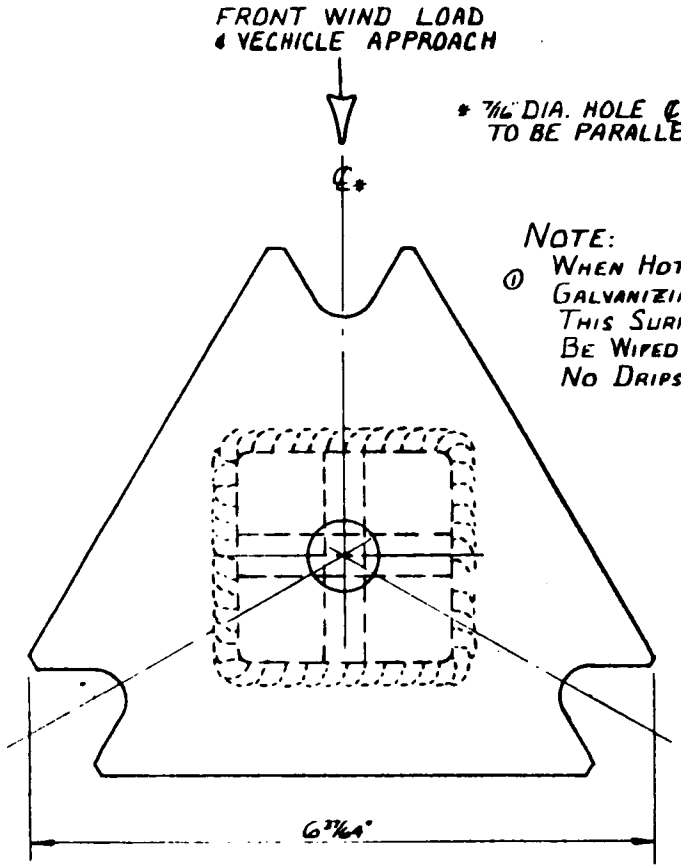
JOB NO.

DRAWING NO. TL-199 B2

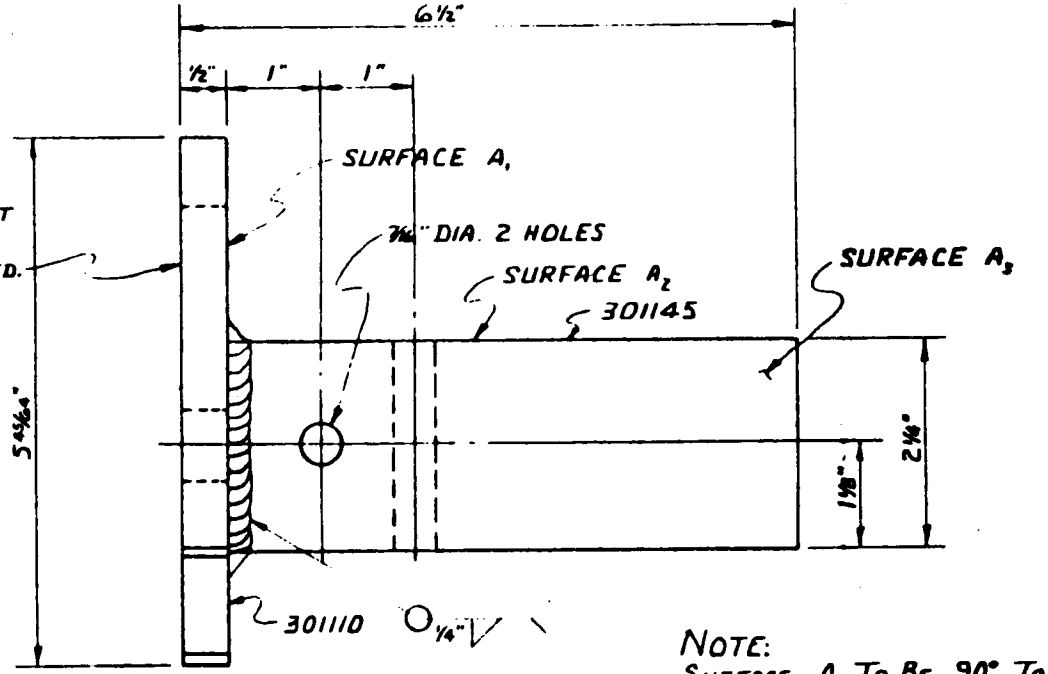
SCALE 3/4 SIZE OR. APP. CHD. TK DATE 4-10-90

R. CARROLL, INC. 1991/89

ITEM NO.	PART NO.	QUAN.	DESCRIPTION
1	301110	1	TRIANGULAR PL. ½" THK.
2	301145	1	2⅛" x 2⅛" x 6" LG. BAR
3			
4			



NOTE:
① WHEN HOT DIP GALVANIZING PART THIS SURFACE MUST BE WIPED CLEAN. NO DRIPS ALLOWED.



NOTE:
SURFACE A1 TO BE 90° TO SURFACE A2 & SURFACE A3 WITHIN ±1°

WT. EA. = 12.097# STD. FIN. = FS-105 PROD. CODE = 1208

NO.	DATE	DESCRIPTION
1	7-9-90 (3776)	ADDED NOTE

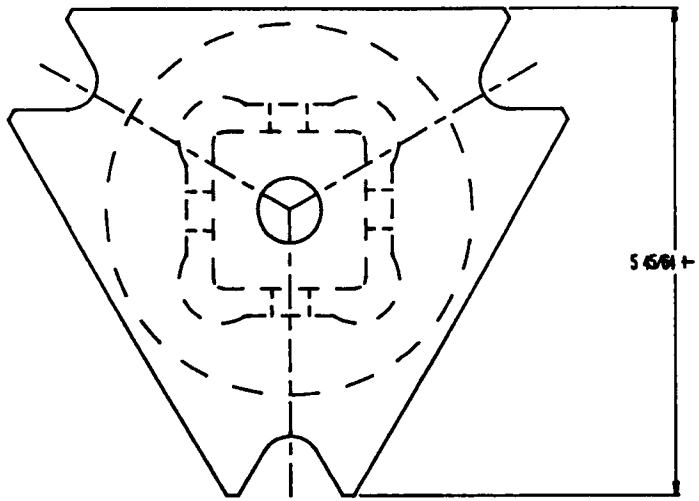
UNISTRUT CORP.
UNISTRUT METAL FRAMING
WAYNE, MICHIGAN

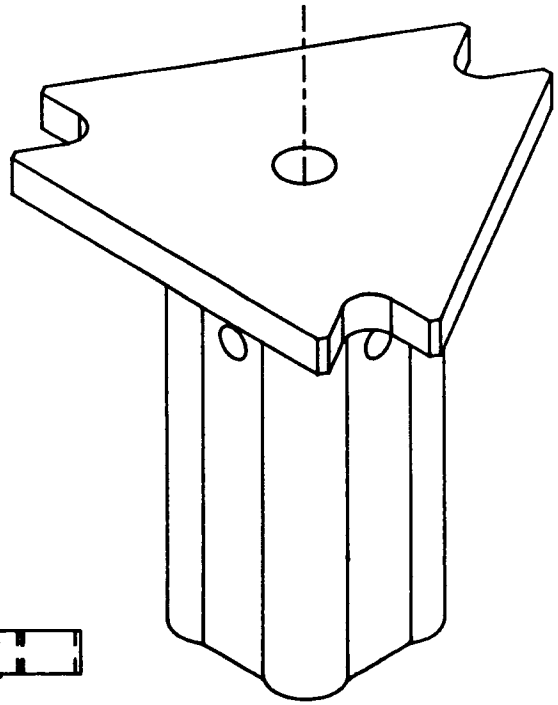
TITLE: TELESPAR SHEAR BASE FITTING (BOTTOM) FOR 2½" POST ANCHOR BASE

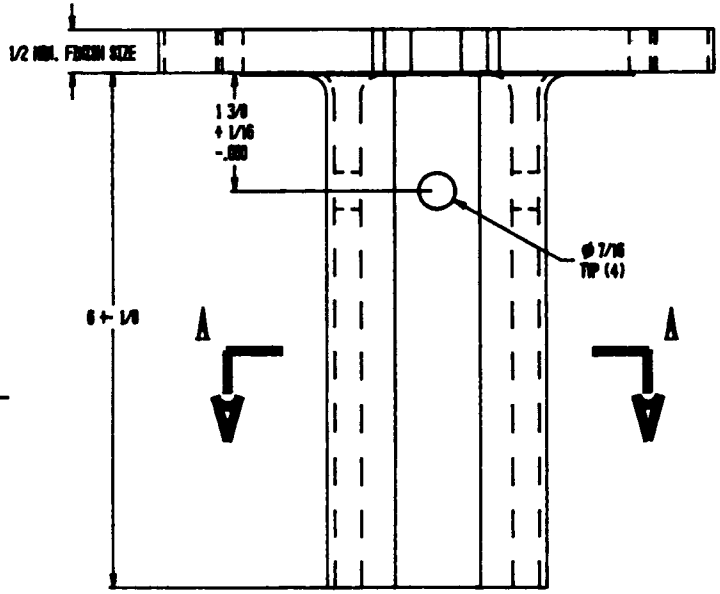
JOB NO.

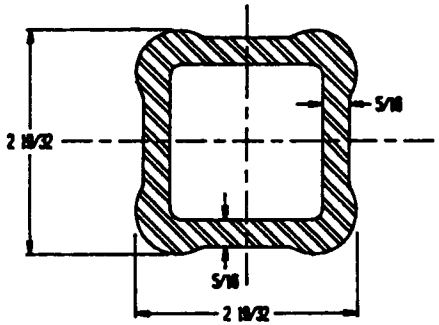
DRAWING NO. TL-199-B3

SCALE ¼" SIZE DR. RBR CHD. MJR DATE 4-12-90









SECTION A:A

MATERIAL

ASTM A-216 GRADE WCA OR DUCTILE IRON
TENSILE STRENGTH 60,000 PSI MIN.
YIELD STRENGTH 30,000 PSI MIN.
ELONGATION IN 2" 24% MIN.
REDUCTION OF AREA 35% MIN.

HOT DIP GALVANIZE AFTER 7/16 HOLES HAVE BEEN DRILLED.
TOP SURFACE TO BE VOPED SHOTBLAST AFTER HOT DIP GALVANIZE
GALVANIZING PER ASTM A-153

TOLERANCES UNLESS OTHERWISE NOTED
FRACTIONAL +- 1/64
DECIMAL +- .030
ANGULAR +- 1.5 DEGREES

REVISION	DATE

WESTERN DIVERSIFIED PRODUCTS CO.
35000 CLINTON ST.
WAYNE, MI. 48184
(313) 721-4040 FAX (313) 721-4106

TITLE: 30K12 ANCHOR POST BASE

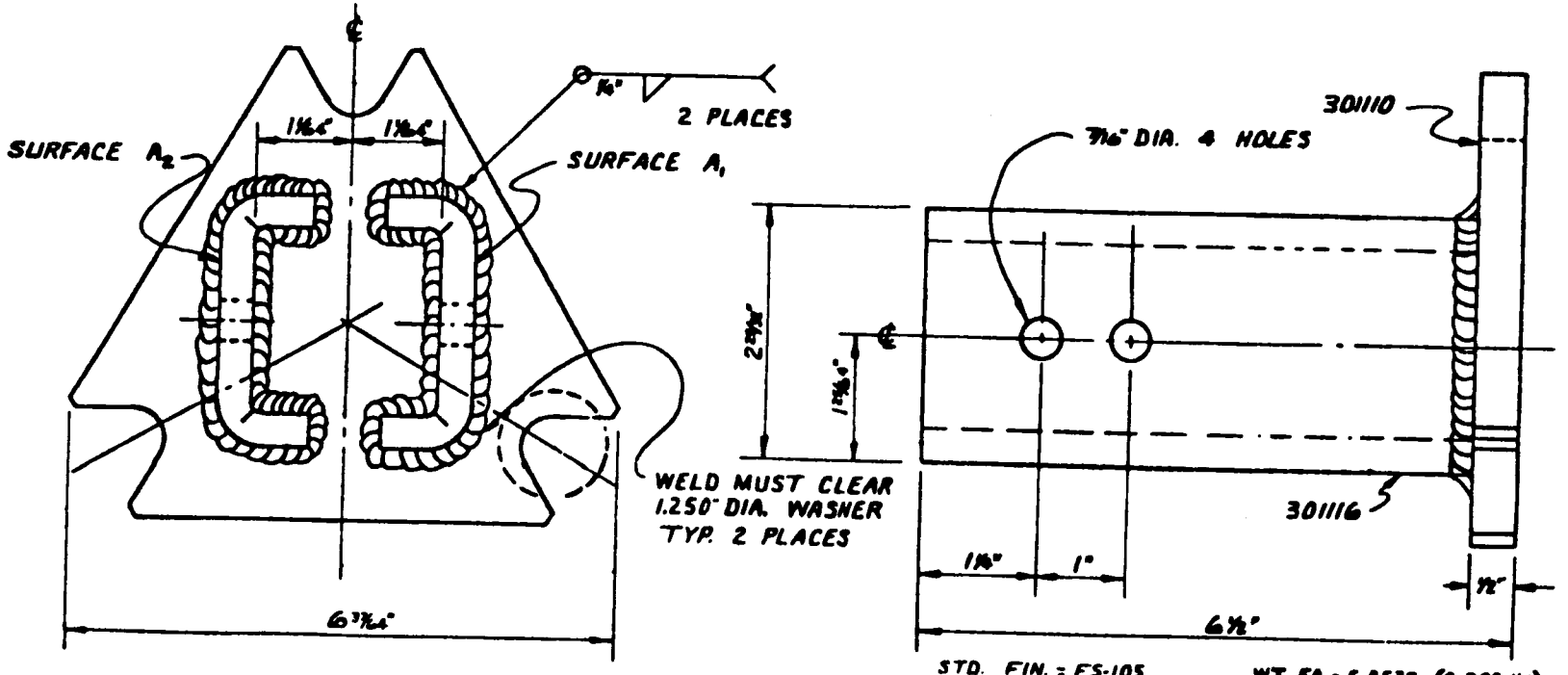
JOB NO. TL-199-84

DRAWN CSH DATE 11 8 90 CHECKED DATE 2-12-91 SHEET 1 OF 1

ITEM NO.	PART NO.	QUAN.	DESCRIPTION
1	301110	1	TRIANGULAR R. W. TNK.
2	301116	2	2 HOLE CLEVIS
3			
4			

FRONT WIND LOAD
4 VENICLE APPROACH

NOTE:
SURFACES A_1 & A_2 TO BE PARALLEL TO PLATE ℄ WITHIN ±1°



STD. FIN. = FS-105 WT. EA. ≈ 5.053# (2.291 Kg) PROD. CODE #1208

UNISTRUT CORP.
UNISTRUT METAL FRAMING
WAYNE, MICHIGAN

TITLE
TELESPAR SHEAR BASE FITTING
(TOP) 2" POST

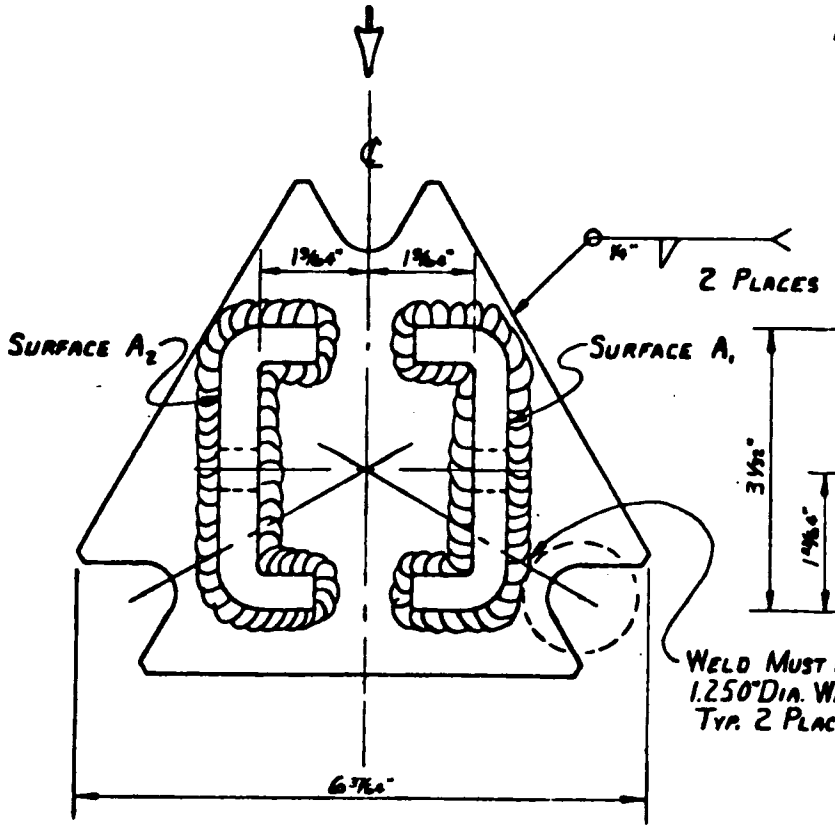
JOB NO.

DRAWING NO.
TL-198-T1

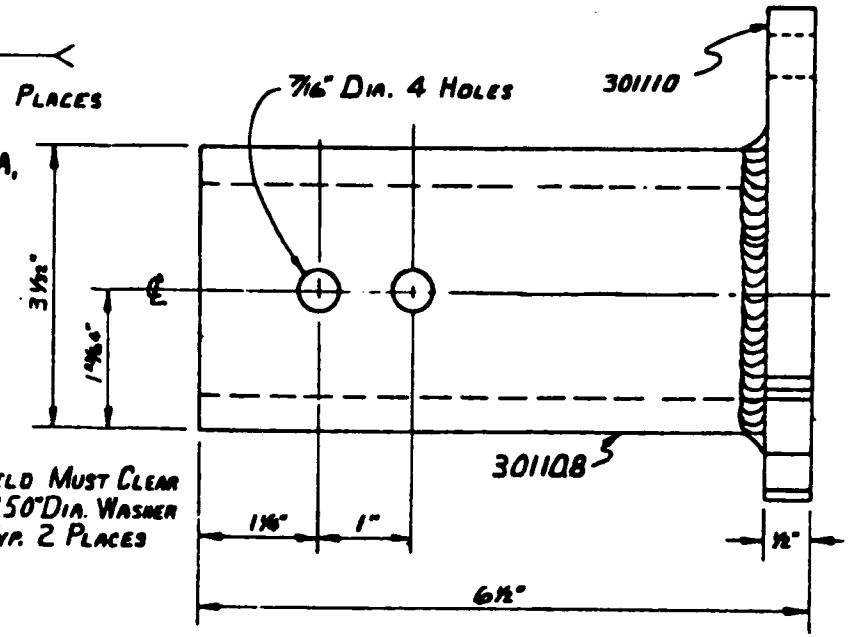
SCALE NONE

ITEM NO.	PART NO.	QUAN	DESCRIPTION
1	301108	2	2 HOLE CLEVIS
2	301110	1	TRIANGULAR PL ½" THICK
3			
4			

FRONT WIND LOAD & VEHICLE APPROACH



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



WT. EA. = 7.405# (3.359 kg) STD. FIN. = FS-105 PROD. CODE = 1208

UNISTRUT CORP.
UNISTRUT METAL FRAMING
WAYNE, MICHIGAN

TITLE
TELESPAR SHEAR BASE FITTING (TOP) 2¼" POST

JOB NO.

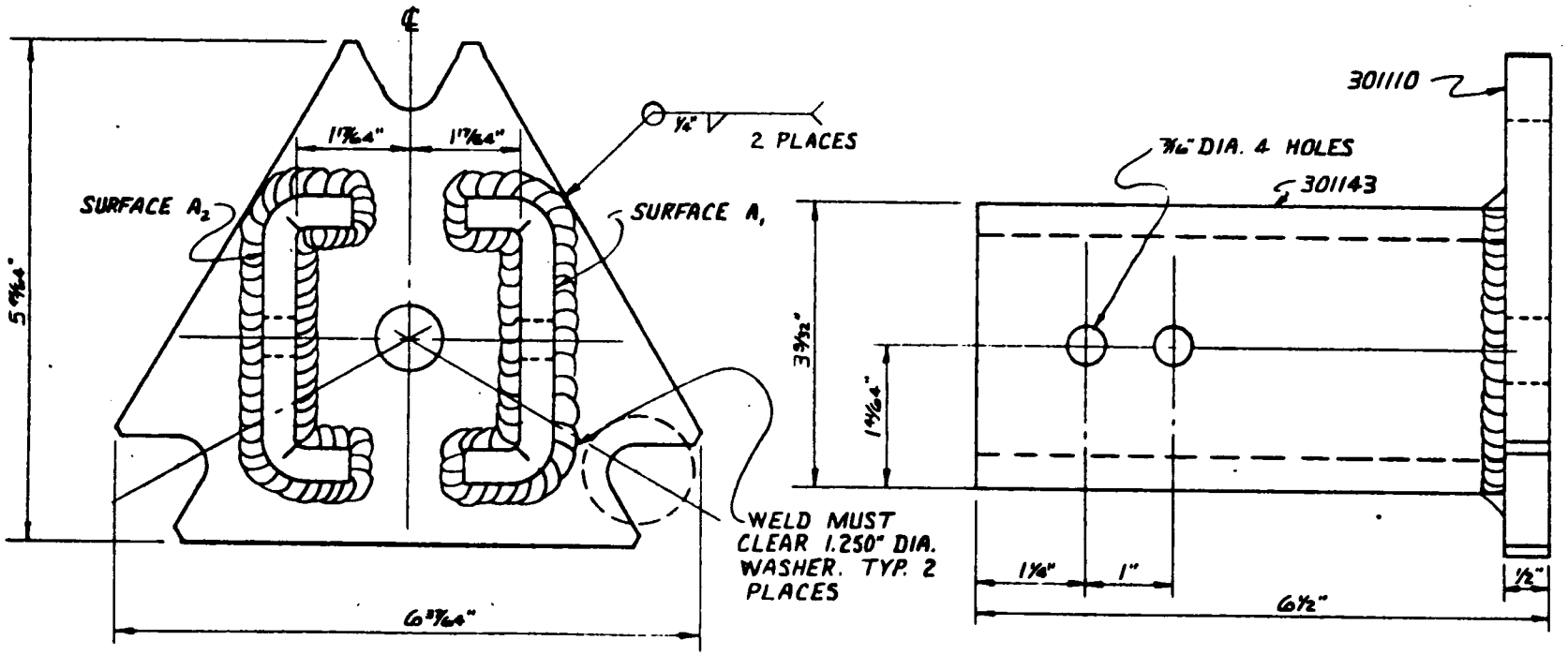
DRAWING NO.
TL-198-TZ

SCALE NONE DR. APP'D. CHD. DATE 4-10-90

ITEM NO.	PART NO	QUAN.	DESCRIPTION
1	301110	1	TRIANGULAR ½" THK. PL.
2	301143	2	2 HOLE CLEVIS
3			
4			

FRONT WIND LOAD & VEHICLE APPROACH

NOTE: SURFACES A_1 & A_2 TO BE PARALLEL TO PLATE ℄ WITHIN ±1°



STD. FIN. = FS-105 WT. EA. = 8.155# PROD. CODE = 120B

UNISTRUT CORP.
UNISTRUT METAL FRAMING
WAYNE, MICHIGAN

TITLE: TELESPAR SHEAR BASE FITTING (TOP) 2½" POST

JOB NO.

DRAWING NO. TL-198-T3

SCALE 3/4" SIZE DR. RBW CHD. DATE 4-11-90