



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

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

June 15, 1987

Refer to: HNG-14/SS-05

Regional Federal Highway Administrators
Direct Federal program Administrator

By notice of proposed rulemaking (NPRM) published November 11, 1986, the FHWA proposed to adopt for application on Federal-aid highway projects the AASHTO's revised "Standard Specification for Highway Signs, Luminaires and Traffic Signals, 1985." The comment period on the NPRM closed on May 11.

It is expected that a final rule will be issued to adopt all of the 1985 AASHTO specification except for Section 7, Breakaway Supports. Any decisions on Section 7 will be delayed until completion and analysis of the on-going crash testing program of existing luminaire hardware at FHWA's Federal Outdoor Impact Laboratory (FOIL). When done, the results will be published in the Federal Register and additional time will be provided for public comment. A final rule on Section 7 would not be issued until after that time.

In the interim, FHWA's requirements for breakaway sign and luminaire supports on Federal-aid projects will remain to be those found in Section 7 of the previously FHWA adopted 1975 AASHTO Specification for Sign and Luminaire Supports. However, a State has the option to begin applying on Federal-aid highway projects the more stringent 1985 AASHTO specification if it so chooses.

The FHWA's capability testing of several luminaire support systems should be completed by mid-1987. However, several significant additions/modifications to the FOIL testing facilities are necessary before we will be in a position to begin testing direct-burial sign supports or multiple breakaway sign supports for larger signs. We are now investigating possible additions/modifications to the testing facility and are hopeful they will be implemented in about a year.

In the meantime, we have received several inquiries seeking information on sign support systems which may have already been tested in accordance with the 1985 AASHTO specification. Based on a review of our files and other information provided to us, we have assembled the attached listing of sign support systems which have been crash tested with an 1,800-pound vehicle and have satisfied the breakaway requirements of the 1985 AASHTO specification.

When using the attached listing, careful attention should be paid to the descriptions of the tested systems and the soil conditions used. Demonstration of satisfactory breakaway performance is limited to the system tested and soil conditions noted. We have encouraged testing several of the sign support systems in both strong (S-1) and weak (S-2) soils as defined in NCHRP 230.

However, in many cases the support was tested in only the strong soil. When this occurs, the crash test then only demonstrates satisfactory breakaway performance if the support is placed in a strong soil.

The attached listing is not intended to be all inclusive. If you are aware of additional sign support systems that have been tested by a State or others in accordance with the new AASHTO requirements, we would appreciate being advised of the test results. As additional information is provided to us, we anticipate that the attached listing will be updated.

For sign support systems of comparable design to ones for which crash test data are available (as shown on the attached listing) and having support post sizes and/or weight equal to or less than the crash tested system, it is our opinion that these sign support systems can be accepted as having satisfied the breakaway requirements of the 1985 AASHTO specification subject to the same limitations as the crash tested system.

Additional information you have available or questions you have on this subject should be directed to Jim Overton (FTS 366-1331) of my staff.

Sincerely yours,

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

Attachment

Sign Support Systems

Compliance with 1985 AASHTO Specification

June 1987

The following listing covers sign support systems which have been crash tested and meet the breakaway performance requirements of the AASHTO's "Standard Specifications for Highway Signs, Luminaires and Traffic Signals, 1985." The listing is based on information available to Federal Highway Administration's (FHWA) Office of Engineering as of the date assembled and is not intended to be all inclusive. Updates are planned as additional information becomes available.

When using this listing careful attention should be paid to the description of the tested system and the soil conditions used. Demonstration of satisfactory performance is limited to the system tested for the soil conditions noted.

The FHWA does not endorse any specific product or system listed herein. Rather this listing is presented for informational purposes to show systems crash tested in accordance with the test parameters in the new 1985 AASHTO specification.

Sign Support System	Test	Test Car Weight	Impact Speed (mph)	Change in Velocity (fps)	Stub Height	Comments
1. Perforated Square Steel Tube (single support)	TTI 7024-3 (5/85 – Ariz. DOT	1770#	20.0	3.5	OK	Tested in strong soil (S-1) only
(See attached Ariz. DOT Dr. 4-s-4.16 – Fig. 1)	TTI 7024-4 (5/85 – Ariz. DOT	1770#	56.8	8.5	OK	Reference: Ariz. DOT Research project HPR-RL-1 (31).
2. Single 3 lb. High Carbon Billet Steel U-Post.	TTUI 7024-8 (11/84 0 Ariz. DOT	1800#	19.9	6.0	OK	Tested in strong soil (S-1) only. Reference: Same as Item 1 above.
(See attached Figure 2)	TTI 7024-7 (11/84 – Ariz. DOT	1800#	60.5	3.1	OK	Also see Note No. 1 below.
3. Dual 3 lb. High Carbon Bilet Steel U-Post. 3'-7' post spacing – both posts hit	TTI 7024-22 (9/85 – Ariz.	1833#	20.0	9.4	OK	Tested in strong soil (S-1) only. Reference: Same as Item 1 above.

(See attached Figure 3)	DOT TTI 7024-23 (9/85 – Ariz. DOT)	1833#	62.8	11.7	OK	Also see Note No. 1 below.
4. Arizona Dual Legged Slip Base S4x7.7 (hinge at midheight of panel). One post hit. (See attached Ariz. DOT DR. 4-s-4.01 & 4-s-4.05 as modified – Fig. 4 & 4A)	TTI 7024-1 (11/84 – Ariz. DOT)	1820#	19.6	5.0	---	Reference: Same as Item 1 above.
	TTI 7024-2 (11/84 – Ariz. DOT)	1820#	59.3	3.0	---	Also see Note No. 2 below.
5. Dual Legged Slip Base – 12WF45 12' x 24' sign panel One Post hit. (See attached Figure 5)	ENSCO 1147-1010 (6/79)	1617#	20.6	9.9 (See Note No. 3)	---	Reference Rept No. FHWA-RD-79-140.
	ENSCO 1147-1009 (6/79)	1516#	61.0	8.8	---	Utilized Texas Type slip base with 1' dia. Bolts tightened to 5000 lb and a slotted fuse plate at the joint. (See Note No. 4)
6. Minute Man breakaway device for use with steel flanged channel sign supports	Reference Mr. Staron's 1/29/87 letter to Minute Man Anchors, Inc.					
7. QWIK-PUNCH tube system	Reference Mr. Staron's 10/3/86 letter to Allied Tube and Conduit Corp.					
8. MICRO=LAM laminated veneer lumber breakaway sign post	Reference Mr. Staron's 8/19/96 letter to Trus Joist Corp.					
9. POZ-LOC anchor system	Reference Mr. Van Ness 7/14/86 and 5/13/86 letters to Southwestern Pipe, Inc.					

Note No. 1 – The tested U-post supports included splices with the upper lap going approximately 5 feet above ground. The spliced supports appear to perform satisfactorily in these tests. However, we are concerned that environmental effects over time could cause the fasteners in the splice to weaken allowing the splice to open under impact. Because of this we have recommended that a splice should not extend more than 24 inches above the ground and that the ground portion of the splice should be in front of the upper post.

Note No. 2 – The tested dual legged support system included inclined slip bases. For multiple legged supports with hinges, we have suggested use of horizontal slip bases.

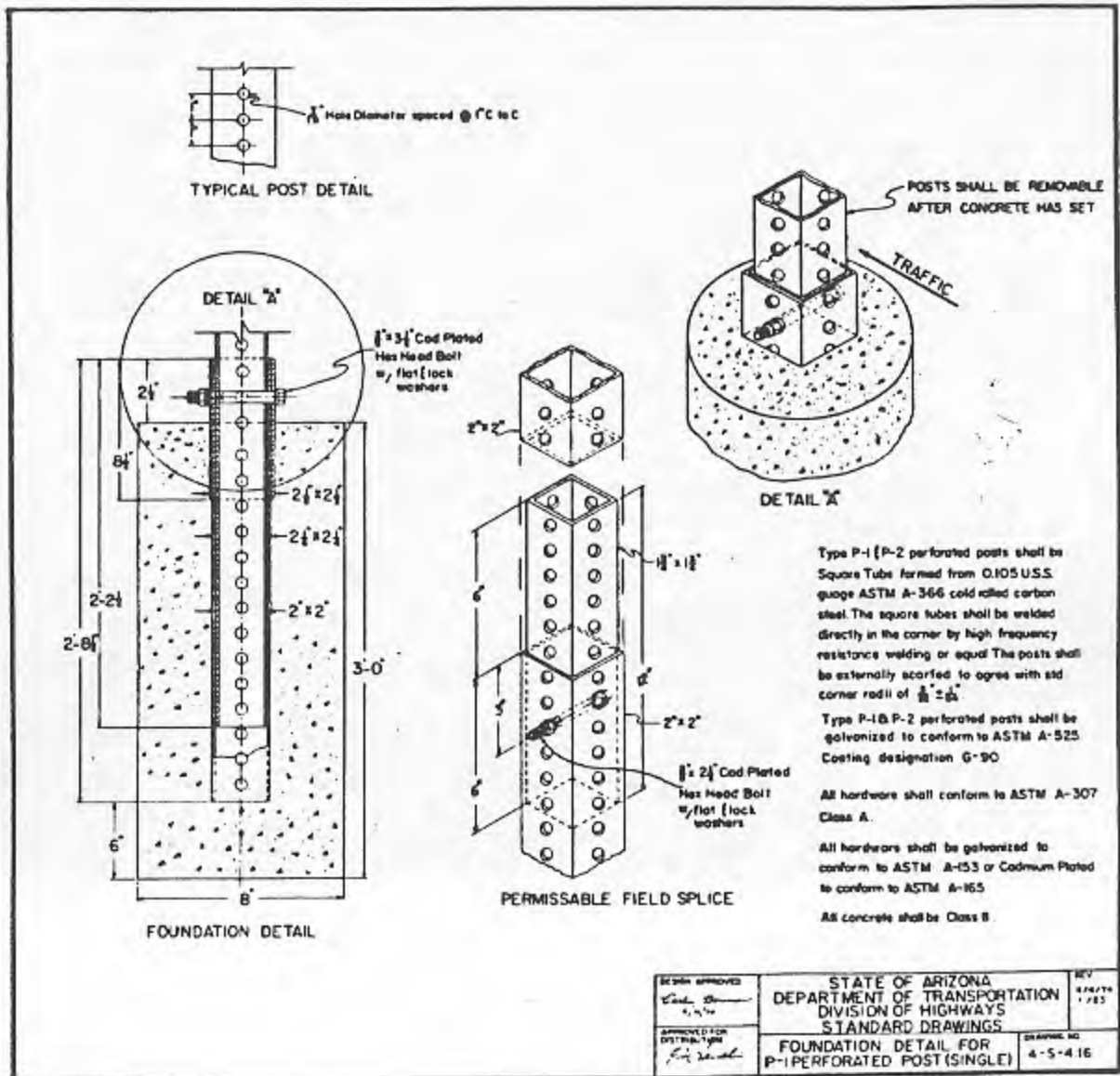
Note No. 3 – Performance of this system during the 20 mph test was considered marginal as the hinge failed to activate and the entire support leg ended resting on top of the vehicle, causing deformation on the roof. The 20-foot long support leg weighed approximately 800 lbs. We would suggest this is the maximum weight of a support leg to be used in these circumstances and recommend use of lesser weights to improve performance.

Note No. 4 – The current recommended torque values for slip base bolt sizes are:

Post Size (lb./ft)	Slip Base Bolt Diameter (inches)	Suggested Clamping Force (lb.)	Slip Base Torque (lb. –in.)
0.8	½	920-1380	95-142
9-20	5/8	1740-2660	226-345
21-30	¾	2400-3600	369-554
30+	1	2400-3600	490-735

For fuse plate connections we recommend use of standard high strength bolting practices. The fuse plate connection should be designed so that it is adequate for anticipated wind load.

Further information on the above listed items is attached.



This figure shows the details of the system tested. A 2-foot wide by 2½-foot high by 5/8 in. thick plywood panel was mounted on the 2-inch square steel sign post. The lower edge of the panel was approximately 5 feet above ground.

FIGURE 1. Square Steel Tube, Single Post

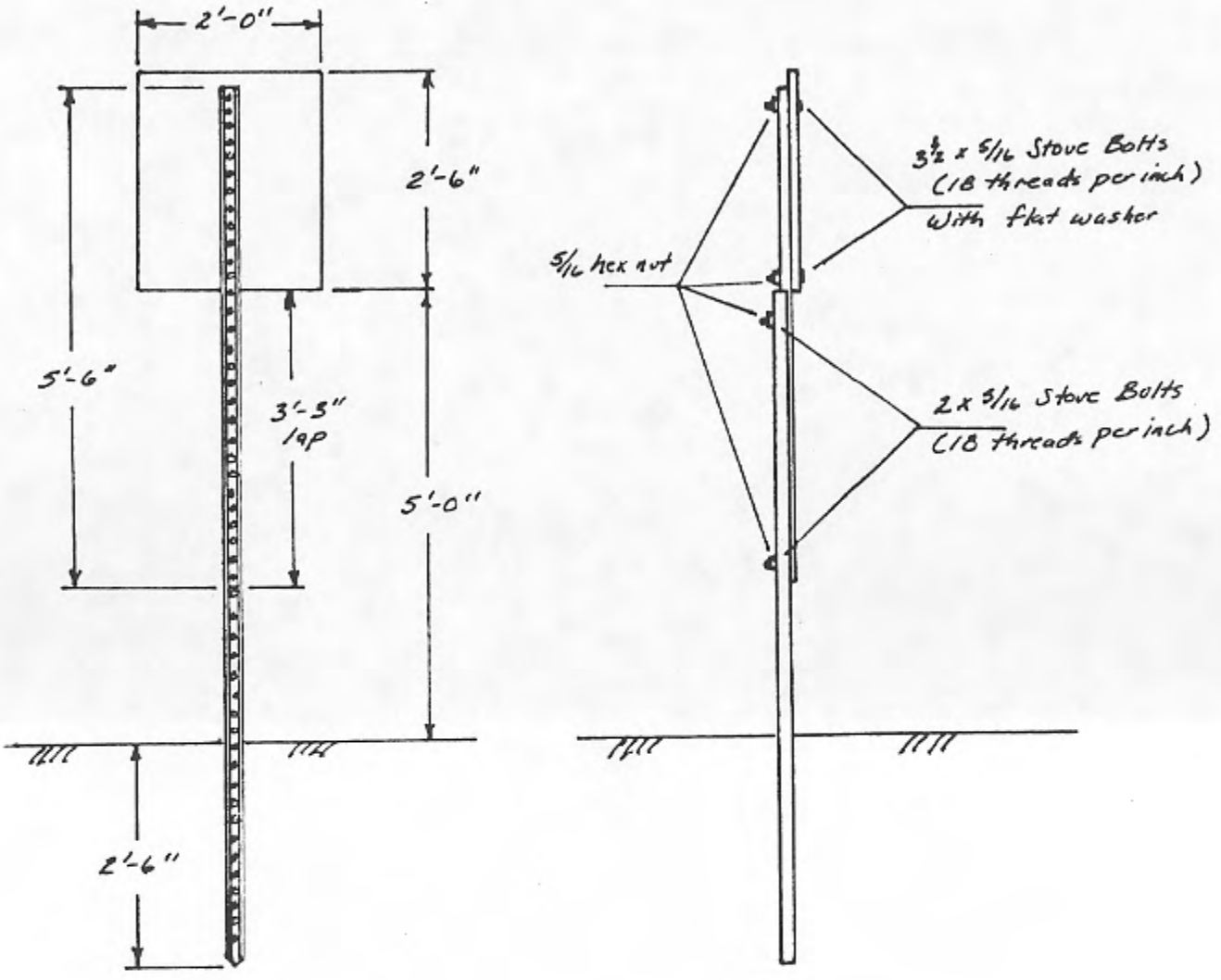


FIGURE 2. Steel U-Post, Single Support

Arizona Dual Legged Slip Base

Details of the tested system are shown in Figures 4 and 4A (see following two sheets) with exceptions noted below.

An 8-foot wide by 5-foot high extruded aluminum panel was mounted on the two S4 x 7.7 posts, with the lower edge of the panel approximately 7 feet above ground. Attachment was with six post clamps and lock nuts per post, all of which were above the hinge. The posts were spaced 5 feet apart.

It is noted that the hinge was placed at the midpoint of the panel as shown on Figure 4, not as shown on Figure 4A. It is also noted that the hinge details differed from those shown on Figure 4A. For the installation tested, the signpost was not cut completely in two as shown. Instead, the flange adjacent to the sign panel and the web was cut but the back flange was not cut. The “friction fuse plate” was installed as shown but there was no need for the “back plate”.

Dual Legged Slip Base (Texas Type Design)

The general features of the system tested are shown in Figure 5 (following).

The sign blank was 12 ft. high by 24 ft. wide, made from 5/8 in. plywood. The blank had 4 aluminum windbeams, the top one being 3Z2.33 and the others being special T-beam. The top windbeam was fastened to each leg with two 1/2 in. diameter bolts. The T-beams were fastened to the leg with cast aluminum clips and 3/8 in. diameter aluminum bolts. The distance from the bottom of the sign to the ground was 8.5 ft.

The legs were fabricated from 12WF45 steel beam. They were spaced at a 15 ft. span and incorporated a Texas type slip base. One-inch diameter slip base bolts tightened to 5,000 lb were used.

The legs included an upper hinge design where the support leg was cut clean through and a back hinge plate and a slotted front hinge plate were used. The front hinge plate was secured with 3/4 in. diameter bolts tightened to 28,000 lb.

(continued)

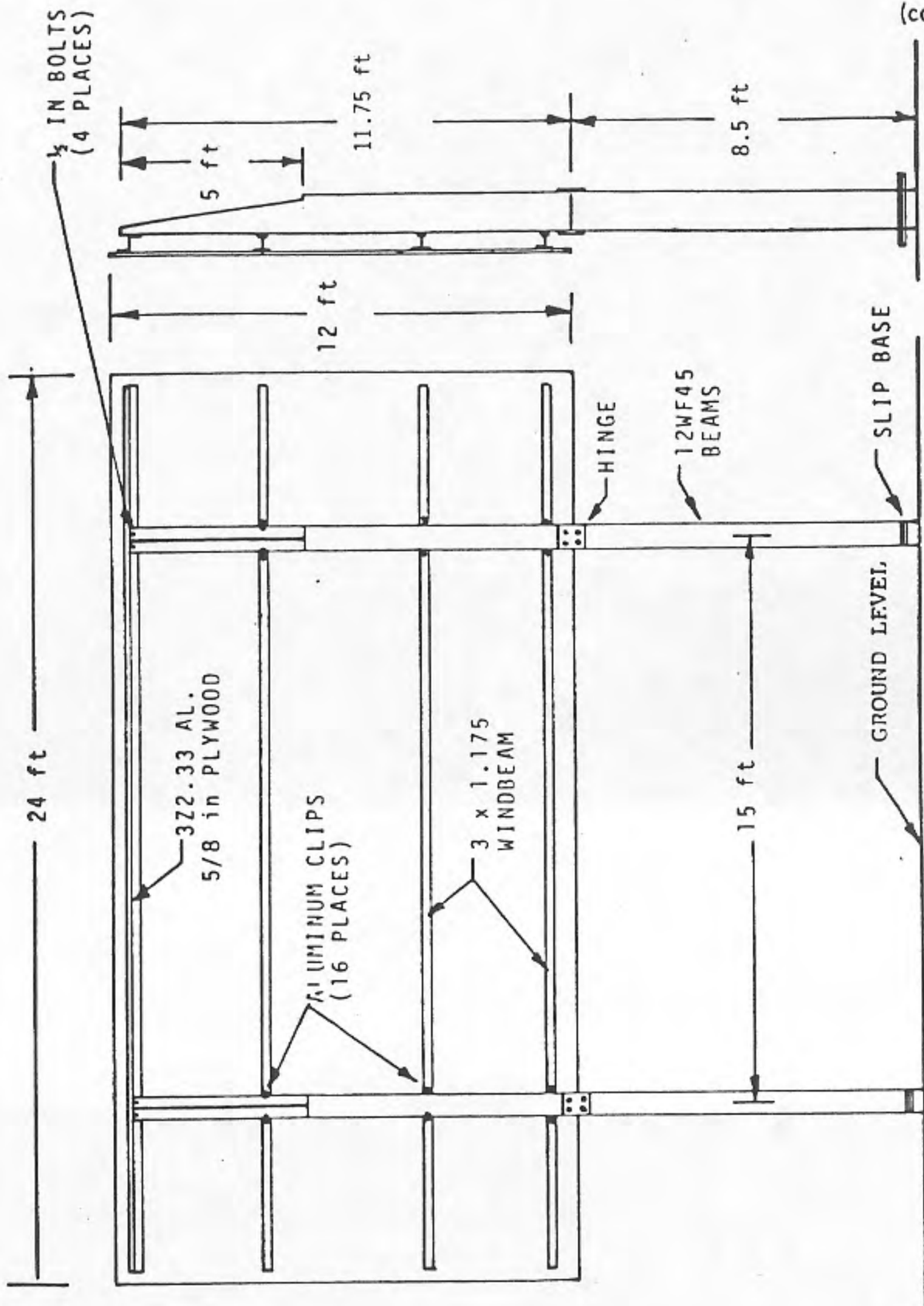


FIGURE 5. Dual Legged Slip Base (Texas Type Design)