LS-30

U.S. Department of Transportation
Federal Highway Administration

Memorandum

t: ACTION: Breakaway Design for the Modification of Timber Utility Poles, Operational Classification

Date: JAN 27 1993

Reply to Attn. of: HNG-12 HNG-14

): Director, Office of Engineering

): Regional Federal Highway Administrators
Federal Lands Highway Program Administrator

The Federal Highway Administration (FHWA) sponsored research during the early 1980's to develop an economical breakaway timber utility pole that would increase the safety of passengers in impacting vehicles and satisfy design criteria of the utility industry. The resulting design, called the Hawkins Breakaway System (HBS), was successfully crash tested at the Texas Transportation Institute and, by 1986, was deemed ready for selective implementation. Information about the development and testing of the HBS and recommendations for its use are contained in FHWA Research Report Number FHWA/RD-86/154, "Safer Timber Utility Poles: Volume 1 - Summary Report," September 1986.

The FHWA provided funds in recent years for "experimental" installations of the HBS in Kentucky and Massachusetts. The recommended design provided some flexibility in determining appropriate materials and dimensions, and both States took advantage of this flexibility to adapt to unique needs. For example, Kentucky retrofitted 35-foot to 45-foot Class 3 (heavier) timber poles in lieu of the recommended 40-foot Class 4 poles; and Massachusetts installed some new 35-foot poles, used all-thread bolts with sleeves instead of lag screws to secure the hinge straps, and used existing telephone cables (double dead-ended) in lieu of installing upper support cables. Typical specifications and plans for the HBS as used in Massachusetts are attached. Three other States--Virginia, Washington, and Texas--are presently developing projects to use breakaway timber utility poles.

Evaluations of the experimental breakaway timber utility pole installations in Kentucky and Massachusetts have been underway for more than 2 years. Poles in both States have been subjected to adverse environmental conditions (wind, snow, ice) and several in Massachusetts have been impacted by errant vehicles. In all cases the poles have performed well. Consequently, the HBS breakaway design for the modification of timber utility poles is now being placed in an "operational" category for use on Federal-aid highway projects.

Operational, relative to the HBS, means the breakaway device has performed satisfactorily in full-scale crash tests and has demonstrated satisfactory in-service performance. It may now be used routinely on all Federal-aid highway projects. Even though the FHWA now considers the HBS

to be operational, the final decision on whether it should be deployed as experimental or operational should be made by the States. Regardless of how a State chooses to deploy it, in-service evaluations remain important. We urge that all new installations receive some form of continued monitoring. This will allow the FHWA to obtain further operational information on the practical aspects of construction, maintenance, and most importantly, performance under field conditions.

Making the HBS design operational does not mean that use of the device is mandated by the FHWA. Rather, this breakaway device now becomes an additional countermeasure available to a State as it considers what actions to take in addressing utility pole safety. Further, there are limitations regarding use of this breakaway device. It should not be used on poles heavier than Class 3 poles. Also, a clear recovery area must be available behind any utility pole that is modified with breakaway hardware so the device has room to perform properly. In addition, use of a breakaway design may not be appropriate where an impacted pole might adversely effect pedestrians or nearby buildings or where fallen wires could interfere with traffic. On the other hand, the field installations have demonstrated that the device will perform satisfactorily in non-tangent roadway sections.

Three FHWA offices have been working together to develop promotional and technology transfer materials. A final evaluation report on the Massachusetts installations has been prepared by a consultant and will soon be distributed to the field by the Office of Technology Applications (HTA-31). A slide presentation on the Massachusetts installations/ accident experience has been developed by the Office of Highway Safety (HHS-11) and may be obtained from them. An evaluation report on the Kentucky installations is available from the Office of Engineering (HNG-12).

The Office of Engineering (HNG-12, HNG-14) will continue to evaluate the design details, specifications, and crash test results for proposed new breakaway utility pole designs, and to establish their acceptability for use on Federal-aid highway projects.

Thomas O. Willett

Federal Highway Administration
HNG-12:CPScott/JMOverton:cad:60450:1-4-93
cc:
HNG-1 HNG-10 HNG-12
Official File, 3132 Reader File, 3212
Reader File, 3206 Reader File, 3132
Pending

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File: 150.06

RECOMMENDED
SPECIAL PROVISIONS, MATERIAL SPECIFICATIONS, AND PLANS
FOR
BREAKAWAY TIMBER UTILITY POLES

Based upon the Special Provisions, Material Specifications, and Plans used in Massachusetts for the fabrication, assembly, and delivery of 20 composite slip base utility pole systems.

Federal Highway Administration
Office of Engineering
Federal-Aid Program Branch (HNG-12)

December 1992

SPECIAL PROVISIONS

Description Of Work

Work to be performed under the fabrication contract shall consist of and be limited to the fabrication, complete assembly by the fabricator, and delivery to the designated delivery locations of twenty (20)compoeite slip base utility pole systems, complete with all required hardware, in accordance with the attached plans and material specifications. In addition, certain system components, to be utilized as replacement parts, shall be furnished in the quantities hereinafter specified.

Each individual system shall consist of an industry standard pressure treated, 35 ft., Class 4, wooden utility pole, squarely cut at dimensions 6 ft. - 6 in. and 21 ft. - 0 in. from the butt end base. The resultant pole sections shall be securely fitted, at the designated locations, with an upper and lower slip base device, intermediate hinge connector assembly, and overhead guy wire connector in compliance with the following assembly specifications. Pole sections shall be placed and centered within the slip base devices. Vertical alignment shall be accomplished by adjusting the 3 alignment bolts provided on the slip base devices. Approximately, equal distances, not less than 3/4 in. shall remain between the slip base tubing and the pole section at the bolt points of application. A poleset compound of a compressive strength of approximately 1,000 psi or that equal to the pole in a plane perpendicular to the grain, shall be used to completely fill the remaining voids and insure a permanent bond and a water tight top seal. Such a compound shall be allowed to properly cure and attain an acceptable working stress prior to any movement of the assemblies. After the curing process has been completed, the exterior portions of the adjustment bolts shall be carefully cut flush with the outer face of the slip base devices, to provide a smooth surface. Required holes shall be drilled in the pole sections at the locations indicated on the plans. The pipe sleeves shall be tapped through the drill holes and cut flush with the exterior faces of the poles. The pole bands shall be tightened to a torque of 100 ft.-lbs. Guy wire connectors shall be attached to the upper pole sections of each individual system. The furnishing of guy wire, for these connectors, will not be required under this Contract.

Each composite system shall be delivered completely assembled to the designated delivery areas hereinafter designated. Extreme caution shall be exercised by all parties in the loading, transport, and unloading of the composite systems to insure that

no damage is incurred during the delivery process. In addition to the 20 assembled composite systems, the furnishing of the following component replacement parts shall be required under this Contract:

40 - Steel strap assemblies
40 - No. A325 slip base bolts with washers and nuts
10 - 26 gauge keeper plates
20 - 1 in. through bolts with washers and nuts
10 - 1/4 in. pipe sleeves

Wooden poles shall be initially and completely pressure treated with a Pentachlorophenol solution in accordance with industry standards and methods. After cutting and altering, any resultant exposed surface shall receive an application of the same solution. All fabricated metal components and assembly methods shall conform to the current edition of A.I.S.C. "Manual of Steel Construction." Welding materials and processes shall conform to the Structural Welding Code - Steel (C1.1) of the American Welding Society. Wooden poles shall be in accordance with the American National Standard Institute (ANSI) Specification 05.1 - 1972, "Specifications and Dimensions for Wood Poles." Pole preservative treatment shall be in accordance with the American Wood Preservation Association (AWPA) Standard P-8. Bonding with Poleset or an approved equivalent shall be in accordance with manufacturers' recommendations. All completed composite slip base utility pole systems and component replacement parts shall be delivered to the designated delivery locations within one hundred twenty (120) days from the effective date of this Purchase Order.

Delivery Locations

The 20 composite slip base systems, completely assembled in a manner previously specified, together with the required number of component replacement parts, shall be delivered in the stated quantities to the following locations:

ENTER THE NAME AND ADDRESS OF DELIVERY LOCATIONS, AND QUANTITIES OF MATERIALS TO BE DELIVERED TO EACH.

Public Safety

The contractor shall observe all relevant Massachusetts State and Department of Public Utilities rules and regulations in the loading and delivery of the systems.

Compensation

Compensation for work required under this Contract, specifically for the fabrication, partial assembly, and delivery, to the previously designated locations of twenty (20) composite slip base utility pole systems and required system component replacement parts, including all necessary hardware required for field erection, pole cutting, and preservation treatment, galvanizing of metal components, and other labor, materials, assembly, and transport of systems shall be paid on a Contract unit price basis, per system furnished and delivered in accordance with the attached plans and specifications. No other method of compensation, exclusive of the previously stated, shall be allowed.

Agreement

To the party of the first part:

The undersigned, as bidder, declares that the only persons or parties interested in this proposal as principals are those named herein; that this proposal is made without collusion with any other person, firm, or corporation: that the location of the proposed work has been carefully examined; that, if this proposal is accepted, all necessary machinery, tools, apparatus,, and other means of construction will be provided: #at all work will be performed in the manner and time required: and that the following unit prices will be accepted in full payment for the work:

ITEM NO.	ESTIMATED QUANTITY	ITEM WITH UNIT BID PRICE WRITTEN IN WORDS	UNIT PRICE	AMOUNT
1	20 Systems	Composite Slip Base Utility Pole Systems		

The stated bid price shall include the furnishing and delivery of all component parts, including replacement, the acquisition and assembly of all materials, the performing of all the labor requisite or proper, and the providing of all necessary machinery, tools, apparatus, and other means of construction: and the doing of all the above mentioned work in the manner set forth, and the completion therefor will be on or before one hundred twenty (120) days from the award of the Contract.

MATERIAL SPECIFICATIONS

Wooden Poles

Poles selected shall be Class 4, 35 ft. Ponderosa Pine, Douglas Fir, or Southern Pine either kiln dried or air seasoned in accordance with current ANSI standards and meeting the following weight and dimension requirements:

Length - 35 ft. Class 4
Vol. - 17.1 cf. Min. Top Circ. - 21"
Min. Top Dia. - 6.7" Weight - .30/.38 # Penta 941 lbs.
Min. Circ. at 6 ft. from butt - 31.5 in.

Treatment

All poles shall be pressure treated with a Pentachlorophenol solution conforming to the requirement of AWPA Standard P-8. The pentachlorophenol shall be carried in a heavy petroleum solvent solution in accordance with the requirements of Section 2, AWPA Standard P-9. The poles shall be treated in accordance with AWPA Standard C-4. Ponderosa Pine and Southern Pine poles shall be treated to a retention of 0.38 pct penta as determined by an assay or borings representing the wood 1/2" to 2" below the surface. Douglas Fir poles shall be treated to the same retention as determined by an assay or borings representing the wood 1/2" to 1" below the surface.

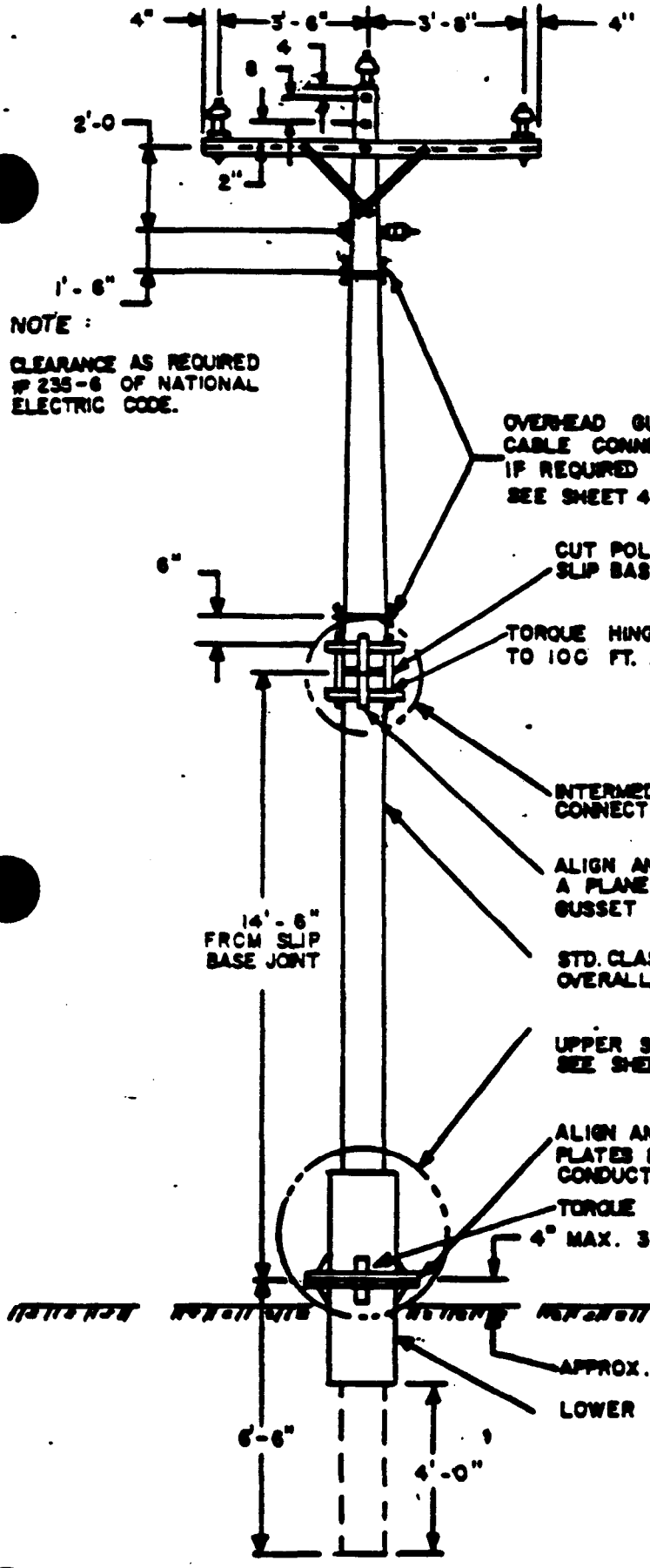
Fabricated Steel Sections

All system metal components shall be fabricated from the steel types designated and in the methods as specified by the AISC "Manual of Steel Construction" and in accordance with ASTM specifications. All welds shall be 3/8" fillet at the locations indicated and for the lengths specified and shall be in conformance with the Structural Welding Code - Steel (C1-1) of the American Welding Society. All fabricated metal components shall be galvanized in accordance with ASTM Designation A123.

Following is a Table listing the fabricated metal component, number required per system, base steel type, and section dimensions.

TABLE OF MATERIALS

2	14" O.D. x 1/4" Wall x 29-1/4" Schedule 10 Pipe
2	22-1/4" dia. x 3/4" Thick Base Plates (A36 Steel or equivalent)
12	2-15/16" x 7-3/8" x 1/2" Triangular Gusset Plates
6	1-1/8" dia. x 3-1/2" A325 Bolts
6	Nuts for 1-1/8" A325 Bolts
6	2-1/2" x 1/8" Washers
12	2-1/2" x 1/4" Washers
12	1/4" Lockwashers
1	26 Gauge x 22-1/4" dia. Keeper Plate
4	Straps 1/2" x 2-3/4" x 2' 2-1/2"
4	Pipe Sleeves, Welded and Seamless ASTM A53, 1.666" O.D., 1/4" x 15"
4	1" dia. x 15" A325 Threaded Rod
8	Nuts for 1" A325 Threaded Rods
8	1-1/4" x 1/4" Washers (hinge)
8	1/4" Lockwashers (hinge)



WOOD TREATMENT

ANY CUT OR ALTERED WOOD SURFACE SHALL BE GIVEN AN APPLICATION OF CONCENTRATED PRESERVATIVE SOLUTION OF THE SAME TYPE AS USED IN THE ORIGINAL TREATMENT AS SPECIFIED IN AWPA STANDARDS.

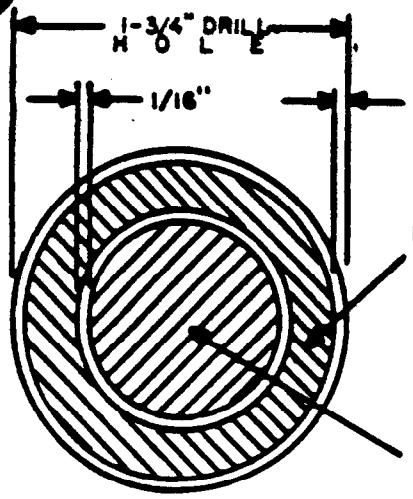
INSTALLATION NOTE

THE BREAKAWAY POLE WILL BE DELIVERED PREASSEMBLED BY THE MANUFACTURER AND INSTALLED BY THE COMPANIES IN ACCORDANCE WITH INDIVIDUAL COMPANY STANDARDS.

ASSEMBLED SLIP BASE UTILITY POLE SYSTEM

NOT TO SCALE

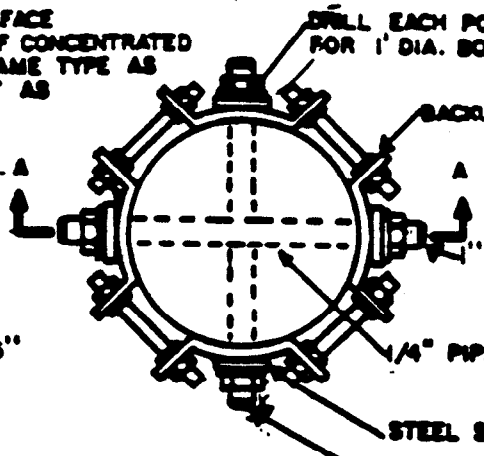
ANY CUT OR ALTERED WOOD SURFACE SHALL BE GIVEN AN APPLICATION OF CONCENTRATED PRESERVATIVE SOLUTION OF THE SAME TYPE AS USED IN THE ORIGINAL TREATMENT AS SPECIFIED IN AWPA STANDARDS



PIPE SLEEVE ASSEMBLY DETAIL

(NOT TO SCALE)

PIPE SLEEVE
GALVANIZED AND SEAMLESS
ASTM A53
ID 1.166"
WT 2.500"
OD 1.666"



PLAN
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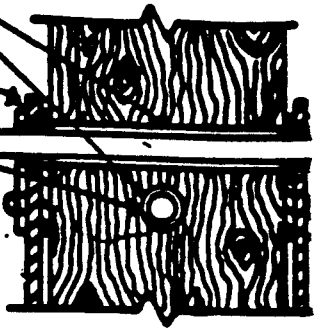
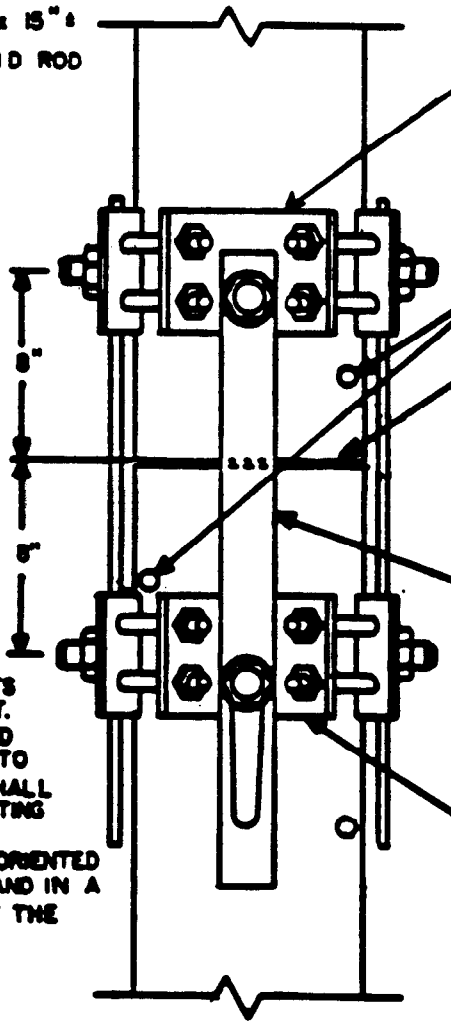


SECTION A-A

SCALE 1/4" = 1"



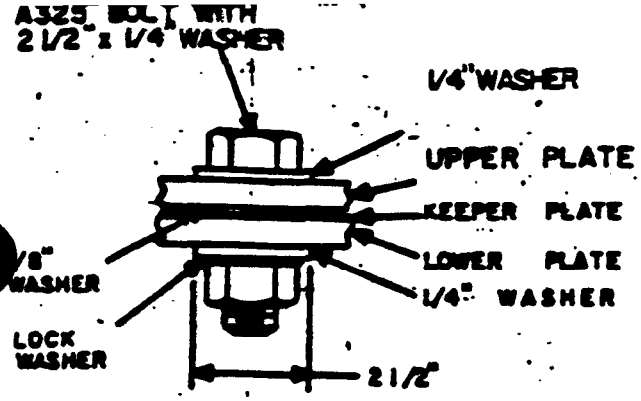
INSTALLATION NOTE

POLE BAND AND THROUGH BOLTS SHALL HAVE A TORQUE OF 100 FT. POUNDS A 1" PRESERVATIVE SOAKED FELT PAD OF A DIAMETER EQUAL TO THAT OF THE POLE SECTIONS SHALL BE INSTALLED PRIOR TO CONNECTING THE STRAPS.

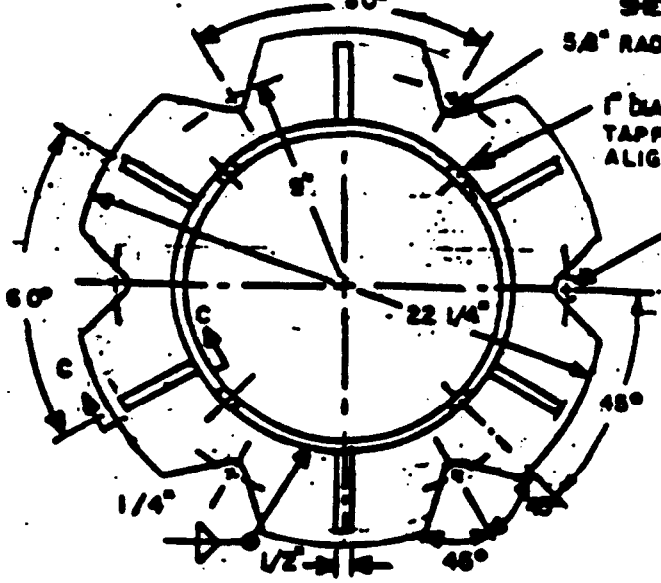
ALL STEEL STRAPS SHALL BE ORIENTED PERPENDICULAR TO CONDUCTORS AND IN A PLANE 45° PARALLEL TO THAT OF THE GUSSET PLATES.

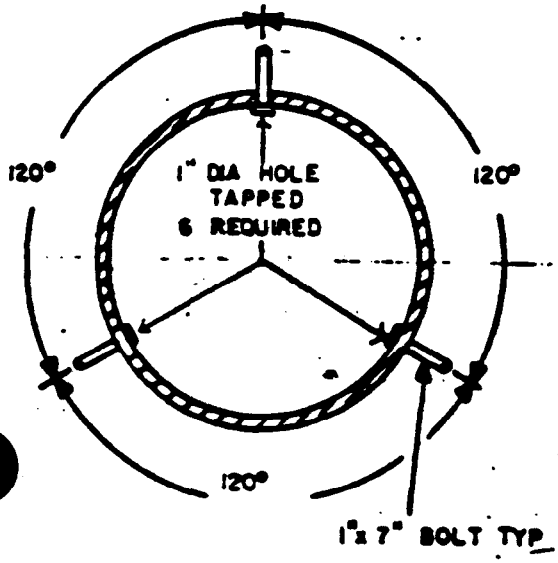
INTERMEDIATE HINGE CONNECTOR DETAIL

NOT TO SCALE

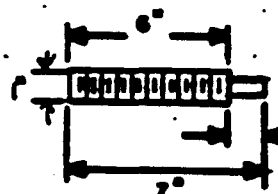


CONNECTER BOLT DETAIL
NOT TO SCALE





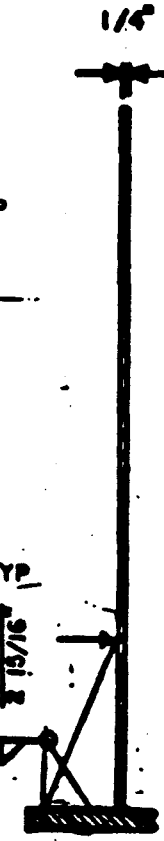
ALIGNMENT BOLT DETAIL
NOT TO SCALE



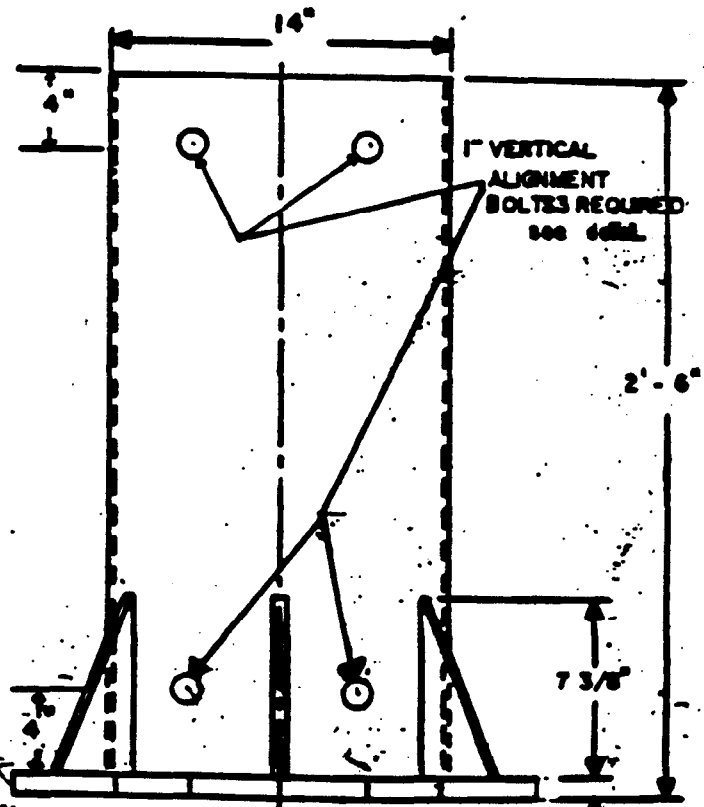
BOLT DETAIL
NOT TO SCALE

FABRICATION DETAILS

SLIP BASE TUBES SHALL BE FABRICATED OF SCHEDULE 10 PIPE AND A36 STEEL OR EQUAL. TWO OPPOSING GUSSET PLATES SHALL BE LOCATED PARALLEL TO CONDUCTORS KEEPER PLATE SHALL BE OF 26 GUAGE STEEL. ALL FABRICATED METAL PARTS SHALL BE GALVANIZED.



SECTION C-C



SLIP BASE TUBE DETAIL
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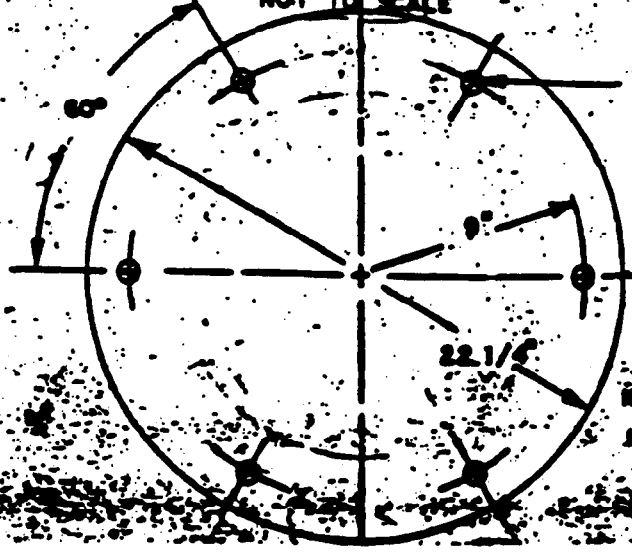

KEEPER PLATE
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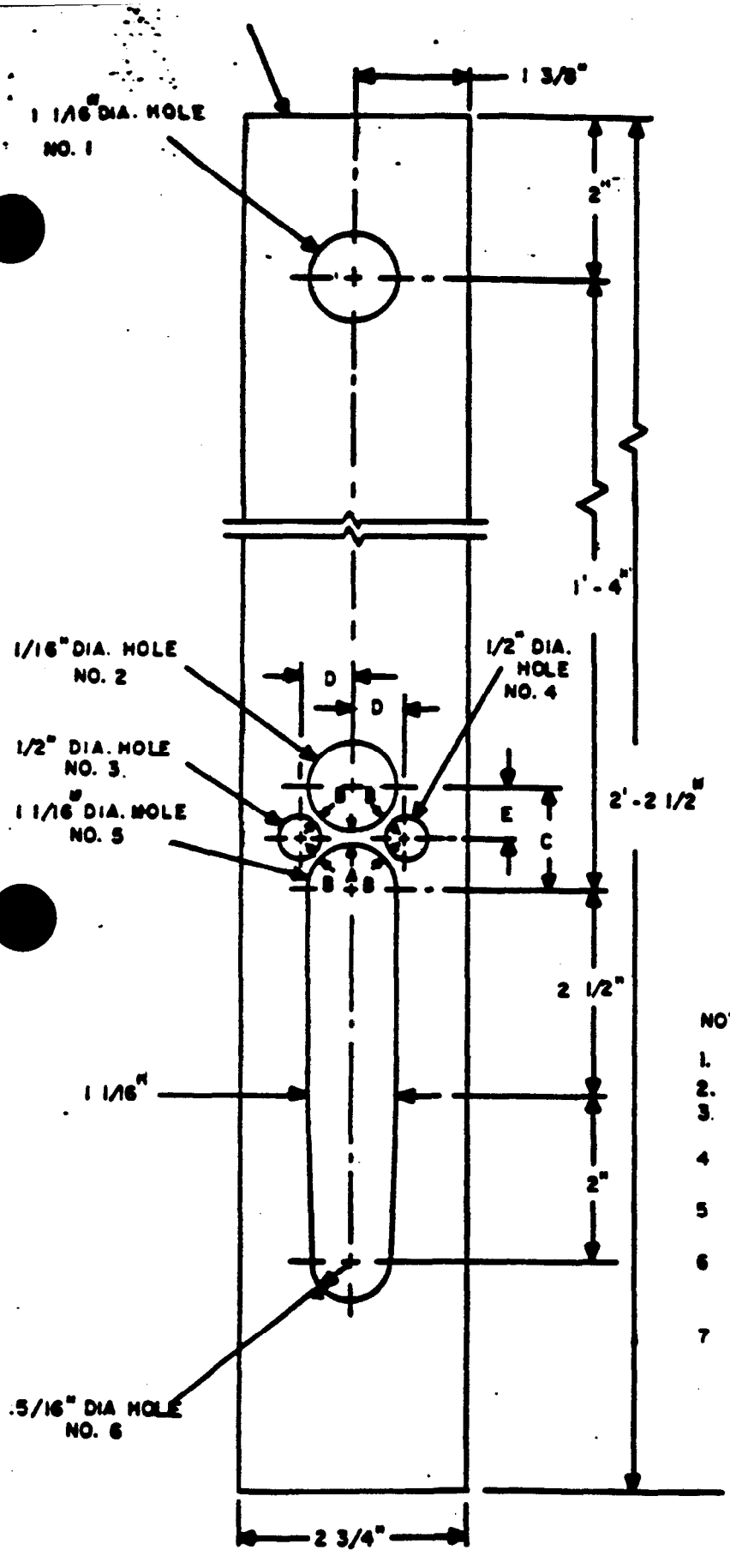

DIMENSIONS				
A	B	C	D	E
0.188	0.125	1.251	0.567	0.625

NOTES

1. LOCATE AND DRILL HOLES NO. 1 THROUGH NO. 6.
2. REMOVE STEEL BETWEEN HOLE NO. 5 AND NO. 6
3. MILL SLOT SIDES TO PROVIDE A SMOOTH AND TAPERED SLOT AS SHOWN.
4. CENTERS FOR HOLES NO. 2 THROUGH NO. 5 ± 1/64" RELATIVE TO EACH OTHER.
5. ALL FABRICATED METAL PARTS TO BE GALVANIZED IN ACCORDANCE WITH ASTM DESIGNATION: A 123
6. ALL BOLTS NUTS - WASHERS AND OTHER MISCELLANEOUS HARDWARE SHALL BE GALVANIZED TO CONFORM TO ASTM DESIGNATION: A 153 CLASS BC OR D OR A-454
7. OVERHEAD GUY WIRE TO BE FURNISHED BY UTILITY COMPANIES

STEEL STRAP DETAIL G
NOT TO SCALE