# TM 11-2614

WAR DEPARTMENT TECHNICAL MANUAL

# ASSEMBLING AND ERECTING 30-FOOT GIN-POLE-TYPE TRYLON LADDER TOWERS



**RESTRICTED.** *DISSEMINATION OF RESTRICTED MATTER.*—The information contained in restricted documents and the essential characteristics of restricted material may be given to any person known to be in the service of the United States and to persons of undoubted loyalty and discretion who are cooperating in Government work, but will not be communicated to the public or to the press except by authorized military public relations agencies. (See also par. 23b, AR 380-5, 15 Mar 1944.)

*WAR DEPARTMENT • 8 SEPTEMBER 1944*

TECHNICAL MANUAL

# ERECTION KIT MX-746/FR

CHANGES No. 2

DEPARTMENT OF THE ARMY
WASHINGTON 25, D. C., *12 April 1950*

TM 11-2614, 8 September 1944, is changed as follows:

(As changed by C 1) The title of the manual is changed to read:

ERECTION KIT MX-746/FR

*Note* (Added). Erection Kit MX-746/FR procured on Order No. 25638-P-49 is similar to all previous procurements of Erection Kit MX-746/FR. All information contained in the basic manual applies equally to Erection Kit MX-746/FR (Order No. 25638-P-49) except where these changes specify otherwise.

## 1. Description

The trylon antenna * * * is not exceeded. Complete illustrated instructions **are forwarded** with the unassembled equipment **which is** packed in two export boxes **and one bundle (MX-746/FR (Order No. 25638-P-49)) or in two export boxes (all other procurements of MX-746/FR).** The sizes, weights, and **volume** of the boxes **and bundle** are as follows:

| | |
|---|---|
| Box No. 1 (**all procurements**): | Size 5 by 20½ by 22 inches.<br>Weight 126 pounds.<br>Volume 1.4 cubic feet. |
| Box No. 2 (**all procurements except Order No. 25638-P-49**): | Size 3½ by 7½ by 133½ inches.<br>Weight 212 pounds.<br>Volume 2.0 cubic feet. |
| **Box No. 2 (Order No. 25638-P-49 only):** | **Size 3½ by 7½ by 127½ inches.<br>Weight 183 pounds.<br>Volume 1.9 cubic feet.** |
| **BUNDLE (Order No. 25638-P-49 only):** | **Size 6 by 9½ by 70 inches.<br>Weight 50 pounds.<br>Volume 2.3 cubic feet.** |

*These changes supersede C 1, 5 September 1947.

It is recommended * * * are thoroughly understood.



## 2. Component Parts

*a.* Box 1.

| *Quantity* | *Item* | *Size* |
|---|---|---|
| * | * * * | * |
| 2 | Front guys (H. S. 7-Str.) (with sheave on 1 end and 2 compression sleeves). **Front guys supplied with Order No. 25638-P-49 have only 1 compression sleeve.** | 50′- 0″ |
| 1 | Back guy (H. S. 7-Str.) (with sheave on 1 end and 2 compression sleeves). **Back guys supplied with Order No. 25638-P-49 have only 1 compression sleeve.** | 80′- 0″ |
| * | * * * | * |
| 4 | Screw anchors, detachable (**all procurements except Order No. 25638-P-49**). | 6″ helix |
| 4 | Anchor keys (**all procurements except Order No. 25638-P-49**). | ¾ x 1$\frac{5}{16}$ x ¼″. |
| * | * * * | * |
| 1 | Attachment cable (with thimble and 2 compression sleeves on each end). **Attachment cables supplied with Order No. 25638-P-49 have only 1 compression sleeve on each end.** | 8′ |
| * | * * * | * |

*b.* Box 2.

| | | |
|---|---|---|
| * | * * * | * |
| 4 | Thimble eye anchor rods (**all procurements except Order No. 25638-P-49**). | ¾″ x 5′-4″ |

*c.* (Added) BUNDLE.

| | | |
|---|---|---|
| 4 | Anchors, screw-type with 6″ helix (Order No. 25638-P-49 only). | ¾″ x 66″ |

## 4. Location

The ladder face * * * inches project (fig. 5).

*Note* (Added). Anchors supplied with Erection Kit MX-746/FR (Order No. 25638-P-49) are one piece anchors and therefore require no assembling.

## 6. Maintenance (Superseded)

*a.* Replace any defective part (par. 3).

*b.* Test for mechanical strength and fitness after any repairs.

*c.* Examine all exposed parts, especially the hot-dip galvanized lattice-work, for rust. When this defect is detected, clean the faulty area with No. 1 sandpaper or steel wool and wipe off with a cloth. Then wipe the surface with carbon tetrachloride to remove any grease or oil that may be present. Apply two coats of zinc chromate primer such as paint (Sig C stock No. 6G1505–4). Allow the primer to dry and then apply two top coats of finisher such as paint (Sig C stock No. 6G1509). Inspect any painted-over surface periodically since enamel paint has a tendency to peel or chip.

*d.* Apply Oil, engine, Grade SAE 10 (OE–10) to all moving parts.

## 7. (Added) Forms and Records

*a.* The following forms will be used for reporting unsatisfactory conditions of equipment:

(1) DD Form 6 (Report of Damaged or Improper Shipment) will be filled out and forwarded as prescribed in SR 745–45–5 or AFR 71–4.

(2) DA AGO Form 468 (Unsatisfactory Equipment Report) will be filled out and forwarded to the Office of the Chief Signal Officer as prescribed in SR 700–45–5.

*b.* Use other forms and records as authorized.

## 8. (Added) Identification Table of Parts for Erection Kit MX–746/FR

*a.* REQUISITIONING PARTS. The fact that a part is listed in the following table is not sufficient basis for requisitioning the item. Requisitions must cite an authorized basis, such as T/O & E's, T/A's, T/BA's, SIG 6, SIG 7, SIG 8, SIG 7 & 8, SIG 7–8–10, SIG 10, list of allowances of expendable material, or another authorized supply basis. The Department of the Army Supply Catalog applicable to the equipment covered in this manual is SIG 7 & 8–MX–746/FR. For an index of available catalogs in the Signal section of the Department of the Army Supply Catalog, see the latest issue of SIG 1.

*b.* IDENTIFICATION TABLE OF PARTS.

| Ref symbol | Name of part and description | Function of part | Signal Corps stock No. |
|---|---|---|---|
| | ERECTION KIT: MX–746/FR; 30′ trylon latticed tower; steel, galv; includes 3 guys, guy attachments, 4 anchors, 3 base pins, top sheave, sling, and hardware; Wind Turbine type 1245. | Used as gin pole for erecting 73′ 7″ lattice radio towers for rhombic antennas; also for other erection purposes not exceeding its capacity. | 2A1666 |
| H–1 | ANCHOR, screw: steel; 6″ diam helix and ¾″ diam x 66″ lg triple eye rod; holding power in sand 2500 lb. | Used as ground holding device for guys. | 5B306 |
| H–4 | BOLT, machine: sq hd, steel; ¾″–10 NC thd; 4½″ lg U. H.; threaded 1¾″; w/one hex nut. | Used to assemble the pulley attached to the tower top plate. | 6L612–4.5G |
| H–13 | BOLT, machine: sq hd, steel; 5/16″–18 NC thd; ¾″ lg U. H.; threaded ½″; w/one hex nut. | Used to secure together the members of the tower. | 5B1505–7 |
| H–14 | BOLT, machine: sq hd, steel; 5/16″–18 NC thd; 1″ lg U. H.; threaded ¾″; w/one hex nut. | Used to secure together the members of the tower. | 5B1505–1A |
| H–15 | BOLT, machine: sq hd, steel; ⅜″–16 NC thd; 1″ lg U. H.; threaded 11/16″; w/one hex nut. | Used to attach the guys to the tower clips. | 5B1506–1 |
| H–16 | BOLT, machine: sq hd, steel; ½″–13 NC thd; 1½″ lg U. H.; threaded 1¼″; w/one hex nut. | Secures the tower top casting to the tower. | 5B1508–1.5 |
| H–17 | BOLT, machine: sq hd, steel; ½″–13 NC thd; 1¾″ lg U. H.; threaded 1¼″; w/one hex nut. | Secures foot casting to base plate assembly. | 5B1508–1.7 |
| H–18 | BOLT, machine: sq hd, steel; ⅝″–11 NC thd; 1½″ lg U. H.; threaded 1⅛″; w/one hex nut. | Secures pulley assembly to tower top casting. | 5B1510–1.5 |

| Ref symbol | Name of part and description | Function of part | Signal Corps stock No. |
|---|---|---|---|
| H-21 | CLAMP: guy wire; malleable iron and steel; one U-bolt ¼″ x 1½″, threaded 1″ each end; w/one saddle to accommodate ¼″ guy strand and 2 hex nuts. | Used as wire rope clamp to secure ¼″ guy strand. | 5B3480 |
| H-5 | CLAMP: guy wire; malleable iron and steel; one U-bolt ½″ x 3″, threaded 1¼″ each end; w/one saddle to accommodate ⅝″ guy strand and 2 hex nuts. | Used as wire rope clamp to secure ⅝″ guy strand. | 5B4024 |
| H-6 | CLAMP: guy wire; malleable iron and steel; one U-bolt $\frac{5}{16}$″ x 2″, threaded 1″ each end; w/one saddle to accommodate ½″ guy strand and 2 hex nuts. | Secures wire rope used to raise 73′ 7″ tower. | 5B4108 |
| H-7 | CLAMP: steel; 2 pieces, each 1¾″ wd x 2⅝″ lg x $\frac{1}{16}$″ thk; rounded one end with 60° bend approx 1½″ from rounded end; formed U other end; one $\frac{13}{32}$″ diam hole; one sq hd machine bolt ⅜″ diam, 1″ lg U. H., threaded $\frac{11}{16}$″; w/one hex nut and palnut. | Used with sheave to form tower clip assembly to attach guys to tower. | 5B3482 |
| WR-1 | GUY: galv steel; 7 strand; ¼″ diam; approx 50′ lg; fixed ¼″ sheave, spliced one end, w/one compression-type sleeve. | Used as side guy to prevent lateral motion of the tower. | 2A1344-66 |
| WR-2 | GUY: galv steel; 7 strand; ¼″ diam; approx 80′ lg; fixed ¼″ sheave, spliced one end, w/one compression-type sleeve. | Used as back guy to prevent lateral motion of the tower. | 2A1344-67 |
| O-1 | HOOK: used with two Crosby clips as strand grip; steel; ½″ diam rod, approx 13″ lg o/a; one end half ovaleye, 1½″ lg x 1¼″ wd; ½″ bend other end. | Provides a means of attachment for the block and fall used to tighten the back guy. | 2A3186.2-1 |
| H-8 | NUT, lock: palnut type; steel; for ½″-13 NC thd bolt. | Secures associated hexagonal nut.. | 6L2651-13 |
| H-9 | NUT, lock: palnut type; steel; for $\frac{5}{16}$″-18 NC thd bolt. | Secures associated hexagonal nut.. | 6L3675-18-9G |
| H-2 | PULLEY: semisteel; 6″ OD, 1½″ thk o/a; bore $\frac{25}{32}$″ diam through $1\frac{29}{32}$″ thk hub; single groove, 1⅛″ wd x $\frac{13}{16}$″ d; 6 weight-reduction holes. | Used to change the direction of the pulling force during the erection of the 73′ 7″ tower. | 6Z7682-15 |
| H-3 | SHACKLE: steel; ½″ diam stock; approx 3½″ lg o/a, 2½″ wd tapering to 1¾″ wd; one hole drilled and one hole drilled and tapped in upper portions of U for pin; one $\frac{5}{16}$″ diam pin, 2¾″ lg o/a, 1⅞″ lg U. H., threaded ⅝″. | Used to attach the sling to the back anchor. | 5B15508 |
| H-11 | THIMBLE, guy: steel; for ½″ guy strand; 3″ lg x 1⅞″ wd o/a; $\frac{5}{16}$″ thk across score. | Protects guy strand from sharp bend and abrasion. | 5B18044 |
| H-12 | THIMBLE, guy: steel; for ¼″ guy strand; 2″ lg x 1⅛″ wd o/a; $\frac{5}{16}$″ thk across score. | Projects guy strand from sharp bend and abrasion. | 5B18054 |
| H-10 | WASHER, flat: steel; round, 2″ OD, $\frac{13}{16}$″ ID---- | ---------------------------- | 6L60012 |

**_Figure 5. Anchor Installation._ (Anchors supplied with Erection Kit MX–746/FR (Order No. 25638–P–49) are one piece and therefore require no assembling.**

[AG 461 (21 Mar 50)]

BY ORDER OF THE SECRETARY OF THE ARMY:

J. LAWTON COLLINS
*Chief of Staff, United States Army*

OFFICIAL:
EDWARD F. WITSELL
*Major General, USA*
*The Adjutant General*

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WAR DEPARTMENT TECHNICAL MANUAL
TM 11-2614

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WAR DEPARTMENT • 8 SEPTEMBER 1944

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*United States Government Printing Office*
*Washington : 1944*

WAR DEPARTMENT,
WASHINGTON 25, D. C., 8 September 1944.

TM 11–2614, Assembling and Erecting 30-Foot Gin-Pole-Type Trylon Ladder Towers, is published for the information and guidance of all concerned.

[A. G. 300.7 (10 Apr. 44).]

BY ORDER OF THE SECRETARY OF WAR:

G. C. MARSHALL,
*Chief of Staff.*

OFFICIAL:
J. A. ULIO,
*Major General,*
*The Adjutant General.*

DISTRIBUTION:
IBn11(2); IC11(5).
(For explanation of symbols see FM 21–6.)

# TABLE OF CONTENTS



# LIST OF ILLUSTRATIONS

# DESTRUCTION NOTICE

**WHY** --To prevent the enemy from using or salvaging this equipment for his benefit.

**WHEN**—When ordered by your commander.

**HOW** —1. Smash—Use sledges, crowbars, heavy tools.

2. Cut —Use axes.
3. Burn —Use gasoline, kerosene, oil, flame-throwers.
4. Explosives—Use firearms, grenades, TNT.
5. Disposal —Bury in slit trenches, fox holes, other holes, wherever possible. Throw in streams. Scatter.

**USE ANYTHING IMMEDIATELY AVAILABLE FOR DESTRUCTION OF THIS EQUIPMENT**

**WHAT**—1. Smash—Ladder tower, base plate assembly, etc.

2. Cut —Guy wires, ladder tower, other components.
3. Burn —Technical manual.
4. Bend —Base plate, anchor rods, ladder tower.
5. Bury or scatter—Any or all of the above pieces, after destroying their usefulness.

# DESTROY EVERYTHING

# ASSEMBLING AND ERECTING
# 30-FOOT GIN-POLE-TYPE TRYLON LADDER TOWER

## 1. DESCRIPTION.

The trylon antenna ladder tower is made of galvanized copper bearing steel. These towers are three sided and are built with legs of specially formed strip steel, shaped like a wedge. Adequate diagonal angle braces are provided for all three faces to balance the stress. Horizontal braces are attached on each face at each panel point, while on the ladder side intermediate horizontal braces are added, spaced 15 inches apart, forming a convenient ladder for climbing. The 30-foot trylon ladder tower is to be used especially as a gin pole for the erection of the 73-foot, 7-inch lattice radio towers for rhombic antennas. It may be used for other purposes where its capacity is not exceeded. Complete illustrated instructions, along with the unassembled equipment are packed in two export boxes. The sizes, weights, and cubage of the boxes are as follows:

**Box No. 1:** Size 5 by 20½ by 22 inches.
Weight 126 pounds.
Volume 1.4 cubic feet.

**Box No. 2:** Size 3½ by 7½ by 133½ inches.
Weight 212 pounds.
Volume 2.0 cubic feet.

It is recommended that the instructions be read completely as soon as they are unpacked. Do not attempt to set up the tower until these instructions are thoroughly understood.

## 2. COMPONENT PARTS.

### a. Box 1.

| *Quantity* | *Item* | *Size* |
|---|---|---|
| 51 | Horizontals | 1/16 x 12″ |
| 1 | Base plate | ¼″ |
| 3 | Base plate attachment plates | ¼″ |
| 3 | Foot castings (bottom leg supports) | |
| 2 | Front guys (H.S. 7-Str.) (with sheave on 1 end and 2 compression sleeves) | 50′–0″ |
| 1 | Back guy (H.S. 7-Str.) (with sheave on 1 end and 2 compression sleeves) | 80′–0″ |
| 6 | Tower guy attachment clips | |
| 1 | Top plate | ¼″ |
| 3 | Top castings (top leg connectors) | |
| 1 | Sheave (pulley) | 6″ OD |
| 2 | Sheave support angles 6″ OD | 3½ x 5 x 5/16″ |
| 1 | Bolt and nut (for sheave) | ¾ x 4½″ |
| 4 | Screw anchors detachable | 6″ helix |
| 4 | Anchor keys | ¾ x 1 3/16 x ¼″ |
| 1 | Oval eyebolt, unthreaded bolt with hood end | ½″ x 14″ |
| 1 | Attachment cable (with thimble and 2 compression sleeves on each end) | 8′ |
| 1 | Anchor shackle | ½″ |
| 6 | Crosby type cable clips | ¼″ |
| 2 | Crosby type cable clips | ⅝″ |
| 2 | Crosby type cable clips | ½″ |
| 6 | Palnuts | ½″ |
| 115 | Palnuts | 5/16″ |
| 3 | Washers for ¾″ bolt | 13/16″ ID |
| 4 | Thimbles, open type | ½″ |
| 2 | Thimbles, open type | ¼″ |
| 95 | Square head galvanized bolts with hex nuts | 5/16 x ¾″ |
| 20 | Square head galvanized bolts with hex nuts | 5/16 x 1″ |
| 3 | Square head galvanized bolts with hex nuts | ⅜ x 1″ |
| 7 | Square head galvanized bolts with hex nuts | ½ x 1½″ |
| 7 | Square head galvanized bolts with hex nuts | ½ x 1¾″ |
| 4 | Square head galvanized bolts with hex nuts | ⅝ x 1½″ |
| 1 | Technical manual | |

### b. Box 2.

| | | |
|---|---|---|
| 3 | Leg channels, right (marked "R") | 10′ 3″ |
| 3 | Leg channels, left (marked "L") | 10′ 3″ |
| 3 | Leg channels, center (marked "C") | 10′ 3″ |
| 36 | Diagonals | 1/16 x 33″ |
| 3 | Square head ground pins | 1 x 30″ |
| 4 | Thimble eye anchor rods | ¾″ x 5′–4″ |

## 3. ASSEMBLY.

**a. General.** As the gin pole is light, it should be assembled at any convenient place where ground is level so that the minimum amount of blocking

614730°—44

will be necessary. When assembled, it may be easily carried to the desired location. Fasten a foot casting to one right leg and one left leg (leg channels are marked inside and at bottom of splice area) with one 5/16- by 1-inch bolt at the bottom hole. Insert a 5/16- by 1-inch bolt on one face, place a horizontal brace upon it, and assemble the full length of the ladder face (figs. 4 and 8). When complete, lay the ladder face to ground and level same by **blocking** (fig. 7). Attach foot casting to the center leg and assemble the remaining two faces of the gin pole (figs. 4 and 8). Assembly is facilitated if all the members are loose-bolted, that is, the nuts are placed on the bolts and are turned until they are finger-tight. When all members are in place, the assembled section is lined up and the nuts are tightened with a wrench. When tightening the bolt be careful not to use too much force, since overtightening either strips the threads or breaks the bolt. A 4-inch wrench is sufficiently long to adequately tighten a 5/16-inch bolt. When the gin pole has been completely assembled and all bolts and nuts have been properly tightened, the Palnut type locknuts are placed on the bolt ends and are tightened with the fingers until the locknut is snug against the regular nut. Take care to apply the locknut with the open side out. It is then tightened with a wrench about one-quarter turn. The wrench should only engage the Palnut and not the regular nut. Maximum holding power of the locknut is developed at one-quarter turn beyond the finger-tight position (fig. 10).

**b. Base Plate.** Attach the base plate and base plate attachments to the foot casting using ½- by 1¾-inch bolts and nuts (fig. 3).

**c. Top Plate and Pulley Assembly.** Assemble the pulley and attach it to the top plate. Then attach this plate to the top leg coupling castings, using ½- by 1½-inch bolts and nuts (fig. 2).

**d. Guy Attachments.** The guys are attached to the tower at the top of the 27.5-foot panel by the use of the tower clip assembly so that they rest on the top side of horizontals (fig. 1). Fasten same by inserting the ⅜- by 1-inch bolt through the holes of the **clip, sheave,** and **clip.** Fasten the nut tightly (fig. 1). Take care to attach the proper guys to the proper leg angles (fig. 1). The 80-foot guy wire runs back to the permanent anchor for the guyed tower to be erected.

## 4. LOCATION.

The ladder face of the gin pole is placed toward the tower to be erected. When used for erecting a latticed radio tower, place the ladder face of the gin pole 3 feet, 6 inches back of the tower as shown in figure 9. The center of the gin pole should be kept in exact line with the center of the mast or tower to be erected. At a distance of 30 feet from base of the gin pole and 60° to the right and left, place one assembled 6-inch screw anchor and screw the anchor into the ground until not more than 6 inches project (fig. 5).

## 5. ERECTION.

**a. General.** Set the assembled gin pole in the proper location so that it will be erected according to the instructions in paragraph 4 and so that the center line of both the gin pole and the latticed tower coincide. To prevent the gin pole from skidding, while it is being raised, place a ground pin on the ground in front of the base plate and drive the remaining pins into the ground at each end so that the three form a **blocking** (fig. 6). When the pole is erect and before the guys are tightened, be sure center lines of both the tower and gin pole are correct. Tighten the guys by aid of a **come-along** and a small block and fall. When in place, drive ground pins through the holes of the base plate attachments.

**b. Eight-foot Sling.** This sling anchors the tackle block used in raising the guyed towers. Insert one end of the 8-foot 7-wire guy strand sling through body of the 12-inch turnbuckle. Protect the strand from the sharp edges of the turnbuckle body by inserting the ½-inch thimble so that the strand lays in the groove of the thimble. See that both ends of the sling are equal, then attach the ends to the ½-inch anchor shackle.

**c. Guy Clamp.** The oval-eye rod attaches to the ⅜-inch guy by using the two ⅜-inch Crosby guy clips. One of these ⅜-inch clips should be placed next to the bent end of this rod. This forms an attachment for the block and fall used to pull up the ⅜-inch back guy.

## 6. MAINTENANCE.

Failure or unsatisfactory performance of equipment will be reported on WD, AGO Form No. 468. If form is not available see TM 38–250. A maintenance parts list has not been authorized for this equipment.

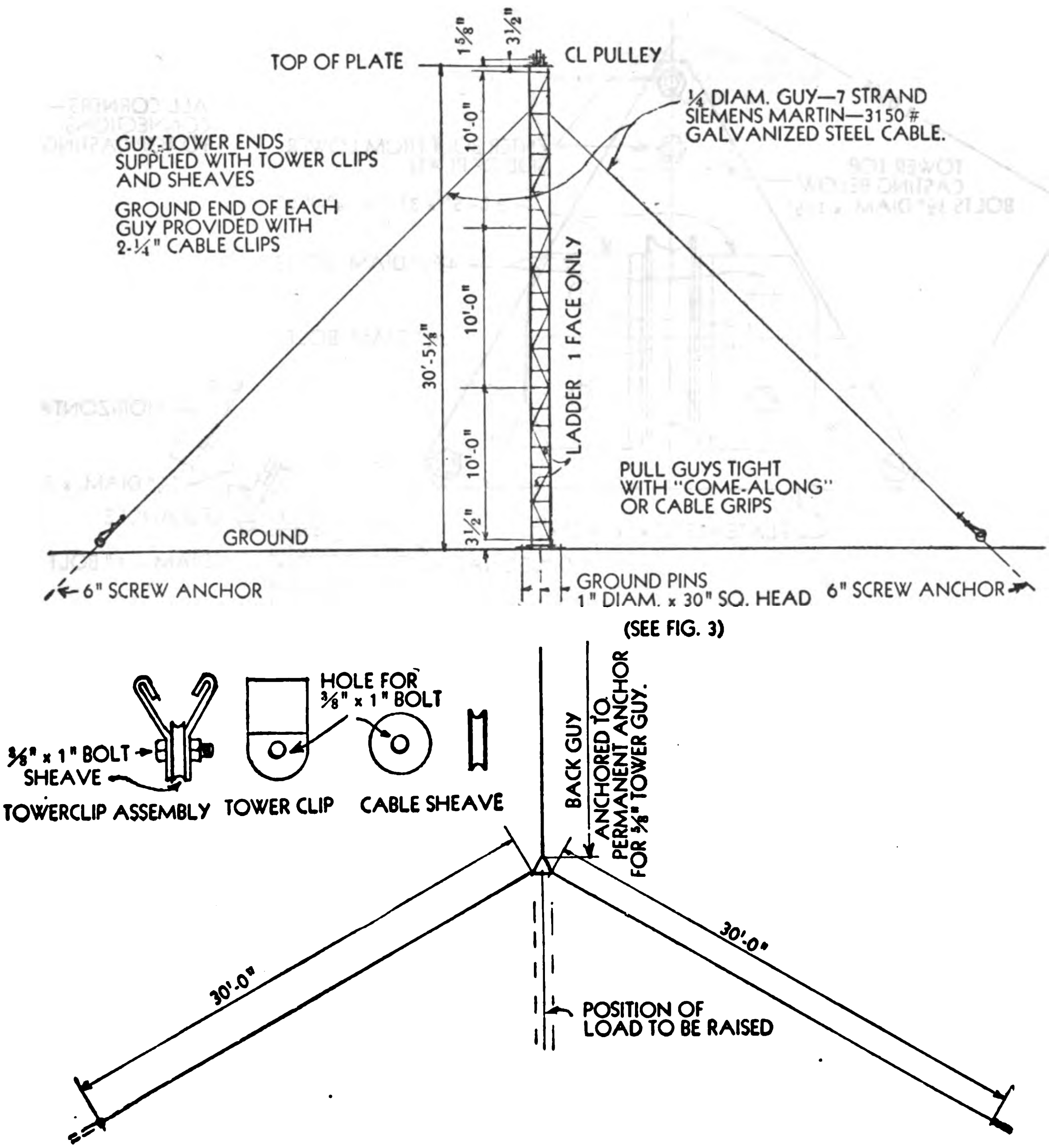



*Figure 1. Plan and elevation, showing guy arrangement.*

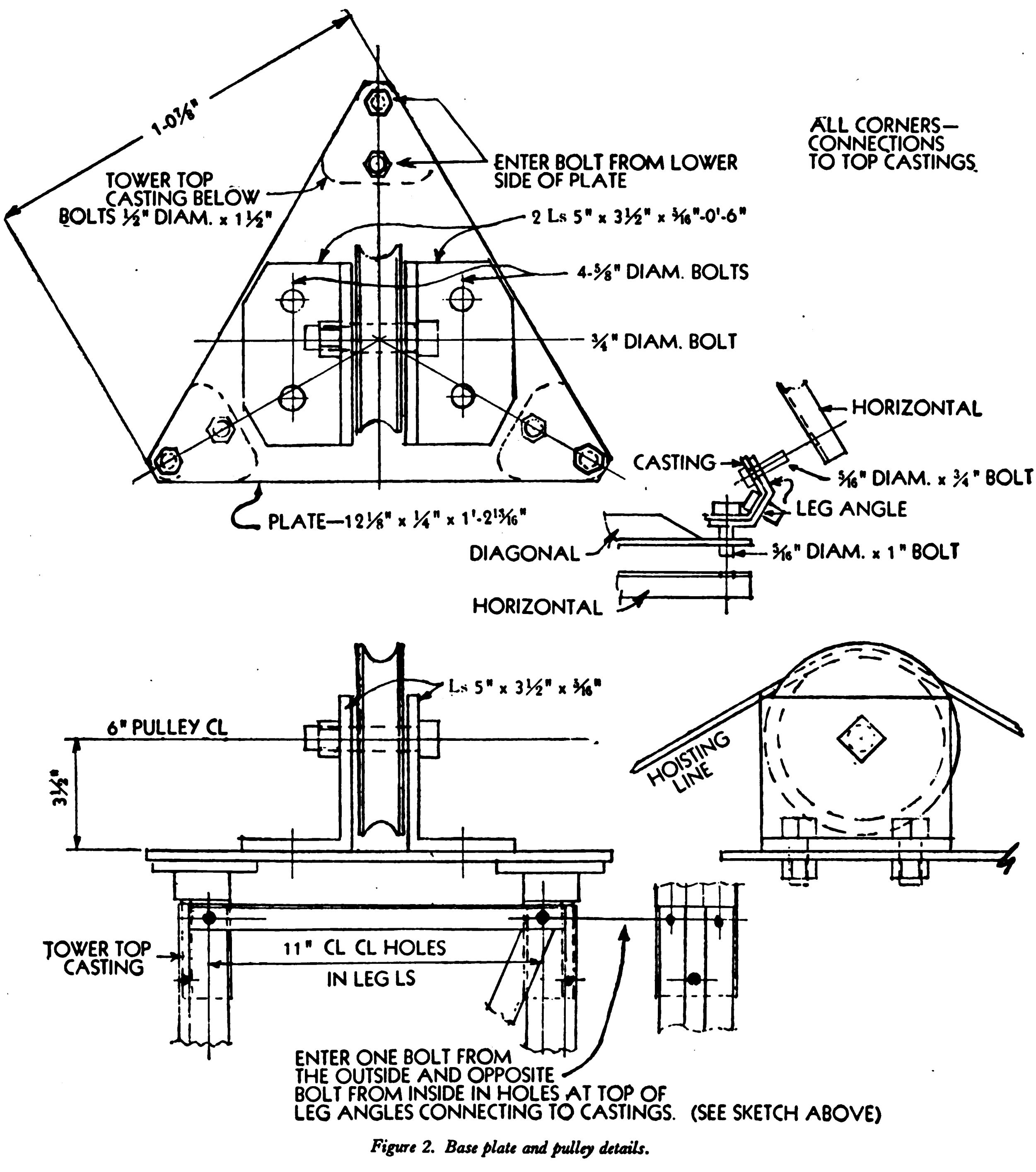
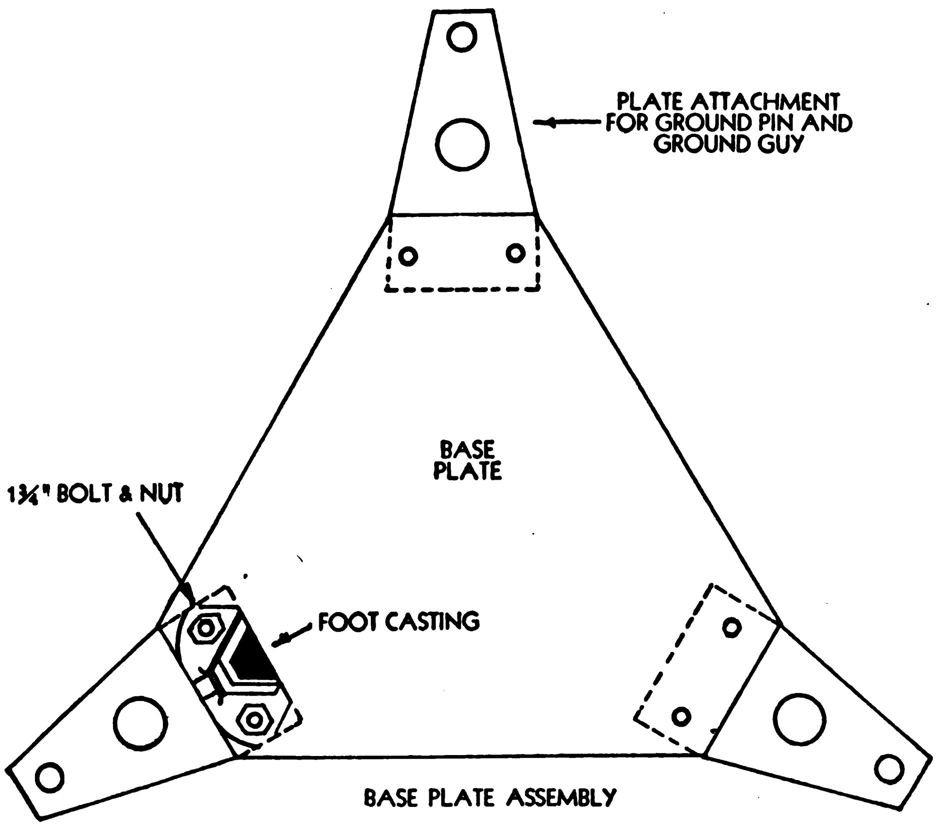



*Figure 2. Base plate and pulley details.*




BASE PLATE ASSEMBLY

ASSEMBLY METHOD

ASSEMBLE LOOSELY—PLATE, PLATE ATTACHMENTS, FOOT CASTINGS, RIGHT, LEFT & CENTER LEGS. ATTACH DIAGONALS & HORIZONTALS PER TOWER SECTION ASSEMBLY SHEET. AS SECTION ASSEMBLES TIGHTEN NUTS, CAREFUL NOT TO STRIP THREADS.

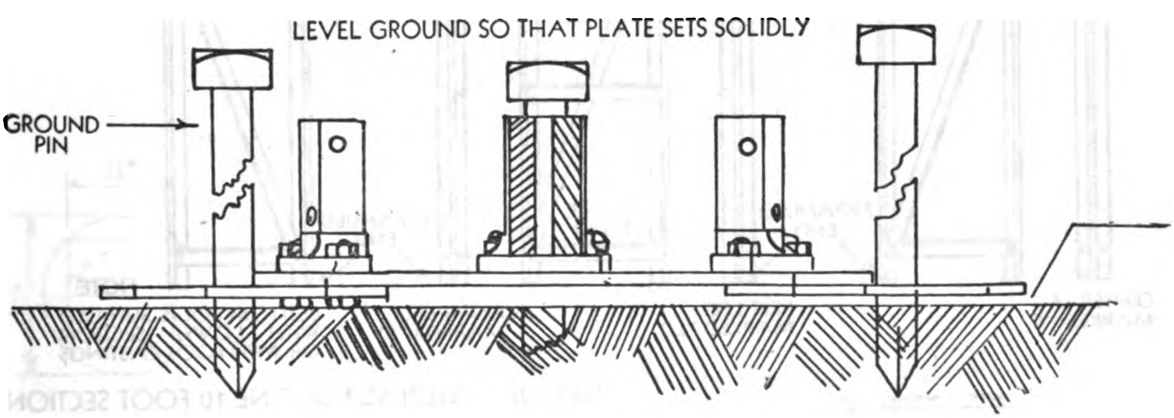
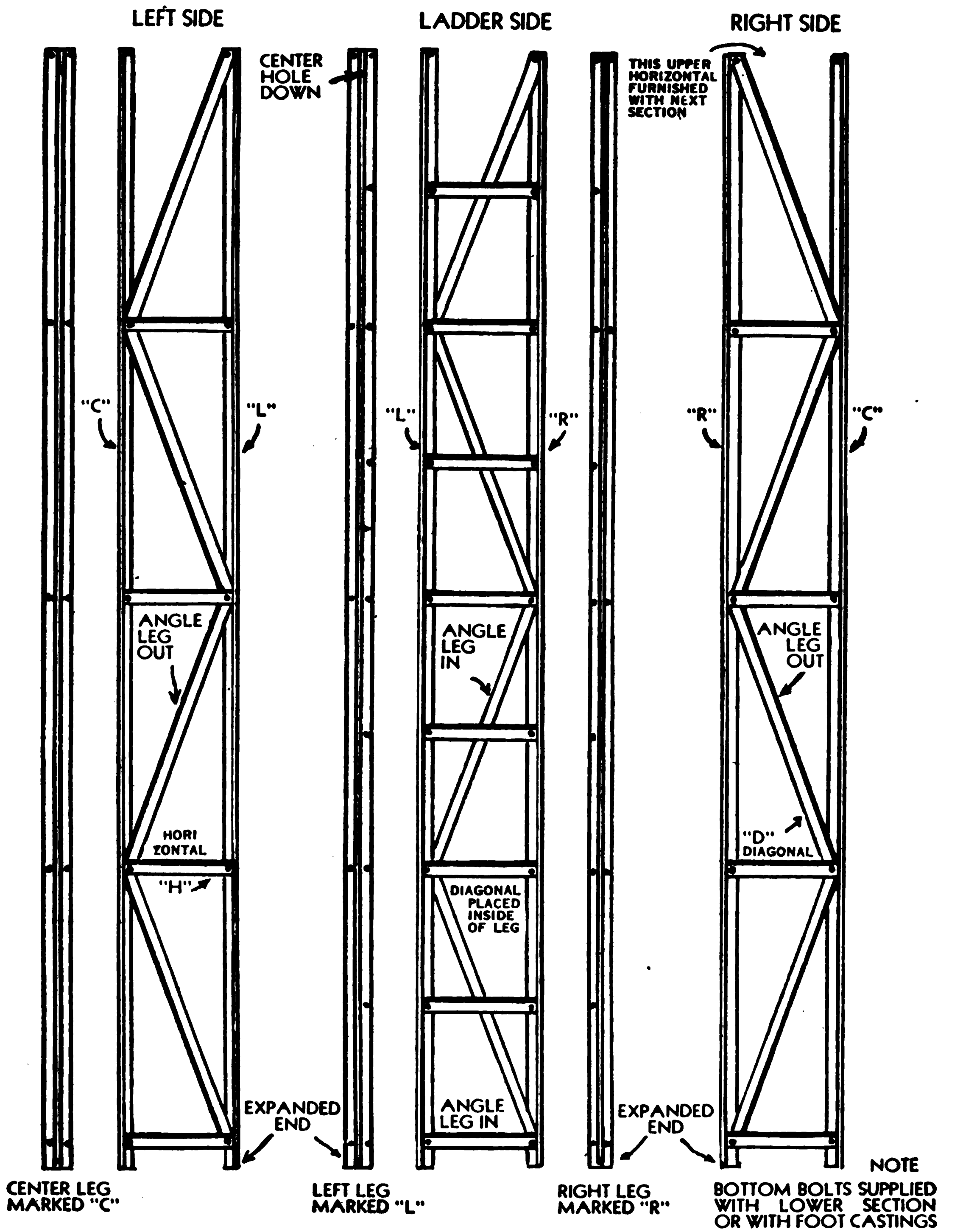



*Figure 3. Base plate assembly and installation.*




HORIZONTAL MARKED "H"

DIAGONAL MARKED "D"

**BILL OF MATERIAL FOR ONE 10 FOOT SECTION**

| | | |
|---|---|---|
| CENTER LEG ANGLE MARKED | "C" | 1 |
| RIGHT " " " | "R" | 1 |
| LEFT " " " | "L" | 1 |
| HORIZONTALS (STANDARD)" | "H" | 16 |
| DIAGONALS (STANDARD) " | "D" | 12 |
| BOLTS AND NUTS $\frac{5}{16}$" x $\frac{3}{4}$" | | 35 |
| "PALNUTS" (LOCKING NUTS) | | 35 |

*Figure 4. Ladder details.*

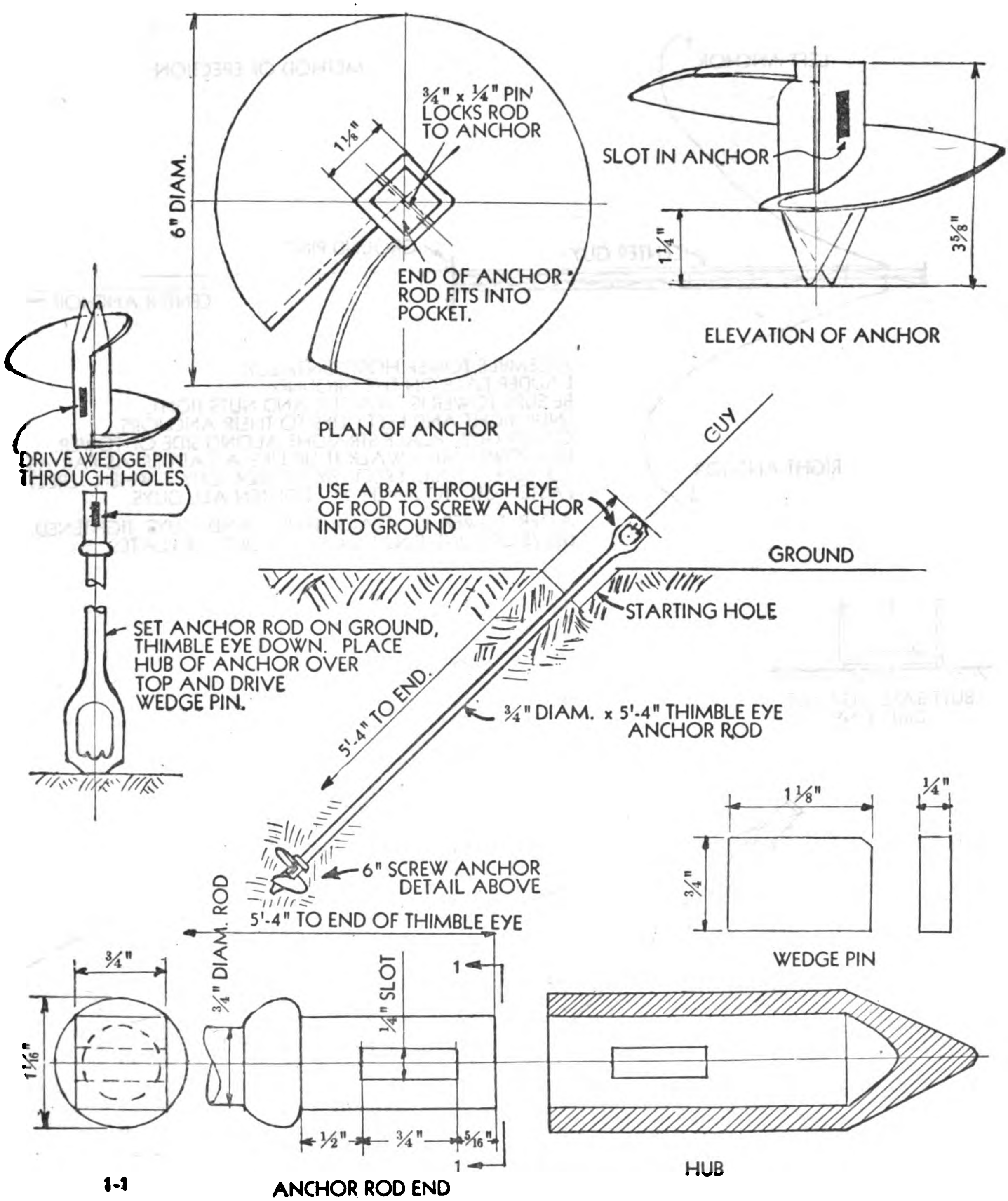



*Figure 5. Anchor installation.*

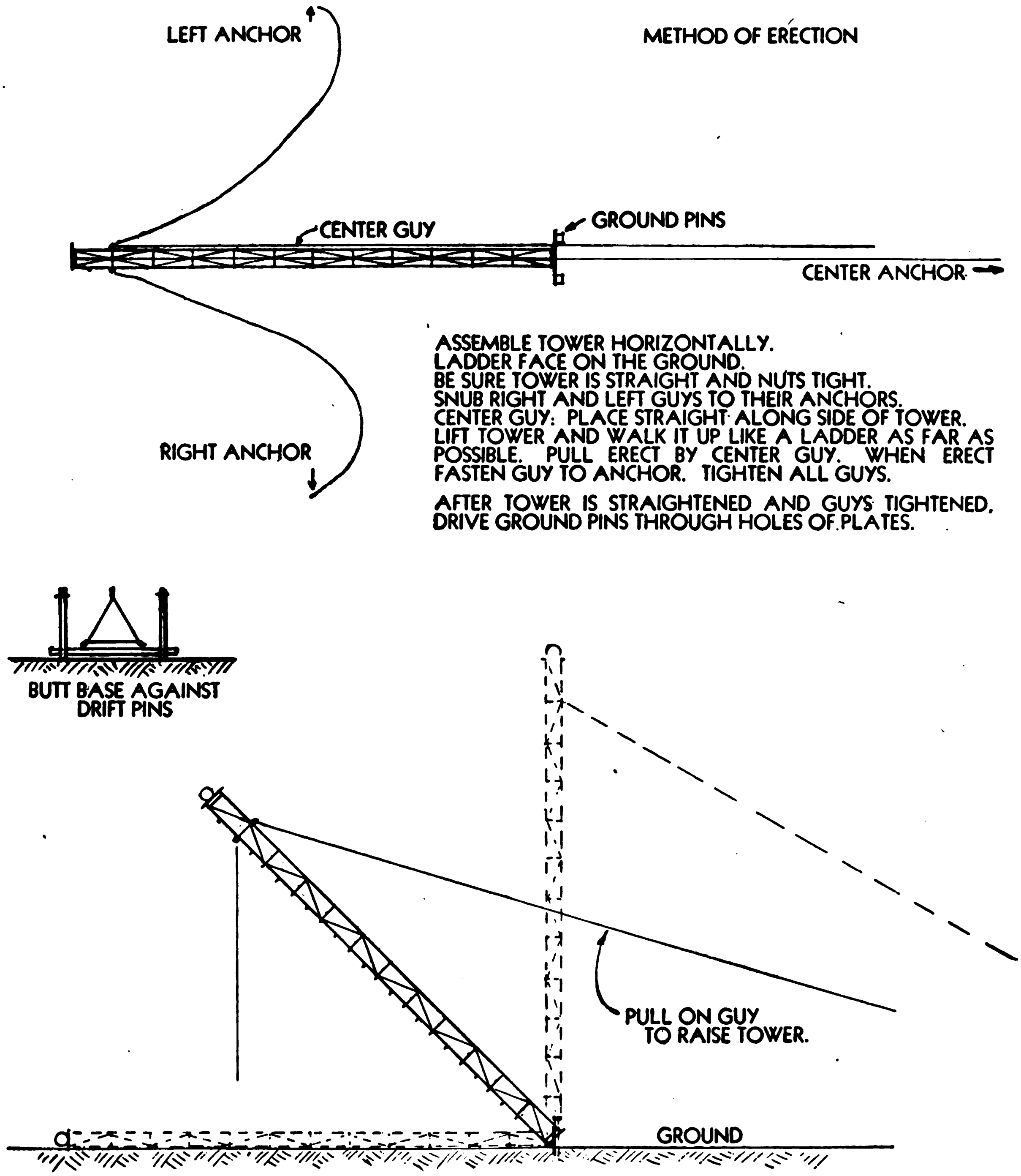



*Figure 6. Method of erection.*

TL 13291

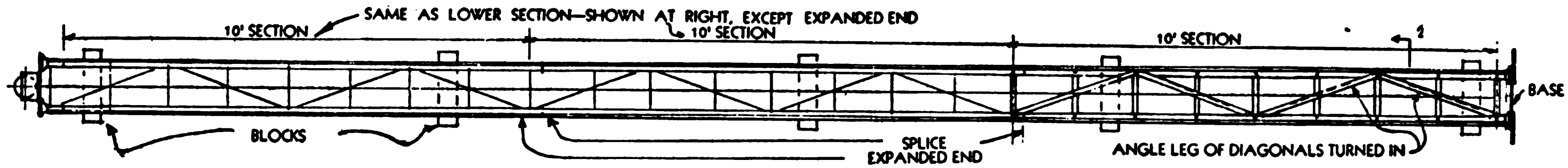



*Figure 7. Horizontal Assembly, ladder face toward ground.*

TL 13292

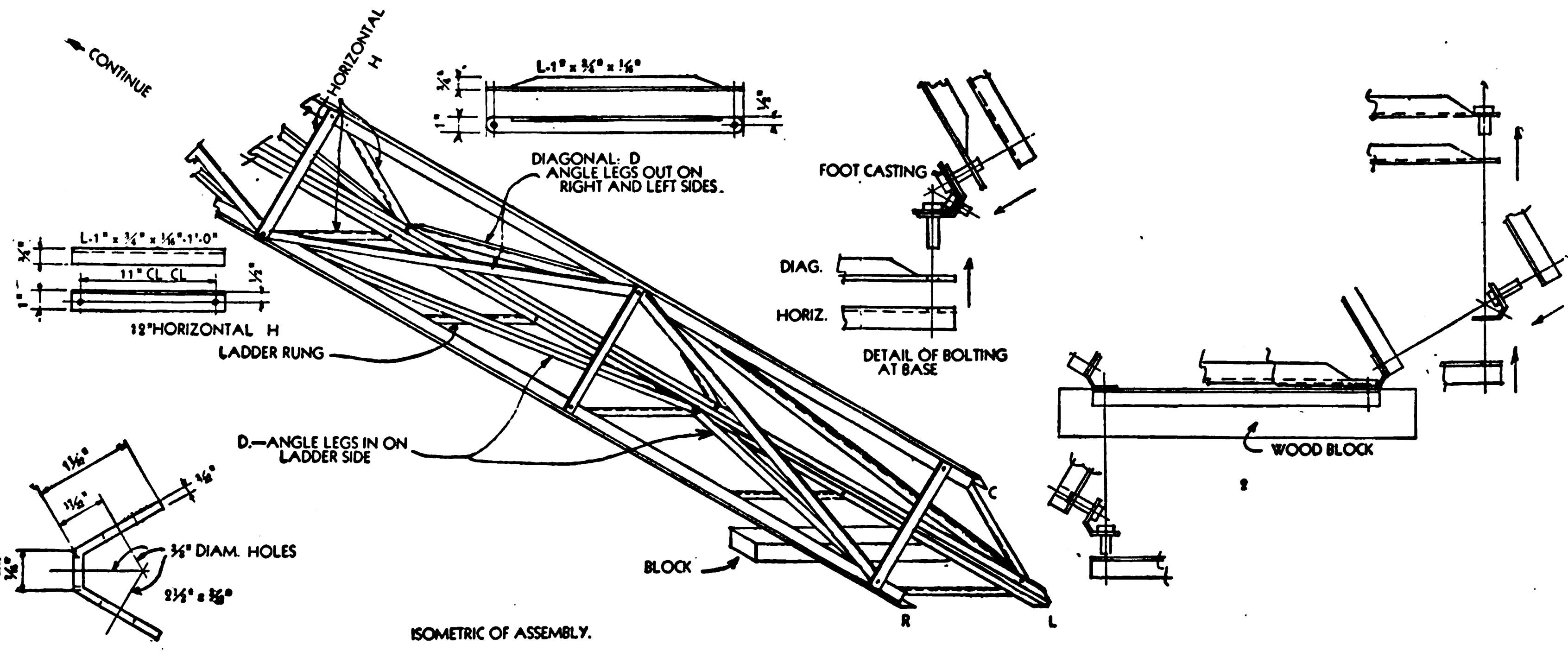



*Figure 8. Right and left sides and center leg erected above ladder face.*

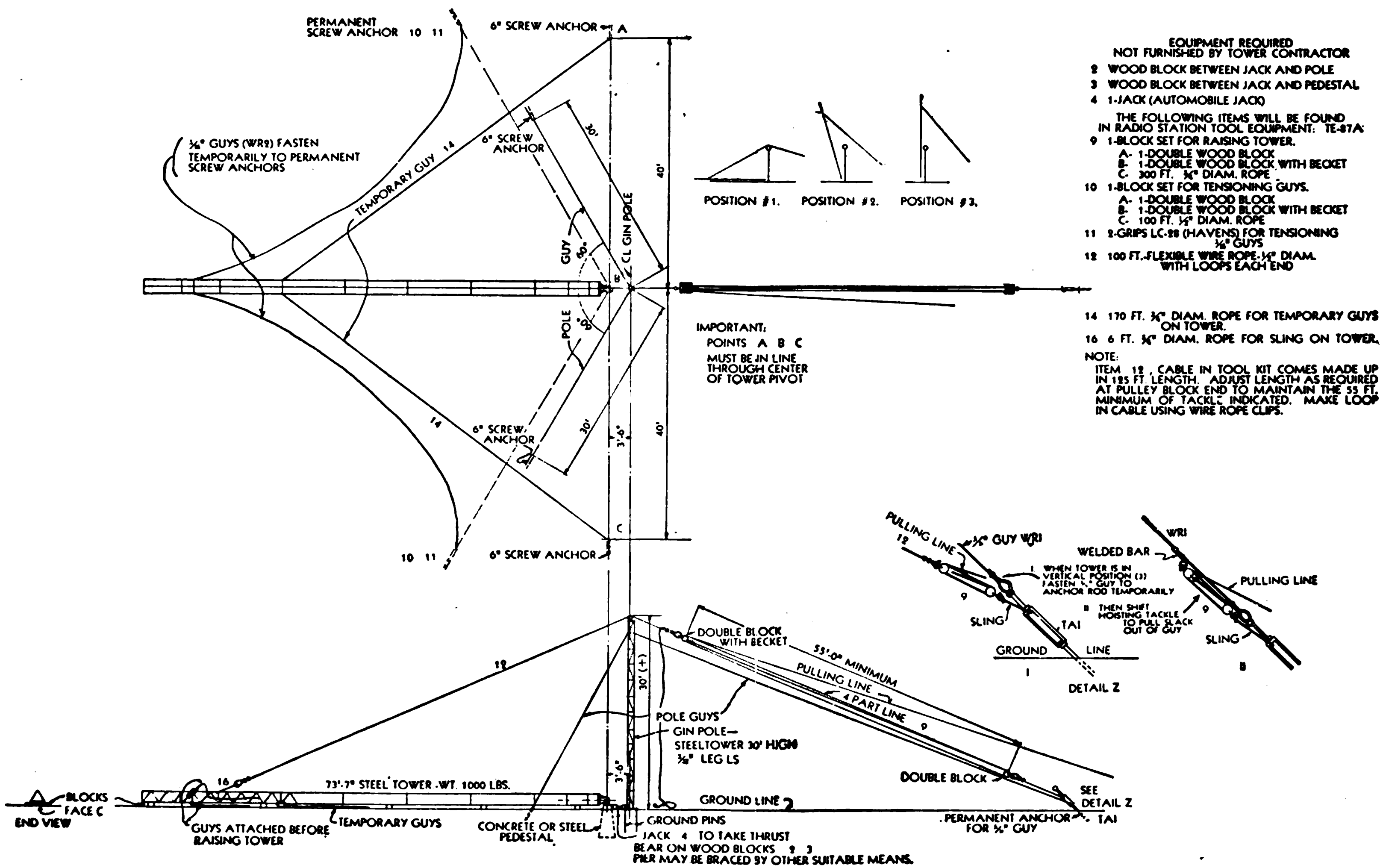
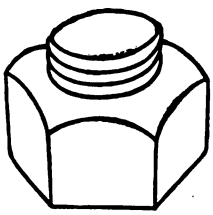
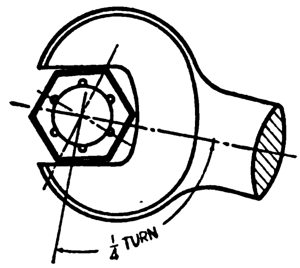


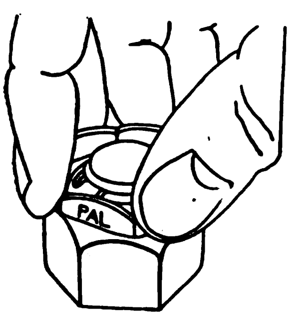

*Figure 9. Elevation position No. 1.*



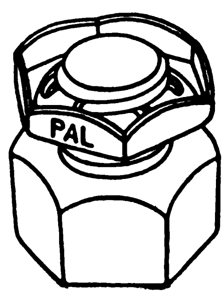
Turn nut to desired tightness with wrench. Be sure that not less than two FULL threads are provided for the Palnut.



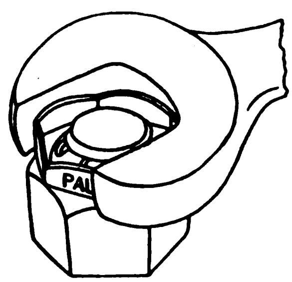

Tighten Palnut about ¼ turn with wrench, making sure wrench does not engage regular nut. Maximum holding power of Palnut is obtained at ¼ turn beyond finger-tight position.




Twirl Palnut onto bolt with fingers, until Palnut is snug against regular nut. Always apply Palnut locknuts with OPEN side out.




To remove Palnuts, first, loosen with a wrench, engaging only Palnut. After Palnut is loosened, Palnu tand regular nut may be removed separately or together, as preferred. Palnuts may be used again, providing most of the spring jaws in the center have retained their arch.




INSPECTION is made by taking a short grip on wrench handle. If it resists tightening with shortened wrench grip, Palnut is locked properly.

*Figure 10. Locknut details.*



U. S. GOVERNMENT PRINTING OFFICE: 1944

# TM 11-2615

## WAR DEPARTMENT TECHNICAL MANUAL

# FOUNDATION STEEL PEDESTAL BASE FOR 73' 7" GUYED RADIO TOWER



**RESTRICTED.** *DISSEMINATION OF RESTRICTED MATTER.* The information contained in restricted documents and the essential characteristics of restricted materiel may be given to any person known to be in the service of the United States and to persons of undoubted loyalty and discretion who are cooperating in Government work, but will not be communicated to the public or to the press except by authorized military public relations agencies. (See also par. 28, AR 380-5, 15 Mar 1944.)

*WAR DEPARTMENT* *18 JULY 1944*

*WAR DEPARTMENT TECHNICAL MANUAL*

*TM 11-2615*

# FOUNDATION STEEL PEDESTAL BASE FOR 73′ 7″ GUYED RADIO TOWER

*WAR DEPARTMENT* *18 JULY 1944*

RESTRICTED. *DISSEMINATION OF RESTRICTED MATTER.* The information contained in restricted documents and the essential characteristics of restricted materiel may be given to any person known to be in the service of the United States and to persons of undoubted loyalty and discretion who are cooperating in Government work, but will not be communicated to the public or to the press except by authorized military public relations agencies. (See also par. 28, AR 380-5, 15 Mar 1944.)

WAR DEPARTMENT,
WASHINGTON 25, D. C., 18 JULY 1944.

TM 11-2615, Foundation Steel Pedestal Base for 73′ 7″ Guyed Radio Tower, is published for the information and guidance of all concerned.

[A. G. 300.7 (10 Apr 44).]

BY ORDER OF THE SECRETARY OF WAR:

G. C. MARSHALL,
*Chief of Staff.*

OFFICIAL:
J. A. ULIO,
*Major General,*
*The Adjutant General.*

DISTRIBUTION:

X

(For explanation of symbols see FM 21-6.)

# TABLE OF CONTENTS



# LIST OF ILLUSTRATIONS

# DESTRUCTION NOTICE

**WHY** — To prevent the enemy from using or salvaging this equipment for his benefit.

**WHEN**—When ordered by your commander.

**HOW** — 1. Smash—Use sledges, crowbars, heavy tools.

2. Cut—Use flame throwers.

3. Explosives—Use firearms, grenades, TNT.

4. Disposal—Bury in slit trenches, fox holes, other holes. Throw in streams. Scatter.

**USE ANYTHING IMMEDIATELY AVAILABLE FOR**

**DESTRUCTION OF THIS EQUIPMENT**

**WHAT**—1. Smash—Corner posts, cap plate, base.

2. Cut—Corner posts, cap plate, base, bolts.

3. Bend—Corner posts, base.

4. Bury or scatter—Any or all of the above pieces after destroying their usefulness.

# DESTROY EVERYTHING

**1. GENERAL.** These are instructions for assembling and setting the foundation steel pedestal base for optional use with the 73-foot, 7-inch radio antenna tower (Signal Corps stock No. 2A3448). This base is used instead of a concrete foundation.

**2. PACKING.** The steel pedestal base is shipped unassembled with all necessary component parts packed for export in two bundles as follows:

***a. Bundle No. 1:*** Cap plate, bolts, nuts, paint, brush, and instruction book.

Bundle size—5-7/8" x 11-1/2" x 11-1/2"
Gross weight—31 lb
Cubage—0.45 cu ft

**CONTENTS**

| *Item* | *Quan.* | *Description* |
|---|---|---|
| 1 | 1 | Cap: 3/8"; plate steel. |
| 5 | 2 | Bolt: steel; 3/8" x 2"; 2 nuts. |
| 6 | 40 | Bolt: steel; 3/8" x 1-1/2"; 2 nuts. |
| 7 | 2 | Paint: black; asphalt; 1-pt can. |
| 8 | 1 | Brush: paint. |
| | 1 | TM 11-2615. |

***b. Bundle No. 2:*** Corner posts and base angles.
Bundle size—5-1/2" x 6-1/2" x 4' 6"
Gross weight—190 lb
Cubage—1.11 cu ft

**CONTENTS**

| *Item* | *Quan.* | *Description* |
|---|---|---|
| 2 | 4 | Corner post: angle; steel; 1/4" x 2" x 2" x 4' 6"; bent. |
| 3 | 4 | Base angle: steel; mitred; 1/4" x 3" x 2-1/2" x 3' 5-3/4". |
| 4 | 4 | Base angle: steel; 1/4" x 3" x 3' 9-3/4". |

**3. LOCATION AND ELEVATION.** The location and elevation will be governed by the tower and its use. Refer to the technical manuals covering the antenna and the tower.

**4. ASSEMBLY.**

***a.*** Refer to figure 5. The pedestal base may be assembled at any convenient place where the ground is level. Place base angles in proper order on the ground and bolt corner posts as indicated in figure 5. The cap (fig. 2) can then be attached by bolting it to the corner posts. The assembly will be easier if all members are *loose bolted,* that is the nuts are placed on the bolts and are turned until they are *finger tight.* When all members are in place, line up the assembly and tighten the nuts with a wrench. Take care when tightening because it is easy to overtighten the bolt which results in either stripping the threads or breaking the bolt. A 5-inch wrench is sufficiently long to adequately tighten a 5/16-inch bolt.

***b.*** After all bolts and nuts have been properly tightened, place the *Palnut*-type locknuts on the bolt ends and tighten with the fingers until the *Palnut* is snug against the regular nut. Be sure to apply *Palnut* locknut with the open side out. Then tighten the *Palnut* with a wrench. Turn the *Palnut* about one-quarter turn. The wrench should engage only the *Palnut* and not the regular nut. Maximum holding power of *Palnut* is developed at a one-quarter turn beyond the finger-tight position.

**5. PAINTING.** The entire surface including the nuts and bolts of the pedestal base shall be painted with two coats of black asphalt paint. Place the pedestal base on a side and paint the bottom and underside of the top cap. Then set it in an upright position on corner blocks or stones. Allow sufficient space under the base for air to dry the paint. Finish painting, allow time for drying, and repeat with second coat. Allow time for final drying and the pedestal base is ready for setting.

**6. SETTING.**

***a.*** The pedestal base should set level in firm earth to a depth of 3 feet, 8 inches. Excavating, filling, or both will be required depending upon elevation requirements as determined from antenna and tower instructions.

***b.*** Where the bottom of the pedestal base is set unusually high in the ground, be sure to remove top soil (loam, dust, or mud) and replace with gravel or best earth available mixed with mixed size stones or rock. Earth shall be tamped down well before leveling. The back fill should also be well tamped. Bring in enough fill to raise the ground level to within 8-inches of the top of the cap over an area 8 to 10 feet in radius from pedestal base.

**c.** Where the pedestal base is set in low ground, provide ditching to carry off surface water.

**d.** In general where excavation of earth discloses poor bearing soil (loam, silt, colloidial sand, etc.) use good judgment to excavate to reasonably firm earth and provide a *mat* of mixed stone, rocks, or concrete.

**7. MISCELLANEOUS.** Two 5/8- by 2-inch steel bolts and nuts are furnished as part of the pedestal base to provide for tower attachment.

**NOTE:** Failure or unsatisfactory performance of equipment will be reported on W.D., A.G.O. Form No. 468. If this form is not available, see TM 38-250.

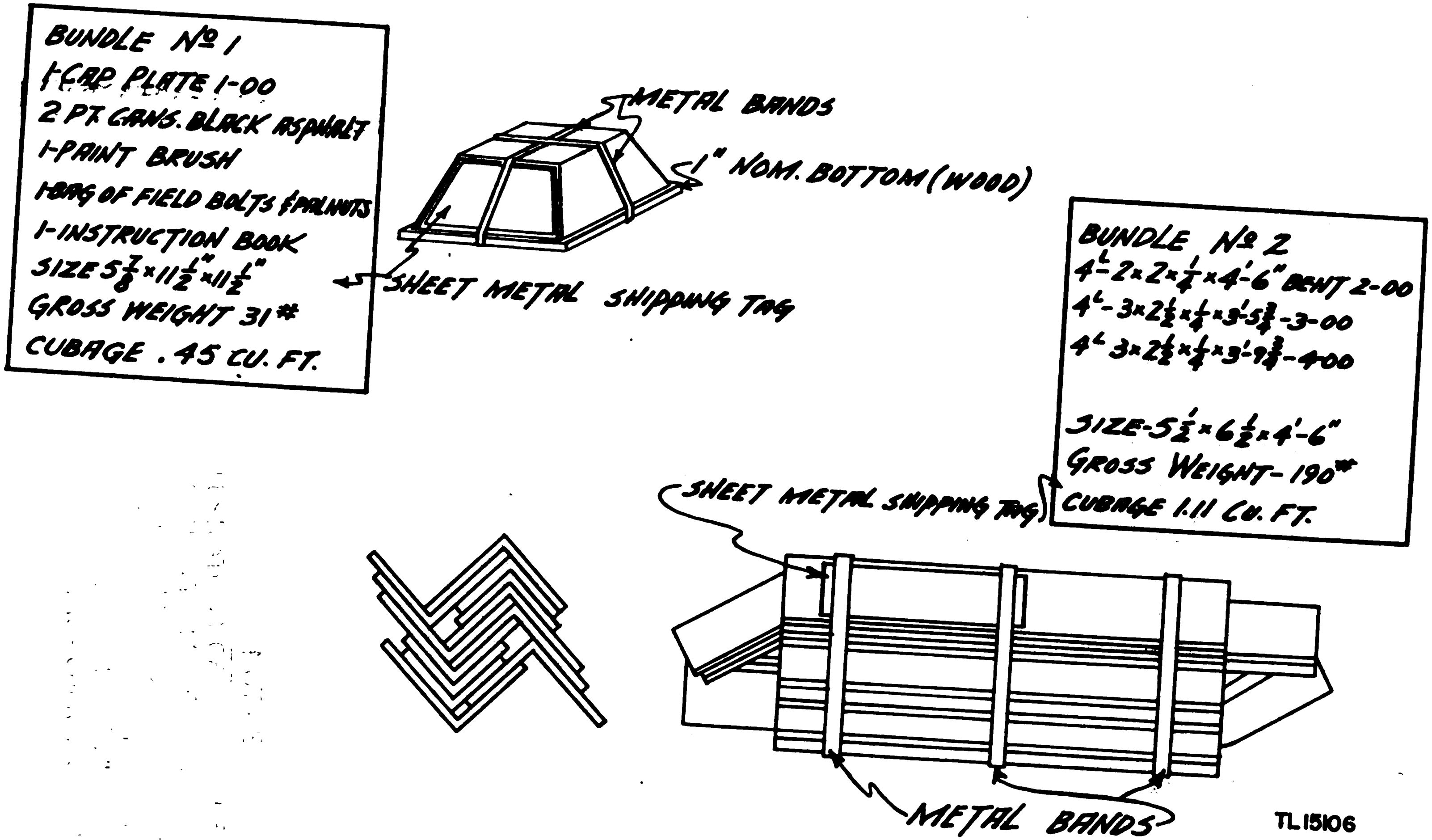



*Figure 1. Shipping details.*

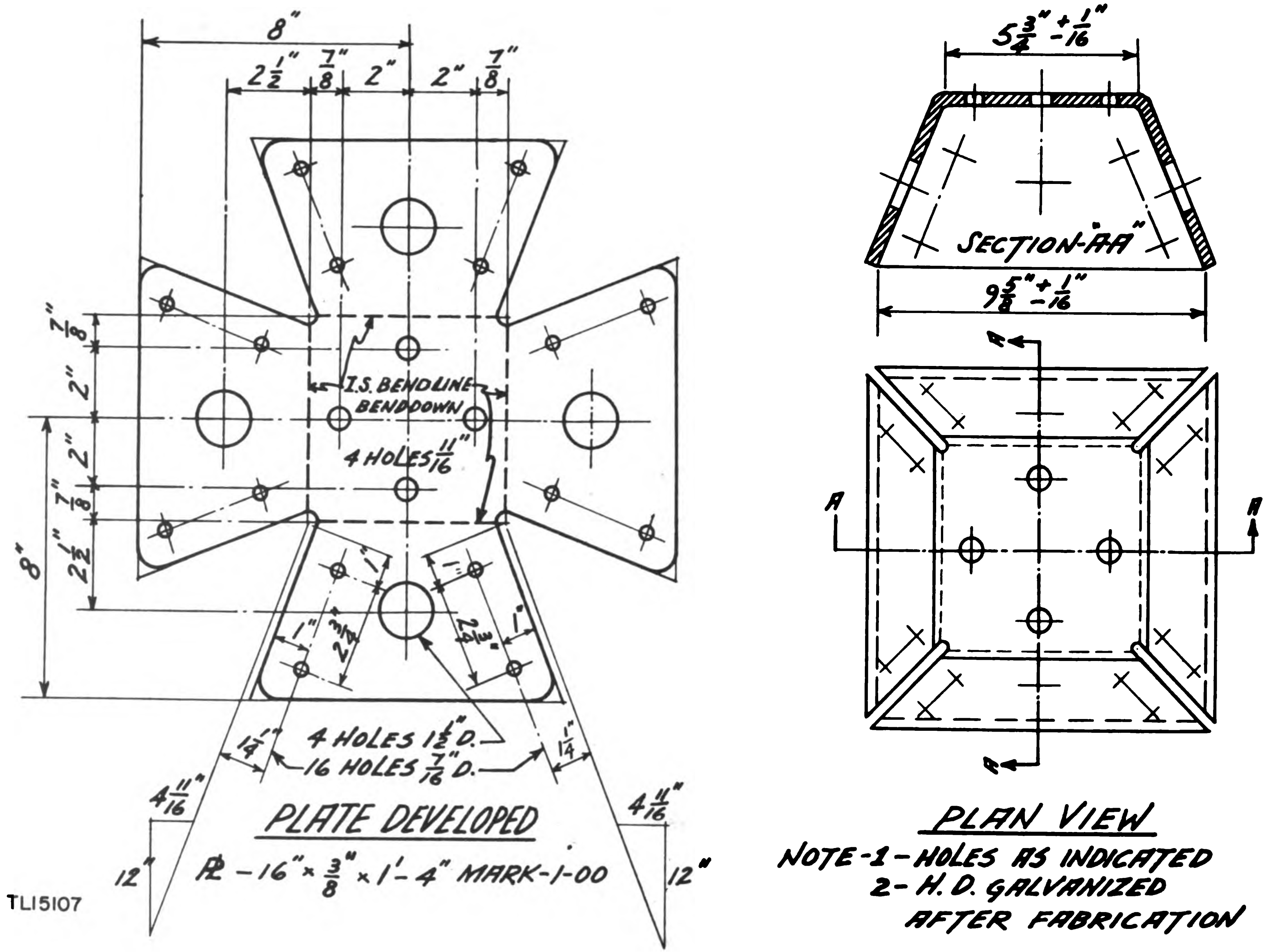



Figure 2. Steel cap plate.

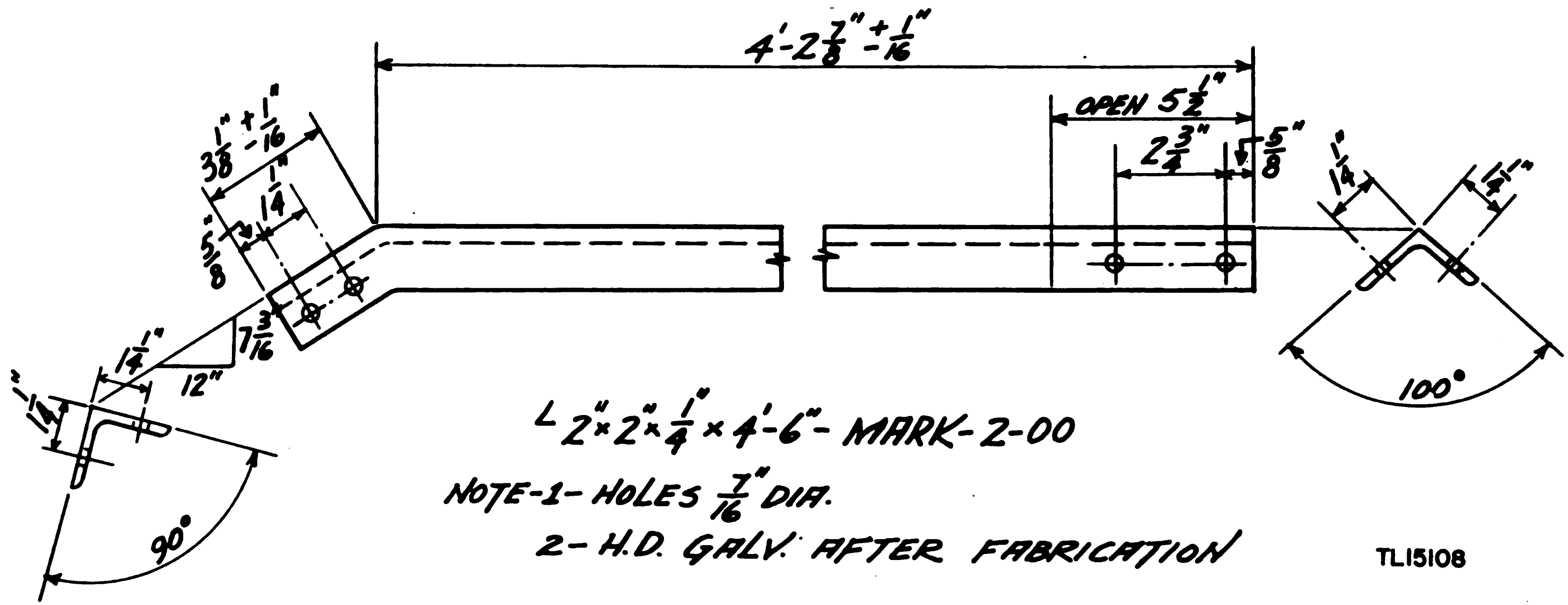



Figure 3. Steel angle corner post-2-00.

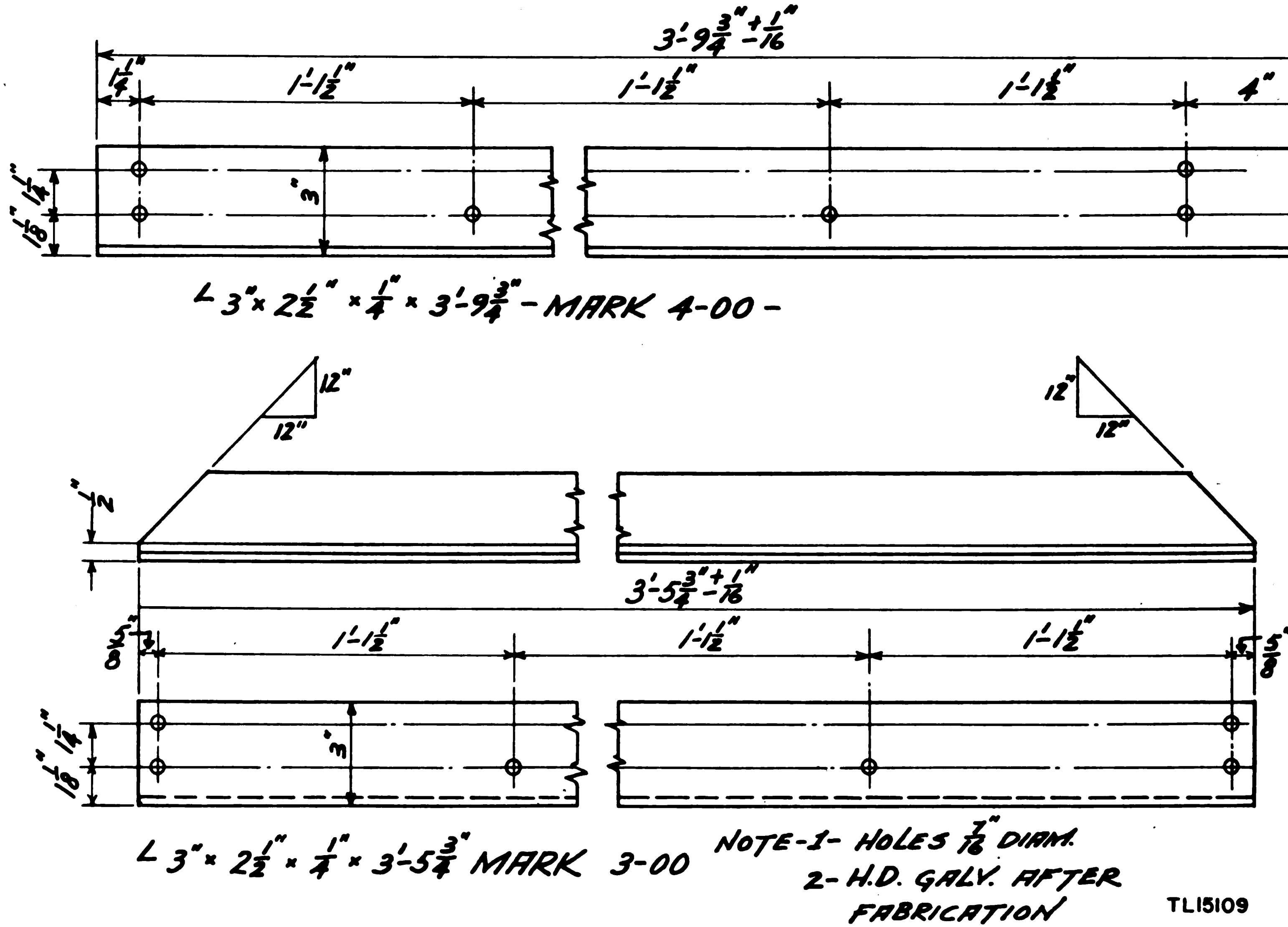
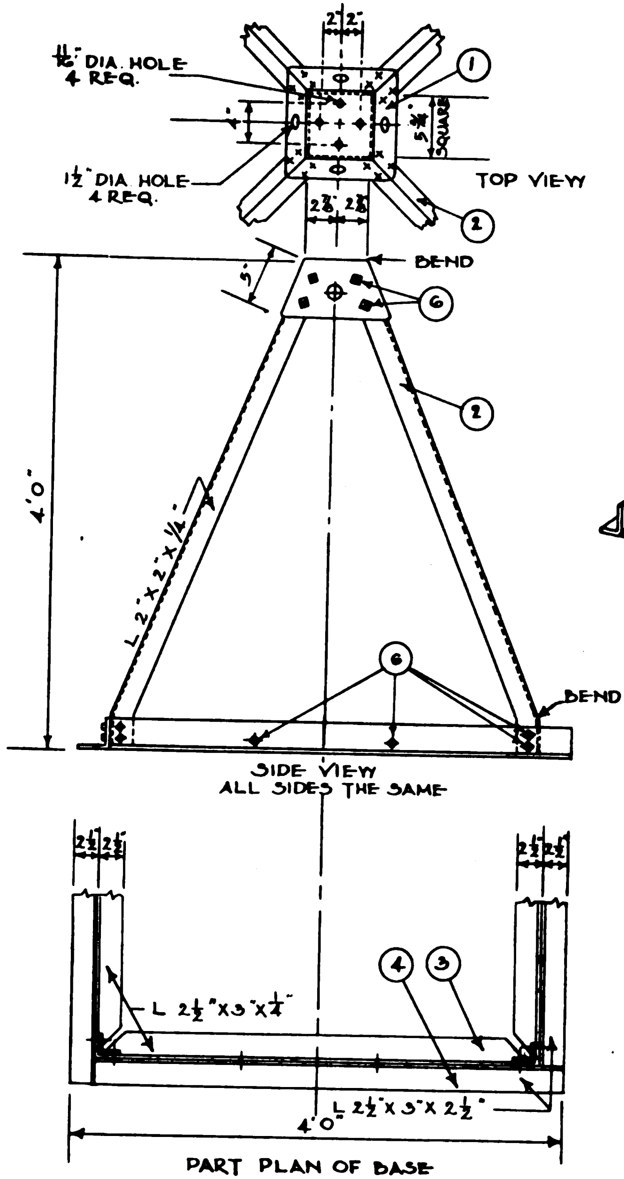
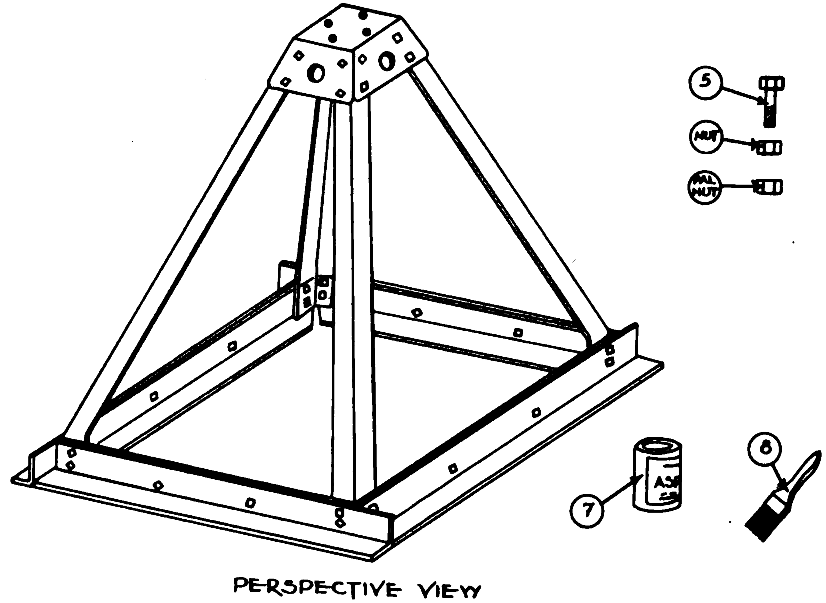



Figure 4. Steel angle base.




NOTE: 1. STEEL MATERIAL, STRUCTURAL GRADE STEEL, HOT DIP GALVANIZED AFTER BENDING AND PUNCHING.

2. BOLTS AND NUTS, HOT DIP GALVANIZED.

3. ITEM 5 BOLT DIAMETER FULL 5/8" NEXT TO HEAD, NOT THREADED FOR 5/8", REMAINDER THREADED.

| ITEM | NO. REQ. | DESCRIPTION |
|---|---|---|
| 1 | 1 | CAP, PLATE STEEL, 3/8" THICK, ONE PIECE, BENT |
| | | TO SHAPE. |
| 2 | 4 | CORNER POST, ANGLE, STEEL, $\frac{1}{4}$" X 2" X 2" X— |
| 3 | 4 | BASE ANGLE, STEEL, MITRED, $\frac{1}{4}$" X 3" X $2\frac{1}{2}$" X— |
| 4 | 4 | BASE, ANGLE, STEEL, $\frac{1}{4}$" X 3" X $2\frac{1}{2}$" X— |
| 5 | 2 | BOLT, STEEL, $\frac{5}{8}$" X 2", WITH NUT & PAL LOCK NUT |
| 6 | 40 | BOLT, STEEL, $\frac{3}{8}$" X $1\frac{1}{2}$", WITH NUT & PAL LOCK NUT |
| 7 | 2 | PAINT, BLACK, ASPHALT, 1-PINT CAN, REMOV- |
| | | ABLE LID-PAF 1-25-FED SPEC SS-A-696 |
| 8 | 1 | BRUSH, PAINT, $1\frac{1}{2}$" APPROX. |

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*Figure 5. Foundation steel pedestal base, assembled.*

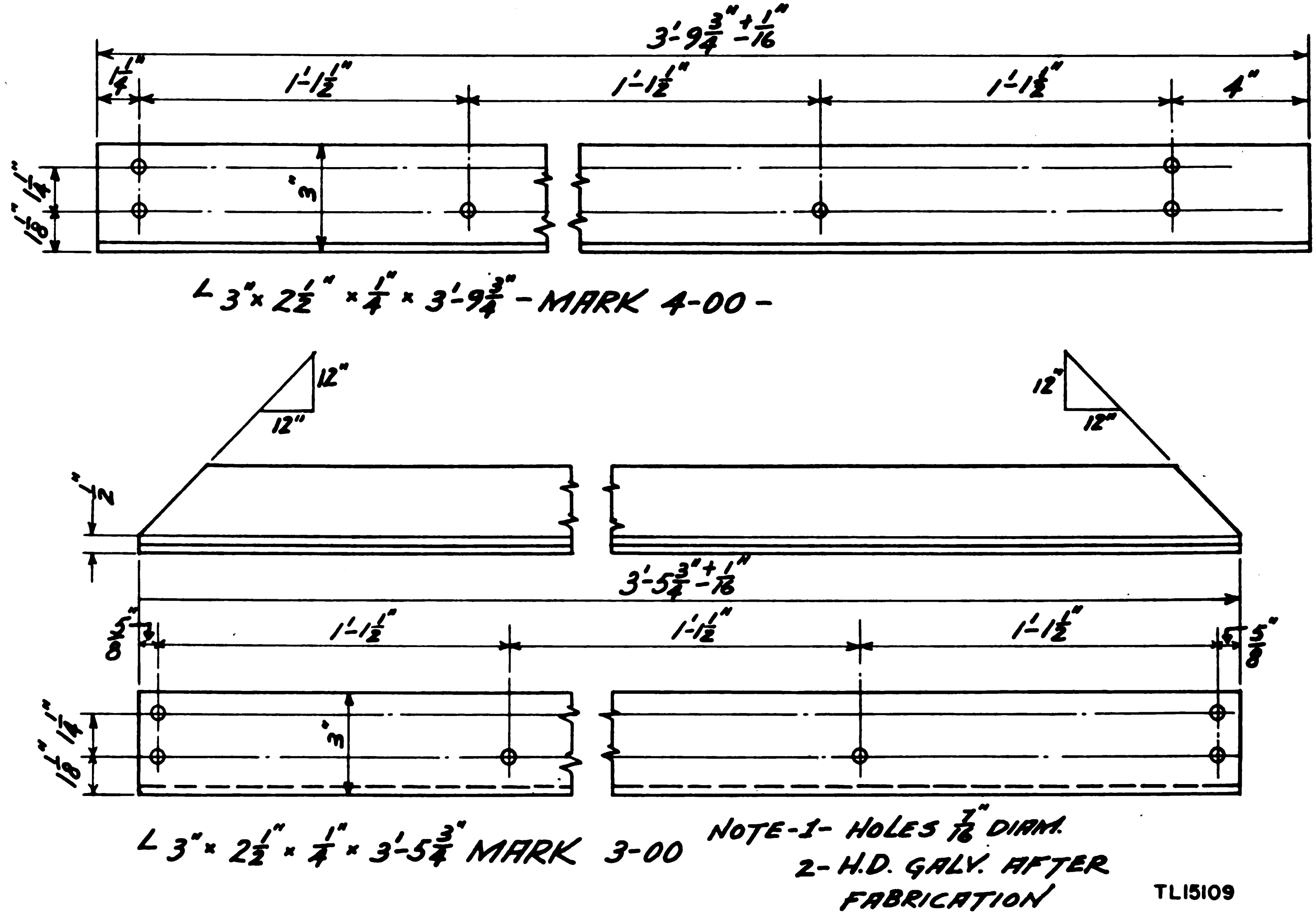
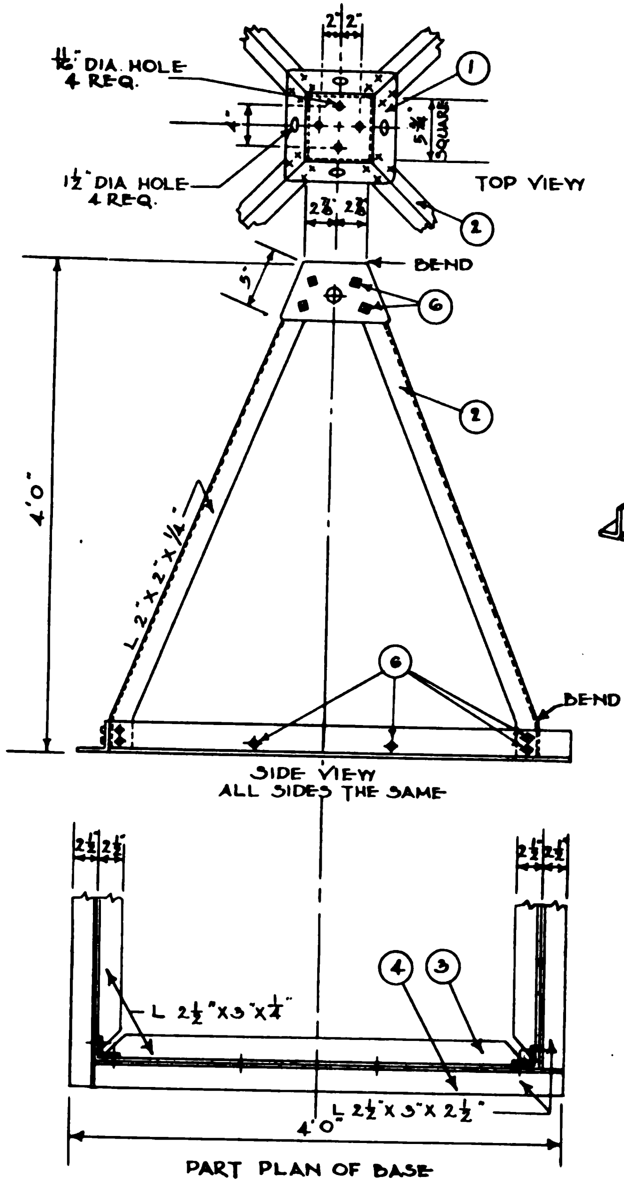
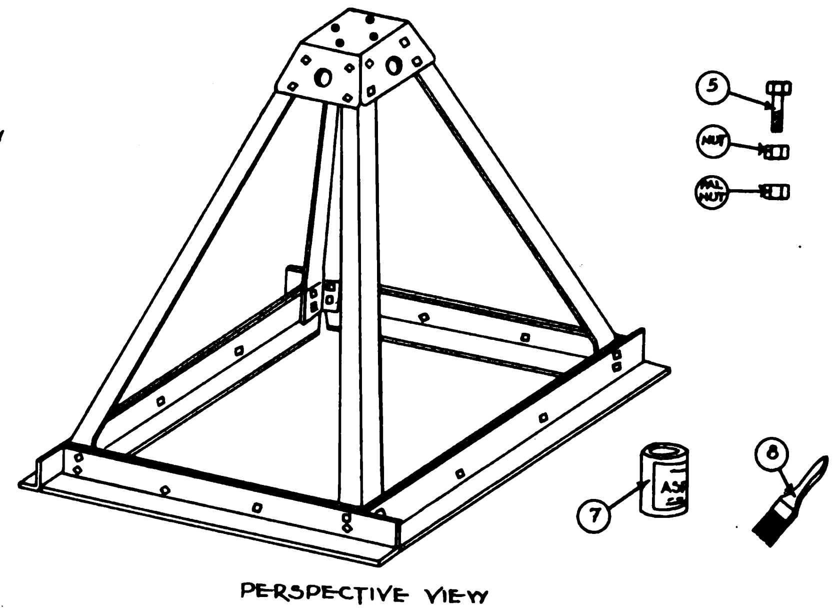



Figure 4. Steel angle base.




NOTE: 1. STEEL MATERIAL, STRUCTURAL GRADE STEEL, HOT DIP GALVANIZED AFTER BENDING AND PUNCHING.

2. BOLTS AND NUTS, HOT DIP GALVANIZED.

3. ITEM 5 BOLT DIAMETER FULL 5/8" NEXT TO HEAD, NOT THREADED FOR 5/8", REMAINDER THREADED.

| ITEM | NO. REQ. | DESCRIPTION |
|---|---|---|
| 1 | 1 | CAP, PLATE STEEL, 3/8" THICK, ONE PIECE, BENT |
| | | TO SHAPE. |
| 2 | 4 | CORNER POST, ANGLE, STEEL, ¼" x 2" x 2" x— |
| 3 | 4 | BASE ANGLE, STEEL, MITRED, ¼" x 3" x 2½" x— |
| 4 | 4 | BASE, ANGLE, STEEL, ¼" x 3" x 2½" x— |
| 5 | 2 | BOLT, STEEL, 5/8" x 2", WITH NUT & PAL LOCK NUT |
| 6 | 40 | BOLT, STEEL, 3/8" x 1½", WITH NUT & PAL LOCK NUT |
| 7 | 2 | PAINT, BLACK, ASPHALT, 1-PINT CAN, REMOV- |
| | | ABLE LID-PAF 1-25-FED SPEC SS-A-696 |
| 8 | 1 | BRUSH, PAINT, 1½" APPROX. |

*Figure 5. Foundation steel pedestal base, assembled.*

Order No. 20301—Phila—44-53; 7000 copies, 18 July 44.

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CTOBER 1944

# TM 11-2616

WAR DEPARTMENT TECHNICAL MANUAL



# ANTENNA EQUIPMENT RC–63

**RESTRICTED.** DISSEMINATION OF RESTRICTED MATTER. The information contained in restricted documents and the essential characteristics of restricted materiel may be given to any person known to be in the service of the United States and to persons of undoubted loyalty and discretion who are cooperating in Government work, but will not be communicated to the public or to the press except by authorized military public relations agencies. (See also par. 28, AR 380-5, 15 Mar 1944.)

WAR DEPARTMENT

17 OCTOBER 1944

WAR DEPARTMENT,
WASHINGTON 25, D. C., 17 OCTOBER 1944.

TM-11-2616, Antenna Equipment RC-63, is published for the information and guidance of all concerned.

[A. G. 300.7 (13 Apr 44).]

BY ORDER OF THE SECRETARY OF WAR:

G. C. MARSHALL,
*Chief of Staff.*

OFFICIAL:
J. A. ULIO,
*Major General,*
*The Adjutant General.*

DISTRIBUTION:
IBn (2); IC6, 11(5).
(For explanation of symbols see FM 21-6.)

# TABLE OF CONTENTS

# LIST OF ILLUSTRATIONS

## DESTRUCTION NOTICE

**WHY**—To prevent the enemy from using or salvaging this equipment for his benefit.

**WHEN**—When ordered by your commander.

**HOW**—1. Smash—Use sledges, axes, handaxes, pickaxes, hammers, crowbars, heavy tools.

2. Cut—Use axes, handaxes, machetes.
3. Burn—Use gasoline, kerosene, oil, flame throwers, incendiary grenades.
4. Explosives—Use firearms, grenades, TNT.
5. Disposal—Bury in slit trenches, fox holes, other holes. Throw in streams. Scatter.

**USE ANYTHING IMMEDIATELY AVAILABLE FOR DESTRUCTION OF THIS EQUIPMENT.**

**WHAT**—1. Smash—Mast, terminal blocks.

2. Cut—All wires, ropes, guys.
3. Burn—All equipment, associated training and technical manuals.
4. Bend—All reels, stakes, hooks.
5. Bury or scatter—All parts after destroying their usefulness.

DESTROY EVERYTHING

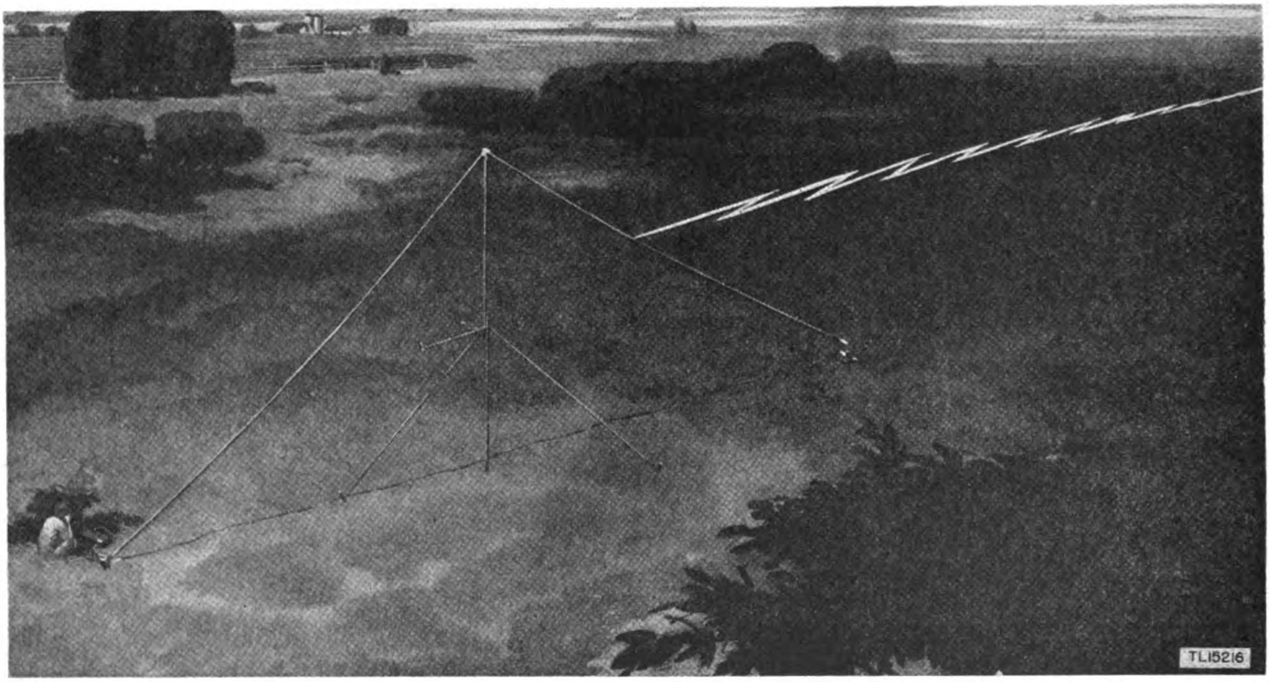


*Figure 1. Typical installation of Antenna Equipment RC-63, showing radio beam leaving antenna.*

# SECTION I

# DESCRIPTION

## 1. PURPOSE.

Antenna Equipment RC-63 is designed to be used as a vertically polarized directional antenna. This equipment is used with, but is not part of, various radio sets.

## 2. GENERAL DESCRIPTION.

Antenna Equipment RC-63, when dismantled and packed in Bag BG-93 for shipment, measures 8 feet by 1 foot by 8 inches and weighs 51 pounds. It provides a means for increasing the range of radio sets 100 percent, in one direction, over other antennas in use with various radio sets. The antenna (fig. 1) consists of a 100-foot antenna wire erected over a single 30-foot mast, and an 85-foot counterpoise wire laid along the ground. The antenna and counterpoise are terminated in a 500-ohm resistor unit, Terminal Block TM-194. The mast consists of four 8-foot sections of 1-19/32-inch wooden rods with metal ferrules, and is so designed that it may be easily erected. The upper half of the mast is hoisted into position by a rope and pulley, and the complete assembly is held in place by three guy ropes.

## 3. SOME EQUIPMENTS WITH WHICH ANTENNA EQUIPMENT RC-63 MAY BE USED.

**a.** Antenna Equipment RC-63 is a broadly tuned half-rhombic antenna. It may be used in conjunction with any radio receiver or low-power radio transmitter operating at frequencies of from 30 to 70 megacycles and equipped with either an r-f impedance output of 500 ohms, or suitable antenna-tuning components.

**b.** Several typical radio sets which will have greater range when using Antenna Equipment RC-63 are as follows:

| *Equipment* | *Frequency range* |
|---|---|
| Radio Set SCR-194-( ). | 27.7 to 52.2 mc. |
| Radio Set SCR-195-( ). | 52.8 to 65.8 mc. |
| Radio Set SCR-300-( ). | 40 to 48 mc. |
| *Radio Set SCR-508-( ). | 20 to 27.9 mc. |
| *Radio Set SCR-528-( ). | 20 to 27.9 mc. |
| *Radio Set SCR-538-( ). | 20 to 27.9 mc. |
| *Radio Set SCR-608-( ). | 27 to 38.9 mc. |
| *Radio Set SCR-609-( ). | 27 to 38.9 mc. |
| *Radio Set SCR-610-( ). | 27 to 38.9 mc. |
| *Radio Set SCR-628-( ). | 27 to 38.9 mc. |
| *Radio Set SCR-808-( ). | 27 to 38.9 mc. |
| *Radio Set SCR-828-( ). | 27 to 38.9 mc. |

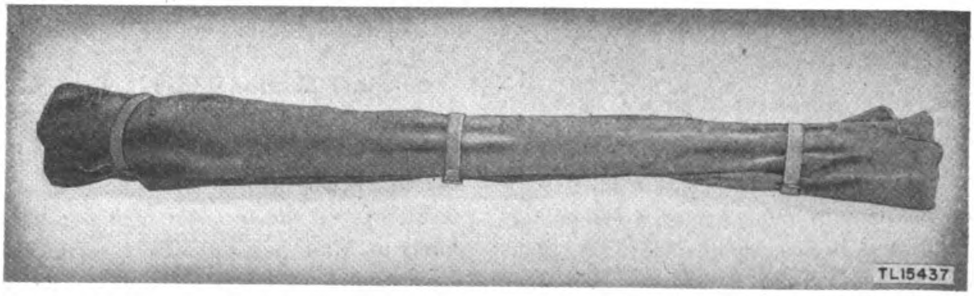



*Figure 2. Antenna Equipment RC-63, packed in Bag BG-93.*

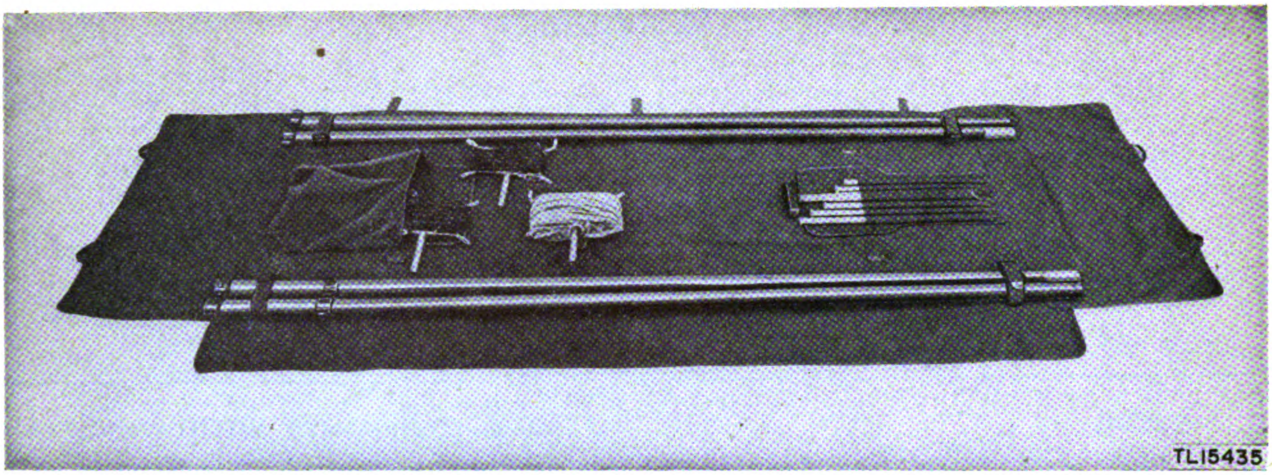


*Figure* 3. *Antenna Equipment RC-63, Bag BG-93 open.*

*At frequencies below 35 megacycles Antenna Equipment RC-63 has a wide beam width and complex lobe details. Refer to section V. In general, beam angles greater than 90° should not be used (fig. 19).

NOTE: Lowest frequency at which Antenna Equipment RC-63 will work efficiently as a beam antenna is 35 megacycles. However, it is more efficient than a vertical antenna as low as 20 megacycles.

## 4. COMPONENT PARTS.

The component parts of Antenna Equipment RC-63 are listed below.

| *Quantity* | *Article* | *Weight (lbs)* |
|---|---|---|
| 1 | Antenna AN-36 | 1.87 |
| 1 | Antenna AN-37 | 1.69 |
| 3 | Guy GY-34 | 0.69 |
| 1 | Guy GY-35 | 0.87 |
| 1 | Mast Section MS-91 | 4.75 |
| 1 | Mast Section MS-92 | 6.12 |
| 1 | Mast Section MS-93 | 5.88 |
| 1 | Mast Section MS-94 | 5.37 |
| 3 | Reel RL-3 | 1.00 |
| 5 | Stake GP-2 | 1.93 |
| 1 | Bag BG-93 | 6.80 |
| 1 | Hammer HM-1 | 1.94 |

Total weight of equipment 51 pounds.

## 5. DESCRIPTION OF PARTS.

**a. Antenna AN-36.** Antenna AN-36 is comprised of 100 feet of 42-strand bronze, number 32 B&S-gauge wire (Wire W-29), and is black weatherproofed. One S-hook is mounted in the center of the antenna wire and is used to attach the center of the antenna to the mast. On each end is an S-hook attached through an isolantite strain insulator to the antenna. Both ends terminate in a bare wire.

**b. Antenna AN-37.** Antenna AN-37 (counterpoise) is comprised of 85 feet of 42-strand bronze, number 32 B&S-guage wire (Wire W-29), and is black weatherproofed. An S-hook is attached to each end. One end terminates in a clip and the other end terminates in a bare wire. Terminal Block TB-194 (terminating resistor) is mounted on and is part of Antenna AN-37. Terminal Block TM-194 comprises a phenolic plate 1¼ by ¼ by 7 inches on each of which is mounted two Binding Posts TM-146-A. It includes Resistor RS-164 (500-ohms, 1-watt, 10-percent, insulated) connected between the binding posts and inclosed by a phenolic box-like cover screwed to the phenolic plate.

**c. Guy GY-34.** Guy GY-34 is made up of 30 feet of Rope RP-5 fitted with Hook FT-131 at one end and Fastener FT-9 at the other end.

**d. Guy GY-35.** Guy GY-35 is made up of 30 feet of Rope RP-5, fitted with Hook FT-131 at one end, Fastener FT-9 at the other end, and Block FT-127 and Hook FT-131 free on the rope.

**e. Mast Section MS-91.** Mast Section MS-91 is the top section of the antenna mast for Antenna Equipment RC-63. It is made of straight grain ash, fir, or spruce wood. It includes a metal plug and screw eye on the top end, and a metal-tubing socket fitted to Mast Section MS-92 on the lower end. Its dimensions are 1-19/32 inches in diameter and 96-19/32 inches long.

**f. Mast Section MS-92.** This is an intermediate section of the antenna mast which connects to Mast Section MS-91. It is similar to Mast Section MS-91 except that it includes metal-tubing sleeve on the top end for fitting Mast Section MS-91 and two steel guide brackets for raising the mast. Its dimensions are 1-7/8 inches in diameter by 5-3/8 inches at brackets by 95-3/4 inches long.

**g. Mast Section MS-93.** This is another intermediate section of the antenna mast which connects to Mast Section MS-91 except that it includes a metal-end plug for fitting to Mast Section MS-94 and a combination steel guide bracket and guy clamp on the upper end. Its dimensions are: diameter of mast, 1-19/32 inches; diameter at guy clamps, 2-3/4 inches; diameter at guide bracket, 6 inches; length of mast, 95-3/4 inches.

**h. Mast Section MS-94.** This is the bottom section of the mast which connects to Mast Section MS-93. It is similar to Mast Section MS-91 except that it includes metal tubing on the top end for fitting Mast Section MS-93 and a metal end piece at the bottom end for resting on the ground. Its dimensions are 1-19/32 by 95-3/4 inches.

**i. Reel RL-3.** Reel RL-3 is a hand reel. One is used for winding and carrying each of the following: Antenna AN-36, Antenna AN-37 (counterpoise), and Guys GP-34 and GP-35. Reel RL-34 consists of a flat rectangular frame, 11¾ by 10 inches. It is made of 3/16-inch iron wire and equipped with a handle made of a 4-9/16-inch length of ½-inch standard iron pipe.

**j. Stake GP-2.** Stake GP-2 is a solid galvanized-iron rod 16 inches long, ¾-inches in diameter, and with a 1⅛-inch diameter head.

**k. Hammer HM-1.** Hammer HM-1 is a double-faced engineer's hammer. It has a 16-inch handle and weighs 2 pounds.

**l. Bag BG-93.** Bag BG-93 is a hard texture, number 8, olive drab duck case, 8 feet long by 3 feet wide with an 18-inch flap at each end. It closes to approximately 8 feet by 1 foot by 8 inches. It is used to pack and carry Antenna Equipment RC-63 complete.

# SECTION II

# INSTALLATION AND OPERATION

## 6. CHOOSING AN ANTENNA SITE.

**a. Initial Procedure.** Before unloading or unpacking Antenna Equipment RC-63, choose an antenna site which will provide a location favorable for strong, forward, radio-beam propagation in the direction required.

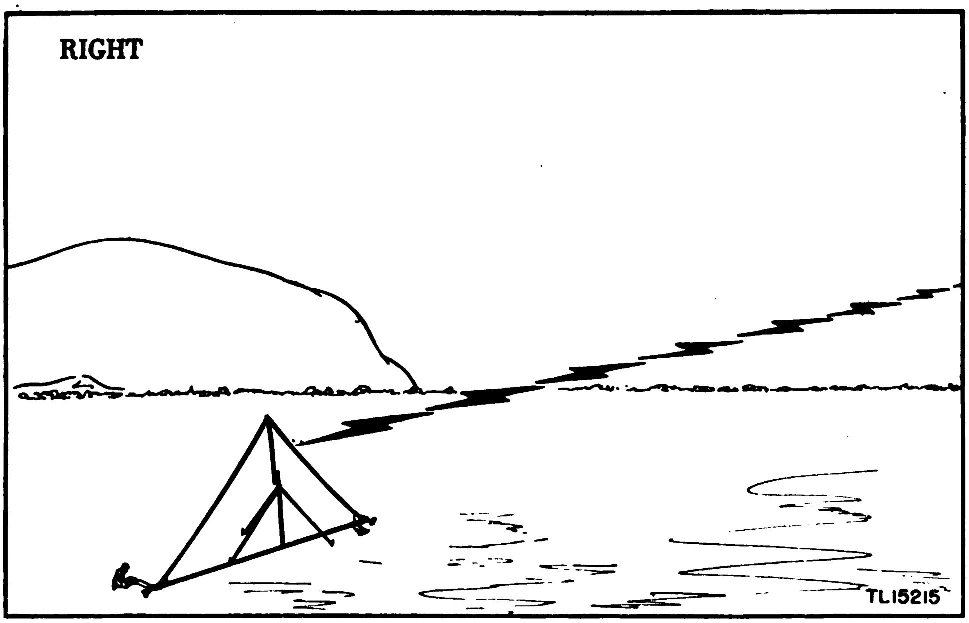
**b. Requirement of the Site.** For maximum propagation using half-rhombic antennas of this type, sites where these antennas are to be erected must be carefully studied.

(1) First, tentatively select a site; then survey the terrain which will be directly in the path of the proposed beam. To fix this direction, stand at the rear or radio set end of the antenna site and look toward the station or center point between stations with which communications is desired. The beam will leave the antenna in this direction.

(2) The terrain in the direction of the beam should be flat, gently rolling, or sloping downward in the beam direction, to provide a clear and unimpeded path to the outgoing and incoming radio signals. Good locations are shown in figures 1 and 4.

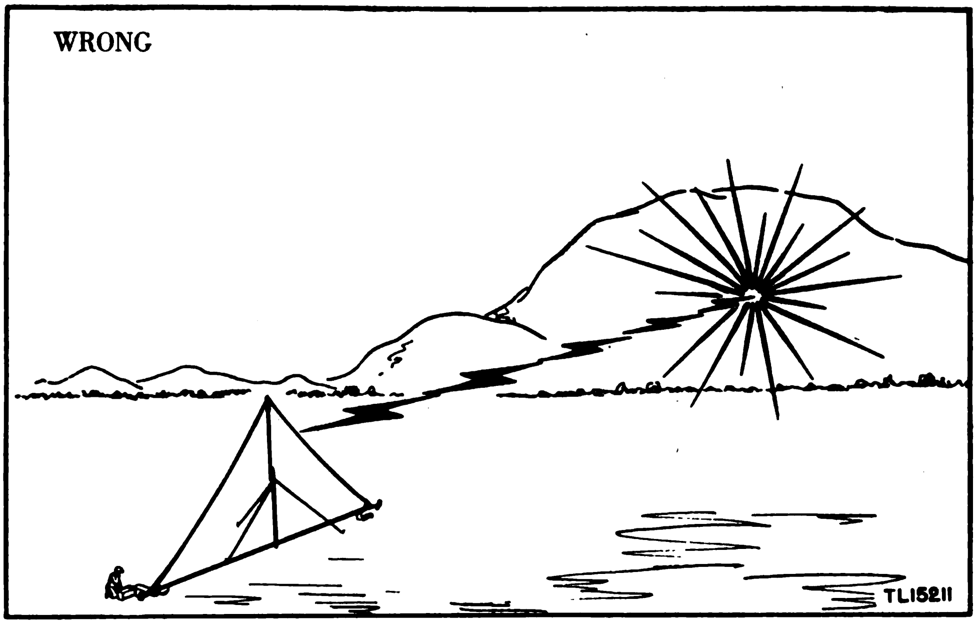
(3) Terrain in the direction of the beam should never include obstructions. Some of the major obstructions are outlined below:

**(a)** Mountains and hills will obstruct outgoing and incoming signals, causing poor radio performance or complete loss of communication. Figure 5 gives a graphic picture of a signal being deflected in its path by a mountain.




Choose a site where terrain in the direction of beam is flat or slopes downward.

*Figure 4. Right choice of antenna site.*

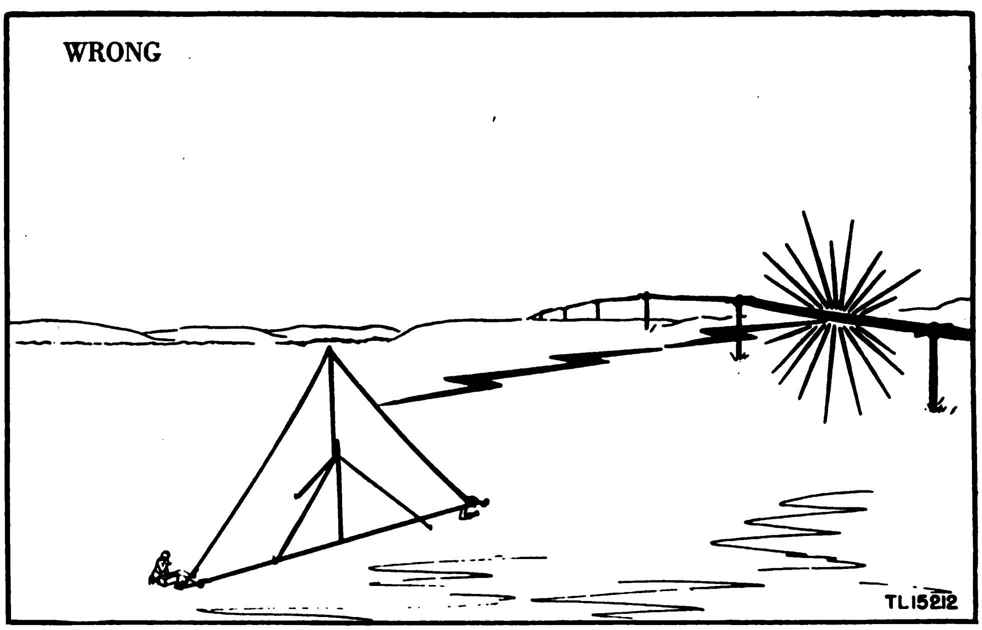



Don't choose a site where a nearby hill or mountain lies directly in the beam path.

*Figure 5. Wrong choice of site.*

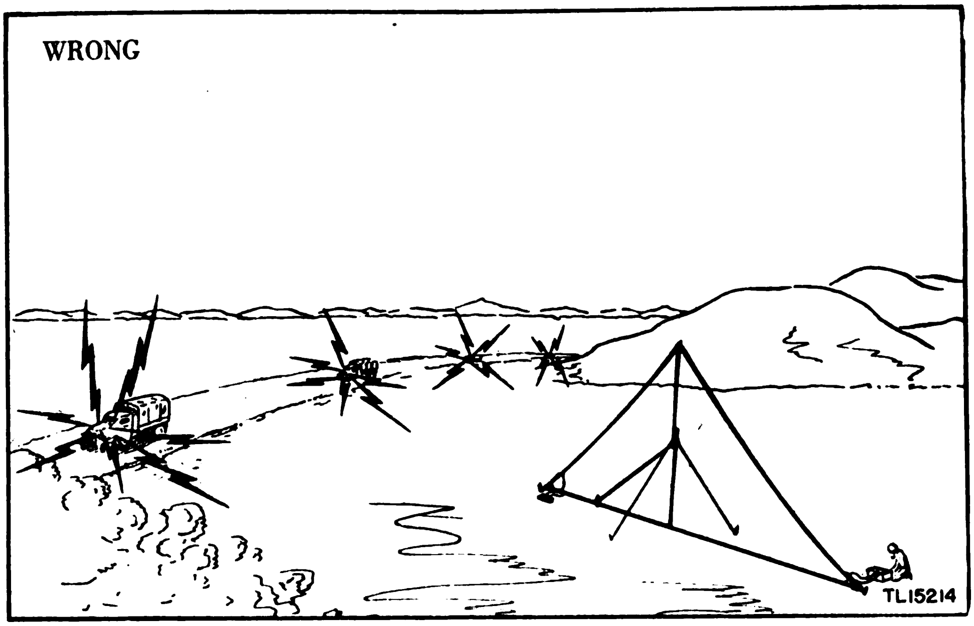
**(b)** Avoid sites (fig. 6) where overhead high-tension or telegraph lines, bridges, buildings, etc., lie directly in beam path. They will absorb and reduce the power of the transmitted beam, and may warp or refract its direction from the indicated by the compass. They may also cause bad interference to radio reception.

**(c)** Avoid sites where the beam path must cross a heavily traveled highway. Ignition noise from passing vehicles, suppressed or not, may blanket reception. Figure 7 shows a bad installation. Vehicle ignition systems radiate a strong damp wave at these high frequencies, causing large amounts of interference at close range. Sites where the beam must cross a nearby electrified town or village, a motor pool, or a col-




Don't choose a site where nearby overhead wires lie in the beam path.
They may absorb power and distort the beam direction; also cause noisy reception.

*Figure 6. Wrong choice of site.*

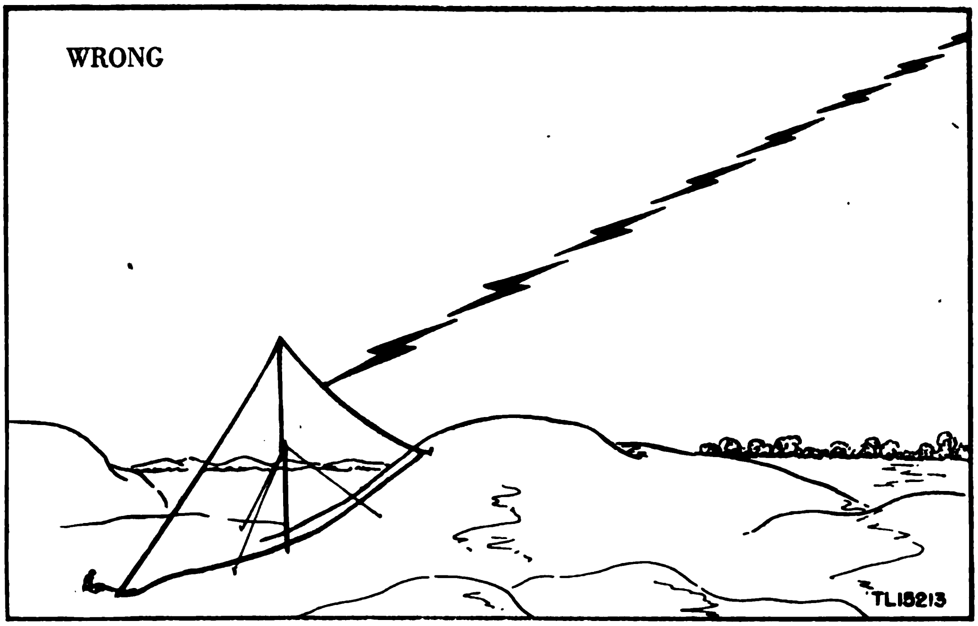



Don't choose a site where beam crosses a nearby heavily traveled highway. Ignition noise from vehicles may blanket reception.

*Figure 7. Wrong choice of site.*

lection of operating battery chargers, dynamotors, and electrical equipment must also be avoided. These equipments may prove noisy and cause blanketing of reception. Half-rhombic antennas providing signal voltage gains of 10 to 50 times over and above half-wave vertical antennas are proportionately sensitive to electrical noise as well as radio signals, and will amplify noise considerably more if the antenna site is carelessly chosen.

**(d)** Avoid installations on the side of a hill away from the direction of the desired beam path (fig. 8). signals from half-rhombic antennas installed in such a location will travel skyward at a high vertical angle, radiating little power at low angles (desired direction) or those angles effective for ground-wave coverage of terrain up to 75 miles. However, sites on the side of a hill toward the beam path and radio target will, for short distances of communication, aid the low-angle transmission and may be used.




Don't choose a site on the side of a hill away from the radio target. Signals will travel skyward, producing little ground wave.

*Figure 8. Wrong choice of site.*

**(e)** When concealment or speed of installation is more important for tactical reasons than sites favorable for efficient installations, less attention may be given to installation. Some of the gain of Antenna Equipment RC-63 will be lost if care is not taken when choosing a site; however, the gain will, in most cases, still be sufficient to warrant this type antenna installation.

**(f)** In choosing a site for Antenna Equipment RC-63, remember that any type of workable antenna may be used for temporary communication between two or more stations, while a site is being located and Antenna Equipment RC-63 is being installed.

> NOTE. *For purposes of clarity, illustrations in this manual do not show necessary camouflage and concealment precautions. These precautions must be closely followed at installations of Antenna Equipment RC-63.*

## 7. INSTALLATION PROCEDURE

After having chosen a suitable site, erect the mast approximately 40 feet from the input end of the antenna (end connected to radio set). If the spot where the mast is to stand is soft loose soil, lay a large flat stone, wide plank, or large heavy metal plate on the ground as a base for the antenna mast.

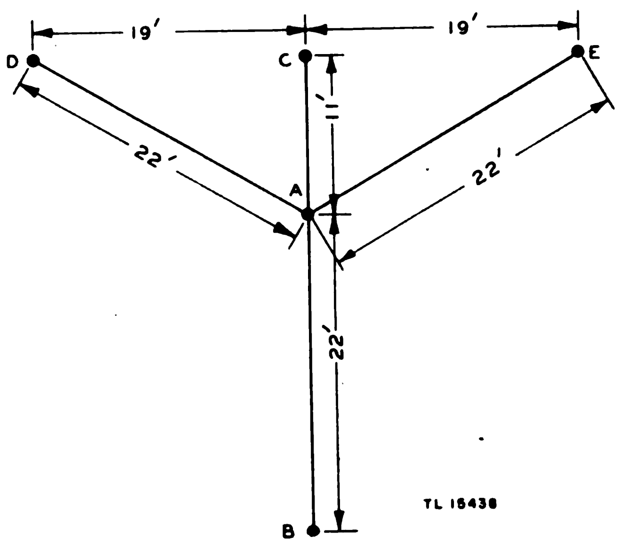



*Figure 9. Dimensional drawing of mast and stake layout, showing a simple method for erecting an antenna mast at point A.*

**a. Stake Layout.** With the spot where the mast is to stand as a center, three stakes, each 22 feet from the center, are driven into the ground to form a triangle. Follow the procedure outlined below. Dimensions are given in figure 9.

(1) Drive a stake *temporarily* into the ground at the spot where the mast is to stand (fig. 9, point A.)

(2) Measure 22 feet from point A to point B, and drive a stake into the ground at point B, slanting away from point A.

(3) Measure 11 feet in the opposite direction to point C, and drive a *temporary* stake into the ground.

(4) Measure 19 feet at right angles outward from C and drive a stake at D. Repeat and drive a stake at point E, both stakes slanting away from point A.

(5) Check to see that stakes at B, D, and E are each 22 feet from point A, forming an equilateral triangle with A as the center.

**b. Mast Assembly.** The mast consists of four sections which are designated as Mast Sections MS-91, MS-92, MS-93, and MS-94, beginning with the top section. Assemble the four sections on the ground as outlined below and indicated in figure 10.

(1) Attach Mast Sections MS-91 and MS-92 by inserting the metal tube socket on end of Mast Section MS-91 into the metal tube sleeve at the top of Mast Section MS-92.

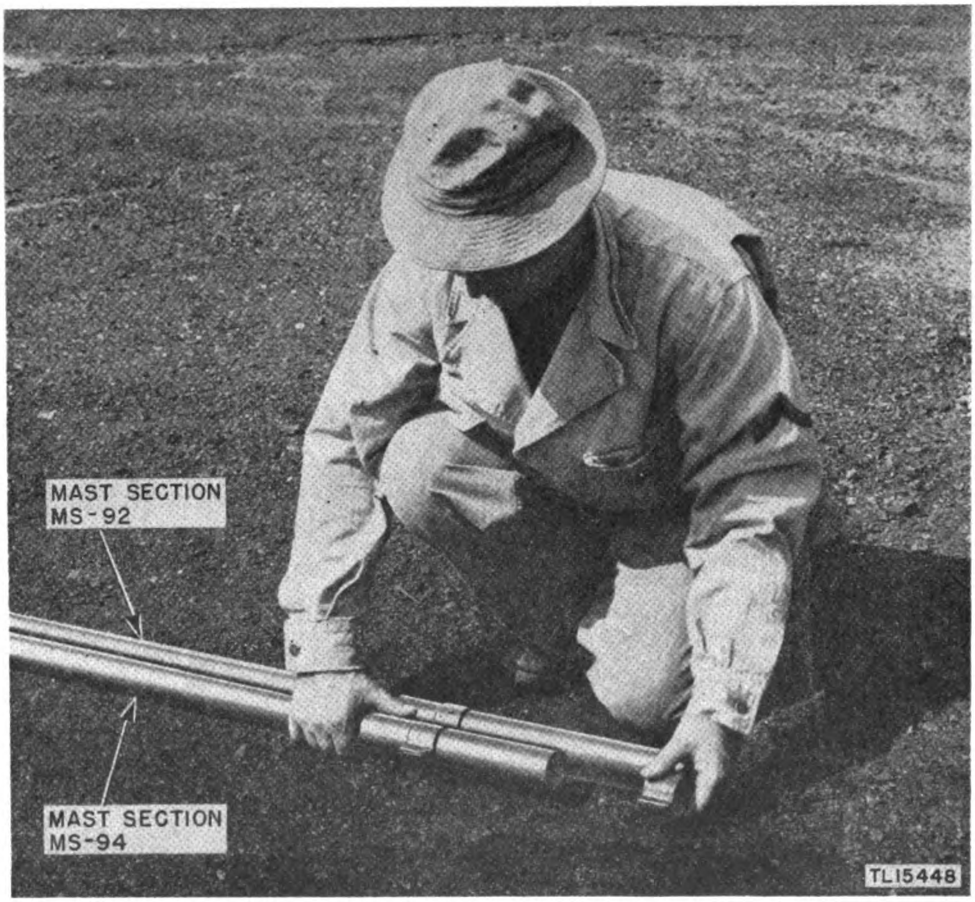



*Figure 10. Mast Section MS-94 being inserted into the two steel guide brackets attached to Mast Section MS-92.*

(2) Attach Mast Sections MS-93 and MS-94 by inserting the metal tube socket on end of Mast Section MS-93 into the metal tube sleeve at the top end of Mast Section MS-94.

(3) With Mast Sections MS-91 and MS-92 attached and lying parallel to Mast Sections MS-93 and MS-94 also attached, insert Mast Section MS-94 into the two steel guide brackets on Mast Section MS-92; at the same time insert Mast Section MS-91 into the steel guide bracket on Mast Section MS-93 (fig. 10).

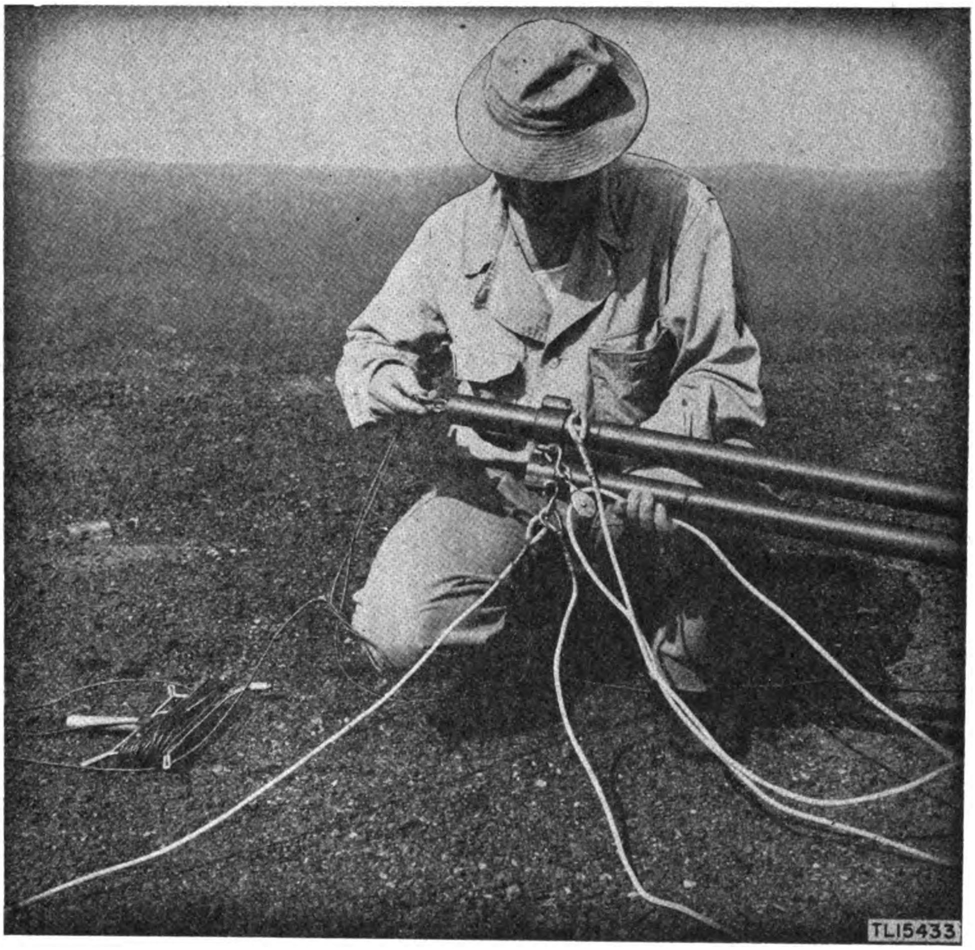



*Figure* 11. *Antenna AN-36 being attached to Mast Section MS-91.*

(4) Secure Guy GY-35 (hoisting rope) to the mast by attaching Hook FT-131, part of Block FT-127, to the eye provided on top of Mast Section MS-93, and attach Hook FT-131 (at one end of Guy GY-35) to bottom of Mast Section MS-92.

(5) Secure three guys GY-34 to the three ears in the metal collar on top of Mast Section MS-93 with Hooks FT-131 and adjust the guys to approximately their correct length (27 feet).

(6) Attach the center of Antenna AN-36 to the eye of top of Mast Section MS-91, using the S-hook secured to the center of Antenna AN-36 (fig. 11).

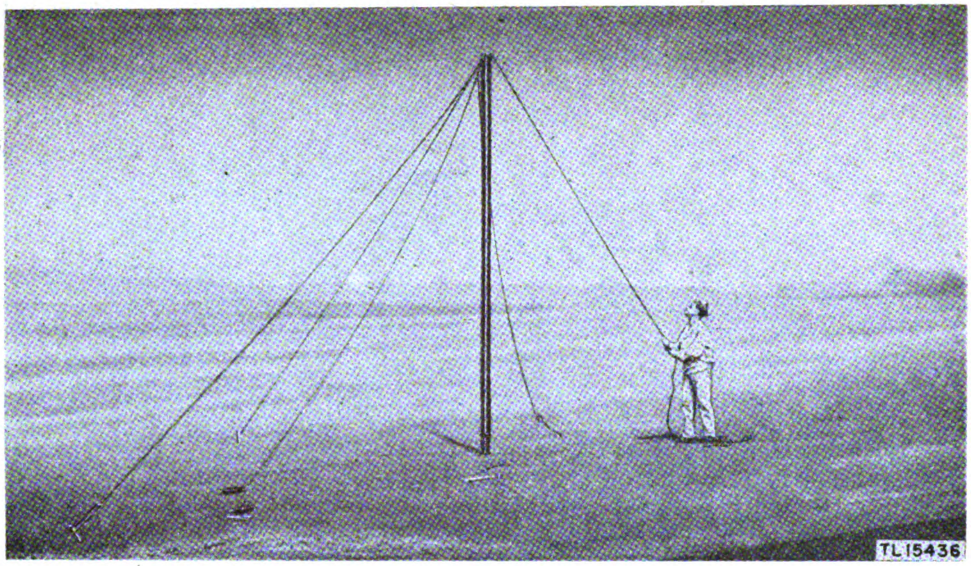



*Figure 12. Erecting mast in a vertical position.*

**c. Erecting Mast Antenna and Counterpoise.** After two guys are previously looped over two of the three guy stakes, the mast is erected in a vertical position (fig. 12). A third guy is then attached to the third guy stake. After the mast is erected in a vertical position and all three guy ropes are *adjusted under strain*, the mast is hoisted to its *full* height and held secure in this position by looping Guy GY-35 (hoist rope) over one of the guy stakes. Antenna and counterpoise are then stretched out in the direction of the beam and staked down.

(1) Attach two Guys GY-34 to two guy stakes by making at least one complete loop over each stake.

(2) Lay base of mast against temporary stake C. (fig. 9) and raise mast to a vertical position.

(3) Hold antenna mast in place with the third guy GY-34 (fig. 12). While holding Guy GY-34, walk over to third stake, make one complete loop around Stake GP-2, and take up on the guy.

(4) Tighten up on all three guys. *Put a heavy strain on each and be sure the mast is in a vertical position.*

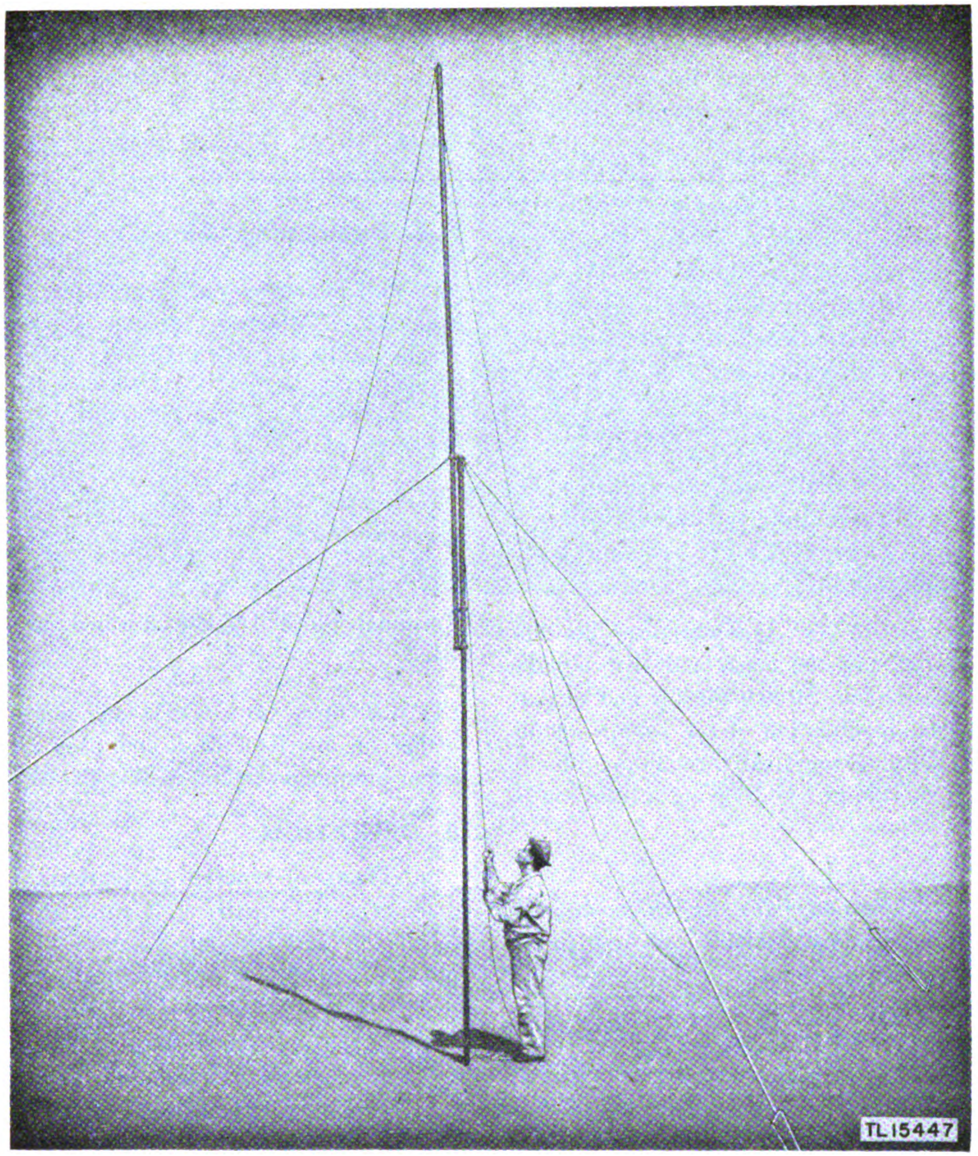



*Figure 13. Hoisting mast with Antenna AN-36 hanging loose.*

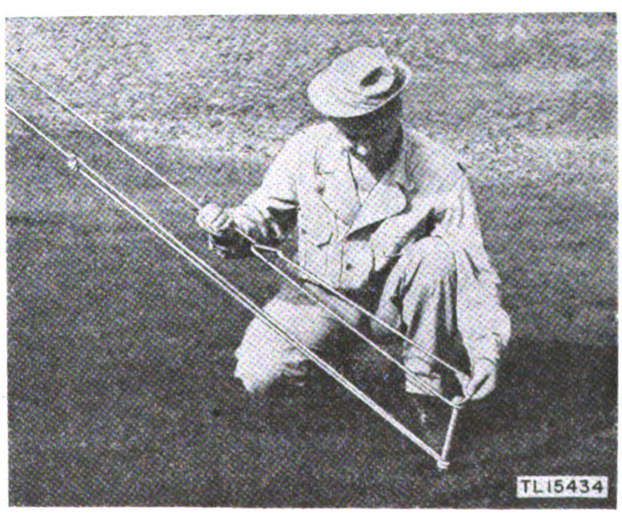



*Figure 14. Looping hoist rope over stake.*

(5) Using Guy Rope GY-35, hoist mast to its full height (fig. 13) and attach Guy GY-35 to one of the guy stakes. Make one complete loop around guy stake (fig. 14) and adjust guy for a *slight strain.*

(6) Remove stake C from base of mast (fig. 9).

(7) Stretch the input end of Antenna AN-36 (end which connects to radio set) out its full length and slip a Stake GP-2 through the S-hook. Slip the same stake through the S-hook attached to the clip end of Antenna AN-37 (counterpoise) and, while stretching Antenna AN-36 out with a little sag to it, drive Stake GP-2 into the ground.

> CAUTION: Never pull Antenna AN-36 tight or put undue strain on it. The antenna mast is pliable and pulling the antenna will cause the mast to bend or arch over with a possible break resulting.

(8) Unreel Antenna AN-37 (counterpoise) its full length, straight out past the mast, and slip a Stake GP-2 through the S-hook. Stretch the far end of Antenna AN-36 (end in direction of the beam) out its full length and slip the same stake through the S-hook. Drive the stake into the ground, leaving a little sag in the antenna.

(9) Adjust the stakes at both ends of Antenna AN-36 and Antenna AN-37 (counterpoise) so that no bend is apparent in the mast and Antenna AN-36 *sags* just a little, as illustrated in figure 1.

(10) Slide Terminal Block TM-194 along Antenna AN-37 (counterpoise) toward the far (beam) end of the antenna, and connect Antenna AN-36 and Antenna AN-37 to the appropriate binding post of Terminal Block TM-194. Terminal Block TM-194 is the antenna-terminating resistance.

**d. Dismantling Antenna Equipment RC-63.**

(1) Pull the stakes out of the gound at both ends of Antenna AN-36 and Antenna AN-37, releasing the strain on the antenna mast.

(2) Lower the antenna mast with Guy GY-35 (hoisting rope).

(3) Release *one* Guy GY-34 from Stake GP-2 and carefully lower mast to the ground.

(4) Reel Antenna AN-36 and Antenna AN-37 with Terminal Block TM-194 attached on separate Reels RL-3.

(5) Reel three Guys GY-34 and one Guy GY-35 together on one Reel RL-3 and pack all parts of Antenna Equipment RC-63 in Bag BG-93.

## 8. OPERATION.

**a. Transmit-receive Operation.** A half-rhombic antenna works equally well on receiving or transmitting. If it will transmit a strong signal to a given point, it will receive equally well from that point, the

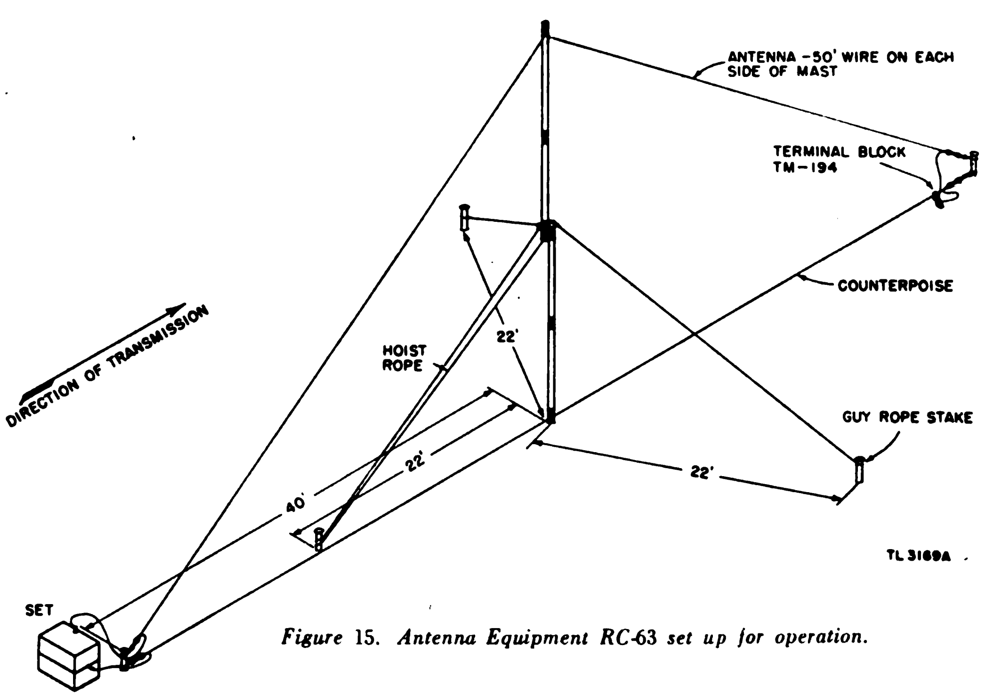



*Figure 15. Antenna Equipment RC-63 set up for operation.*

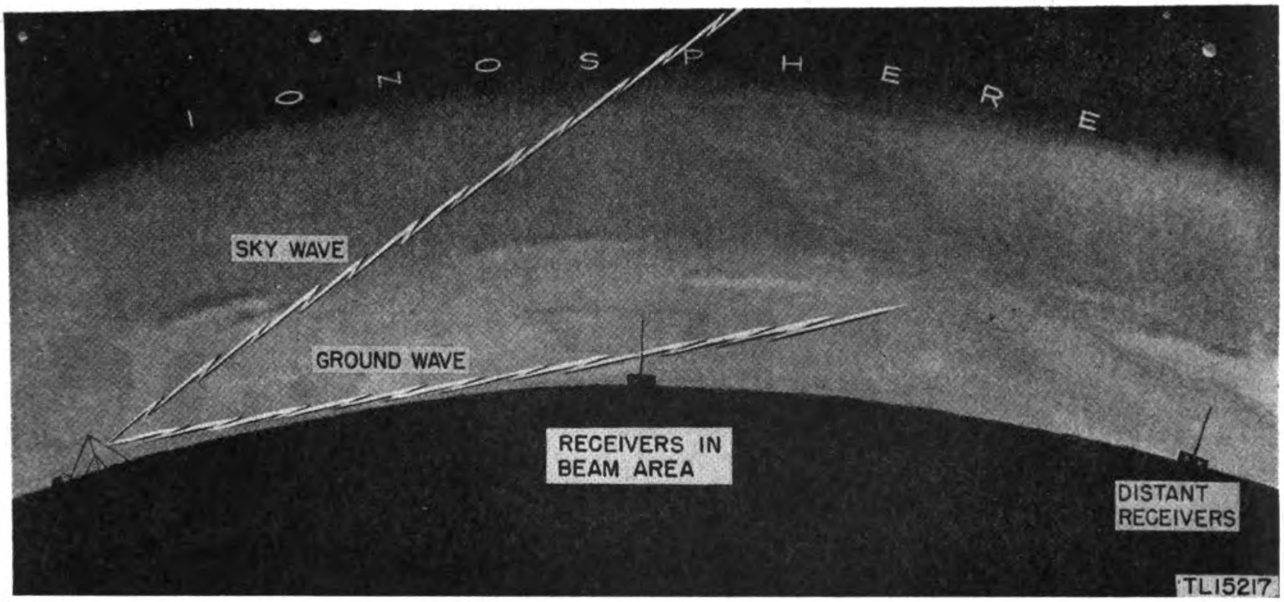



*Figure* 16. *Ground and sky wave produced by Antenna Equipment RC-63.*

power gain of the antenna being applied to both incoming and outgoing signals. For example, if radio transmitter A delivers 5 watts at 30 megacycles to Antenna Equipment RC-63, which has a gain of five times at this frequency, the effective power of the transmitter will be increased, in the direct line of the beam, to 25 watts. Similarly, signals received from a 5-watt station directly in the beam will be increased in the direct line of the beam to a level equal to a signal coming from a 25-watt station. This equal performance of an antenna on transmitting and receiving is known as antenna reciprocity and is more fully covered in TM 11-314, Antennas and Antenna Systems.

**b. Ground Wave and Sky Wave.** As is the case with most very-high-and-ultra-high-frequency antenna systems, transmissions from this antenna depend for effect on the ground wave. As shown in figure 16, the ground wave is sent out at a low vertical angle from the antenna and, skirting the ground, is effective in reaching receivers within approximately 5 to 25 miles and under exceptional conditions more than 25 miles. The sky-wave, power-radiated at a high vertical angle, strikes the ionosphere and either is absorbed in traveling through the ionosphere, or is reflected off the ionosphere at a low vertical angle continuing past the earth into space.

## 9. ORIENTATION OF ANTENNA FOR MAXIMUM SIGNAL STRENGTH.

If it is desired to receive or transmit signals to one locality, the antenna is normally aimed at that locality with the aid of a compass, or other method which may be available. For the greatest possible signal strength, follow the procedure outlined below, after the initial installation has been made.

**a.** Tune in the desired signal. Once tuned in, leave the receiver controls fixed so that any changes in the antenna will cause an increase or decrease in receiver volume.

**b.** Using the mast as a center, rotate the entire antenna, counterpoise, and radio set from left to right until a maximum received signal is produced on the receiver. When a position is found, at which a maximum signal is received from the desired station, stake down and secure both ends of the antenna and counterpoise in the same manner as outlined in paragraph 7.

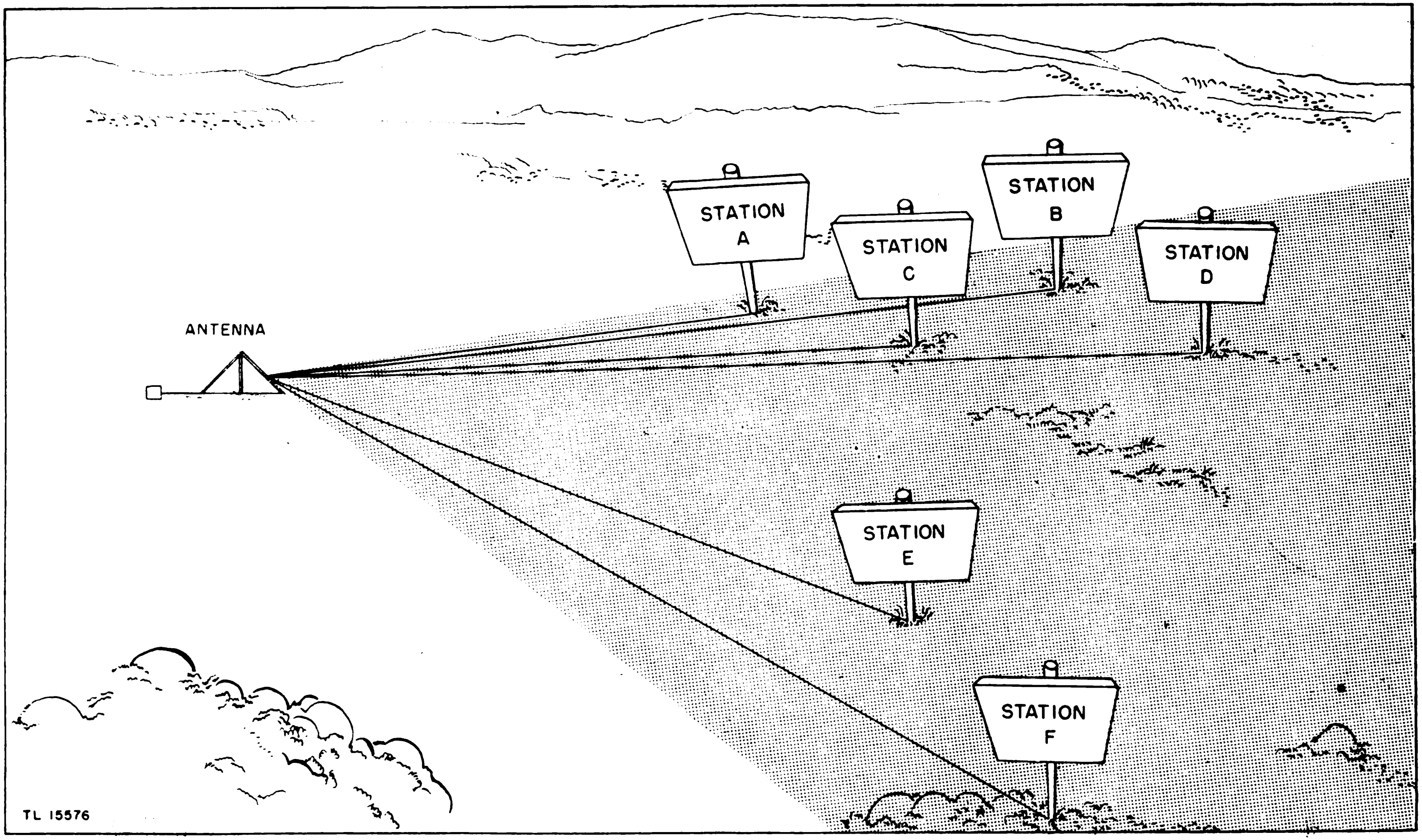



*Figure 17. Half-rhombic antenna correctly oriented.*

## 10. ORIENTATION FOR COMMUNICATION WITH A GROUP OF STATIONS.

**a.** It may be desirable to transmit and receive the strongest possible signals with a number of stations spread over a wide sector. It will therefore be necessary to analyze the beaming action and beam coverage of the antenna.

**b.** Antenna Equipment RC-63 concentrates radio energy fed to it into a beam precisely as a searchlight concentrates the light it casts in the direction it is pointed (fig. 18). Unlike a searchlight, however, the width of the radio beam sent out by the antenna varies with the frequency at which the antenna is used; the higher the frequency used, the sharper and more powerful the beam.

(3) Turn on the receiver and tune in a station to the extreme left of the antenna. Station located at position A or B (fig. 17) should be tuned in.

(4) Leave the receiver gain or volume control intact, and tune in a station to the extreme right of the antenna by using only the receiver tuning control. Station located at position E or F (fig. 17) should be tuned in.

(5) If the signal strength from the station to the left (station A) is equal to the signal strength from the station to the right (station F), no realignment of the antenna is required. However, if the signal strength from one side is weaker than from the other side, the antenna will have to be rotated toward the weak station balancing the signal strength from each station. Follow the procedure given in paragraph 9.

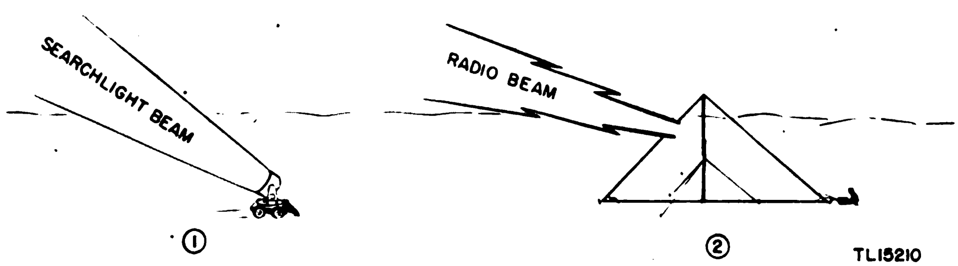



*Figure 18. Radio and searchlight beam.*

**c.** When communication is desired between two or more stations and the antenna has been installed in the general direction of the stations, proceed as follows:

(1) Survey the area with a compass, or by observation and available information, and draw a line on the ground from the mast a short distance out toward each station with which communication is desired. This area outlined on the ground from the mast outward is the area to be covered by the antenna.

(2) Pull up from the ground the two Stakes GP-2 which are holding the antenna and counterpoise in place, and rotate the antenna and counterpoise to a point half-way between the two extreme stations (fig. 17).

## 11. TRANSFER OF BEAM COVERAGE TO A MAP.

Orientation of the antenna may be accomplished with the aid of a map if desired. To help in quickly laying out the beam produced by Antenna Equipment RC-63 on any map regardless of scale, figures 19 and 20 give a number of beam widths for various frequencies at which the antenna is used. These beam widths are drawn to scale and may be traced or transferred to any map. By this method it is possible to ascertain quickly whether the antenna at a given frequency will cover the required area with sufficient signal strength.

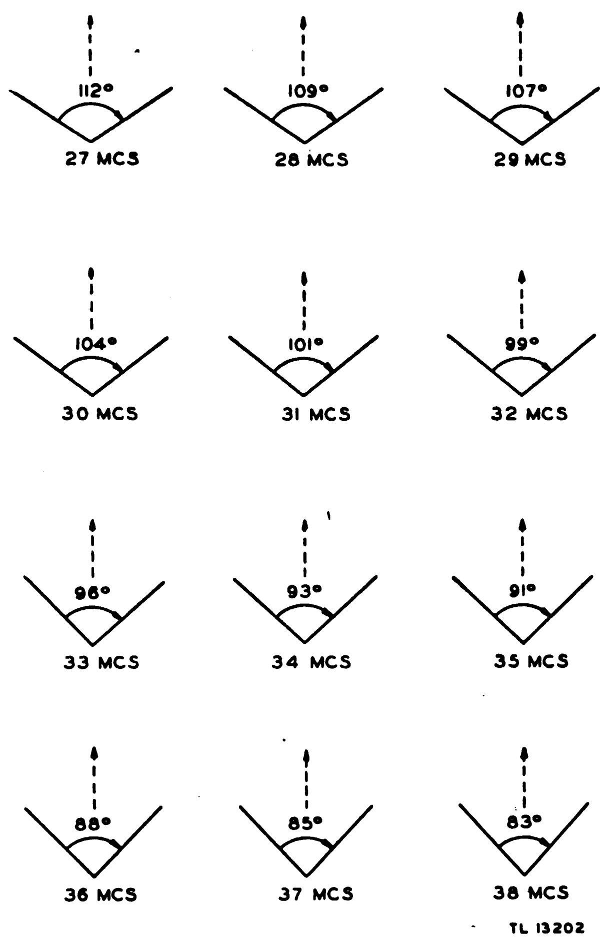



*Figure* 19. *Beam angles at frequencies of* 27 *to* 38 *megacycles.*

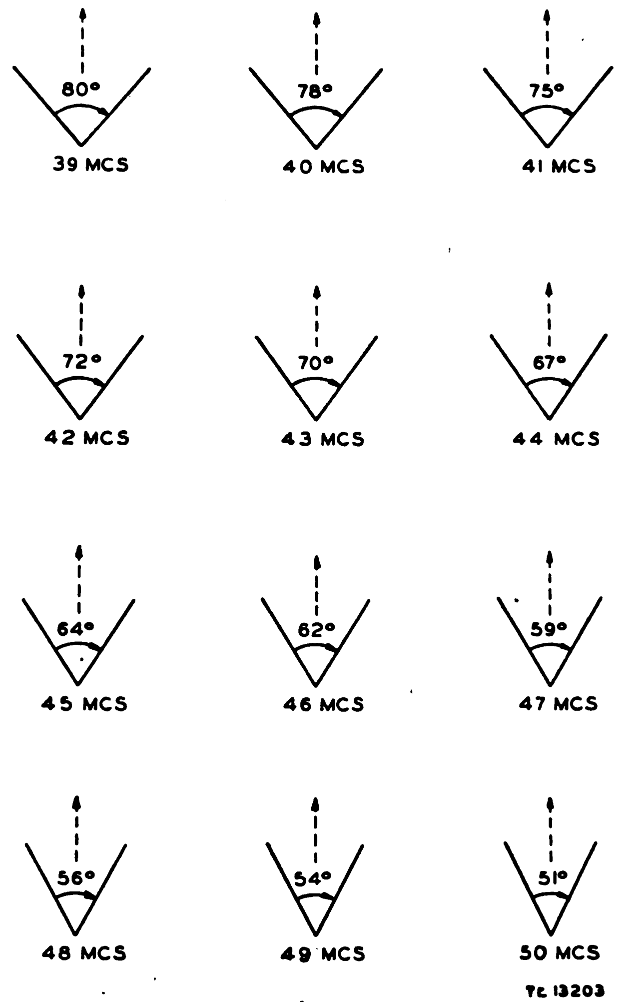



*Figure* 20. *Beam angles at frequencies of* 39 *to* 50 *megacycles.*

## 12. MATCHING ANTENNA TO TRANSMITTER OR RECEIVER.

After Antenna Equipment RC-63 has been installed and connected to a radio set, it will be necessary to align the antenna tank circuits of the transmitter, and the antenna circuits of the receiver.

**a.** Adjust the transmitter antenna tank circuits as directed for the particular equipment in use. Align for maximum antenna current.

**b.** Adjust the receiver antenna circuits as directed for the particular equipment in use. Align the receiver for greatest sensitivity.

## 13. TRANSMISSION LINE REQUIREMENTS.

**a.** In most equipment used with Antenna Equipment RC-63, Antennas AN-26 and AN-27 terminate at the radio set, allowing connection directly to antenna terminals or tank coil.

**b.** If it is necessary to use a transmission line between the antenna and the radio set, use a parallel pair transmission line as follows.

(1) Obtain the necessary length of No. 14, No. 16, or No. 18 S-gauge copper wire.

(2) Run two parallel wires *evenly spaced at* 2 *to* 2½ *inches apart* connecting Antennas AN-36 and AN-37 to the radio set.

(3) Keep the transmission line as short as possible.

(4) Adjust transmission line length for maximum antenna current with transmitter on transmit.

(5) Check transmission line length for maximum sensitivity on receiver. *The length and spacing of transmission line is important in matching antenna and radio antenna circuits.*

## 14. SIMULTANEOUS OPERATION OF TWO OR MORE HALF-RHOMBIC ANTENNAS FOR THE COVERAGE OF SEVERAL SECTIONS.

**a.** It may be desirable to cover two or more sections simultaneously using half-rhombic antennas. This may be accomplished by using two or more radio sets connected to separate rhombic antennas, using one radio set connected first to one antenna and then to another antenna or using a combination of both systems. When such operations are planned, half-rhombic antennas must be placed sufficient distances apart so that the antennas or signals from the antennas will not interact on each other.

**b.** As a relatively small amount of power is radiated at right angles from these antennas, two or more half-rhombic antennas may be placed side by side. When installing half-rhombic antennas side by side, space them approximately 200 feet apart, and in no case less than 100 feet apart. The beams from the antennas should fan outward. *Never cross beams.* Use a common center area for the radio sets.

**c.** If half-rhombic antennas are installed, one in front of the other or with beams crossing, the antennas must be placed at least 2,000 feet apart.

> NOTE: *If half-rhombic antennas are installed, one in front of the other, or in such a way that the beams cross at close range, the radio beams will interact at a large number of frequencies, causing a bending of each beam. This method should not be used.*

# SECTION III

# FUNCTIONING OF PARTS

## 15. BEAM ACTION OF ANTENNA.

**a.** When properly erected and adjusted, half-rhombic antennas radiate a major portion of the radio-frequency power fed to them in the direction of the triangle baseline as sighted from the input end (end connected to radio set) to the output end (end in direction or radiated beam). Antenna Equipment RC-63 acts to concentrate this radio power as a searchlight concentrates a light beam (fig. 18).

**b.** Conversely, on reception, Antenna Equipment RC-63 receives and amplifies signals within its beam area, rejecting or discriminating against signals arriving from localities outside the beam. The action on receiving is similar to looking at a target through a telescope; the target itself is magnified, the surrounding area not seen.

## 16. BEAM-FORMING FUNCTION OF WIRES.

**a.** Radio frequency power from the transmitter is fed directly to leg No. 1 of the antenna and to the counterpoise (fig. 21). As this power flows through leg No. 1 and leg No. 2, each leg acts as if its were an individual long-wire antenna, producing four major lobes of power radiation at a very definite angular relation to the wire itself. This angular relation depends on the length in wavelengths of each leg (see the angles shown by arrows in figure 21 and marked △). As the length of legs No. 1 and No. 2 are increased at a given frequency, the lobes will lie closer to legs No. 1 and 2. and the angles △ will get smaller in proportion.

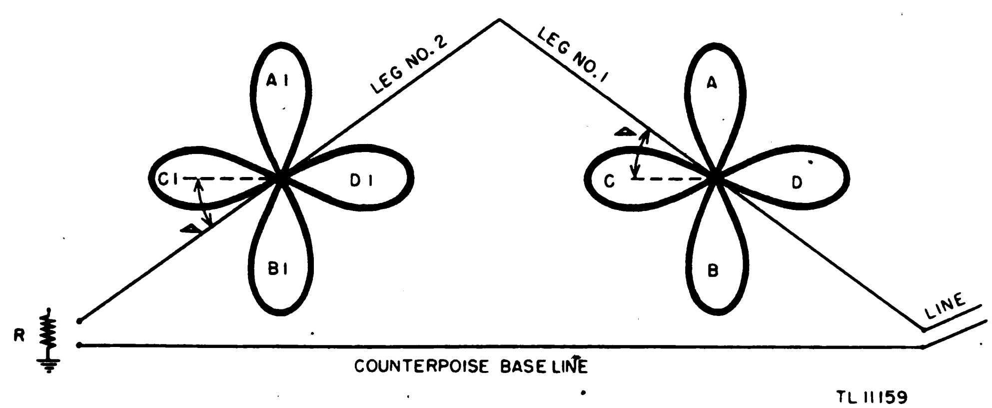



*Figure 21. Radiation lobes produced by the individual legs of Antenna Equipment RC-63.*

**b.** When these antenna legs are tilted at a correct angle in respect to ground. a combination of these lobes take place. Lobes C and C1, and D and D1 combine to add their power, while lobes A and B and A1 and B1 act to cancel. Thus radiation from combined legs 1 and 2 is then concentrated in two directions, directly forward and directly to the rear. The terminating resistance in Terminal Block TM-194 acts to eliminate the rear transmission.

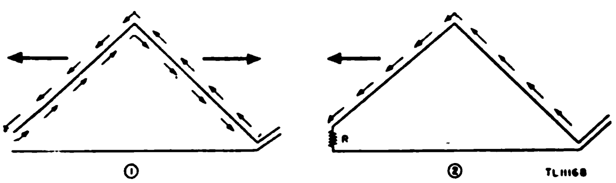



*Figure 22. Current flow with and without the terminating resistance. Note that the antenna without a terminating resistance is bidirectional, the antenna with a terminating resistance is unidirectional. Direction of transmission is indicated by large arrows.*

**c.** The action of terminating resistance in eliminating rear transmission can easily be understood by examining current flow. Figure 22 gives an analogy of current flow in the antenna. Small arrows lying close to the antenna wires indicate current flowing from the transmission line to the far end of the antenna wire, and power is radiated in the forward direction of the antenna. The current arriving at the far end of the antenna would normally be reflected back and travel in the opposite direction as indicated by the small arrows pointing from left to right (fig. 22 ①). While traveling in this opposite direction, the current would radiate power in both directions (forward and backward). The terminating resistance, however, prevents this round trip by the current. Figure 22 ② shows the terminating resistor connected and current flowing from the near to the far end of the antenna and radiating energy in the forward direction only. The current not radiated arrives at the terminating resistance and is dissipated in the form of heat. The result is only forward transmission by the antenna. The terminating resistance in no way decreases the power radiated forward, but merely absorbs the power which, without it, would circulate throughout the antenna circuit upsetting the phase relation and causing radiation in more than one direction.

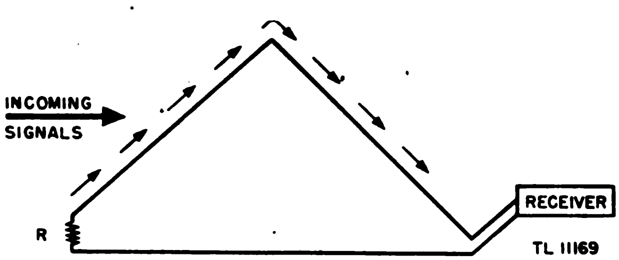



*Figure 23. Currents set up in the antenna wire by incoming signals within the beam of the antenna.*

**d.** The function of the antenna on receiving is similar to its function on transmitting. Incoming signals, within the antenna's forward beam, strike the antenna and set up currents moving from left to right (far end to receiver) as shown in figure 23. These currents proceed through to the receiver. Signals arriving from the rear of the antenna, however, set up currents moving in the opposite direction, and arriving at the terminating resistance, are dissipated. Hence, reception from the rear is eliminated. Signals which arrive at angles other than those at the front or rear of the antenna (from the sides, etc.) set up opposing currents in the antenna wires cancelling each other to an extent depending on the angle from the forward center. The sensitivity of the antenna is at a maximum straight forward, and decreases to an increasingly greater extent at angles away from the forward direction.

## 17. SPREAD ANGLE OF THE ANTENNA TRIANGLE.

As can readily be seen from figure 21, it is essential for the production of greatest beam power that antenna triangle legs No. 1 and 2 be set at an angle which will produce maximum addition of lobes C and C1 and maximum cancellation of lobes A and B and A1 and B1. This upper spread angle for Antenna Equipment FC-63 is approximately 100°, the optimum angle for average lobe at frequencies of 30 to 70 megacycles, and therefore for maximum output. A further interesting and important characteristic of this antenna is that the optimum spread angle varies in opposite direction to the optimum length of the triangle legs for a change in frequency. Beam production by the antenna is therefore self-stabilized as frequency is shifted.

## 18. COUNTERPOISE FUNCTION.

The counterpoise wire forming the base of the antenna triangle serves as a low-resistance return for the terminating resistance and completes the electrical circuit of the antenna. It also serves, in part, as an artificial ground underneath the antenna which, because of its low resistance as compared to earth, acts to materially increase transmitted and received signal strength, likewise stabilizing the operation of the antenna over differing soil conditions.

## 19. VERTICAL POLARIZATION.

Signals transmitted by Antenna Equipment RC-63 are *vertically polarized,* and therefore produce maximum signal in all vertical whip antennas used by field radio stations or vehicular installations within the beam of the antenna. This identical polarization is of enormous advantage in missions assigned to Antenna Equipment RC-63. This antenna is also vertically polarized on reception, providing increased signal strength from whip antennas used by installations within the beam area.

# SECTION IV

# MAINTENANCE

**NOTE: Failure or unsatisfactory performance of equipment will be reported on W.D., A.G.O. Form No. 468. If this form is not available, see TM 38-250.**

## 20. ANTENNA ASSEMBLY.

**a.** Check Antennas AN-36 and AN-37 (counterpoise). See that no kinks, Q-loops, or sharp right-angle bends have been accidently made in the wire.

**b.** Clean antenna insulators with carbon tetrachloride and see that they are not cracked or broken. Dirty insulators will cause noisy and intermittant reception. When transmitting, dirty insulators will cause loss of radiated power with possible arcing across the insulator. This may also upset the radiated beam angle of the antenna.

**c.** Clean Terminal Block TM-194 with carbon tetrachloride. Test for defective wiring or open circuit in the terminal block. If resistance is open, the antenna will not function properly, will become bidirectional and more noisy on reception, and will reflect strong reactance back to the transmitter during transmitting on some frequencies. Proceed as follows:

(1) Disconnect Antennas AN-36 and AN-37 from Terminal Block TM-194. Using a low-range ohmmeter, check resistance across the terminals. The resistance should be between 450 and 550 ohms. A continuity resistance between these values *must* be present. High-resistance readings may mean poor prod connections, unsoldered internal leads, or burned-out resistor. If necessary, replace resistor.

(2) As a maintenance expedient to permit operation of radio equipment with Antenna Equipment RC-63 when a replacement resistor is unavailable, use two ground stakes in place of Terminal Block TM-194 and proceed as follows:

**(a)** Drive one stake into the ground at the far end of the antenna and connect Antenna AN-36 to it, making a good electrical connection.

**(b)** Drive a second stake into the ground about 5 feet from the first stake. With test prod leads of ohmmeter, measure the stake to stake resistance. Relocate the stake until resistance reads between 450 and 550 ohms.

**(c)** Connect the leg of Antenna AN-37 (counterpoise) to the second stake, thus providing the antenna with a suitable stopgap terminating resistance. If the volume of water in the ground varies appreciably from day to day, the resistance between stakes will likewise vary.

**d.** Check connection of antenna at radio equipment for continuity.

# SECTION V

# SUPPLEMENTARY DATA

## 21. FIELD EXPEDIENTS, HALF-RHOMBIC ANTENNAS.

For communication or other radio measures, it is possible to use a half-rhombic antenna, correctly designed, at virtually any frequency at which the proper physical support is available, thus putting to use the large power gain and other advantages of this type of radio-beam antenna. This use of half-rhombic antennas other than Antenna Equipment RC-63 is treated in this manual to provide information for field expedients. These antennas should be designed and used only with permission, and under the guidance of the officer in charge.

## 22. PHYSICAL LIMITATIONS OF HALF-RHOMBIC ANTENNAS.

Since the triangular dimensions of the antennas are related mathematically to the operating frequency used, physical support at the correct height and sufficient wire for the triangle legs must be available to permit the installation of a given half-rhombic antenna. The height of this required support varies inversely with frequency: the lower the frequency used, the higher the support required for maximum gain, while at higher frequencies this support becomes of such practical size that lance poles, small masts, or trees may be used.

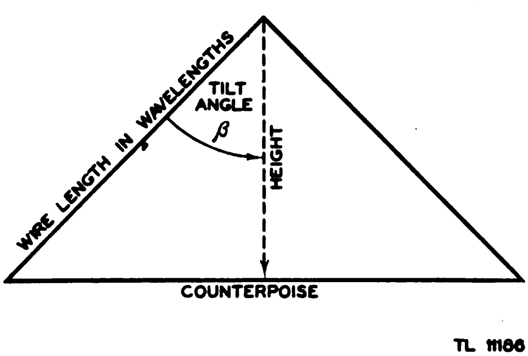



*Figure 24. Half-rhombic antenna triangle showing height of the upper apex, wire length on a leg, and tilt angle.*

## 23. WIRE LENGTH AND APEX ANGLES.

As previously stated, the required length of each side of the antenna triangle, the height of the upper apex angle above ground, and the counterpoise length are interrelated. To visualize this, see figure 24.

**a.** In figure 24 the *height* of the triangle is shown by the dotted line so marked.

**b.** The Wire length in wavelengths indicated on the left leg is a measure which will be used for the design of any half-rhombic antenna. How to convert it to feet will be shown shortly.

**c.** The *tilt angle* $\beta$ is of great importance to the design and must be correct for maximum antenna gain.

**d.** The *counterpoise* length is determined by the leg length and the angle $\beta$

## 24. SIZE OF HALF-RHOMBIC ANTENNA POWER GAIN AND WIDTH OF BEAM.

At any given frequency there are a number of half-rhombic sizes which may be used, varying from a minimum size at which the beam will work at a given frequency, to a large size limited only by the height of the support (balloon, kite, or pole), the weight of wire the support will carry, and the length of wire available. The larger the size at a given frequency, the sharper the beam produced and the more gain realized within that beam.

**a.** Various half-rhombic sizes are identified in engineering practice by referring to the number of electrical full wavelengths which lie on one of the vertically-supported triangle legs. For instance, the half-rhombic antenna shown in figure 24 would be identified by the number of full wavelengths which lie on the leg marked *wire length in wavelengths* at a given frequency. If there were two full wavelengths lying on this leg at 40 megacycles it would be referred to as a half-rhombic antenna with two full wavelengths on a leg at 40 megacycles. This, in fact, is Antenna Equipment RC-63.

**b.** Converting full wavelengths to feet is quickly done by the formula:

$$\text{Length of a full wavelength measured in feet} = \frac{984}{\text{Frequency in megacycles}}$$

**c.** The minimum size at which a half-rhombic antenna will perform satisfactorily is one having a single full wavelength on a leg, or side, at the average frequency at which it is to be operated.

## 25. HALF-RHOMBIC ANTENNA DESIGN (fig. 25).

From the chart (fig. 25) the triangular dimensions of any half-rhombic antenna may be quickly derived.

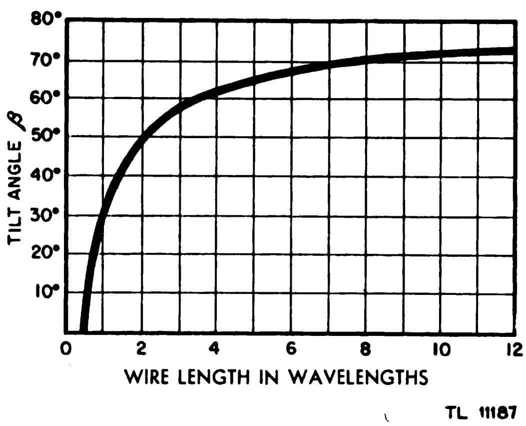



*Figure 25. Half-rhombic antenna design chart showing tilt angle plotted against wire length of each triangle leg.*

The tilt angle $\beta$ (fig. 25) is plotted against the wire length measured in full wavelengths lying on an antenna triangle leg. For example, strong point-to-point ground wave communication is desired on 30 megacycles. As an expedient it has been decided to erect a half-rhombic antenna with two wavelengths on a leg at that frequency. Then:

$$\text{Length of a full wavelength measured in feet} = \frac{984}{30} = 32.8 \text{ feet}$$

Each vertically-supported leg of the antenna would then measure 32.8 x 2 (for two wavelengths) or 65.6 feet. From figure 25, the tilt angle $\beta$ for an antenna with two wavelengths on a leg is shown as approximately 50°. As the tilt angle is exactly half the apex angle, the entire apex angle will be 100°. The correct counterpoise length will be that required to complete the triangle, simply determined by a method shown in the next paragraph.

## 26. TRIANGLE DIMENSIONS WITHOUT TRIGONOMETRY.

In the above paragraph, the two leg lengths and the apex angle were quickly derived. However, the height of the required supporting pole or mast and the exact counterpoise length were not obtained. To avoid trigonometric functions, the following table keys all dimensions of the antenna triangle to the length of a side. Note that each dimension is expressed in wavelengths at the desired frequency. This is readily converted to linear feet by the formula in paragraph 24. Using this method, any size half-rhombic antenna may be designed for any frequency by no more than multiplication.

| Number of wavelengths on a triangle leg. | Tilt angle $\beta$ | Height of the upper triangle apex from the counterpoise (pole height), measured in wavelengths at the operating frequency. | Entire counterpoise length measured in wavelengths at the operating frequency. |
|---|---|---|---|
| 1 | 30° | 0.87 | 1 |
| 2 | 50° | 1.3 | 3 |
| 3 | 57° | 1.6 | 5 |
| 4 | 62° | 1.9 | 7 |
| 5 | 65° | 2.1 | 9 |
| 6 | 67° | 2.3 | 11 |
| 7 | 68° | 2.6 | 13 |
| 8 | 70° | 2.7 | 15 |
| 9 | 70.5° | 3.0 | 17 |
| 10 | 71° | 3.3 | 19 |
| 11 | 72° | 3.4 | 21 |
| 12 | 73° | 3.5 | 23 |

**a.** For example, the half-rhombic antenna using two wavelengths on a side at 30 megacycles was quickly found in paragraph 25 to have 65.6 feet on a leg. Glancing at the table, it can be seen that an antenna with two wavelengths on a leg has a tilt angle or 50°, the pole height required 1.3 wavelengths, and the over-all counterpoise length 3 wavelengths. Since the length of a wavelength at 30 megacycles was found to be 32.8 feet (by dividing the frequency in megacycles into 984), the height of the pole required will be 42.6 feet and the counterpoise length 98.4 feet.

**b.** Take another example. As a field expedient, a very powerful beam is required to operate at 20 megacycles. The sector to be covered will be narrow; therefore the beam may be sharp and provide high gain. Because balloon or kite support is available, the height of the antenna supporting structure presents little or no problem. It has therefore been decided to erect an antenna with 12 wavelengths on a leg. The table shows that an antenna with 12 wavelengths on each leg must have its apex 3.5 wavelengths above ground, and a counterpoise 23 wavelengths long. Dividing 984 by the frequency in megacycles, or 20, we quickly find that the length of a full wavelength at 20 megacycles is 49.2 feet. Each leg of the triangle will then be 590 feet, the apex supported at 172.2 feet from the ground, and the over-all counterpoise length 1,131.6 feet. The gain of this antenna will approximate 18 decibels or a signal voltage gain of 64 times that of a vertical whip.

**c.** Where the size of the antenna will be wholly governed by the height of the supporting pole, tree, or mast, calculations can be made using the tabular column showing required pole heights, so that the maximum size antenna (hence the greatest gain) may be designed for the available mast height. For example, a 60-foot palm tree may be available which appears to offer excellent half-rhombic antenna support. If the mean operating frequency to be used is 40 megacycles, dividing 984 by 40 shows a full wavelength to be 24.6 feet at that frequency. The table indicates that an antenna having two wavelengths on a leg requires a mast height of 1.3 wavelengths, or 31.9 feet. As the tree is far taller than 31.9, a larger antenna is possible, therefore the table is reexamined for an antenna having six wavelengths on a leg which, the table indicated, requires a pole height of 2.3 wavelengths or 56.5 easily possible with a 60 foot tree. Simple multiplication then shows the antenna will have 147.6 feet on each leg and 270.6 feet for its counterpoise. The beam produced by this antenna may be pointed in any direction simply by rotating the antenna around the tree.

**d. Steel masts, or wooden masts using metal guy wires must never be used. The presence of metal support at the center of the antenna will disrupt its functioning.**

## 27. TRANSMISSION LINE AND TERMINATING RESISTANCE.

**a.** Teminal Block TM-194 supplied with Antenna Equipment RC-63 may be used with any half-rhombic antenna employed with radio equipment having a low-power radio transmitter. With medium or high-power transmitters a 500-ohm resistor having higher wattage is required.

**b.** A two-wire parallel-line transmission line as outlined in section II paragraph 13 may be used. This transmission line must have a spacing of 2 to 2½ inches and the wires must be equally spaced. Any good insulator may be used or any good insulating material may be substituted when 2-inch insulators are not available.

## 28. SITES FOR HIGH-FREQUENCY OPERATION.

Where half-rhombic antennas are to be used for quasi-optical (line of sight), point-to-point work using frequencies above 20 megacycles, the antenna should be located on the highest possible ground for maximum effective range and signal strength. When so installed, the half-rhombic antenna is one of the most effective types of beam antennas for the propagation and reception of high-frequency, vertically-polarized signals. The use of this antenna will increase the distance obtained many times above that provided by a simple vertical dipole (half-wave antenna) at the same average height above ground.

## 29. BEAM WIDTH.

The width of the beam produced by half-rhombic antennas of various sizes are shown in figure 26. The widths are indicated within each angle and represent an average over varying terrain and soil conditions. They are drawn to half power; in other words, signals sent at any angle within the spread indicated will be more than half the maximum power of the beam.

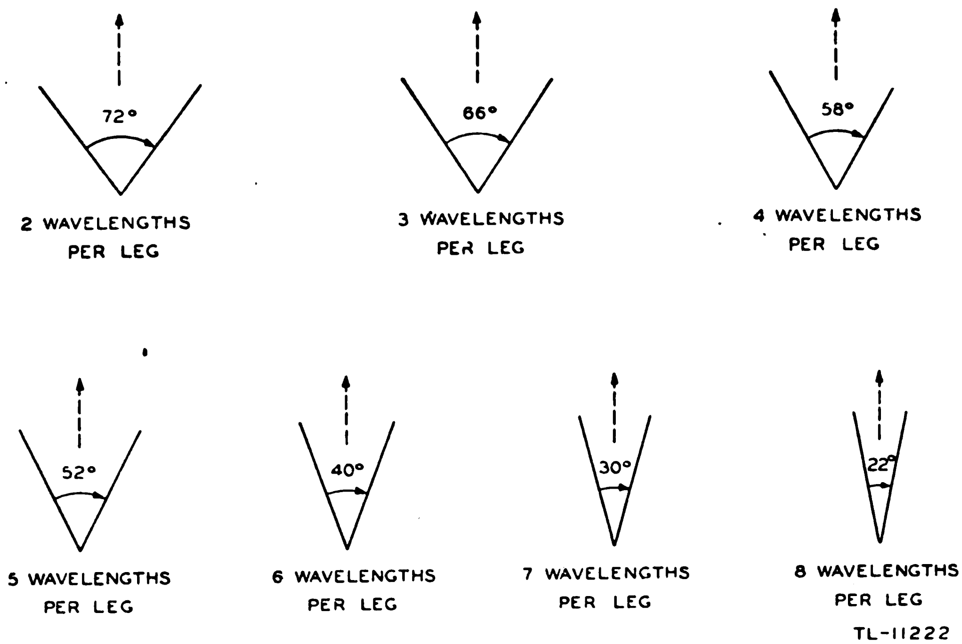



*Figure 26. Approximate beam widths of various half-rhombic antenna sizes.*

## 30. MAINTENANCE PARTS LIST FOR ANTENNA EQUIPMENT RC-63.

| Ref. symbol | Signal Corps stock No. | Name of part and description | Quan. per unit | Mfrs. part and code No. | †Station stock | †Region stock |
|---|---|---|---|---|---|---|
| | 2A276-63 | ANTENNA EQUIPMENT RC-63: directional; in accordance with Spec. 71-1035; consists of: 1 Antenna AN-36, 1 Antenna AN-37; (includes Terminal Block TW-194), 1 Bag BG-93, 3 Guys GY-34, 1 Guy GY-35, 1 Hammer HM-1 (6Q49001), 1 Mast Section MS-91, 1 Mast Section MS-92, 1 Mast Section MS-93, 1 Mast Section MS-94, 3 Reels RL-3, 5 Stakes GP-2. | 1 | | | |
| | 2A278-63.1 | ANTENNA EQUIPMENT RC-63: (includes 2 Binding Posts TM-176 and 1 less Guy Reel RL-3 and 2 less Guy Reels GY-34); directional; in accordance with Spec. 71-1035; consisting of: 1 Antenna AN-36, 1 Antenna AN-37, (includes Terminal Block TM-194), 1 Bag BG-93, 1 Guy GY-34, 1 Guy GY-35, 1 Hammer HM-1, 1 Mast Section MS-91, 1 Mast Section MS-92, 1 Mast Section MS-93, 1 Mast Section MS-94, 2 Reels RL-3, 5 Stakes GP-2, 2 Binding Posts TM-176 (1 in use, 1 spare). | 1 | | | |
| | 2A278-63.2 | ANTENNA EQUIPMENT RC-63: includes 2 Binding Posts TM-176, less 1 Mast Section MS-91, less 1 Mast Section MS-92, less 1 Mast Section MS-93, less 1 Mast Section MS-94, and less 1 Reel RL-3; directional; in accordance with Spec. 71-1035; consisting of the following: 1 Antenna AN-36, 1 Antenna AN-37, (includes Terminal Block TM-194), 1 Bag BG-93, 3 Guys GY-34, 1 Guy GY-35, 1 Hammer HM-1 (6Q49001), 2 Reels RL-3 (2A3103), 5 Stakes GP-2 (2A3302), 2 Binding Posts TM-176, (1 in use; 1 spare). | 1 | | | |
| | 2A278-63.3 | ANTENNA EQUIPMENT RC-63: directional in accordance with Spec. 71-1035; consisting of: 1 Astenna AN-36, 1 Antenna AN-37, 1 Bag BG-93, 2 Binding Posts TM-176 (1 in use; 1 spare) (3Z276), 3 Guys GY-34, 1 Guy GY-35, 1 Hammer HM-1, 1 Mast Section MS-91, 1 Mast Section MS-92, 1 Mast Section MS-93, 1 Mast Section MS-94, 2 Reels RL-3, 5 Stakes GP-2, 1 Terminal Block TM-194. | 1 | | | |

† Parts not stocked in station or region stock are carried in depot stock.
* Indicates stock available.

# TM 11-2617

WAR DEPARTMENT TECHNICAL MANUAL



# ANTENNA KIT FOR RHOMBIC TRANSMITTING ANTENNA (DRAWING ES-E-368-D)



*WAR DEPARTMENT* *31 MARCH 1945*

WAR DEPARTMENT TECHNICAL MANUAL
TM 11-2617

*This manual supersedes TM 11-2617, 24 October 1944*

# ANTENNA KIT FOR RHOMBIC TRANSMITTING ANTENNA (DRAWING ES-E-368-D)

WAR DEPARTMENT 31 MARCH 1945

WAR DEPARTMENT,
WASHINGTON 25, D. C., 31 MARCH 1945.

TM 11-2617, Antenna Kit for Rhombic Transmitting Antenna, is published for the information and guidance of all concerned.

[A. G. 300.7 (24 Apr 44).]

BY ORDER OF THE SECRETARY OF WAR:

G. C. MARSHALL,
*Chief of Staff.*

OFFICIAL:

J. A. ULIO,
*Major General,*
*The Adjutant General.*

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(For explanation of symbols see FM 21-6.)

# TABLE OF CONTENTS

# LIST OF ILLUSTRATIONS

# DESTRUCTION NOTICE

**WHY** — To prevent the enemy from using or salvaging this equipment for his benefit.

**WHEN** — When ordered by your commander.

**HOW** — 1. Smash — Use sledges, axes, handaxes, pickaxes, hammers, crowbars, heavy tools.

2. Cut — Use axes, handaxes, machetes.

3. Burn — Use gasoline, kerosene, oil, flame throwers, incendiary grenades.

4. Explosives — Use firearms, grenades, TNT.

5. Disposal — Bury in slit trenches, fox holes, other holes. Throw in streams. Scatter.

**USE ANYTHING IMMEDIATELY AVAILABLE FOR DESTRUCTION OF THIS EQUIPMENT.**

**WHAT** — 1. Smash — All insulators and spacers.

2. Cut — All antenna wires, guy wires, transmission lines, dissipation lines, down leads, and poles.

3. Burn — All instruction manuals, poles, and wire.

4. Bend — All anchor rods, ground rods, and braces.

5. Bury or scatter — All remaining pieces of the above equipments including all connectors, bolts, nuts, and washers.

**DESTROY EVERYTHING**

# SAFETY NOTICE

**VOLTAGES ON THE ANTENNA AND TRANSMISSION LINE ARE HIGH ENOUGH TO ENDANGER LIFE AND MAY BE FATAL IF CONTACTED BY OPERATING PERSONNEL. MAKE CERTAIN THAT TRANSMITTER IS OFF WHEN MAKING ADJUSTMENTS.**

*This manual supersedes TM 11-2617, 24 October 1944.*

# PART ONE

# INTRODUCTION

## SECTION I. DESCRIPTION.

### 1. GENERAL.

**a.** This technical manual covers the construction of a three-wire curtain rhombic transmitting antenna.

**b.** The purpose of the rhombic antenna is to direct radiation, thus providing a stronger signal in the desired direction of transmission.

### 2. DESCRIPTION OF SYSTEM.

**a. Transmission Line.** The transmission line consists of two three-strand conductors spaced 12 inches apart, and has a characteristic impedance of 600 ohms.

**b. Antenna Curtain.** The antenna curtain (side wires) consists of three copperweld conductors. The three conductors are grouped at each end and are anchored to the front and rear poles. This multiple arrangement of the conductors lowers the characteristic impedance of the antenna, thereby making it possible to match the system to the 600-ohm transmission line.

**c. Dissipation Line.** The dissipation line consists of a down lead and modified exponential line. This dissipation line acts as a resistance dissipating the power arriving at the end of the antenna. A forced-perspective drawing of the line is shown in figure 12.

### 3. FREQUENCY RANGE.

Seven sizes of antennas have been designed for operation over various distance ranges at frequencies of 4 to 22 megacycles. Basic information concerning the seven sizes of antennas is shown in table 1, figure 32. With the exception of the side wire length L, the tilt angle Ø, and the antenna height above ground H, all antennas have the same construction details.

### 4. PACKING INFORMATION.

**a. Antenna Kit.** The antenna kit comes from the manufacturer packed in three boxes. The first box measures 9⅛ x 24⅛ x 24⅛ inches and weighs 171 pounds. Its volume is 3.1 cubic feet. The second box measures the same and weighs 178 pounds. The third box measures 5⅛ x 23⅝ x 31¼ inches and weighs 144 pounds. Its volume is 2.2 cubic feet.

**b. Pole Guy Kit 75PX.** This pole guy kit comes packed in a box measuring 7 x 15 x 112 inches. Its volume is 6.8 cubic feet; its weight is 202 pounds.

**c. Pole Guy Kit 75PXX.** This pole guy kit comes packed in a box measuring 7 x 18 x 124 inches. Its volume is 9.04 cubic feet; its weight is 288 pounds.

**d. Transmission Line Kit.** The transmission line kit comes packed in two boxes and one bundle. One box measures 8⅛ x 23⅝ x 23¾ inches and weighs 186 pounds. Its volume is 2.6 cubic feet. The second box measures 15⅝ x 20⅝ x 34¾ inches and weighs 238 pounds. Its volume is 5.9 cubic feet. The bundle measures 3¼ x 3¾ x 79 inches and weighs 36 pounds. Its volume is 0.6 cubic feet.

**e. Dissipation Line Kit.** The dissipation line kit comes packed in one box and one bundle. The box measures 5¼ x 26 x 30¾ inches and weighs 115 pounds. Its volume is 2.5 cubic feet. The bundle measures 2¼ x 2¾ x 79 inches and weighs 14 pounds. Its volume is 0.3 cubic feet.

**NOTE:** This packing information is applicable for Order No. 28719-Phila-44. The stock numbers are marked on the boxes.

# SECTION II. INSTALLATION.

## 5. GENERAL.

Data tables and detail drawings are furnished in this technical manual. The successful completion of an installation with the materials and equipment furnished depends on careful attention to the instructions. Certain illustrations in this manual are based on procurement drawings and can be used in the field for checking dimensions of components and for emergency manufacture of repair parts. Figure 32**a** is detachable and may be used as an original for making blueprint copies.

## 6. LOCATING ANTENNA.

**a.** If possible, locate the antenna on level or evenly sloping open ground. If the antenna must be situated on ground covered by woods or brush, clear out around and between pole sites to facilitate setting the poles and hanging the antenna curtain. In selecting a site for an antenna, avoid obstructions such as hills or buildings directly in front of and on the bearing line of the antenna. No obstruction in front of the antenna should be more than 2° or 3° above the horizontal plane of the antenna. This is approximately 200 or 300 feet at a distance of 1 mile from the antenna.

**b.** In general, construct the antennas as near the transmitter building as is practicable for any particular installation, and make the transmission line as short as possible. The usual procedure is to locate the antenna so that the transmission line runs directly from the rear of the antenna to the transmitter building.

## 7. ANTENNA ORIENTATION.

The bearing of an antenna, or its horizontal direction of transmission or reception, is given in degrees measured clockwise from true north. A line bearing true north and south must therefore be available before proceeding with the location of the antenna. The bearing of the antenna should be determined with an accuracy of plus or minus 15 minutes of arc.

## 8. GROUND ELEVATIONS.

Ground elevations at each antenna pole location stake must be obtained for use in determining the point above the ground for attaching the antenna harness. These elevations are also required to compute the position of the plane of the antenna curtain where the antenna must be located on uneven ground.

## 9. LOCATING ANTENNA POLES.

**a.** The location of the front and rear poles of the antenna should be determined by direct standard steel tape measurements along the major axis (bearing line) of the antenna. To determine the location of the side poles, locate a stake on the major axis at the midpoint of the antenna. Lay off perpendiculars each side of the base line from this midpoint, and then measure the correct distance to the side poles on the minor axis of the antenna. Pole-to-pole lengths and pole-to-pole widths are shown in table 1, figure 32.

**b.** Locate pole location stakes with an accuracy of plus or minus 0.2 foot. Measure all distances at least twice to make certain that the desired accuracy is obtained. Set four reference stakes around each antenna pole location, two on the antenna axis and two approximately at right angles to the axis. Set these stakes at a sufficient distance from the pole location to eliminate the possibility of being disturbed while the pole is being set.

**c.** Locate the dissipation line poles on the major axis of the antenna with locations and distances as shown in figure 32.

## 10. LOCATING TRANSMISSION LINE POLES.

Locate transmission line poles between the antenna and the transmitter building in as nearly a direct line as possible. Use a staggered spacing in locating these poles so that no two adjacent spans have the same length. Normally, use a 5-foot difference in spacing interval as follows: 100 feet, 105 feet, 95 feet, 100 feet, 95 feet, etc. Maximum span lengths should not exceed 105 feet.

## 11. LOCATING ANCHORS.

**a.** Be sure that anchor guys have at least a one-to-one lead; that is, the distance from the base of the pole to the upper end of the guy is the same or less than the horizontal distance from the base of the pole to the guy strand or to the axis thereof, depending upon the slope of the terrain. Set a stake to indicate the point where the anchor rod breaks the ground. Locate all antenna guys along the axis of the antenna.

**b.** Locate transmission line corner anchors, where required, on a line bisecting the interior angle on the outside of the corner to be guyed.

c. Locate the dissipation line anchor on the centerline of the dissipation line (at the weighted end). Anchor one end to the antenna end pole as shown in figure 32.

## 12. ESTABLISHING PLANE OF ANTENNA CURTAIN.

a. In many antenna locations the ground will be more or less uneven, and elevations taken at the antenna pole stakes may vary by several feet. Where elevation variations are less than 10 feet, the plane of the antenna should be made horizontal. Because the pole heights and points of harness attachments shown in table 1, figure 32, are for level ground, pole heights and points of harness attachment must be calculated for each pole of the proposed antenna, taking into account the ground elevation at the base of each pole.

b. Disregard the elevation at any pole where it is considerably greater or less than the others. Determine the average elevation by averaging the remaining three elevations, and provide a longer or shorter pole for the fourth location. With the above exception, the elevations at all four antenna pole stakes should be averaged, and the antenna erected so that its plane is a distance H above this average elevation.

c. Points of attachment of curtain harnesses may be calculated as indicated in the following example.

EXAMPLE:

| POLE | GROUND ELEVATION FRONT POLE = 0' | GROUND ELEVATION AVERAGE = 0' | POINTS OF HARNESS ATTACHMENT ABOVE GROUND |
|---|---|---|---|
| Front | 0 | —0.2 | P+0.2 |
| Right side | +3.4 | +3.2 | P—3.2 |
| Left side | +2.6 | +2.4 | P—2.4 |
| Rear | —5.2 | —5.4 | P+5.4 |
| 4/ | +0.8 = 0.2 | 0.0 | |
| Average | +0.2 | 0.0 | |

P = H + ½ Sag at 90° F.

(See table 1, fig. 32).

d. The calculation of the various dimensions associated with the poles will be greatly facilitated if a diagram is drawn similar to that show in figure 1. Make the diagram large enough so that all dimensions for each pole can be put on it directly. Required pole length = 1 ft + P + pole set ± deviation of pole ground level from average ground level.

(+ if ground is low at the pole;

— if ground is high at the pole).

e. In some cases, due to irregularity of ground conditions, reasonable doubt may exist as to the accuracy of the average ground level. It is then preferable to make the average antenna height a few feet greater than that obtained by computation.

f. In calculating new pole heights, provide approximately 1 foot of pole top above the harness attachments. Because only one guy per pole is

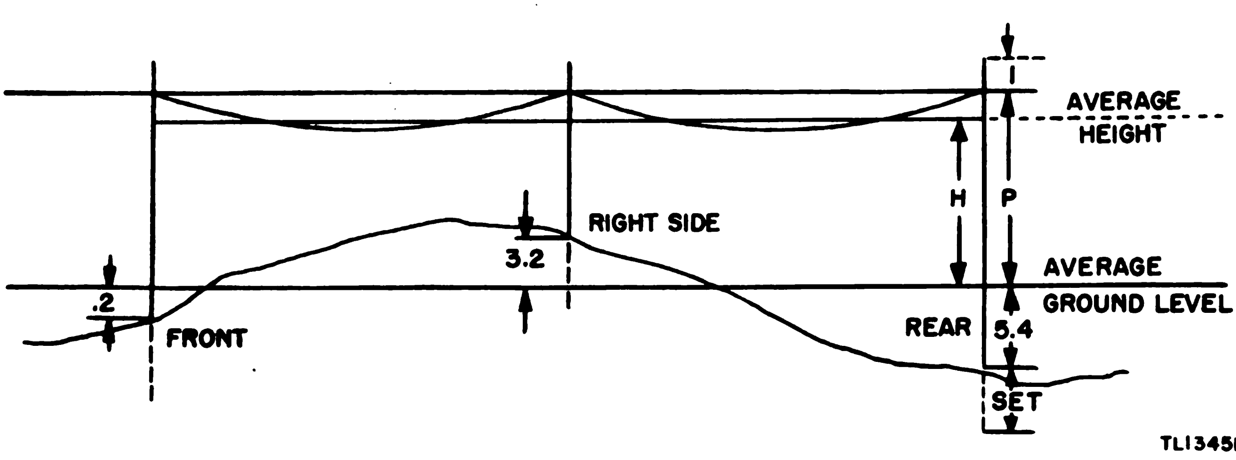


*Figure 1. Average ground elevation diagram.*

used, set the antenna poles the full required depth indicated in table 2, figure 32. In no case should the depths of setting be reduced by more than 10 percent.

**g.** Where ground elevations at antenna pole stakes vary by more than 10 feet, the plane of the antenna may be tilted to take advantage of the ground slope. This applies only where the slope is consistent from front to rear, and extends for at least 1,000 yards in front of the antenna. In these cases make the front and rear poles approximately equal in height, to bring the major axis of the antenna parallel to the average ground slope. The minor axis of the antenna should be horizontal.

**h.** In order to design the antenna structure properly for sloping ground, contour lines of the area for a considerable distance must be available and allowances made for the characteristics of the terrain. It is advisable to locate the antenna on level ground, or on ground where the difference in average ground level from front to rear of the antenna is not more than 20 feet.

## 13. POLE WORK.

**a. Poles.** Creosoted pine or fir, butt-treated cedar, or poles of other woods obtained locally may be used. Poles should be class 2 or heavier.

**b. Stepping Poles.** Stagger 5/8- by 10-inch spikehead pole steps 18 inches apart on opposite sides of the pole. This makes steps on the same side of the pole 36 inches apart. Drill guide holes 1/2 inch in diameter and 3 inches deep in creosoted pine poles before installing the steps. In Douglas fir and cedar poles (soft woods) drill 3/8-inch diameter guide holes. All the boring work may be done on the ground before the poles are set. Use wood pole steps in place of spikehead pole steps for the first three steps at the ground end of pole. Install first step 36 inches from ground line. Install steps on the antenna poles parallel with the axis of the antenna. Figure 22 shows pole step data.

**c. Setting Antenna Poles.** (1) After the antenna pole has been dug to the required size and depth, set the pole and center it accurately in the hole. Use temporary guys to keep the antenna pole plumb while the hole is being backfilled and tamped.

(2) When raising the antenna pole and centering it in the hole, a gin pole approximately 5 feet longer than half the length of the poles to be set will be found convenient. The gin pole should have adequate temporary guying in four directions, and may be raked toward the pole hole for ease in setting the antenna pole. Since a 90-foot pole may weigh 5,000 pounds, it is evident that pole setting operations must be carefully planned.

(3) Attach the permanent back guy and the temporary guying to the antenna pole before it is raised. Be sure that the bent thimble-eye eyebolt for the guy and the thimble-eye eyenut for the antenna harness are directly on the axis line of the antenna before the earth is backfilled around the pole.

**d. Setting Transmission Line Poles.** Set the transmission line poles, varying in height from 20 to 30 feet as required for grading, in accordance with standard pole line construction practices. Save time by attaching crossarms and fixtures to line poles before they are set. Set all poles to the full depths as required for individual pole lengths as indicated in table 2, figure 32.

## 14. ANCHORS AND GUYS.

**a. Installing Anchors.** (1) Expanding plate anchors have been specified for these antennas but alternate anchors of creosoted pine plank or logs, concrete blocks, or other local substitutes of sufficient holding power may be used.
(2) To install the explanding plate anchor, start a hole at the anchor stake and extend it downward at an angle in line with the guy. Make the hole large enough to take the unexpanded or closed anchor and deep enough to accomodate the full length of anchor rod supplied. An earth auger and digging bar may be used on the small holes required for this type of anchor. After the anchor hole is dug, attach the anchor rod to the anchor and lower the assembly into the anchor hole. Expand the anchor into the undisturbed sides of the hole by pounding with a tamping bar or special expanding bar which fits around the anchor rod. Thoroughly tamp the earth used in backfilling the hole, especially at the bottom of the hole on top of the anchor.

**NOTE:** Steel towers (73-foot, 7 inches) complete with guys and anchors are available for all areas where reduction of shipping space is important. A steel pedestal base assembly is available for use in supporting the tower instead of concrete, and may be used where the soil will support 2,000 pounds per square foot.

**b. Guys.** (1) All antenna pole guys should be broken with strain insulators at 20-foot intervals with the first insulator approximately 4 feet from the eyebolt in the pole. The last section next to the ground may be longer than 20 feet but should not exceed 30 feet in length.

(2) Guys are furnished in kit sets. Two types are provided, the 75PX (10800 lbs.) used on side poles and the 75PXX (18000 lbs.) used on end poles. Both are factory assembled. Each type of guy uses strand, 3-bolt clamps each side of porcelain strain insulators at 20-foot intervals, a bent-eye eyebolt, curved washers, anchor, and anchor rod, as indicated in figures 17 and 18. This makes possible quick and easy attachment of guys to poles. Before installing the guys, check the tightness of the bolts in the guy clamps.

(3) Single guys, supporting the antenna curtain stress only, are generally supplied to be used on self supporting poles which have been set at proper depth in firm earth (table 2, fig. 32).

(4) Guys on transmission line and dissipation line poles do not require insulators. The guys consist of $\frac{5}{16}$-inch strand (6000 lbs.) with one 3-bolt clamp at each end together with an eyebolt, curved washers, anchor, and anchor rod (supplied with transmission and dissipation line kits).

(5) When guy kits are not available and guys have to be made up on location, they should be fabricated in a shop where the use of a vise and wrenches will enable a thorough tightening of the clamps on the enclosed strand. Use caution to prevent fracturing or shearing of bolts or stripping of threads.

(6) At locations where the nature of the soil is such that two anchors will be required for guys on the front and rear antenna poles, the last insulated section may be made in the form of a bridle with the strand passing from one anchor through the porcelain strain insulator and back to the second anchor, with a clamp at the insulator.

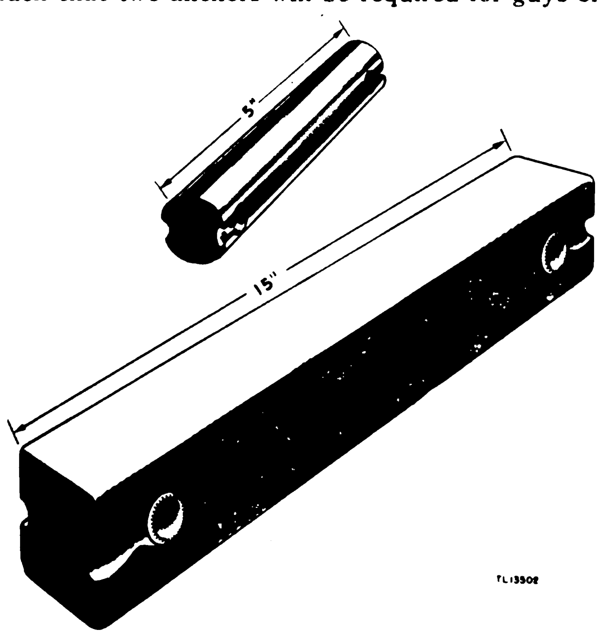


*Figure 2. Strain insulators for line and curtain sides.*

(7) Properly tension all guys. This may be done using come-along-grips with a coffing hoist or block and tackle.

## 15. ANTENNA CURTAIN.

High strength, 40-percent conductance, 3-strand No. 12 AWG copperweld wire has been specified for the antenna. Its rated breaking load is 2,236 pounds. Other wire, such as No. 6 AWG (0.162), 40-percent conductance copperweld, may also be used.

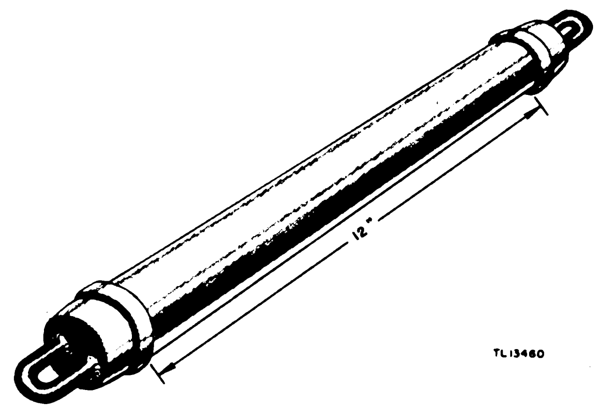


*Figure 3. Strain insulator for antenna curtain ends.*

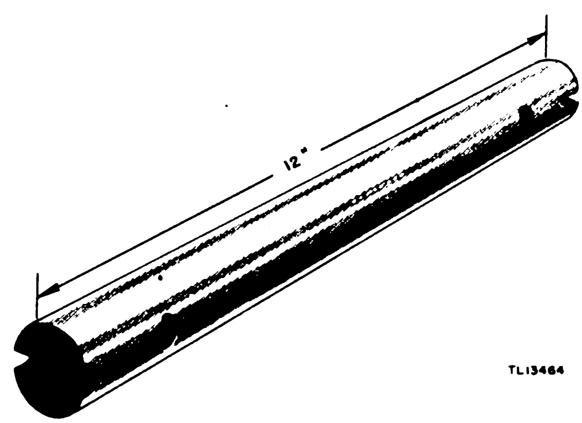


*Figure 4. Spreader insulator.*

**a.** In handling the copperweld wire, be careful not to nick or scratch the wire with pliers, sharp rocks, or climbing spurs. Nicks which penetrate through the outer shell of copper will expose the steel core to corrosion, which will in time reduce the strength of the wire. Be especially careful

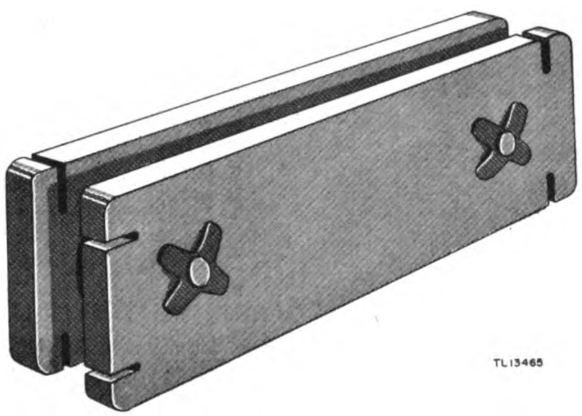


*Figure 5. Dissipation line insulator, exponential spreader.*

A large heavy duty soldering iron, well tinned, may be used.

**NOTE:** Three-strand No. 12 AWG copperweld 40 percent conductivity has a breaking strength of 2,236 pounds. When annealed by too much heat, the breaking strength is reduced more than 50 percent.

**b.** If the nature of the ground will permit, it is advisable to fabricate the antenna curtain at the location of the antenna. The antenna can then be raised into position (on the poles) directly from the ground. The poles provide convenient points for dead-ending the wires while they are measured under tension.

when handling the wire used in the antenna curtain. When soldering served joints, cover the joint with flux and hold it over a solder pot. Pour hot 50-50 solder over the serving until the entire assembly is heated and solder has penetrated to the center of the joint. The poured joint must be handled carefully until it has cooled and the solder becomes set. Although it is definitely not recommended, served joints may be soldered using the flame from a gasoline blowtorch. With this method use extreme care to keep the flame moving and to apply only sufficient heat to melt the solder into the joint. It is very easy to apply too much heat with an open flame, thereby annealing the copperweld wires and reducing their strength.

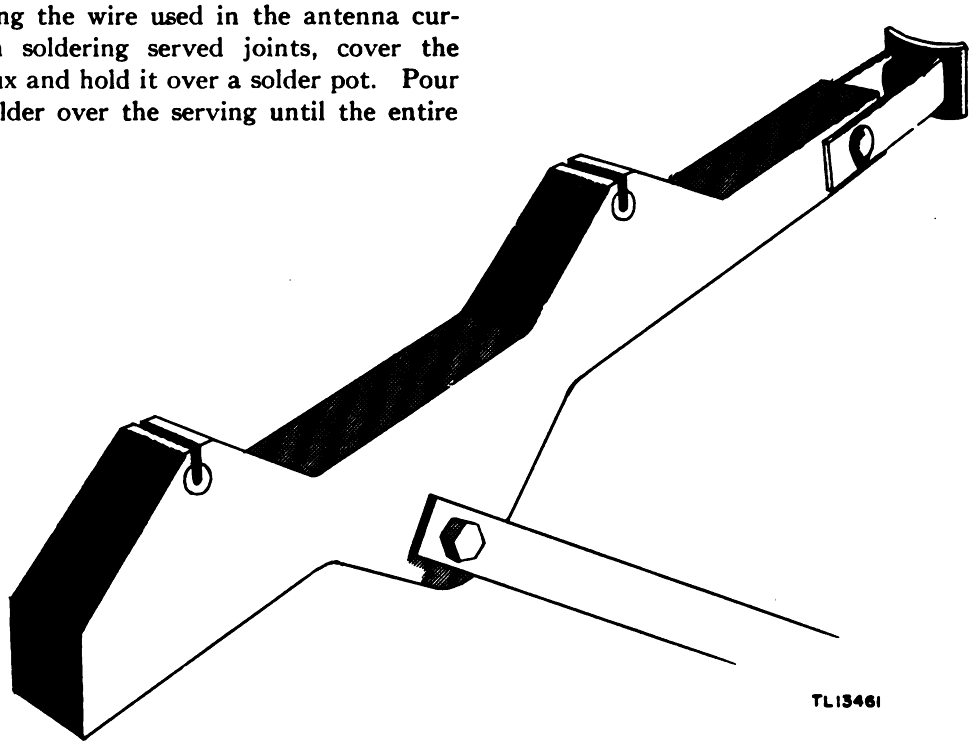


*Figure 6. Transmission line insulator, support.*

## 16. FABRICATION OF ANTENNA CURTAIN.

**a.** Measure from either the front or rear pole anchor, along the center line of the antenna, a distance equal to twice the side length (L) of the antenna specified, plus 5 feet. Drive a stake to mark this distance. Set up a wire payout reel at the anchor and pull out six copperweld antenna wires between the anchor and the stake. Three wires should pass on the left side of the antenna poles, and three wires on the right side.

**b.** Slide a single long-bar strain insulator (fig. 2) on each of these wires. Be sure that the glazed saddleway end of each insulator is placed on the wire.

**c.** To measure the wires of length L for the antenna, fasten an insulator (with the antenna wire attached) to an anchor. Attach at the opposite end a wire grip with a set of small blocks, and place the wire in tension. Place boxes or other supports under the wire so that it will be in as nearly a straight line as possible. The tension should be at least 200 pounds, and each wire should be measured under the same conditions of sag and tension.

**d.** Starting from the bearing point of the pole end of the insulator (fig. 3), measure off with a standard steel tape a distance equal to twice the side length (L) of the antenna specified, subtract the length of the insulator, and carefully mark the wire for the bearing point of the insulator. The wire length plus the length of the two insulators is to be 2 L. As an example, this measurement is 2 feet x 375 feet = 750 feet for antenna type A. Repeat the measurements to be sure of accuracy. Mark the point so that it will not be lost. Two pieces of friction tape, one each side of the mark, wrapped around each wire is one way of retaining the marks. Establish similar marks at the midpoint of each wire, to be used later in establishing the insulator locations at the side poles of the antenna. In every case attach the wire to the insulator so that the mark falls on the bearing point of the insulator.

**e.** Splice the transmission line down leads with the antenna leads. Set up two coils of 3-strand No. 12 AWG on two payout reels at the antenna rear end pole. Pull two wires out on the ground, each of sufficient length to allow erection of down leads.

**f.** Slide a long-bar strain insulator (fig. 2) on each of these wires. Be sure that the glazed saddleway end of each insulator is placed on the wire.

**g.** Insert one of the wires into each saddleway at opposite ends of a long-bar strain insulator used as a spreader (fig. 32, detail 7).

**h.** Splice the antenna curtain wires and the transmission line down lead to the metal-capped large strain insulator (fig. 3).

**i.** This same procedure is followed for the dissipation line down leads at the front end pole, except that two down leads, each made up of two No. 14 AWG stainless steel wires are used instead of the 3-strand No. 12 copperweld.

**j.** Down lead connections are illustrated in fig. 32, detail 1. Be sure that the down lead hangs through the saddleway of the metal-capped large strain insulator.

**k.** Clean the group of seven wires (made up of three antenna dead ends doubled back and the down lead) so that they are bright, clean, free of grease, dirt, oxide, or sulphate. Form these wires into a tight and smooth group held by wire connectors as shown on figure 32, detail 1. Wrap (serve) the group tightly and smoothly with No. 18 AWG tinned copper wire between wire connectors, and solder the joint.

**l.** After antenna dead-end splices are completed, locate the bar insulator (fig. 2) used as a spreader 12 inches down from antenna in a level position, lash, and hold permanently in place with tie wires (fig. 32, detail 7). Use copperweld tie-wire on the transmission line and stainless steel tie-wire on the dissipation line.

**m.** Do not install the remaining regular insulator spreaders (fig. 4) until after the antenna wires have been erected, fastened, and sagged; and the down leads pulled reasonably taut.

## 17. ERECTION OF ANTENNA CURTAIN.

The following steps are suggested as a sequence of operation for erection of the antenna.

**a.** Lay each group of three curtain wires as straight as possible on the ground between the end poles. Shackle the end harness to the end insulators, and move the side insulators along the wires to their previously marked center location.

**b.** Using halyards or hand lines, hoist each end of the assembled curtain shackle to the eyenut on the pole. One end at a time may be raised. Avoid kinking or bending the antenna wires at any time.

**c.** Shackle the side harnesses to the side insulators, attach hand lines to the harnesses, and raise the antenna sides into position. With the antenna roughly positioned, check the anchors and guys to bring the poles to approximate vertical position.

**d.** Pull up the antenna to 3 feet from the center of the side poles and front pole, respectively, and 8 inches from the rear pole. The entire antenna structure should now be approximately in position and the antenna sag should be roughly as specified. If the antenna does not fall reasonably into position with these preliminary adjustments, the difficulty should be found and remedied before accurate adjustment of sag is undertaken.

**e.** With the antenna approximately in position, locate a point on the side poles level with the antenna wire nearest the pole. At a distance below the point equal to the sag specified for the particular rhombic antenna being built and the prevailing atmospheric temperature, nail a lath horizontally on the pole so that it can be plainly seen from either end pole. Nail a lath similarly on each end pole so that it can be seen from each side pole. Adjust the saddle length to make the antenna wire dip to the line formed by two laths. The saddle lengths should be nearly 3 feet when the sag is correct. See figure 14 for sag data for antenna curtain.

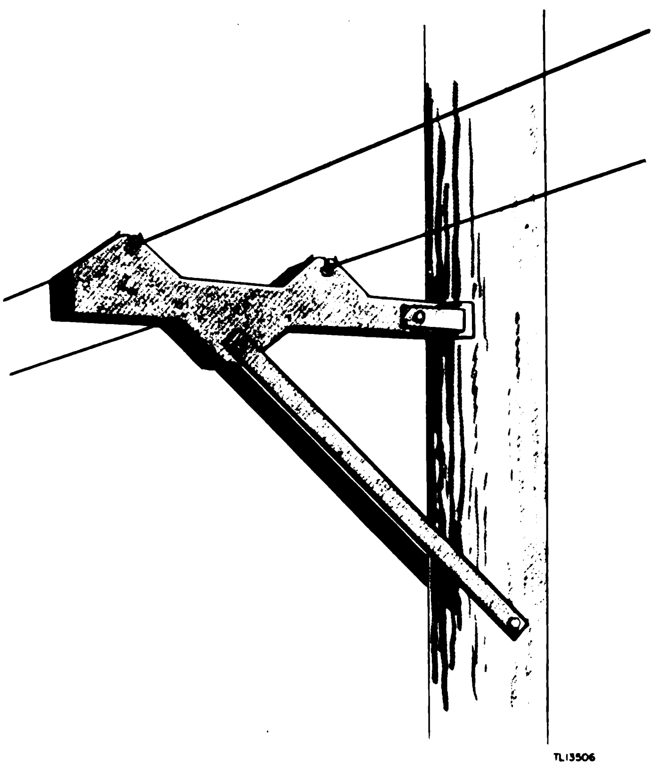


*Figure 7. Transmission line insulator, pole view.*

## 18. TRANSMISSION LINE.

**a.** The transmission line consists of two (3-strand No. 12 AWG copperweld) wires spaced 12 inches apart, has a characteristic impedance of 600 ohms, and connects the power output of the radio transmitter to the rhombic antenna. The down lead constitutes part of the transmission line, and the wire as furnished in rolls of specified length should require splicing at terminal ends only.

**b.** Shackle the large-bar strain insulators, which are already on the line wires, to the line end pole.

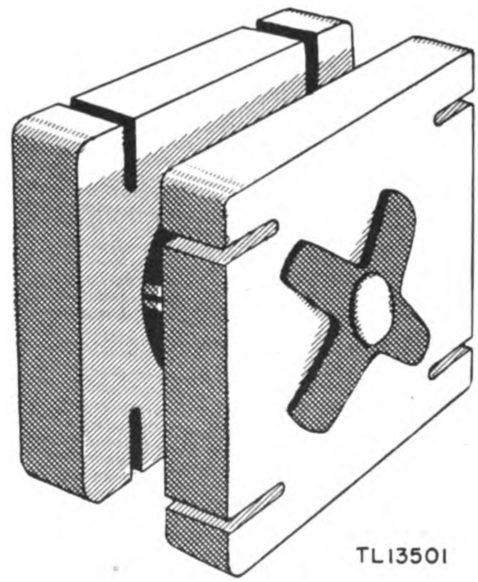


*Figure 8. Dissipation line insulator, spacer.*

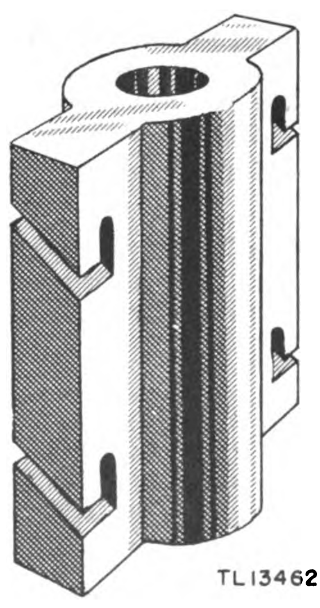


*Figure 9. Dissipation line insulator, support.*

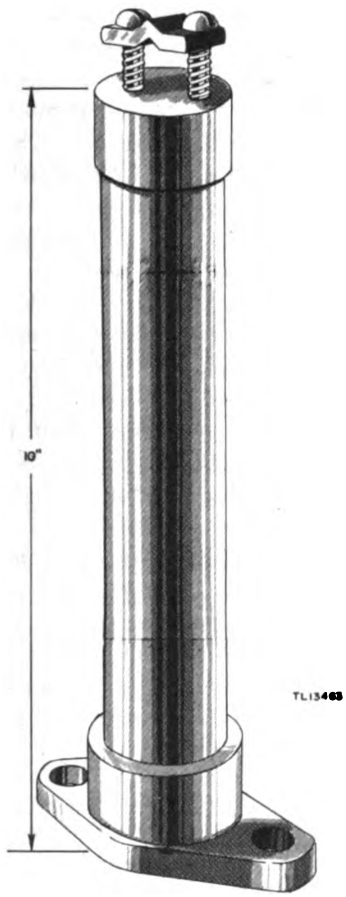


*Figure 10. Horn gap insulator.*

The line wires pass freely through the glazed saddleway of these insulators, thereby extending line tension to the down leads (fig. 11).

**c.** Support the line between the end poles using 2-wire line support insulators attached to intermediate poles (figs. 6 and 7). In most cases it will be found that the transmission line wires will stay in the slots of these insulators without being fastened. However, a short piece of wire may be inserted in the wire-retaining slot hole of the insulator with the ends bent upward ½ inch to keep the locking wire in place.

**d.** When line turns are required they should be made using the intermediate pole 2-wire line support insulator with its major axis bisecting the outside of the turn angle. Limit line turns to 30° line turn for any one pole (detail 6, fig. 32). Divide turns greater than 30° between two or more poles. Back guys are required on turns that exceed 5° and are led off the insulator side of the pole on an axis bisecting the outside of the turn angle.

**e.** Terminate the transmission line at the station end in large bar-strain insulators shackled to a front-braced pole which also supports the horn gaps (detail 5, fig. 32). Sag the transmission line wires in accordance with the stringing sag and tension data shown in figure 14. Make the dead-end splice, and serve it together with a lead-in wire of suitable length to connect to the horn gap and to pass through the plastic bushings of the entrance bowl insulators into the transmitter building. Place a small quantity of Duco household cement (which may be obtained from station maintenance kit) on the line wires where they pass through the plastic bushings to make a water-tight seal. Mount the two entrance bowl insulators on a plywood mat so that their centers are spaced 12 inches apart (line spacing). For details of wire serving and splice see figure 15. Horn gap data is indicated on figure 32, note 5, detail 5. A horn gap insulator is shown in figure 10.

**NOTE:** Generally, it is less work to remove plywood mat from the building casing, mount the insulators, and reinstall the mat in the building casing.

## 19. DISSIPATION LINE.

**a.** The dissipation line is constructed of No. 14 AWG annealed stainless steel wire and includes the down lead, all in one length. The down lead portion is made up as a 2-wire line, (each wire, 2 strands No. 14 AWG stainless steel long lay twist) spaced 12 inches and has a characteristic impedance of approximately 650 ohms. The down lead becomes part of the horizontal portion of the dissipation line by a right-angle bend, and at this point a modified exponential line begins (fig. 12). The 2-wire down lead is transformed into a 4-wire dissipation line without the necessity of joining or splicing. The 12-inch spacing starts diminishing, the 2 strands (long lay twist) of each line wire now starts to become separate spaced lines, and in this manner in a line length of exactly 62.5 feet the 12 inches spacing tapers to 5.5 inches as the side members diverge to 1.3 inch at the dissipation line spreader insulator (fig. 5). From this point on, in a line length of an additional 62.5 feet, the 5.5-inch spacing tapers to 1.3 inches, while the side members remain spaced 1.3 inches apart. From this point, the line continues as a 1.3-inch square spaced 4-wire line. The modified exponential portion of the dissipation line transforms the approximately 650-ohm impedance of the down leads to appriximately 200 ohms. The equally spaced 4-wire portion of the dissipation line is fundamentally two 400-ohm lines in parallel, one of which is terminated open circuit (free, not connected to anything) and the other of which is terminated short circuit (ends connected diagonally) and grounded.

**b.** Shackle the large-bar strain insulators (fig. 2) which are already on the line wires, to the dissipation line pole under the down leads. The dissipation line wires pass freely through the glazed saddleway of these insulators, thereby extending line tension to the down leads. Twist together the two No. 14 stainless steel wires that make up each wire of the down leads in a "long lay twist" (one twist in about 5 feet length of wires) to keep the wires neatly together. String the four wires in exponential formation (fig. 32) to and through the first intermediate pole line support insulator (fig. 9) and in equal spaced formation (fig. 32) through the support insulators on the remaining intermediate poles. Temporarily terminate at the counterweight end pole. At this point, attach a temporary rigging to put equal tension of about 30 pounds, on each of the four wires. Install the dissipation line spreader insulator (fig. 5) as indicated in figure 32. Install the line supported spacer insulators (fig. 8) in the middle of the spans of the equally spaced portion of the dissipation line.

**c.** Measure off a distance of 1½ feet from the last line support insulator and mark this position accurately on each of the wires. Remove the tension rigging. Insert the wires in the end strain insulators, (fig. 2) and fasten with wire connectors so that the marks are located accurately in corresponding positions of the end insulators. Allow at least 18 inches of tail wire on each wire of the diagonal pair, the bottom wire of which is next to the pole. Make up the harness sets for line tension and equalization, attach them to the remaining ends of the end insulators, and install them as indicated in figure 13. Install the counterweight assembly. With the line under normal tension, select the upper tail wire mentioned, bend it back directly to the diagonally opposite bottom wire, and seize both tail wires and fasten them together with wire connectors. Splice the ground wire to the tail wires a few inches below the line. Leave enough slack in the ground wire to allow for change in position with thermal changes in the line. Cut off the tail wires of the other diagonal pair of wires in the line about an inch beyond the connector. As shown in figure 32, install a 4-wire line spacer of the type used in the middle of spans (fig. 8) as close as possible to the end strain insulators.

**NOTE:** The dimensions of the exponential line portion of the dissipation line and spreader position are critical.

**d.** The pulleys are for equalization and tension of the dissipation line, and are shown in figures 26 and 27.

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## PART TWO

# OPERATING INSTRUCTIONS

No specific operating instructions.

# PART THREE
# PREVENTIVE MAINTENANCE

## SECTION III. PREVENTIVE MAINTENANCE TECHNIQUES.

### 20. MEANING OF PREVENTIVE MAINTENANCE.

Preventive maintenance is a systematic series of operations performed at regular intervals on equipment to eliminate major break-downs and unwanted interruption in service, and to keep the equipment operating at top efficiency. The prime function of preventive maintenance is to **prevent** break-downs, and therefore, the need for repair.

### 21. DESCRIPTION OF PREVENTIVE MAINTENANCE TECHNIQUES.

**a. General.** This section of the manual contains specific instructions and serves as a guide for personnel assigned to perform maintenance operations. Usually six basic operations are performed. However, in this manual only three are used, namely: Inspect, Tighten, and Clean.

**b. Inspect.** Inspection in this manual consists of carefully observing all parts of the antenna, noticing especially the state of cleanliness.

**c. Tighten and Clean.** These two operations are self-explanatory. Be careful when tightening. Fittings tightened beyond the pressure for which they are designed will be damaged or broken.

### 22. ITEMIZED PREVENTIVE MAINTENANCE.

Preventive maintenance on the rhombic transmitting antenna will be performed once a year. The equipment should be checked for satisfactory performance after each time maintenance work is performed.

### 23. COMMON MATERIALS NEEDED.

The following materials will be needed in performing preventive maintenance:

Common hand tools (TE-41 or equivalent).

Clean cloth.

Solvent, Dry-cleaning, Federal Specification P-S-661a.

NOTE: Leaded gasoline will not be recommended as a cleaning fluid for any purpose. Solvent, Dry-cleaning, Federal Specification P-S-661a, is available, as cleaning fluid, through established supply channels. Oil, Fuel, Diesel, U. S. Army Specification 2-102B, may be used for cleaning purposes when dry-cleaning solvent is not at hand. Since unleaded gasoline is available only in limited quantities, and only in certain locations, it should be used for cleaning purposes only when no other agent is suitable.

### 24. RHOMBIC TRANSMITTING ANTENNA.

**a. Inspect.** Inspect the antenna and transmission and dissipation lines for cleanliness of insulators and looseness of connections. Inspect pole guys for proper tension.

**b. Tighten.** All loose connections and loose guys.

**c. Clean.** Using a clean cloth and dry-cleaning solvent, clean the antenna and transmission and dissipation line insulators.

### 25. PREVENTIVE MAINTENANCE CHECK LIST.

The following check list is a summary of the preventive maintenance operations to be performed on the rhombic transmitting antenna. The time interval shown on the check list may be reduced at any time by the local commander. However, for best performance of the equipment, it is recommended that the operations be performed at least as frequently as called for in the check list. The echelon column indicates which operations are first echelon maintenance and which operations are second echelon maintenance.

| Item No. | Operations | Item | When performed | | | | | | | Echelon |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Before operation | After operation | Daily | Weekly | Monthly | Semi-annually | Yearly | |
| 1 | ITC | Antenna | | | | | | | X | 1st |

F Feel I Inspect T Tighten C Clean A Adjust L Lubricate

## PART FOUR

# AUXILIARY EQUIPMENT

Not used.

## PART FIVE

# REPAIR INSTRUCTIONS

### SECTION IV. THEORY.

See TM 11-455, Radio Fundamentals, and TM 11-314, Antennas and Antenna Systems.

## APPENDIX

# MAINTENANCE PARTS

### 26. MAINTENANCE PARTS FOR RHOMBIC TRANSMITTING ANTENNA.

The following information was compiled on 27 March 1945. The appropriate section of the ASF Signal Supply Catalog for Antenna Kit for Rhombic Transmitting Antenna (Drawing ES-E-368-D) is:

**SIG 10-450, Antenna Kit for Rhombic Transmitting Antenna (Drawing ES-E-368-D), when published.**

For the latest index of available catalog sections, see ASF Signal Supply Catalog SIG 2.

| Ref symbol (fig. 32) | Signal Corps stock No. | Name of part and description | Quan. Issued per unit |
|---|---|---|---|
| | 2A1624 | **ANTENNA KIT** | |
| 1 | 1A807.12 | WIRE: (3 strands No. 12 AWG) copperweld; 40% cond; high strength. | 5000 ft. |
| 2 | 1A115 | WIRE: 5/16" messenger; GS; (6,000 lb.). | 30 ft. |
| 3 | 1A90 | WIRE: 3/8" messenger; GS; (10,800 lb). | 15 ft. |
| 4 | 1A116 | WIRE: 7/16" messenger; GS; (18,000 lb). | 10 ft. |
| 5 | 1A818.1 | WIRE: No. 18 AWG; copper; tinned; soft drawn, for serving. | 1 lb. |
| 6 | 3G1300-300 | INSULATOR: strain; 12"; (dwg. ES-A-32534-A). | 5 (1) |
| 7 | 3G1100-192 | INSULATOR: strain; 12"; (dwg. SC-A-286-D). | 8 (1) |
| 8 | 3G1250-192.3 | INSULATOR: spreader; 12"; (dwg. SC-A-258-A). | 4 (2) |
| 9 | 5B1510-16 | BOLT: machine; 5/8" x 16"; GI with nut. | 4 |
| 10 | 5B4305 | EYE NUT: thimble eye; GI; for 5/8" bolt; (Hubbard No. 7510, or equal). | 5 (1) |
| 11 | 5B20310 | WASHER: curved; GI; for 5/8" bolt; (Hubbard No. 7822, or equal). | 9 (1) |
| 12 | 5B3449 | CLAMP: guy; 3-bolt; medium; GI; (Hubbard No. 7449, or equal). | 13 (1) |
| 13 | 5B3461 | CLAMP: guy; 3-bolt; heavy; GI; (Hubbard No. 7461, or equal). | 9 (1) |
| 14 | 5B18043 | THIMBLE: steel; galv; 3/8" rope; (Hubbard No. 7593, or equal). | 6 (1) |
| 15 | 5B18044 | THIMBLE: steel; galv; 1/2" rope; (Hubbard No. 7594, or equal). | 2 (1) |
| 16 | 5B4209 | CONNECTOR: solderless; Reliable No. 1F. | 16 (4) |
| | 2A1624-4 | **POLE GUY KIT 75PX** | |
| 3 | 1A90 | WIRE: 3/8"; messenger; GS; (10,800 lb). | 117 ft. Approx. |
| 13 | 5B3461 | CLAMP: guy; 3-bolt; heavy; GI; (Hubbard No. 7461, or equal). | 12 |
| 17 | 5B1442-16 | BOLT: bent eye; 3/4" x 16"; GI; (Hubbard No. 6116, or equal). | 1 |
| 18 | 5B4306 | EYENUT; thimble eye; GI; for 3/4" bolt; (Hubbard No. 7511, or equal). | 1 |
| 19 | 5B20312 | WASHER: curved; GI; for 3/4" bent eye bolt; (Hubbard No. 7823, or equal). | 1 |
| 20 | 5B20212-13 | WASHER: square; 3" x 3"; 13/16" hole; GI; for A rod; (Hubbard No. 7817). | 1 |
| 21 | 5B109 | ANCHOR: (A-H-9); 4-way expanding; 15" diam. open. | 1 |
| 22 | 5B707A | ANCHOR ROD: (AH-7A); 3/4" x 9'; GI; (Hubbard No. 8429, or equal). | 1 |
| 23 | 3G1875-504 | INSULATOR: ball; strain; (Thomas No. 504, or equal). | 5 |
| 24 | 5B17504 | PLATE: curved lift; GI; for 3/4" bent eye bolt; (Hubbard No. 8888, or equal). | 1 |

Quantities shown in parenthesis are spares included in the basic quantities.

## 26. MAINTENANCE PARTS FOR RHOMBIC TRANSMITTING ANTENNA (contd).

| Ref symbol (fig. 32) | Signal Corps stock No. | Name of part and description | Quan. Issued per unit |
|---|---|---|---|
| 25 | 5B10008-4.5 | SCREW: lag; GI; ½" x 4½". | 1 |
| 26 | 5B17137 | STEP: pole; ⅝" x 10"; GI; (Hubbard No. 7125, or equal). | 38 |
| 27 | 5A3710 | STEP: pole; wood; (dwg. SC-A-4007-A). | 3 |
| 28 | 6L1460 | SPIKE: gauge No. 2; 6" long; (for upper nail fastening, wood step). | 3 |
| 29 | 6L1430 | SPIKE: gauge No. 5; 4½" long; (for lower nail fastening, wood step). | 3 |
| | 2A1624-3 | **POLE GUY KIT 75PXX** | |
| 4 | 1A116 | WIRE: 7/16"; messenger; GS; (18,000 lb). | 125 ft. Approx. |
| 13 | 5B3461 | CLAMP: guy; 3-bolt; heavy; GI; (Hubbard No. 7461, or equal). | 24 |
| 30 | 5B1316-16 | BOLT: bent eye; 1" x 16"; GI; (Hubbard No. 6196, or equal). | 1 |
| 31 | 5B4308 | EYENUT: thimble eye; GI; for 1" bolt; (Hubbard No. 7512, or equal). | 1 |
| 32 | 5B20316 | WASHER: curved; GI; for 1" bent eyebolt; (Hubbard No. 7824, or equal). | 1 |
| 33 | 5B20077 | WASHER: square; 4" x 4"; 1 3/16" hole; GI; (Hubbard No. 7820, or equal). | 1 |
| 34 | 5B110 | ANCHOR: (AH-10); 4-way expanding; 19" diam open. | 1 |
| 35 | 5B708A | ANCHOR ROD: (AH-8-A); 1" x 10'; GI; (Hubbard No. 8440, or equal). | 1 |
| 36 | 3G1875-506 | INSULATOR: ball; strain; (Thomas No. 506, or equal). | 5 |
| 37 | 2A1624-2/P1 | PLATE: curved lift; GI; for 1" bent eyebolt; (Hubbard No. 8899, or equal). | 1 |
| 25 | 5B10008-4.5 | SCREW: lag; GI; ½" x 4½". | 2 |
| 26 | 5B17137 | STEP: pole; ⅝ " x 10"; GI; (Hubbard No. 7125, or equal). | 38 |
| 27 | 5A3710 | STEP: pole; wood; (dwg. SC-A-4007-A). | 3 |
| 28 | 6L1460 | SPIKE: gauge No. 2; 6" long; (for upper nail fastening, wood step). | 3 |
| 29 | 6L1430 | SPIKE: gauge No. 5; 4½" long; (for lower nail fastening, wood step). | 3 |
| | 2A1624-2 | **TRANSMISSION LINE KIT** | |
| 1 | 1A807.12 | WIRE: (3 strands No. 12); copperweld; 40% cond; high strength. | 1300 ft. |
| 2 | 1A115 | WIRE: 5/16" messenger; GS; (6,000 lb). | 100 ft. |
| 38 | 1A806 | WIRE: No. 6 AWG; copper; hard-drawn; for horn gap. | 10 ft. |
| 7 | 3G1100-192 | INSULATOR: strain; 12" (dwg. SC-A-286-D). | 9 (1) |
| 39 | 3G1350-88 | INSULATOR: stand off; (dwg. ES-A-19521-C); 10". | 4 (1) |
| 40 | 3G1050-128 | INSULATOR: entrance bowl; including mounting hardware; (dwg. ES-C-32552-B). | 3 (1) |
| 41 | 3G1350-103 | INSULATOR ASSEMBLY: transmission line support; 2-wire spaced 12"; including mounting hardware; (dwg. ES-C-32574-A). | 6 |
| 42 | 2A1624-2/S1 | SHACKLE: forged steel; galvanized; for strain insulator; (dwg. SC-A-274-D). | 5 (1) |
| 43 | 5A1601.5 | CROSS ARM: wood; douglas fir; 3¼" x 4¼" x 18". | 2 |
| 44 | 5B1309-12.1 | BOLT: oval eye; ⅝" x 12"; GI; (Hubard No. 39962, or equal). | 2 |
| 45 | 5B1308-8 | BOLT: oval eye; ½" x 8"; GI; (Hubbard No. 39938, or equal). | 9 (1) |
| 9 | 5B1510-16 | BOLT: machine; ⅝" x 16"; GI; with nut. | 1 |

Quantities shown in parenthesis are spares included in the basic quantities.

| Ref symbol (fig. 32) | Signal Corps stock No. | Name of part and description | Quan. Issued per unit |
|---|---|---|---|
| 46 | 5B1505-5.5 | BOLT: machine; 5/16" x 5½"; GI; with nut. | 6 |
| 25 | 5B10008-4.5 | SCREW: lag; GI; ½" x 4½". | 3 |
| 11 | 5B20310 | WASHER: curved; GI; for ⅝" bolt; (Hubbard No. 7822, or equal). | 3 |
| 47 | 5B20209-11 | WASHER: square; 2¼" x 2¼"; 11/16" hole; GI; (Hubbard No. 7813, or equal). | 3 (1) |
| 48 | 6L58026Z | WASHER: round; ⅜" hole; ⅞" OD; GI. | 6 |
| 49 | 5B20109 | WASHER: round, 9/16" hole; 1⅜" OD; GI; (Hubbard No. 7803, or equal). | 18 (2) |
| 50 | 5B20111 | WASHER: round; 11/16" hole; 1¾" OD; GI; (Hubbard No. 7805, or equal). | 2 (1) |
| 12 | 5B3449 | CLAMP: guy; 3-bolt; medium; GI; (Hubbard No. 7449, or equal). | 8 |
| 51 | 5B101 | ANCHOR: (AH-1); 8" cone-shaped. | 4 |
| 52 | 5B704 | ANCHOR ROD: (AH-4); ⅝" x 6'; Spec 71-68. | 4 |
| 53 | 5B4426 | GROUND ROD: (GP-26); ½" x 6'; GI. | 1 |
| 54 | 5B17001.5 | STAPLE: 1½" long; 3/16" spread; galv; (Hubbard No. 7200, or equal). | 36 |
| 14 | 5B18043 | THIMBLE: steel; galv; ⅜" rope; (Hubbard No. 7593, or equal). | 6 (1) |
| 55 | 5B5283.5 | HOOK: guy; J; (Hubbard No. 7583½, or equal). | 3 |
|  | 2A1624-1 | **DISSIPATION LINE KIT** |  |
| 1 | 1A807.12 | WIRE: (3 strands No. 12); copperweld; 40% cond; high strength. | 25 ft. |
| 2 | 1A115 | WIRE: 5/16"; messenger; GS; (6,000 lb). | 40 ft. |
| 56 | 1A814.13 | WIRE: No. 14 AWG; stainless steel; fully annealed. | 1500 ft. |
| 57 | 1A706 | WIRE: flexible wire tiller rope; galv 3/16", (Perko or equal). | 12 ft. |
| 58 | 1A708 | WIRE: flexible wire tiller rope, galv ¼", (Perko or equal). | 12 ft. |
| 7 | 3G1100-192 | INSULATOR: strain; 12"; (dwg. SC-A-286-D). | 4 (1) |
| 59 | 3G1250-80.5 | INSULATOR: strain; 4"; ¾" diam; (dwg. ES-A-19517-A). | 5 (1) |
| 8 | 3G1250-192.3 | INSULATOR: spreader; 12"; (dwg. SC-A-258-A). | 4 (1) |
| 60 | 3G1350-76 | INSULATOR: line support; 4-wire spaced 1.3"; (dwg. ES-A-19514-B). | 4 (1) |
| 61 | 3G1350-77 | INSULATOR: spacer; 4-wire spaced 1.3"; (dwg. ES-A-19512-B). | 4 (1) |
| 62 | 3G1150-99 | INSULATOR: spacer; 4-wire spaced rectangular; 5.5" and 1.3"; (dwg. ES-B-32573-B). | 2 (1) |
| 42 | 2A1624-2/S1 | SHACKLE: forged steel; galv; for strain insulator; (dwg. SC-A-274-D). | 3 (1) |
| 43 | 5A1601.5 | CROSS ARM: wood; douglas fir; 3¼" x 4¼" x 18". | 1 |
| 44 | 5B1309-12.1 | BOLT: oval eye; ⅝" x 12"; GI; (Hubbard No. 39962, or equal). | 2 |
| 45 | 5B1308-8 | BOLT: oval eye; ½" x 8"; GI; (Hubbard No. 39938, or equal). | 2 |
| 11 | 5B20310 | WASHER: curved; GI; for ⅝" bolt; (Hubbard No. 7822, or equal). | 3 |
| 47 | 5B20209-11 | WASHER: square; 2¼" x 2¼"; 11/16" hole; GI; (Hubbard No. 7813, or equal). | 1 |
| 63 | 5B20080 | WASHER: round; 7/16" hole; 1" OD; 5/64" thick; (Hubbard No. 7801, or equal). | 8 (2) |
| 49 | 5B20109 | WASHER: round; 9/16" hole; 1⅜" OD; (Hubbard No. 7803, or equal). | 6 (2) |
| 25 | 5B10008-4.5 | SCREW: lag; ½" x 4½". | 1 |

Quantities shown in parenthesis are spares included in the basic quantities.

## 26. MAINTENANCE PARTS FOR RHOMBIC TRANSMITTING ANTENNA (contd).

| Ref symbol (fig. 32) | Signal Corps stock No. | Name of part and description | Quan. Issued per unit |
|---|---|---|---|
| 64 | 5B10006-6A | SCREW: lag; GI; 3/8" x 6". | 3 |
| 12 | 5B3449 | CLAMP: guy; 3-bolt; medium; GI; (Hubbard No. 7449, or equal). | 3 |
| 10 | 5B4305 | EYENUT: thimble eye; GI; for 5/8" bolt; (Hubbard No. 7510, or equal). | 1 |
| 51 | 5B101 | ANCHOR: (AH-1); 8" cone-shaped. | 1 |
| 52 | 5B704 | ANCHOR ROD: (AH-4); 5/8" x 6'; Spec 71-68. | 1 |
| 53 | 5B4426 | GROUND ROD: (GP-26); 1/2" x 6'; GI. | 1 |
| 54 | 5B17001.5 | STAPLE: 1 1/2" long; 3/16" spread; galvanized; (Hubbard No. 7200, or equal). | 36 |
| 55 | 5B5283.5 | HOOK: guy; J; (Hubbard No. 7583 1/2, or equal). | 1 |
| 65 | 6R7449 | PULLEY: sheave; for line tension equalization; (dwg. ES-A-19518-A). | 3 |
| 66 | 6R7449-1 | PULLEY: sheave; for line tension; (dwg. ES-B-19519-A). | 1 |
| 67 | 5B4103 | CLIP: wire rope; 3/16"; GS; (U-W, GE Co, or equal). | 12 |
| 68 | 5B4104 | CLIP: wire rope; 1/4"; GS; (Hubbard No. 7480, or equal). | 4 |
| 69 | 5B4105 | CLIP: wire rope; 5/16"; GS; (Hubbard No. 7481, or equal). | 6 |
| 14 | 5B18043 | THIMBLE: steel; galvanized; 3/8" rope; (Hubbard No. 7593, or equal). | 4 |
| 16 | 5B4209 | CONNECTOR: wire; (Reliable No. 1F, or equal). | 9 (3) |
| 70 | 6Z3185 | CONNECTOR: wire; (Reliable No. 109, or equal). | 12 (2) |
| 74 | 5B4222 | CONNECTOR: wire; (Reliable No. 4F with bar spacer, or equal). | 3 (1) |

Quantities shown in parenthesis are spares included in the basic quantities.

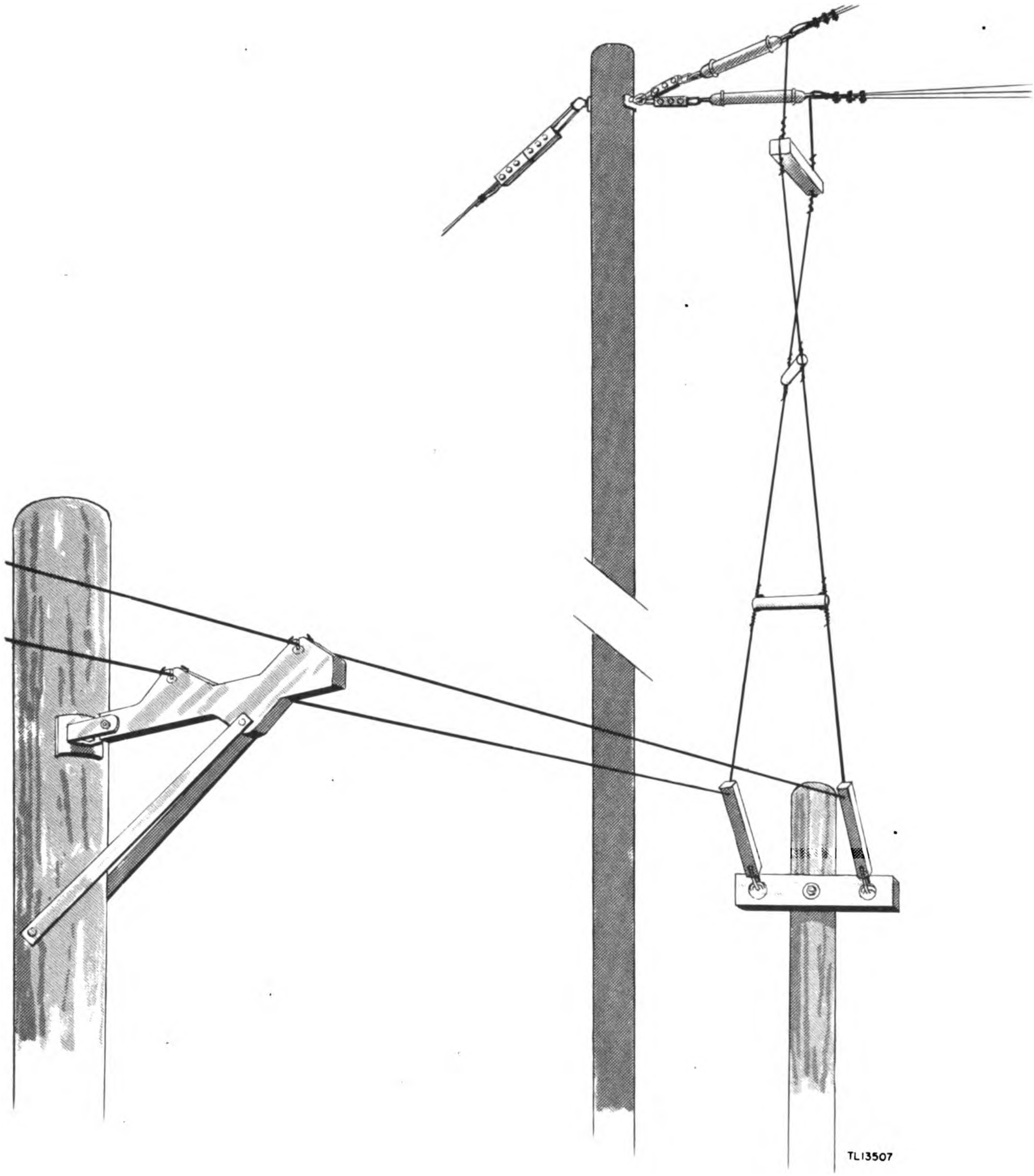



*Figure 11. Transmission line, down-lead view.*

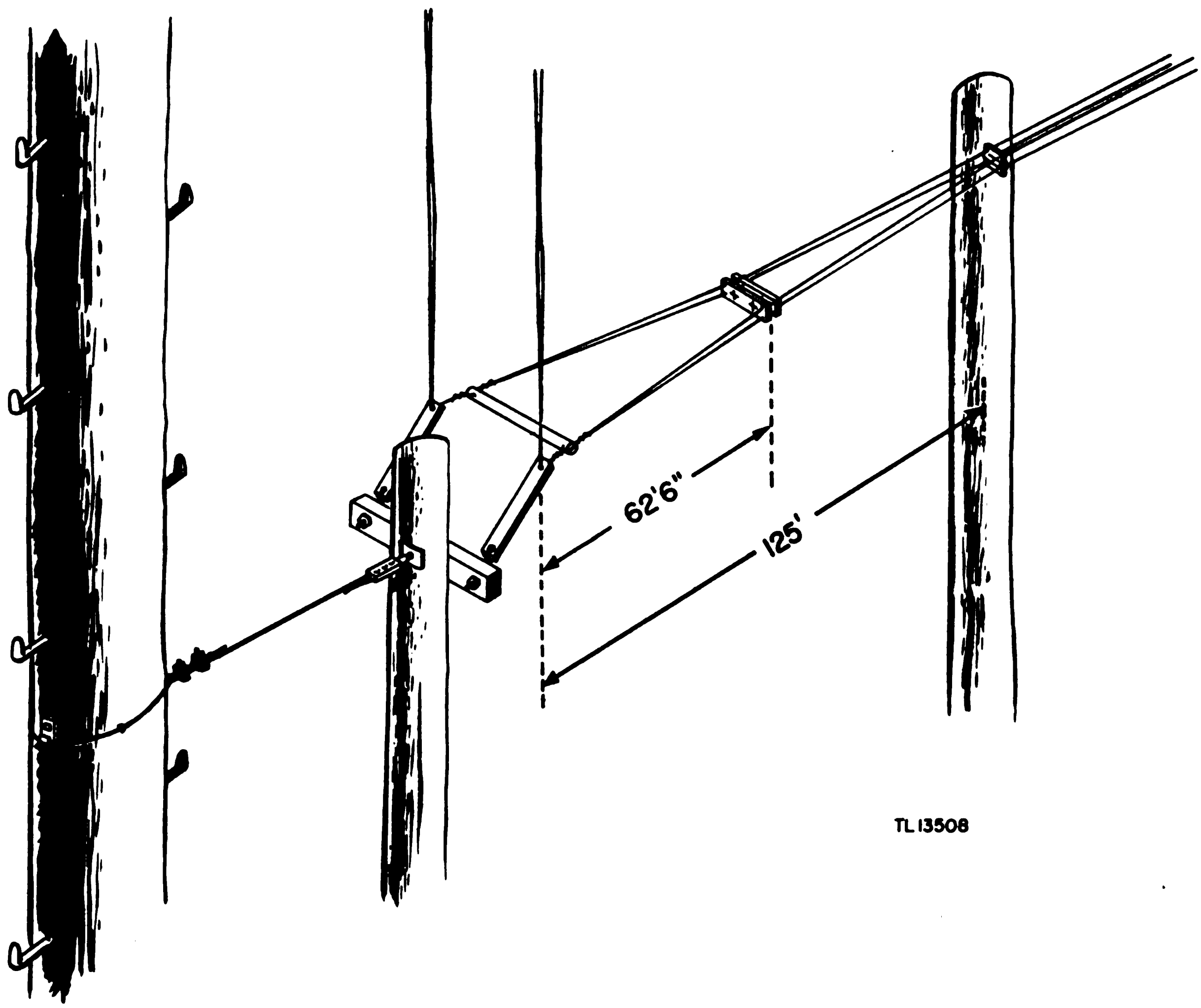



*Figure 12. Dissipation line, exponential portion.*

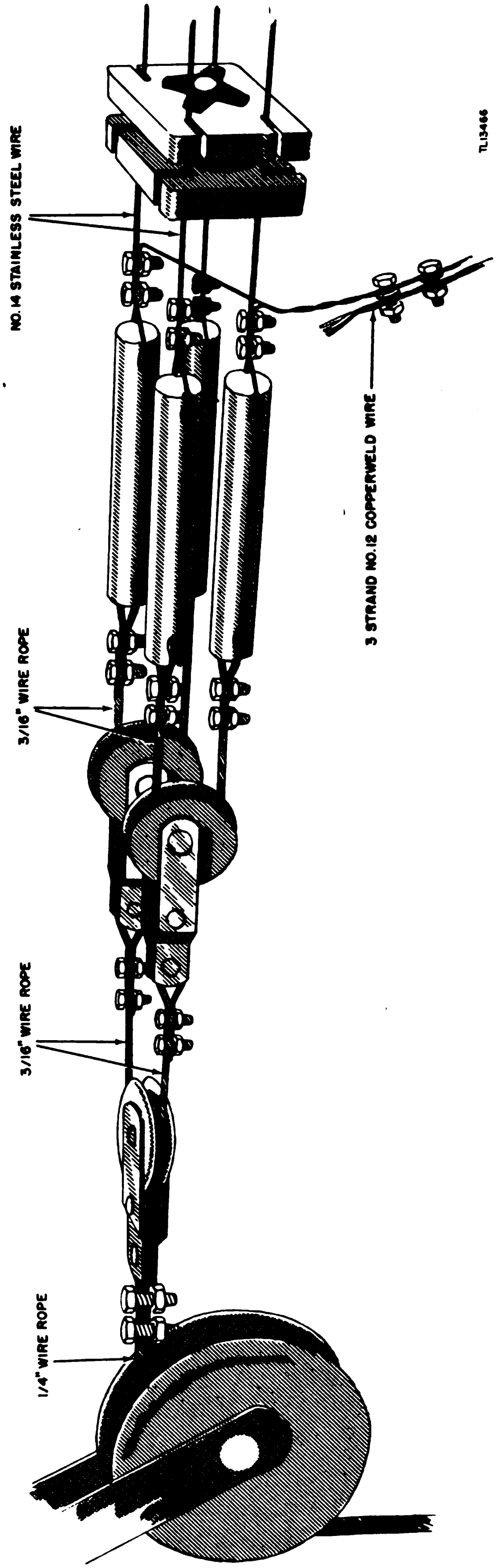



*Figure 13. Dissipation line, terminating assembly.*

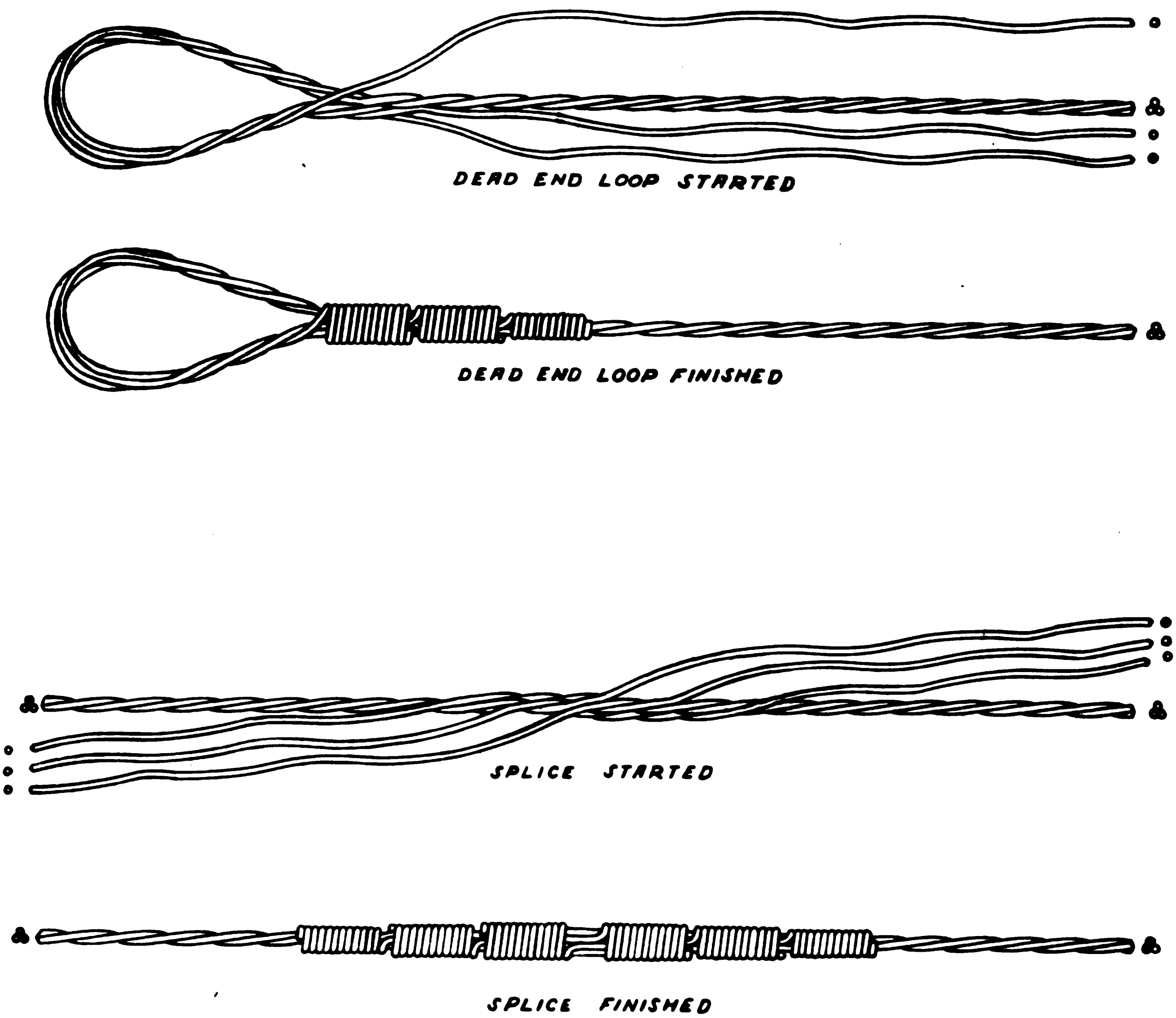
| SPAN IN FEET | SAG IN INCHES | | | TENSION IN POUNDS | | |
|---|---|---|---|---|---|---|
| Span | 30°F | 60°F | 90°F | 30°F | 60°F | 90°F |
| 100 | 2.3 | 2.8 | 3.8 | 362 | 288 | 216 |
| 125 | 3.6 | 4.5 | 5.9 | 360 | 288 | 218 |
| 150 | 5.1 | 6.4 | 8.4 | 358 | 288 | 221 |
| 175 | 7.1 | 8.7 | 11.4 | 357 | 288 | 223 |
| 200 | 9.3 | 11.4 | 14.7 | 355 | 288 | 226 |
| 225 | 11.7 | 14.5 | 18.1 | 353 | 288 | 228 |
| 245 | 13.9 | 17.1 | 21.3 | 352 | 288 | 230 |
| 250 | 14.6 | 17.9 | 22.2 | 352 | 288 | 231 |
| 270 | 17.2 | 20.8 | 25.9 | 350 | 288 | 233 |
| 275 | 17.8 | 21.6 | 26.8 | 350 | 288 | 233 |
| 290 | 19.8 | 24.0 | 29.6 | 349 | 288 | 235 |
| 300 | 21.1 | 25.6 | 31.4 | 349 | 288 | 236 |
| 315 | 23.4 | 28.3 | 34.3 | 348 | 288 | 237 |
| 325 | 24.9 | 30.1 | 36.4 | 347 | 288 | 238 |
| 350 | 29.2 | 35.0 | 42.0 | 345 | 288 | 241 |
| 375 | 33.8 | 40.3 | 48.0 | 344 | 288 | 243 |
| 400 | 38.5 | 45.6 | 53.8 | 342 | 288 | 246 |
| 425 | 44.0 | 51.5 | 60.0 | 340 | 288 | 248 |
| 450 | 49.7 | 57.8 | 67.2 | 338 | 288 | 250 |
| 475 | 55.8 | 64.5 | 74.5 | 335 | 288 | 251 |
| 500 | 62.2 | 71.4 | 81.8 | 332 | 288 | 252 |

NOTE: THE ABOVE TABLES ARE BASED ON A 60°F. STRINGING TENSION OF 288 LBS., 12.8% OF THE RATED BREAKING STRENGTH OF THE CONDUCTOR.

| STRINGING SAG AND TENSION DATA<br>COPPERWELD CONDUCTOR<br>3 STRANDS, #12, 40% CONDUCTIVITY | | | ISSUE |
|---|---|---|---|
| DATA A.A.R. | CK. A.A.R. | APPROVED | |
| DR. A.A.R. | VERIFIED FE | DATE - 9-10-43 | |
| O. C. SIG. O. U.S. ARMY PLANT ENGINEERING AGENCY PHILA. PA. | | ES-A-19529- | A |



Figure 14. Wire sag data.




NOTES:

1-POUR SOLDER OVER SERVE DO NOT USE BLOW TORCH.

2-EACH INDIVIDUAL WIRE SERVING OF GROUP - 12 TURNS EACH.

TL 13458

| SPLICE AND DEAD END DETAILS FOR STRANDED COPPERWELD | | | ISSUE |
|---|---|---|---|
| DATA A.A.R. | CK. A.A.R. | APPROVED | |
| DR. A.A.R. | VERIFIED | DATE - 5-18-43 | |
| O.C. SIG.O. U.S. ARMY PLANT ENGINEERING AGENCY PHILA. PA. | | ES-A-19352- | A |

*Figure 15. Dead end and splice detail.*

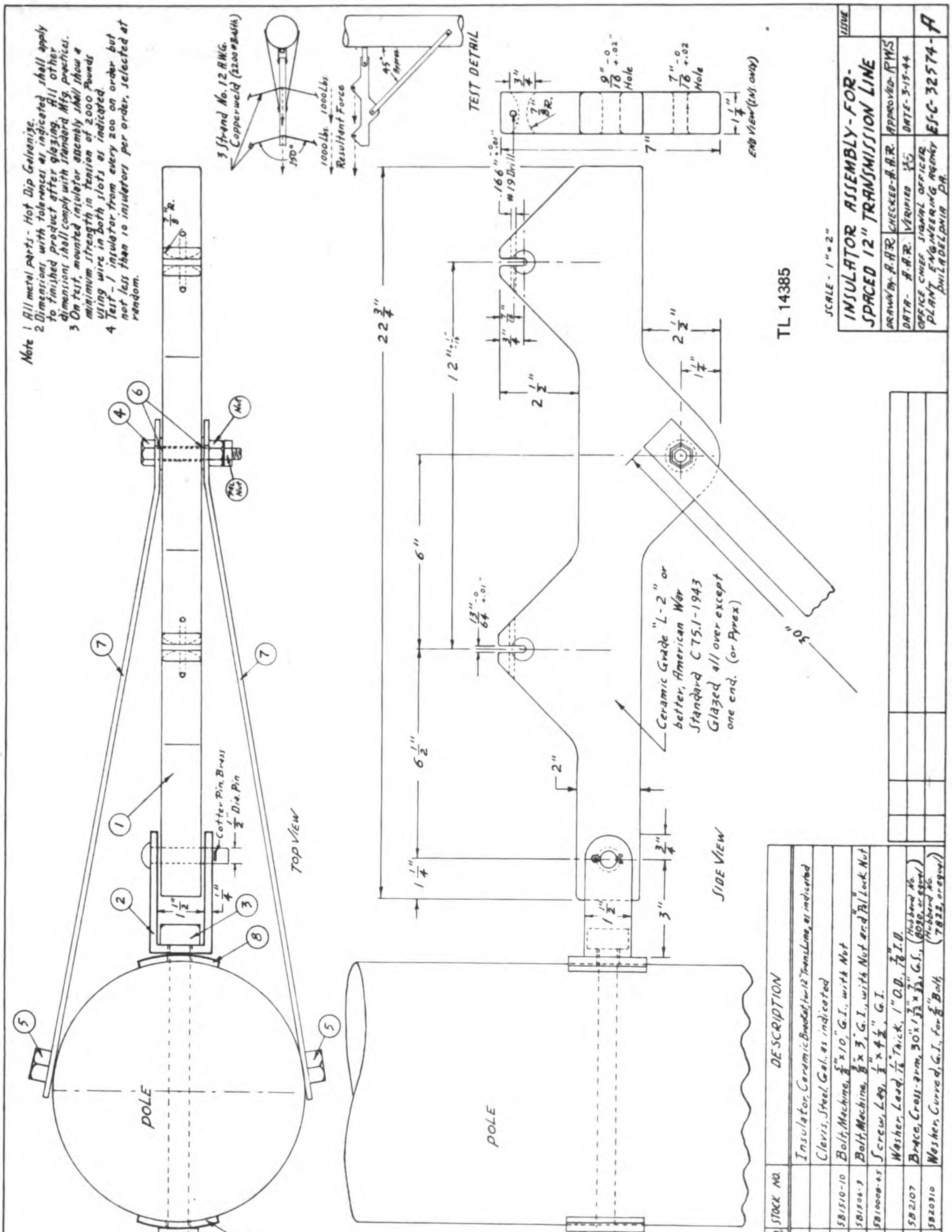
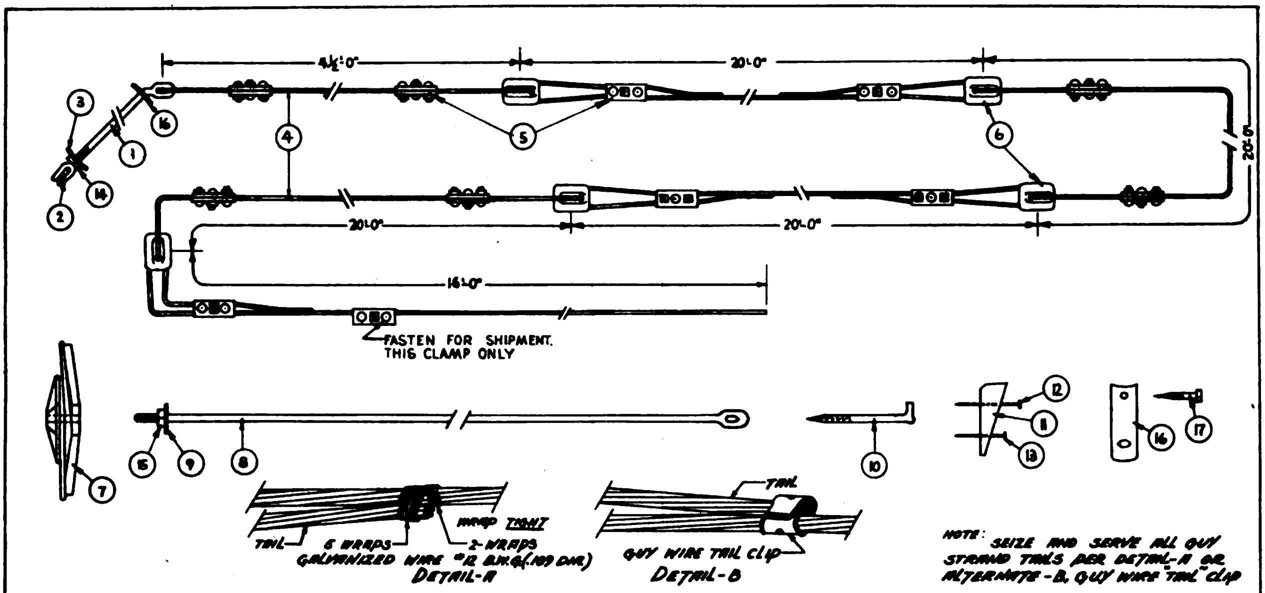


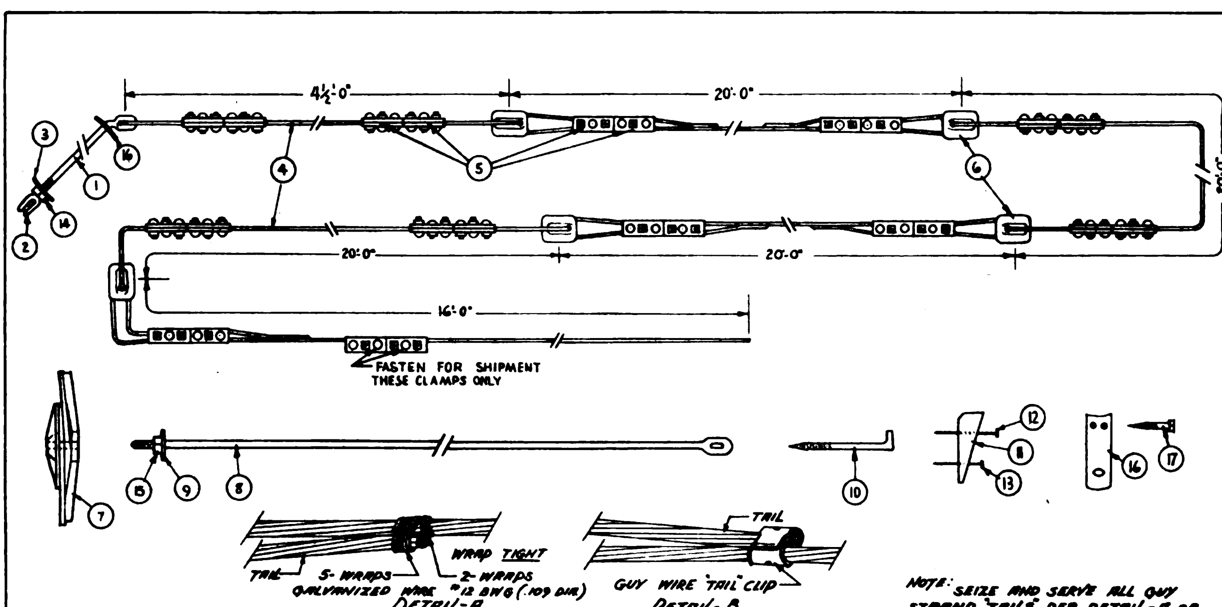

**Figure 16. Transmission line insulator assembly, dwg. ES-C-32574-A.**




| ITEM | NO. REQ. | STOCK Nº | DESCRIPTION | ITEM | NO. REQ. | STOCK Nº | DESCRIPTION |
|---|---|---|---|---|---|---|---|
| 1 | 1 | | BOLT, BENTEYE, ⅝" x 16" (HUBBARD Nº 6116, OR EQUAL) | 10 | 38 | 5B17137 | STEP, POLE, ⅝" x 10", G.I., (HUBBARD Nº 7125, OR EQUAL) |
| 2 | 1 | 5B4506 | EYE NUT, THIMBLEYE, G.I., FOR ⅝" BOLT, (HUBBARD NO. 7211, OR EQUAL) | 11 | 3 | 5A3710 | STEP, POLE, WOOD. (DWG. SC-A-4007) |
| 3 | 1 | 5B20512 | WASHER, CURVED, G.I., FOR ⅝" BENTEYE BOLT, (HUBBARD Nº [illegible] OR EQUAL) | 12 | 3 | 6L1460 | SPIKE, G.I., GAGE Nº 2, 6" LONG |
| 4 | 117' APPR | 1A 90 | WIRE, ⅜", MESSENGER, G.S., (10,800 LBS.) | 13 | 3 | 6L1430 | SPIKE, G.I., GAGE Nº 5, 4½" LONG |
| 5 | 12 | 5B3461 | CLAMP, GUY, 3 BOLT, G.I., (HUBBARD NO. 7461, OR EQUAL) | 14 | 1 | | NUT, PART OF ITEM Nº 1 |
| 6 | 5 | 3G1075-504 | INSULATOR, BALL, STRAIN, (THOMAS NO. 504, OR EQUAL) | 15 | 1 | | NUT, PART OF ITEM Nº 8 |
| 7 | 1 | 5B109 | ANCHOR, (AH-9), 4 WAY EXPANDING, 15" DIA. OPEN | 16 | 1 | | PLATE, CURVED LIFT, FOR ¾" BENTEYE BOLT, (HUBBARD Nº [illegible] OR EQUAL) |
| 8 | 1 | 5B707A | ANCHOR ROD, (AH-7A) ¾" x 9', (HUBBARD NO. 8429, OR EQUAL) | 17 | 1 | 5B10008-2.2 | SCREW, LAG, G.I., ½" x 4½" |
| 9 | 1 | 5B20212-13 | WASHER, SQUARE, 3" x 3"; 13/16" HOLE, (HUBBARD Nº 7817, OR EQUAL) | | | | |

POLE GUY KIT 75 PX ASSEMBLED — ISSUE A
DATA A.R.R. | CHECKED A.R.R. | APPROVED C.G.
DRAWN L.R.P. | VERIFIED F.C. | DATE 10-21-43
OFFICE CHIEF SIGNAL OFFICER, PLANT ENGINEERING AGENCY, PHILADELPHIA, PENNA. | ES-B-32500 | A

*Figure 17. Pole guy 75PX, dwg. ES-B-32500-A.*




| ITEM | NO. REQ. | STOCK Nº | DESCRIPTION | ITEM | NO. REQ. | STOCK Nº | DESCRIPTION |
|---|---|---|---|---|---|---|---|
| 1 | 1 | | BOLT, BENTEYE, 1" x 16" (HUBBARD Nº 6196, OR EQUAL) | 10 | 38 | 5B17137 | STEP, POLE, ⅝" x 10", G.I. (HUBBARD Nº 7125, OR EQUAL) |
| 2 | 1 | 5B4508 | EYE NUT, THIMBLEYE, G.I., FOR 1" BOLT, (HUBBARD Nº 7612, OR EQUAL) | 11 | 3 | 5A3710 | STEP, POLE, WOOD, (DWG. SC-A-4007) |
| 3 | 1 | 5B20516 | WASHER, CURVED, G.I., FOR 1" BENTEYE BOLT, (HUBBARD Nº 7226, OR EQUAL) | 12 | 3 | 6L1460 | SPIKE, G.I., GAGE Nº 2, 6" LONG |
| 4 | 125' APP. | 1A116 | WIRE, 7/16", MESSENGER, G.S., (18,000 LBS.) | 13 | 3 | 6L1430 | SPIKE, G.I., GAGE Nº 5, 4½" LONG |
| 5 | 24 | 5B3461 | CLAMP, GUY, 3 BOLT, G.I., (HUBBARD NO. 7461, OR EQUAL) | 14 | 1 | | NUT, PART OF ITEM Nº 1 |
| 6 | 5 | 3G1075-506 | INSULATOR, BALL, STRAIN, (THOMAS Nº 506, OR EQUAL) | 15 | 1 | | NUT, PART OF ITEM Nº 8 |
| 7 | 1 | 5B110 | ANCHOR, (AH-10), 4 WAY EXPANDING, 19" DIA. OPEN | 16 | 1 | | PLATE, CURVED LIFT, FOR 1" BENTEYE BOLT, (HUBBARD Nº [illegible] OR EQUAL) |
| 8 | 1 | 5B708A | ANCHOR ROD, (AH-8A), 1" x 10', (HUBBARD NO. 8440 OR EQUAL) | 17 | 2 | 5B10008-2.2 | SCREW, LAG, G.I. ½" x 4½" |
| 9 | 1 | 5B20077 | WASHER, SQUARE, 4" x 4"; 1 3/16" HOLE, (HUBBARD Nº 7826, OR EQUAL) | | | | |

POLE GUY KIT 75 PXX ASSEMBLED — ISSUE A
DATA A.R.R. | CHECKED A.R.R. | APPROVED C.G.
DRAWN L.R.P. | VERIFIED F.C. | DATE 10-21-43
OFFICE CHIEF SIGNAL OFFICER, PLANT ENGINEERING AGENCY, PHILADELPHIA, PENNA. | ES-B-32502 | A

*Figure 18. Pole guy 75PXX, dwg. ES-B-32502-A.*

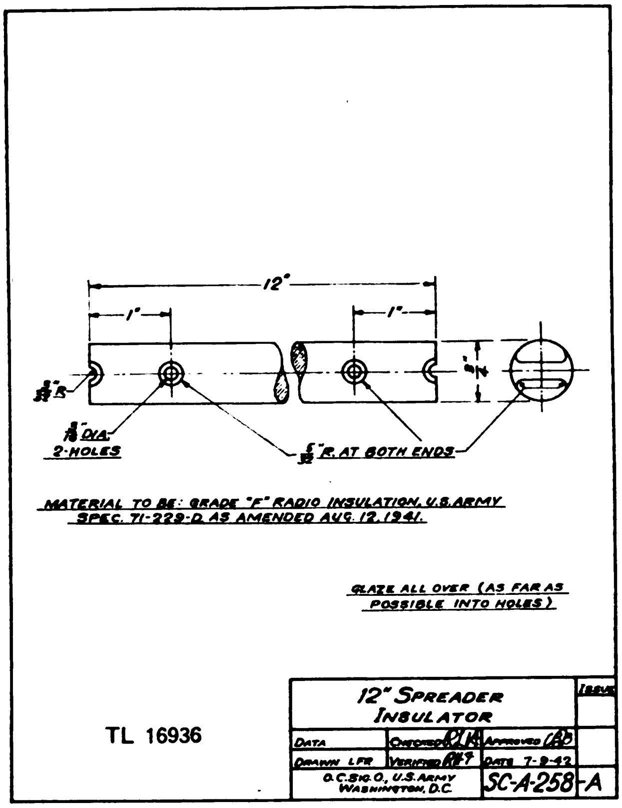



Figure 19. 12-inch spreader insulator, dwg. SC-A-258-A.

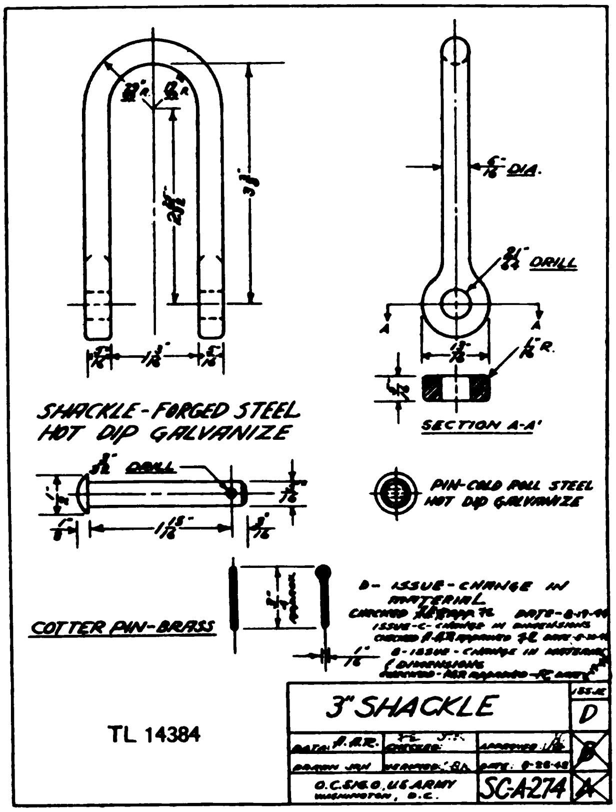



Figure 20. 3-inch shackle, dwg. SC-A-274-D.

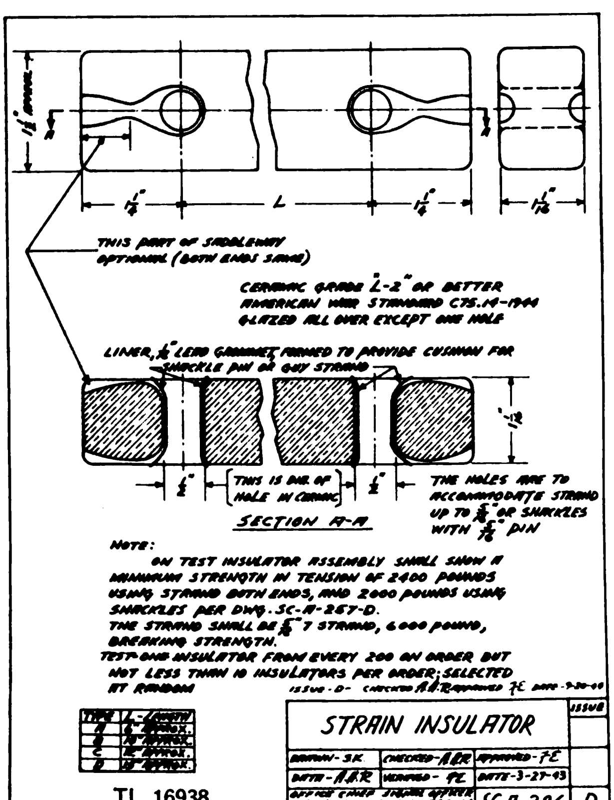



Figure 21. Strain insulator, dwg. SC-A-286-D.

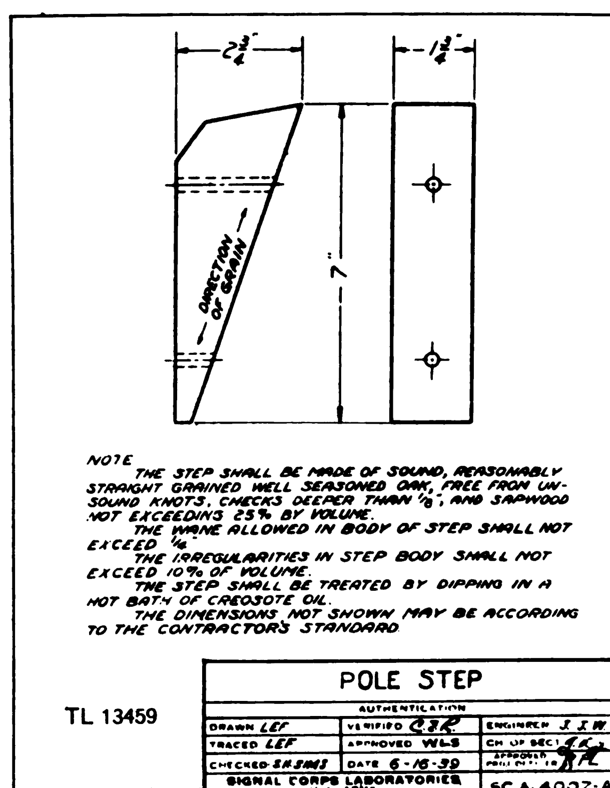
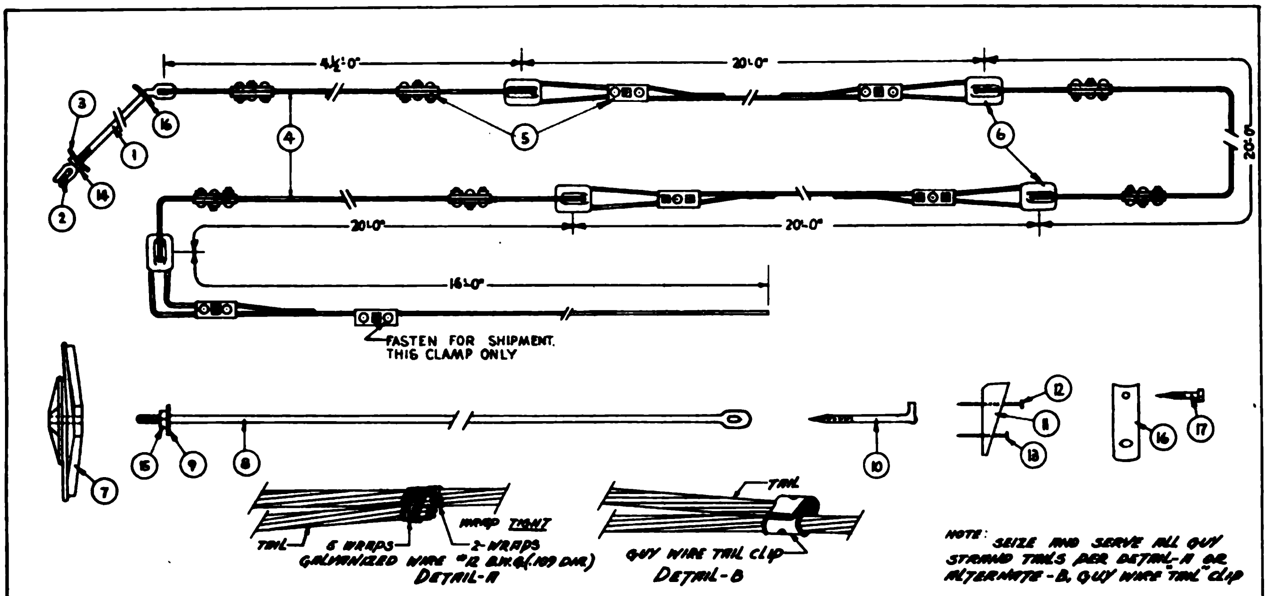



Figure 22. Pole step data, dwg. SC-A-4007-A.



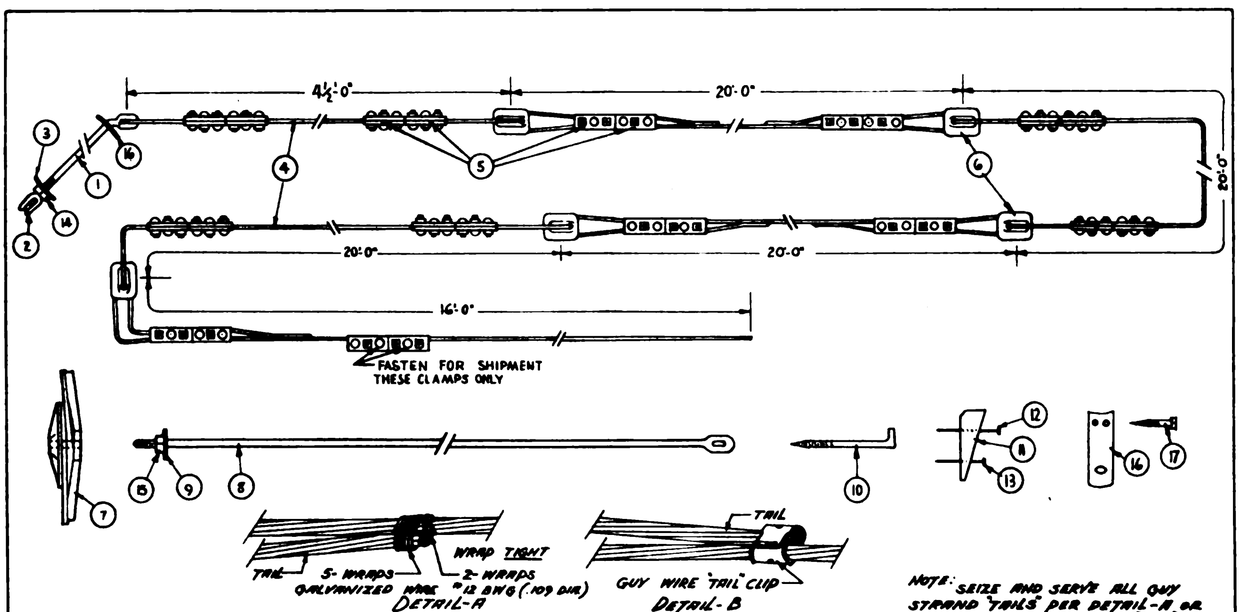

| ITEM | NO. REQ. | STOCK NO. | DESCRIPTION | ITEM | NO. REQ. | STOCK NO. | DESCRIPTION |
|---|---|---|---|---|---|---|---|
| 1 | 1 | | BOLT, BENTEYE, ⅝" x 16" (HUBBARD NO 6146, OR EQUAL) | 10 | 38 | 5B17137 | STEP, POLE, ⅝" x 10", G.I., (HUBBARD NO 7125, OR EQUAL) |
| 2 | 1 | 5B4506 | EYE NUT, THIMBLEYE, G.I., FOR ¾" BOLT, (HUBBARD NO. 7511, OR EQUAL) | 11 | 3 | 5A3710 | STEP, POLE, WOOD. (DWG. SC-A-4007) |
| 3 | 1 | 5B20512 | WASHER, CURVED, G.I., FOR ¾" BENTEYE BOLT, (HUBBARD NO 7823, OR EQUAL) | 12 | 3 | 6L1460 | SPIKE, G.I., GAGE NO 2, 6" LONG |
| 4 | 177' APR. | 1A 90 | WIRE, ⅜", MESSENGER. G.S., (10,800 LBS.) | 13 | 3 | 6L1430 | SPIKE, G.I., GAGE NO 5, 4½" LONG |
| 5 | 12 | 5B3461 | CLAMP, GUY, 3 BOLT, G.I., (HUBBARD NO. 7461, OR EQUAL) | 14 | 1 | | NUT, PART OF ITEM NO 1 |
| 6 | 5 | 3H875-504 | INSULATOR, BALL, STRAIN, (THOMAS NO.504, OR EQUAL) | 15 | 1 | | NUT, PART OF ITEM NO. 8 |
| 7 | 1 | 5B109 | ANCHOR, (AH-9), 4 WAY EXPANDING, 15" DIA OPEN | 16 | 1 | | PLATE, CURVED LIFT, FOR ¾" BENTEYE BOLT, (HUBBARD NO [illegible], OR EQUAL) |
| 8 | 1 | 5B707A | ANCHOR ROD, (AH-7A), ¾" x 9', (HUBBARD NO. 8429, OR EQUAL) | 17 | 1 | 5B10008-A.3 | SCREW, LAG, G.I., ½" x 4½" |
| 9 | 1 | 5B20512-B | WASHER, SQUARE, 3" x 3"; 13/16" HOLE, (HUBBARD NO 7817, OR EQUAL) | | | | |

TL 13456

POLE GUY KIT 75 PX
ASSEMBLED

| POLE GUY KIT 75 PX ASSEMBLED | | | ISSUE |
|---|---|---|---|
| DATA A.R.R. | CHECKED A.R.R. | APPROVED C.B. | |
| DRAWN L.R.P. | VERIFIED F.C. | DATE 10-21-43 | |
| OFFICE CHIEF SIGNAL OFFICER PLANT ENGINEERING AGENCY PHILADELPHIA, PENNA. | | ES-B-32500 | A |

*Figure 17. Pole guy 75PX, dwg. ES-B-32500-A.*




| ITEM | NO. REQ. | STOCK NO. | DESCRIPTION | ITEM | NO. REQ. | STOCK NO. | DESCRIPTION |
|---|---|---|---|---|---|---|---|
| 1 | 1 | | BOLT, BENTEYE, 1" x 16", (HUBBARD NO 6196, OR EQUAL) | 10 | 38 | 5B17137 | STEP, POLE, ⅝" x 10", G.I. (HUBBARD NO 7125, OR EQUAL) |
| 2 | 1 | 5B4508 | EYE NUT, THIMBLEYE, G.I., FOR 1" BOLT, (HUBBARD NO 7612, OR EQUAL) | 11 | 3 | 5A3710 | STEP, POLE, WOOD, (DWG. SC-A-4007) |
| 3 | 1 | 5B20516 | WASHER, CURVED, G.I., FOR 1" BENTEYE BOLT, (HUBBARD NO 7824, OR EQUAL) | 12 | 3 | 6L1460 | SPIKE, G.I., GAGE NO 2, 6" LONG |
| 4 | 183' APP. | 1A116 | WIRE, 7/16", MESSENGER, G.S., (18,000 LBS.) | 13 | 3 | 6L1430 | SPIKE, G.I., GAGE NO 5, 4½" LONG |
| 5 | 24 | 5B3461 | CLAMP, GUY, 3 BOLT, G.I., (HUBBARD NO. 7461, OR EQUAL) | 14 | 1 | | NUT, PART OF ITEM NO 1 |
| 6 | 5 | 3G1875-506 | INSULATOR, BALL, STRAIN, (THOMAS NO 506, OR EQUAL) | 15 | 1 | | NUT, PART OF ITEM NO 8 |
| 7 | 1 | 5B110 | ANCHOR, (AH-10), 4 WAY EXPANDING, 19" DIA OPEN | 16 | 1 | | PLATE, CURVED LIFT, FOR 1" BENTEYE BOLT, (HUBBARD NO [illegible], OR EQUAL) |
| 8 | 1 | 5B708A | ANCHOR ROD, (AH-8A), 1" x 10', (HUBBARD NO. 84-4Q, OR EQUAL) | 17 | 2 | 5B10008-A.3 | SCREW, LAG, G.I. ½" x 4½" |
| 9 | 1 | 5B20077 | WASHER, SQUARE, 4" x 4"; 1 3/16" HOLE, (HUBBARD NO 7826, OR EQUAL) | | | | |

TL 13455

| POLE GUY KIT 75 PXX ASSEMBLED | | | ISSUE |
|---|---|---|---|
| DATA A.A.R. | CHECKED A.A.R. | APPROVED C.B. | |
| DRAWN L R P | VERIFIED F.C. | DATE 10-21-43 | |
| OFFICE CHIEF SIGNAL OFFICER PLANT ENGINEERING AGENCY PHILADELPHIA, PENNA. | | ES-B-32502 | A |

*Figure 18. Pole guy 75PXX, dwg. ES-B-32502-A.*

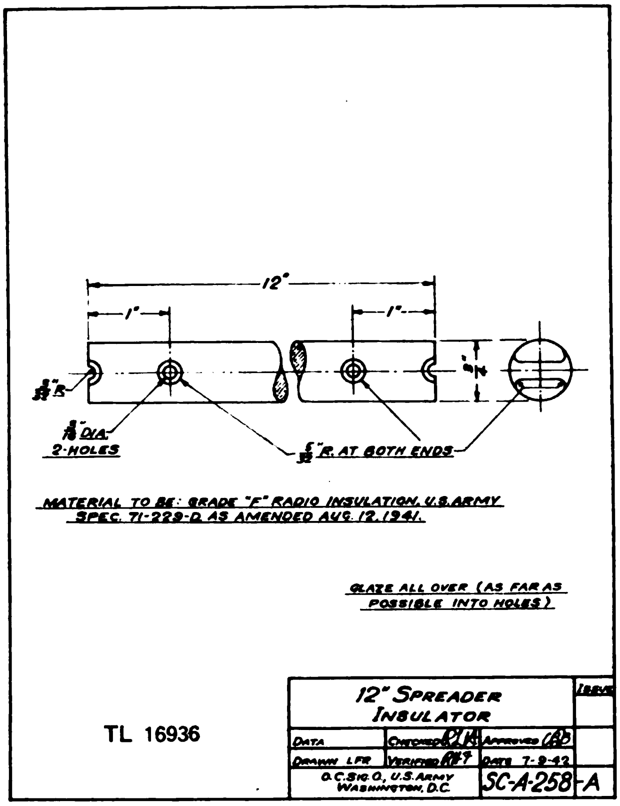



Figure 19. 12-inch spreader insulator, dwg. SC-A-258-A.

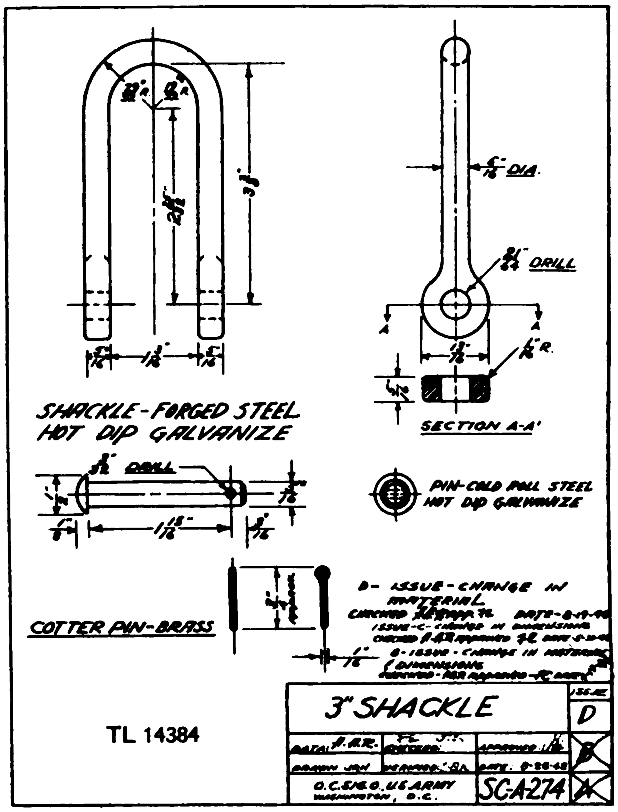



Figure 20. 3-inch shackle, dwg. SC-A-274-D.

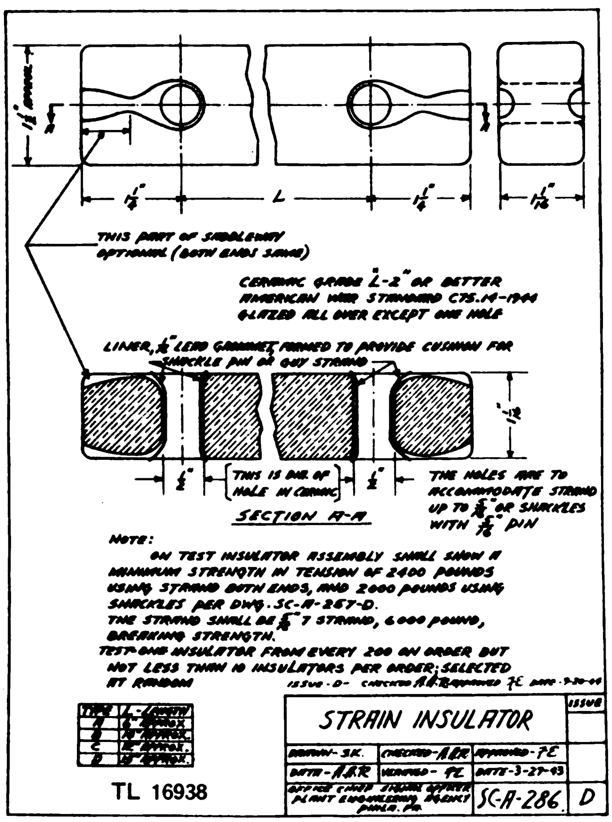



Figure 21. Strain insulator, dwg. SC-A-286-D.

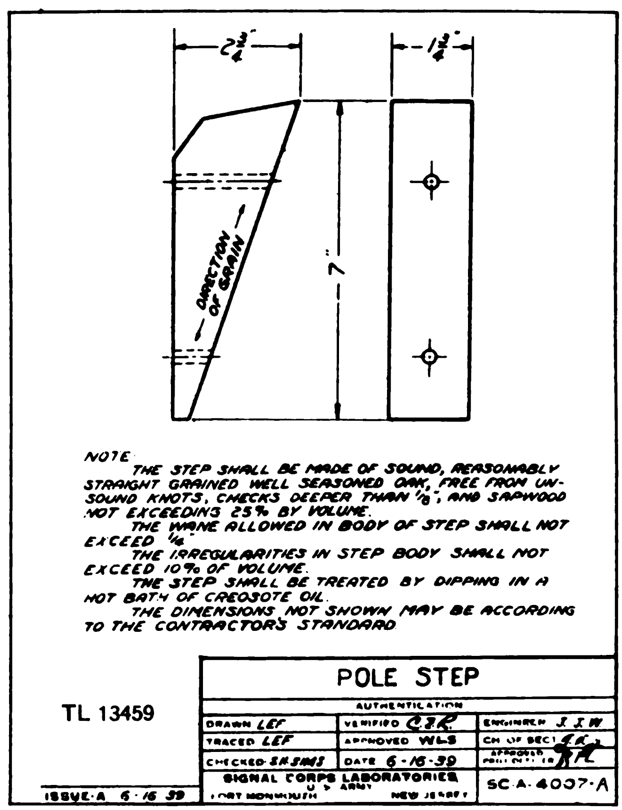



Figure 22. Pole step data, dwg. SC-A-4007-A.

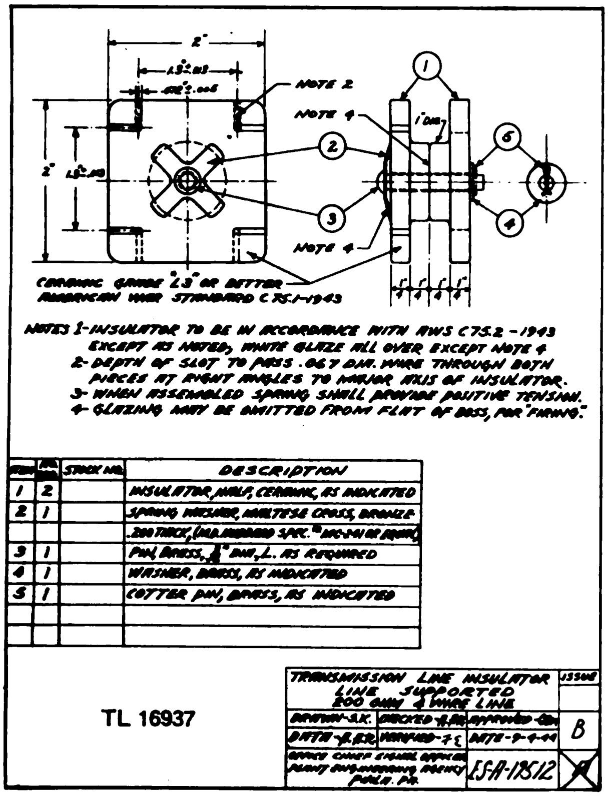



*Figure 23. Transmission line insulator, line supported, dwg. ES-A-19512-B.*

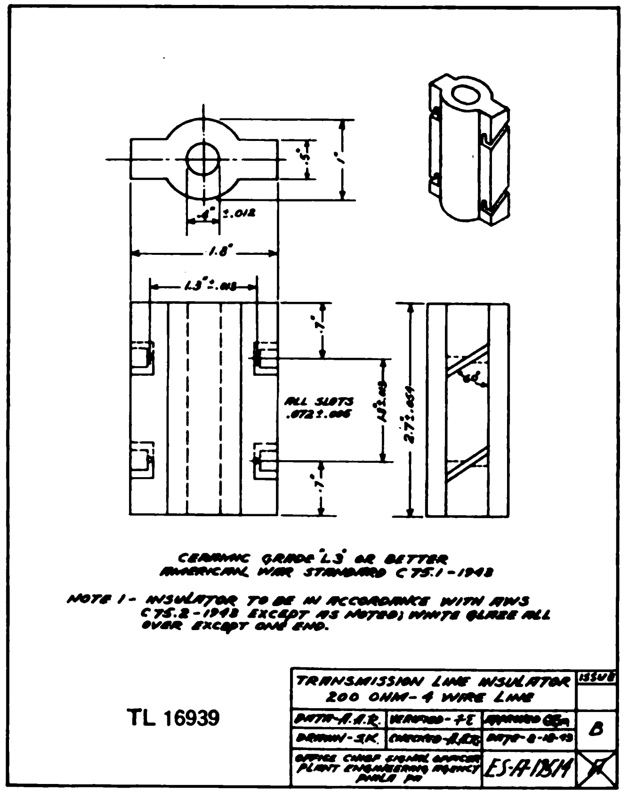



*Figure 24. Transmission line insulator, line support, dwg. ES-A-19514-B.*

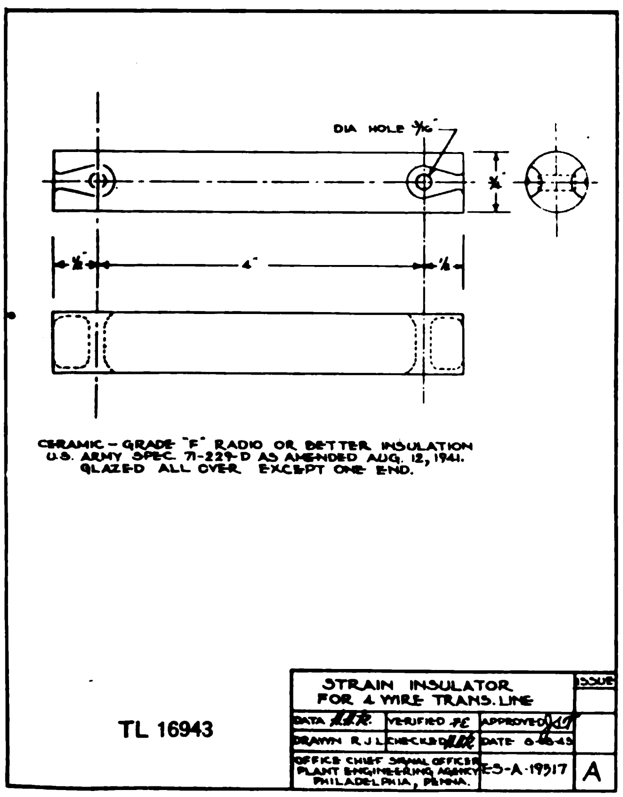



*Figure 25. Strain insulator for 4-wire transmission line, dwg. ES-A-19517-A.*

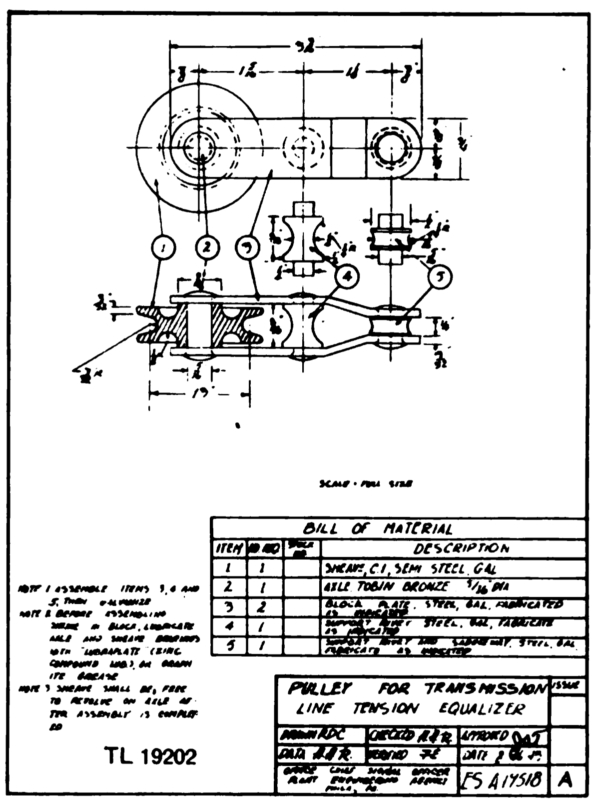



*Figure 26. Dissipation line pulley, dwg. ES-A-19518-A.*

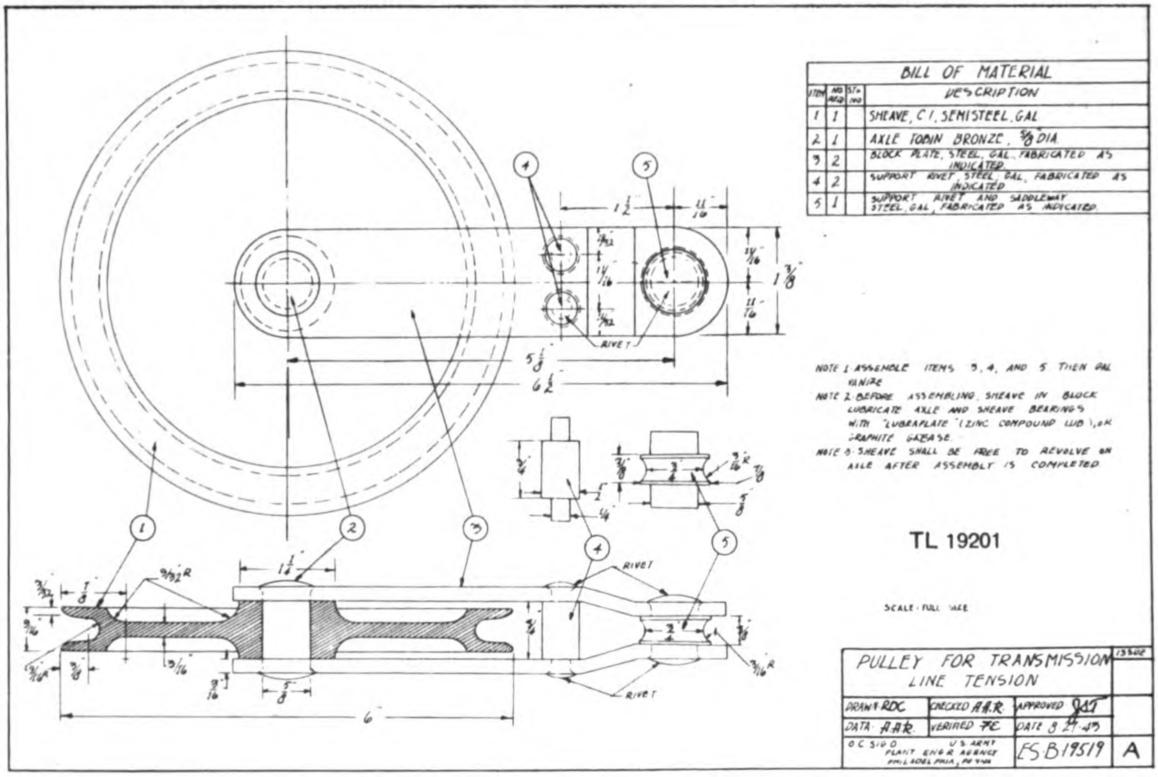



*Figure 27. Dissipation line pulley, dwg. ES-B-19519-A.*

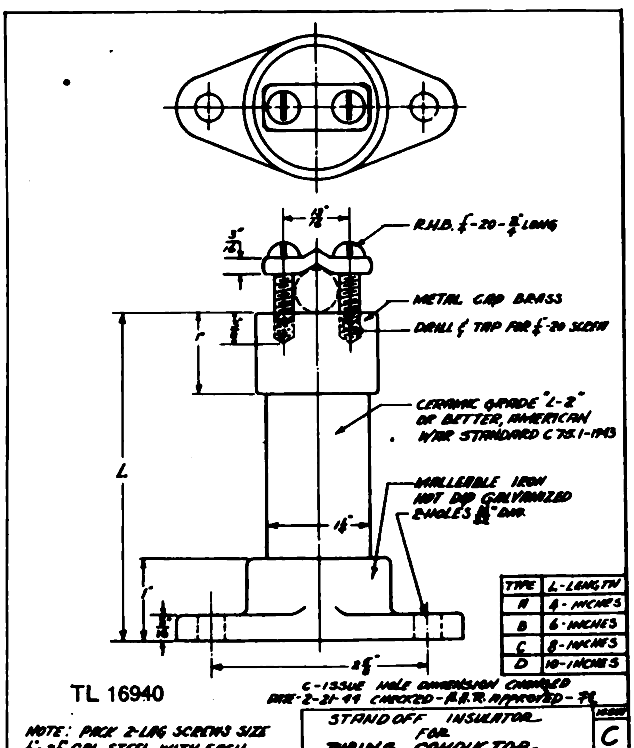



*Figure 28. Stand-off insulator, dwg. ES-A-19521-C.*

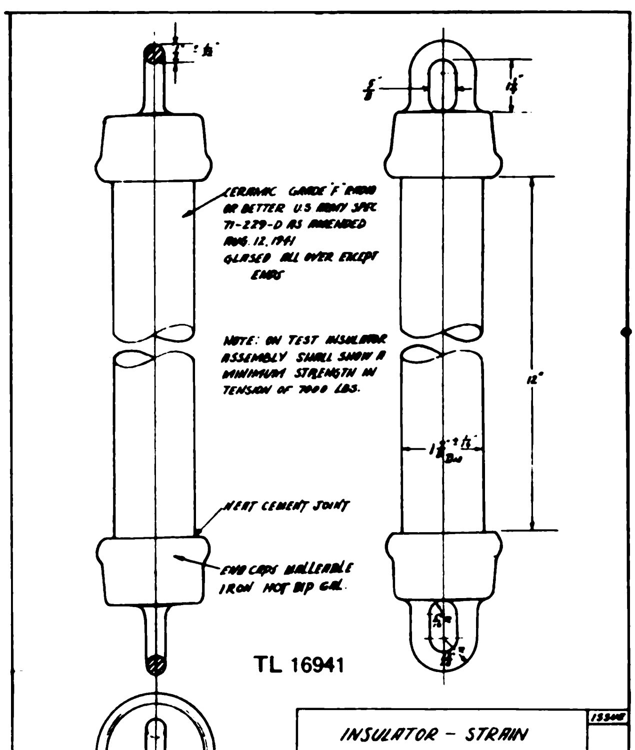



*Figure 29. Strain insulator, dwg. ES-A-32534-A.*

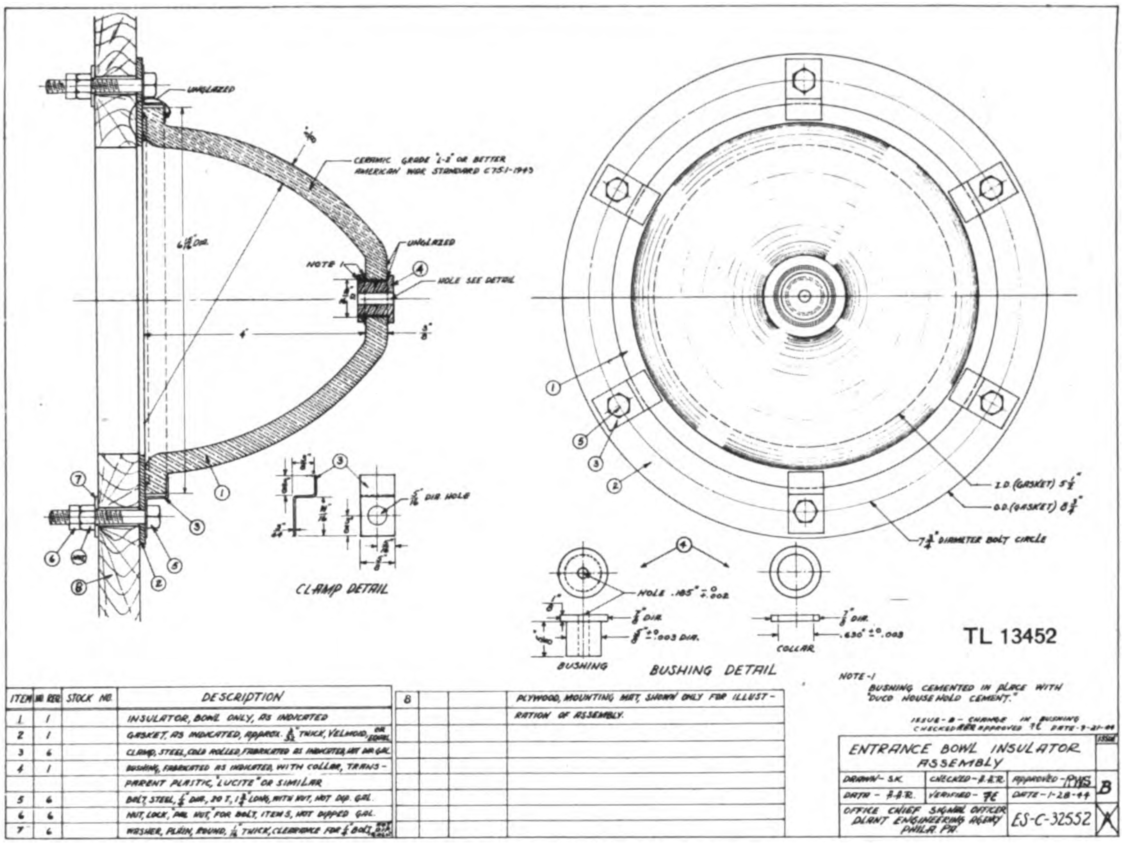



*Figure 30. Bowl insulator, dwg. ES-C-32552-B.*

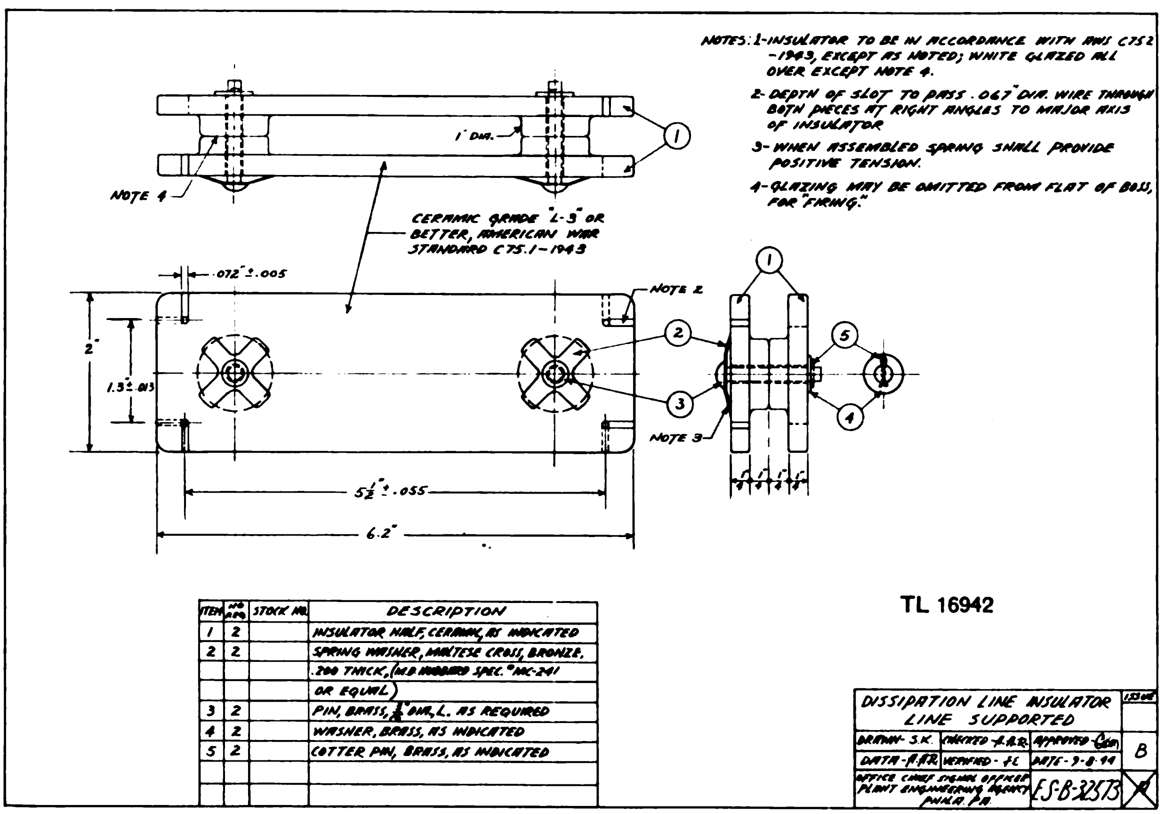
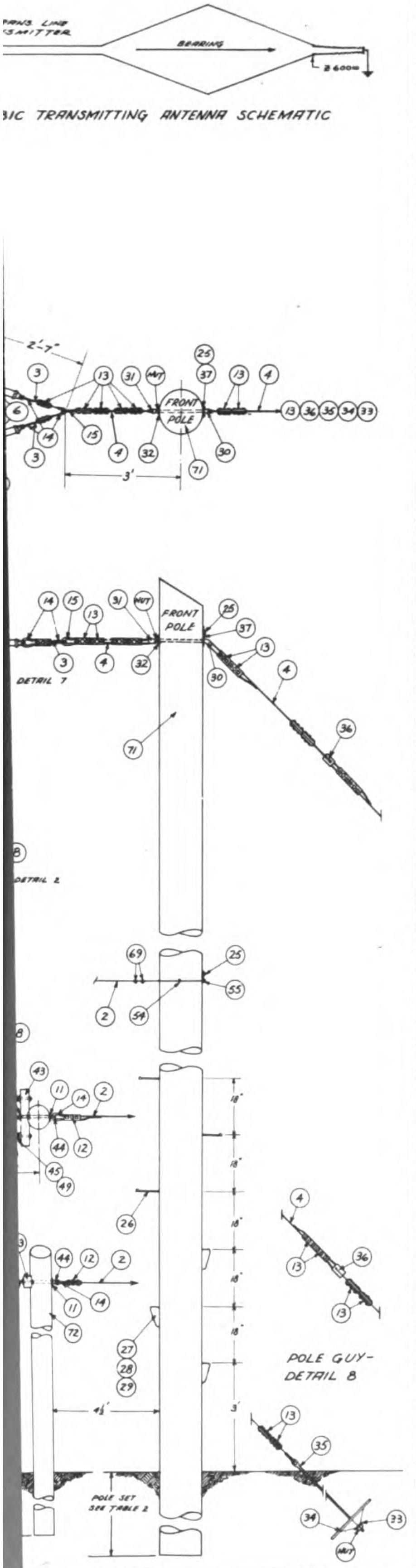



*Figure 31. Dissipation line insulator, line supported, dwg. ES-B-32573-B.*

Order No. 28719—Phila-44-53; 36,000 copies; 31 March 1945




## BILL OF MATERIAL

| ITEM | NO. REQ. | STOCK NO. | DESCRIPTION |
|---|---|---|---|
| | | 2A1624 | ANTENNA KIT (1 REQUIRED) |
| 1 | 5000 FT | 1A807.12 | WIRE, (3 STRANDS #12 AWG) COPPERWELD, 40% COND., HIGH STRENGTH |
| 2 | 30 FT | 1A115 | WIRE, 5/16" MESSENGER, G.S., (6,000 LBS.) |
| 3 | 15 FT | 1A90 | WIRE, 3/8" MESSENGER, G.S., (10,800 LBS.) |
| 4 | 10 FT | 1A116 | WIRE, 7/16" MESSENGER, G.S., (18,000 LBS.) |
| 5 | 1 POUND | 1A818.1 | WIRE, #18 AWG, COPPER, TINNED, SOFT DRAWN, FOR SERVING |
| 6 | 4 | 3G1300-300 | INSULATOR, STRAIN, 12", (DWG.-ES-A-32534-A) |
| 7 | 7 | 3G1100-192 | INSULATOR, STRAIN, 12", (DWG.-SC-A-286-D) |
| 8 | 2 | 3G1250-192.3 | INSULATOR, SPREADER, 12", (DWG.-SC-A-258-A) |
| 9 | 4 | 5B1510-16 | BOLT, MACHINE, 5/8"×16", G.I., WITH NUT |
| 10 | 4 | 5B4305 | EYE NUT, THIMBLE EYE, G.I., FOR 5/8" BOLT, (HUBBARD NO. 7510 OR EQUAL) |
| 11 | 8 | 5B20310 | WASHER, CURVED, G.I., FOR 5/8" BOLT, (HUBBARD NO. 7822 OR EQUAL) |
| 12 | 12 | 5B3449 | CLAMP, GUY, 3 BOLT, MEDIUM, G.I., (HUBBARD NO. 7449 OR EQUAL) |
| 13 | 8 | 5B3461 | CLAMP, GUY, 3 BOLT, HEAVY, G.I., (HUBBARD NO. 7461, OR EQUAL) |
| 14 | 5 | 5B18043 | THIMBLE, STEEL, GALV., 3/8" ROPE, (HUBBARD NO. 7593, OR EQUAL) |
| 15 | 1 | 5B18044 | THIMBLE, STEEL, GALV., 1/2" ROPE, (HUBBARD NO. 7594, OR EQUAL) |
| 16 | 12 | 5B4209 | CONNECTOR, SOLDERLESS, RELIABLE NO. 1F, (GRAYBAR CAT. 102 PG. 84) |
| | | | |
| | | | |
| | | | |
| | | 2A1624-4 | POLE GUY KIT 75 PX (2 REQUIRED SIDE POLES) (DWG-ES-B-32500-A) |
| 3 | 117 FT APPROX. | 1A90 | WIRE, 3/8" MESSENGER, G.S., (10,800 LBS.) |
| 13 | 12 | 5B3461 | CLAMP, GUY, 3 BOLT, HEAVY, G.I., (HUBBARD NO. 7461, OR EQUAL) |
| 17 | 1 | 5B1442-16 | BOLT, BENTEYE, 3/4"×16", G.I., (HUBBARD NO. 6116, OR EQUAL) |
| 18 | 1 | 5B4306 | EYE NUT, THIMBLEYE, G.I., FOR 3/4" BOLT, (HUBBARD NO. 7511, OR EQUAL) |
| 19 | 1 | 5B20312 | WASHER, CURVED, G.I., FOR 3/4" BENTEYE BOLT, (HUBBARD NO. 7823, OR EQUAL) |
| 20 | 1 | 5B20212-13 | WASHER, SQUARE, 3"×3", 13/16" HOLE, G.I., FOR A ROD, (HUBBARD NO. 7817, OR EQUAL) |
| 21 | 1 | 5B109 | ANCHOR, (A-H-9), 4 WAY EXPANDING, 15" DIA. OPEN |
| 22 | 1 | 5B707A | ANCHOR ROD, (AH-7A), 3/4"×9', G.I., (HUBBARD NO. 6429, OR EQUAL) |
| 23 | 5 | 3G1875-504 | INSULATOR, BALL, STRAIN, (THOMAS NO. 504, OR EQUAL) |
| 24 | 1 | 5B17504 | PLATE, CURVED LIFT, G.I., FOR 3/4" BENT EYE BOLT, (HUBBARD NO. 8888, OR EQUAL) |
| 25 | 1 | 5B10008-4.5 | SCREW, LAG, G.I. 1/2"×4 1/2" |
| 26 | 38 | 5B17137 | STEP, POLE, 5/8"×10", G.I., (HUBBARD NO. 7125, OR EQUAL) |
| 27 | 3 | 5A3710 | STEP, POLE, WOOD, (DWG. SC-A-4007-A) |
| 28 | 3 | 6L1460 | SPIKE, G.I., GAGE NO. 2, 6" LONG, (FOR UPPER NAIL FASTENING, WOOD STEP) |
| 29 | 3 | 6L1430 | SPIKE, G.I., GAGE NO. 5, 4 1/2" LONG, (FOR LOWER NAIL FASTENING, WOOD STEP) |
| | | | |
| | | | |
| | | | |
| | | 2A1624-3 | POLE GUY KIT 75 PXX (2 REQUIRED END POLES) (DWG ES-B-32502-A) |
| 4 | 125 FT APPROX. | 1A116 | WIRE, 7/16", MESSENGER, G.S., (18000 LBS.) |
| 13 | 24 | 5B3461 | CLAMP, GUY, 3 BOLT, HEAVY, G.I., (HUBBARD NO. 7461, OR EQUAL) |
| 30 | 1 | 5B1316-16 | BOLT, BENTEYE, 1"×16", G.I., (HUBBARD NO. 6196, OR EQUAL) |
| 31 | 1 | 5B4308 | EYE NUT, THIMBLE EYE, G.I., FOR 1" BOLT, (HUBBARD NO. 7512, OR EQUAL) |
| 32 | 1 | 5B20316 | WASHER, CURVED, G.I., FOR 1" BENT EYE BOLT, (HUBBARD NO. 7824, OR EQUAL) |
| 33 | 1 | 5B20077 | WASHER, SQUARE, 4"×4", 1 3/16" HOLE, G.I., (HUBBARD NO. 7820, OR EQUAL) |
| 34 | 1 | 5B110 | ANCHOR, (AH-10), 4 WAY EXPANDING, 19" DIA. OPEN |
| 35 | 1 | 5B708A | ANCHOR ROD, (AH-8-A), 1"×10', G.I., (HUBBARD NO. 6440, OR EQUAL) |
| 36 | 5 | 3G1875-506 | INSULATOR, BALL, STRAIN, (THOMAS NO. 506, OR EQUAL) |
| 37 | 1 | 2A1624-2/P1 | PLATE, CURVED LIFT, G.I., FOR 1" BENT EYE BOLT, (HUBBARD NO. 8899, OR EQUAL) |
| 25 | 2 | 5B10008-4.5 | SCREW, LAG, G.I., 1/2"×4 1/2" |
| 26 | 38 | 5B17137 | STEP, POLE, 5/8"×10", G.I., (HUBBARD NO. 7125, OR EQUAL) |
| 27 | 3 | 5A3710 | STEP, POLE, WOOD, (DWG. SC-A-4007-A) |
| 28 | 3 | 6L1460 | SPIKE, G.I., GAGE NO. 2, 6" LONG, (FOR UPPER NAIL FASTENING, WOOD STEP) |
| 29 | 3 | 6L1430 | SPIKE, G.I., GAGE NO. 5, 4 1/2" LONG, (FOR LOWER NAIL FASTENING, WOOD STEP) |
| | | | |
| | | | |
| | | | |
| | | 2A1624-2 | TRANSMISSION LINE KIT (1 REQUIRED) |
| 1 | 1300 FT | 1A807.12 | WIRE, (3 STRANDS #12), COPPERWELD, 40% COND. HIGH STRENGTH |
| 2 | 100 FT | 1A115 | WIRE, 5/16" MESSENGER, G.S., (6000 LBS.) |
| 38 | 10 FT | 1A806 | WIRE, #6 AWG, COPPER, HARD DRAWN, FOR HORN GAP |
| 7 | 8 | 3G1100-192 | INSULATOR, STRAIN, 12", (DWG.-SC-A-286-D) |
| 39 | 3 | 3G1350-88 | INSULATOR, STAND-OFF, (DWG.-ES-A-19521-C), 10" |
| 40 | 2 | 3G1050-128 | INSULATOR, ENTRANCE BOWL, INCLUDING MOUNTING |
| | | | HARDWARE, (DWG.-ES-C-32552-B) |
| 41 | 6 | 3G1350-103 | INSULATOR ASSEMBLY, TRANS. LINE SUPPORT, 2 WIRE |
| | | | SPACED 12", INCLUDING MOUNTING HARDWARE, |
| | | | (DWG.-ES-C-32574-A) |
| 42 | 4 | 2A1624-2/S1 | SHACKLE, FORGED STEEL, GAL., FOR STRAIN INSULATOR, |
| | | | (DWG.-SC-A-274-D) |
| 43 | 2 | 5A1601.5 | CROSS ARM, WOOD, DOUGLAS FIR, 3 1/4"×4 1/4"×18" |
| 44 | 2 | 5B1309-12.1 | BOLT, OVAL EYE, 5/8"×12", G.I., (HUBBARD NO. 39962, OR EQUAL) |
| 45 | 8 | 5B1308-8 | BOLT, OVAL EYE, 1/2"×8", G.I., (HUBBARD NO. 39938, OR EQUAL) |
| 9 | 1 | 5B1510-16 | BOLT, MACHINE, 5/8"×16", G.I., WITH NUT |
| 46 | 6 | 5B1505-5.5 | BOLT, MACHINE, 5/16"×5 1/2", G.I., WITH NUT |
| 25 | 3 | 5B10008-4.5 | SCREW, LAG, G.I., 1/2"×4 1/2" |
| 11 | 3 | 5B20310 | WASHER, CURVED, G.I., FOR 5/8" BOLT (HUBBARD NO. 7822, OR EQUAL) |
| 47 | 2 | 5B20209-11 | WASHER, SQUARE, 2 1/4"×2 1/4", 11/16" HOLE, G.I., (HUBBARD NO. 7813, OR EQUAL) |
| 48 | 6 | 6L580262 | WASHER, ROUND, 3/8" HOLE, 7/8" O.D., G.I., |
| 49 | 16 | 5B20109 | WASHER, ROUND, 9/16" HOLE, 1 3/8" O.D., G.I., (HUBBARD NO. 7803, OR EQUAL) |
| 50 | 1 | 5B20111 | WASHER, ROUND, 11/16" HOLE, 1 3/4" O.D., G.I., (HUBBARD NO. 7805, OR EQUAL) |
| 12 | 8 | 5B3449 | CLAMP, GUY, 3 BOLT, MEDIUM, G.I., (HUBBARD NO. 7449, OR EQUAL) |
| 51 | 4 | 5B101 | ANCHOR, (AH-1), 8" CONE SHAPED |

| ITEM | NO. REQ. | STOCK NO. | DESCRIPTION |
|---|---|---|---|
| 52 | 4 | 5B704 | ANCHOR, ROD, (AH-4) 5/8"×6', SPEC. 71-68 |
| 53 | 1 | 5B4426 | GROUND ROD, (GP-26), 1/2"×6', G.I. |
| 54 | 36 | 5B17001.5 | STAPLE, 1 1/2" L. 3/16" SPREAD, GAL., (HUBBARD NO. 7200, OR EQUAL) |
| 14 | 5 | 5B18043 | THIMBLE, STEEL, GAL., 3/8" ROPE, (HUBBARD NO. 7593 OR EQUAL) |
| 55 | 3 | 5B5283.5 | HOOK, GUY, "J", (HUBBARD NO. 7583 1/2, OR EQUAL) |
| | | | NOTE - FOR LINE EXCEEDING 500 FT. IN LENTGH |
| | | | ADD ONE EACH OF ITEM 41 AND 200 FT. OF ITEM 1, |
| | | | FOR EACH ADDITIONAL HUNDRED FEET OF LINE. |
| | | | |
| | | | |
| | | | |
| | | 2A1624-1 | DISSIPATION LINE KIT (1 REQUIRED) |
| 1 | 25 FT | 1A807.12 | WIRE, (3 STRANDS #12), COPPERWELD, 40% COND., HIGH STRENGTH |
| 2 | 40 FT | 1A115 | WIRE, 5/16" MESSENGER, G.S., (6000 LBS.) |
| 56 | 1500 FT | 1A814.13 | WIRE, #14 AWG., STAINLESS STEEL, FULLY ANNEALED |
| 57 | 12 FT | 1A706 | WIRE, FLEXIBLE WIRE TILLER ROPE, GAL. 3/16" (PERKO OR EQUAL) |
| 58 | 12 FT | 1A708 | WIRE, FLEXIBLE WIRE TILLER ROPE, GAL. 1/4", (PERKO OR EQUAL) |
| 7 | 3 | 3G1100-192 | INSULATOR, STRAIN, 12", (DWG.-SC-A-286-D) |
| 59 | 4 | 3G1250-80.5 | INSULATOR, STRAIN, 4", 1/4" DIA., (DWG. ES-A-19517-A) |
| 8 | 3 | 3G1250-192.3 | INSULATOR, SPREADER, 12", (DWG. SC-A-258-A) |
| 60 | 3 | 3G1350-76 | INSULATOR, LINE SUPPORT, 4 WIRE SPACED-1.3", |
| | | | (DWG. ES-A-19514-B) |
| 61 | 3 | 3G1350-77 | INSULATOR, SPACER, 4-WIRE SPACED-1.3", (DWG. ES-A-19512-B) |
| 62 | 1 | 3G1150-99 | INSULATOR, SPACER, 4-WIRE SPACED RECTANGULAR, |
| | | | -5.5" AND 1.3", (DWG. ES-B-32573-B) |
| 42 | 2 | 2A1624-2/S1 | SHACKLE, FORGED STEEL, GAL., FOR STRAIN INSULATOR, |
| | | | (DWG. SC-A-274-D) |
| 43 | 1 | 5A1601.5 | CROSS ARM, WOOD, DOUGLAS FIR, 3 1/4"×4 1/4"×18" |
| 44 | 2 | 5B1309-12.1 | BOLT, OVAL EYE, 5/8"×12", G.I., (HUBBARD NO. 39962, OR EQUAL) |
| 45 | 2 | 5B1308-8 | BOLT, OVAL EYE, 1/2"×8", G.I., (HUBBARD NO. 39938, OR EQUAL) |
| 11 | 3 | 5B20310 | WASHER, CURVED, G.I., FOR 5/8" BOLT, (HUBBARD NO. 7822, OR EQUAL) |
| 47 | 1 | 5B20209-11 | WASHER, SQUARE, 2 1/4"×2 1/4", 11/16" HOLE, G.I., (HUBBARD NO. 7813, OR EQUAL) |
| 63 | 6 | 5B20080 | WASHER, ROUND, 7/16" HOLE, 1" O.D., 5/64" THICK, G.I., (HUBBARD NO. 7801, OR EQUAL) |
| 49 | 4 | 5B20109 | WASHER, ROUND, 9/16" HOLE, 1 3/8" O.D., G.I., (HUBBARD NO. 7803 OR EQUAL) |
| 25 | 1 | 5B10008-4.5 | SCREW, LAG, G.I., 1/2"×4 1/2" |
| 64 | 3 | 5B10006-6A | SCREW, LAG, G.I., 3/8"×6" |
| 12 | 3 | 5B3449 | CLAMP, GUY, 3 BOLT, MEDIUM, G.I., (HUBBARD NO. 7449, OR EQUAL) |
| 10 | 1 | 5B4305 | EYE NUT, THIMBLE EYE, G.I., FOR 5/8" BOLT, (HUBBARD NO. 7510 OR EQUAL) |
| 51 | 1 | 5B101 | ANCHOR, (AH-1), 8" CONE SHAPED |
| 52 | 1 | 5B704 | ANCHOR ROD, (AH-4), 5/8"×6', SPEC. 71-68 |
| 53 | 1 | 5B4426 | GROUND ROD, (GP-26), 1/2"×6', G.I. |
| 54 | 36 | 5B17001.5 | STAPLE, 1 1/2" L., 3/16" SPREAD, GAL., (HUBBARD NO. 7200, OR EQUAL) |
| 55 | 1 | 5B5283.5 | HOOK, GUY, "J" (HUBBARD NO. 7583 1/2, OR EQUAL) |
| 65 | 3 | 6R7449 | PULLEY, SHEAVE, FOR LINE TENSION EQUALIZATION, |
| | | | (DWG.-ES-A-19518-A) |
| 66 | 1 | 6R7449-1 | PULLEY, SHEAVE, FOR LINE TENSION, (DWG. ES-B-19519-A) |
| 67 | 12 | 5B4103 | CLIP, WIRE ROPE, 3/16" G.S., ("U-H" G.E. CO, OR EQUAL) |
| 68 | 4 | 5B4104 | CLIP, WIRE ROPE, 1/4" G.S., (HUBBARD NO. 7480, OR EQUAL) |
| 69 | 6 | 5B4105 | CLIP, WIRE ROPE, 5/16" G.S., (HUBBARD NO. 7481, OR EQUAL) |
| 14 | 4 | 5B18043 | THIMBLE, STEEL, GAL., 3/8" ROPE, (HUBBARD NO. 7593, OR EQUAL) |
| 16 | 6 | 5B4209 | CONNECTOR, WIRE, RELIABLE, NO. 1F, OR EQUAL, (GRAYBAR CAT. 102 PG. 84) |
| 70 | 10 | 6Z3185 | CONNECTOR, WIRE, RELIABLE, NO. 109, OR EQUAL (GRAYBAR CAT. 102 PG. 85) |
| 74 | 2 | 5B4222 | CONNECTOR, WIRE, RELIABLE, NO. 4F-WITH BAR SPACER, |
| | | | OR EQUAL |
| | | | |
| | | | |
| | | | POLES |
| 71 | | | POLE, WOOD, ANTENNA |
| 72 | | | POLE, WOOD, LINE |
| 73 | | | WEIGHT, CONCRETE, MADE ON LOCATION |

ISSUE-D-ERRORS CORRECTED, ITEM 74 ADDED-AAR

TL 13453

RHOMBIC TRANSMITTING ANTENNA
(3 WIRE CURTAIN)

| DRAWN-S.K. | CHECKED-AAR | APPROVED-RWS | ISSUE |
|---|---|---|---|
| DATA-AAR | VERIFIED-FC | DATE-4-20-44 | D |
| OFFICE CHIEF SIGNAL OFFICER PLANT ENGINEERING AGENCY PHILA. PA. | ES-E-368- | | D |

Figure 32. Installation dwg. ES-E-368-D.