

MICROWAVE ANTENNAS
KS-15676 HORN-REFLECTOR AND WAVEGUIDE SYSTEM
CIRCULAR STRAIGHT RIGID WAVEGUIDE AND CIRCULAR FLEXIBLE WAVEGUIDE
INSTALLATION

CONTENTS	PAGE
1. GENERAL	1
2. METHOD OF INSTALLATION—CIRCULAR STRAIGHT RIGID WAVEGUIDE	1
3. METHOD OF INSTALLATION—CIRCULAR FLEXIBLE WAVEGUIDE	6

1. GENERAL

1.01 This section pertains to the installation of the WC 281 circular straight rigid waveguide and the KS-20104 circular flexible waveguide. The following components are furnished for installation:

- (a) ED-59409-70, -20 Circular Rigid Waveguide Assemblies
- (b) KS-20104 Circular Flexible Waveguide.

1.02 This section is reissued to incorporate the installation of the KS-20104 circular flexible waveguide and to update hardware specifications and installation procedures for both types of waveguide. Marginal arrows have been omitted since this is a general revision.

2. METHOD OF INSTALLATION—CIRCULAR STRAIGHT RIGID WAVEGUIDE

2.01 The tower-erecting crew will install the hanger plate assembly (for supporting the waveguide), the tubular waveguide restrainers, and the tower mounting angles (slot angles). The preferred hanger plate orientation is shown in Fig. 1. This crew will leave a manila line threaded through all tubular restrainers.

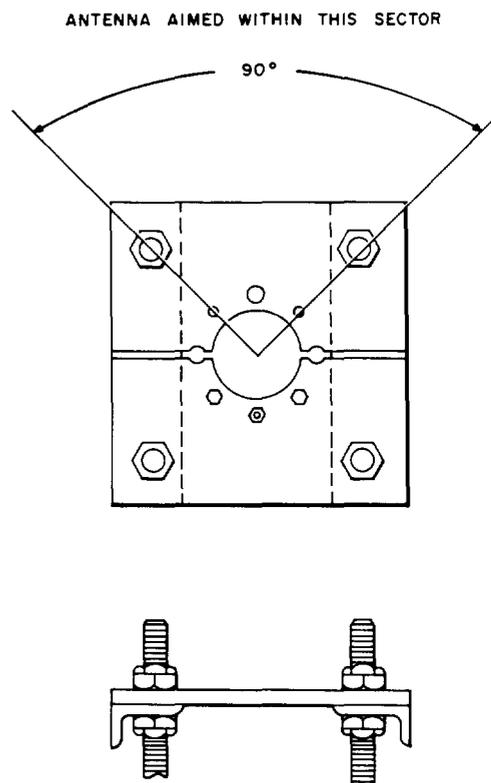


Fig. 1—Hanger Plate Orientation

2.02 One length of circular waveguide is supplied in each container. Each container will have the following information stenciled thereon:

ED-59409-70, -20 Group _____ Length
_____ Feet _____ Inches _____

2.03 The following tools and equipment are necessary for the installation of the circular waveguide.

SECTION 402-421-203

Quantity	Item
1	AT-8390 B Waveguide Alignment Wrench
1	Torque Wrench, Sturtevant Model P.S. 200-1 (factory preset for 160 inch-pounds), equipped with a 3/8-inch square drive (redesignated S200-I)
1	1/2-inch manila rope hand line with single sheave block
1	AT-6276 Wire Rope Snatch Block
1	AT-7571 B Waveguide Pulling Head
1	AT-7570 B Waveguide Pressure Cap
1	AT-6266 1/2-inch Connecting Link
1	AT-6656 Regulator
2	Cans AT-6501 Soap Solution
1	Tank, dry nitrogen
3	Ratchet wrenches with 3/8-inch square drive
3	1/2-inch sockets with 3/8-inch square drive
3	Long 1/2-inch sockets with 3/8-inch square drive
3	1/2-inch open-end wrenches
1	5/8-inch open-end wrench
1	Platform (see 2.06)
1	Construction truck with winch
2	Extension bars, extra short—3 inches long, 3/8-inch square drive to 3/8-inch square drive
1	12-point, 9/16-inch socket with 3/8-inch square drive

2.04 Attach a wire rope snatch block, using a rope sling, from the list 4 mounting base on the antenna platform at least 3 feet above the hanger plate assembly. The snatch block must be adjusted in conjunction with the placing of the truck so that the winch line will pull concentrically through the hole in the split plate of the hanger plate assembly.

2.05 Using a hand line, take the winch line from the truck up to the snatch block. Thread the winch line through the snatch block and down through the waveguide restrainers, using the manila rope found threaded through these restrainers.

2.06 When the ice protection platform or other support facility is not available, a platform should be constructed at the base of the tower which will permit waveguide sections approximately 12-1/2 feet long to be joined while in a vertical position. The platform must also permit free passage of the waveguide from the ground into the restrainers on the tower. The platform should be built so that two men can work at joining flanges and soaping joints to check for gas pressure tightness. A convenient height for this platform is about 9 feet from the ground. The platform should be movable so that it can be used for each waveguide run in turn.

2.07 Consult the specific installation drawing before selecting the first length of waveguide to be raised. Generally, lengths shorter than 12-1/2 feet are used at the top and bottom of each run.

2.08 Uncrate two lengths of waveguide, preserving the containers. Place the two containers parallel and about 6 feet apart, uncrate the remaining waveguide (discarding the containers), and place the lengths of waveguide across the two saved containers in the proper sequence for assembly.

Caution: Waveguide must be handled carefully. Any dents will impair its transmission characteristics.

2.09 Inspect the waveguide internally for the presence of dirt or metal chips, which should be removed when present. To remove foreign matter, thread a line (string, cord, or marlin) through the waveguide. On one end of the line, tie a soft cloth or Scott utility wipes and draw the material through the waveguide. Use care to

avoid scratching the surface, which may impair the transmission characteristics of the waveguide.

2.10 Attach the waveguide pulling head to the winch line using a 1/2-inch connecting link as shown in Fig. 2.

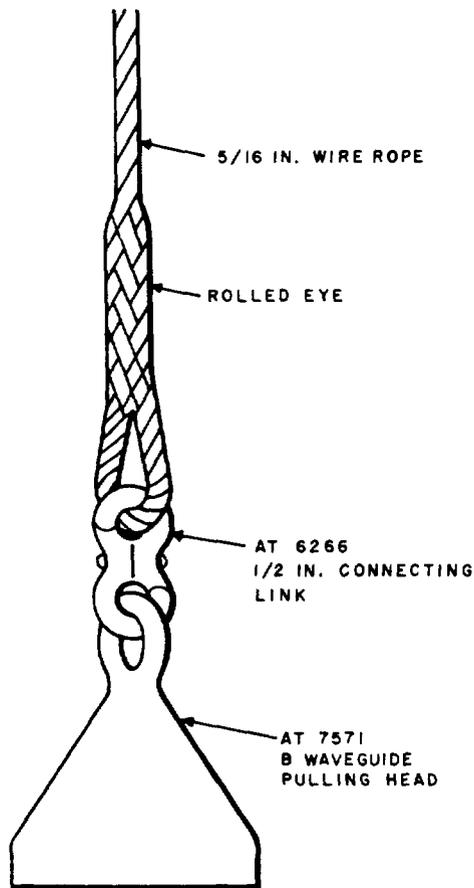


Fig. 2—Attachment of Winch Line to Pulling Head

2.11 Remove the protecting cover from one end of the first length of waveguide to be installed, and attach the waveguide pulling head, using four of the waveguide bolts. This assembly should be joined by one of the O-ring gaskets furnished with the waveguide as shown in Fig. 3. Remove the cover from the other end of the waveguide and install the waveguide pressure cap as shown in Fig. 4. Pressurize the waveguide section with dry nitrogen to a pressure of 5 PSI. Soap the joint between the waveguide flange and the pulling head, as shown in Fig. 5. Check the

joint for leakage. Some leakage can be tolerated between the waveguide and these two end fittings since their purpose is only to permit a buildup of gas pressure so that the joints between waveguide sections may be tested for leakage.

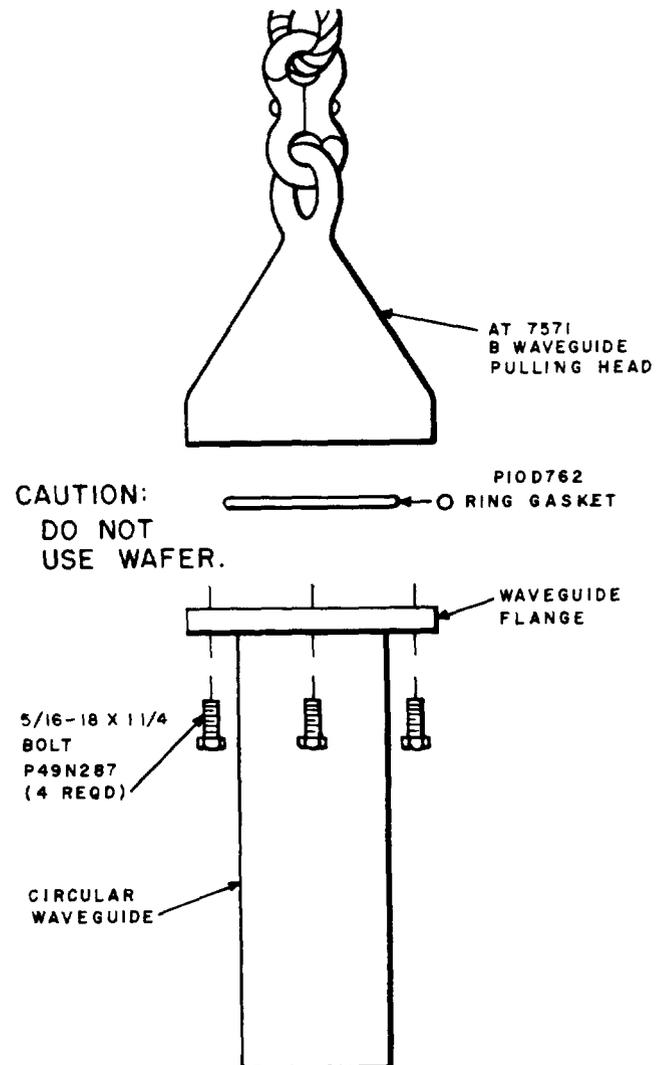


Fig. 3—Attachment of Pulling Head

2.12 Take up on the winch line and raise the first section of waveguide to a level where the lower flange may be worked on from the platform. Remove the pressure cap and lower it to the ground. Remove the protecting cover from the bottom end of the next section of waveguide and install the pressure cap. Raise this section to

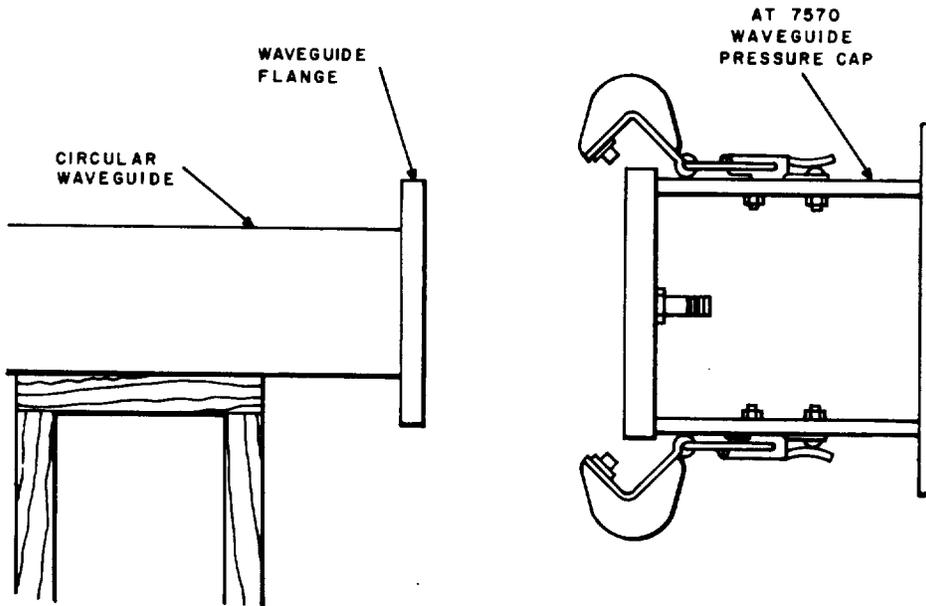


Fig. 4—Attachment of Pressure Cap

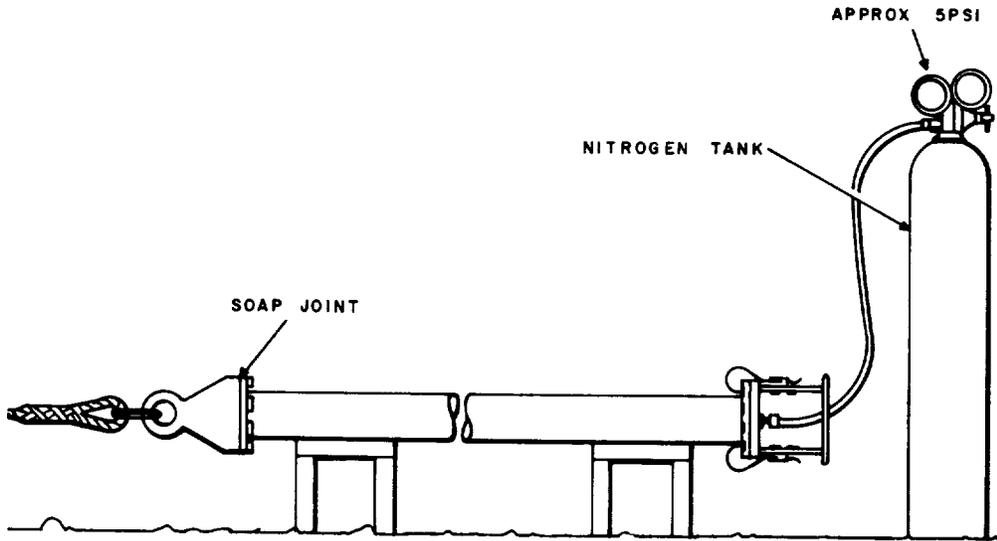


Fig. 5—Pressure Test of Pulling Head Connection

a vertical position for joining to the previous section. Remove the protective cover from the upper end of the waveguide.

Note: Rigid waveguide sections with either of two types of flanges may be encountered

during installation. See Fig. 6 for flange identification.

Join the waveguide sections according to the arrangements of parts shown in Fig. 7, 8, or 9 as applicable. When an integral gasket groove is provided in one flange (Fig. 7) or in both of the

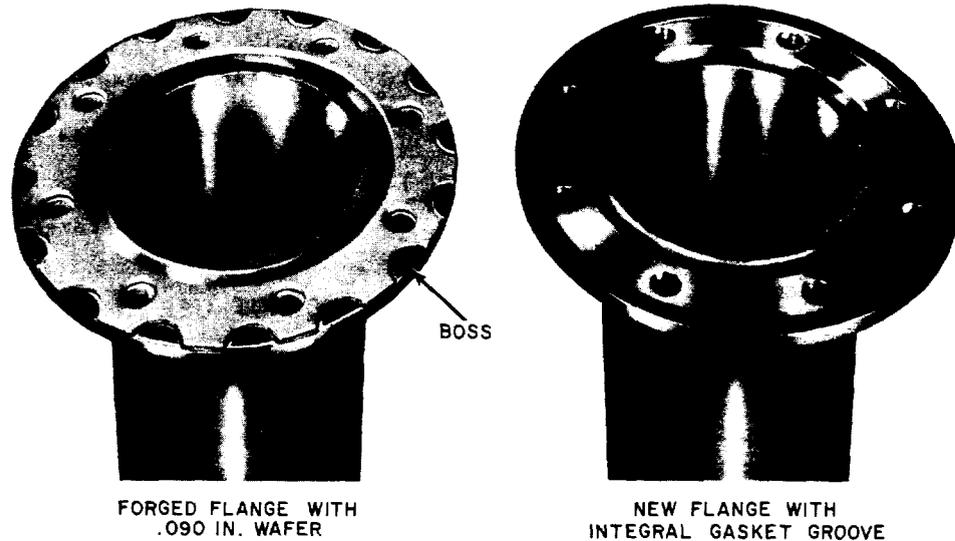


Fig. 6—WC-281 Circular Waveguide Flanges

mating flanges (Fig. 8), *no* wafer shall be used. When two of the forged flanges (Fig. 9) are provided, a thick (.090-inch) wafer (P-37B483) shall be used to form the gasket groove. Place a 10D762 "O" ring gasket in the groove between the flanges. If natural rubber gaskets are used, lightly coat the gaskets with Dow Corning 4 compound. If EPR gaskets are provided, *do not* use Dow Corning 4 compound since the EPR material has inherent resistance against oxidation. Run up the nuts on the bolts until the flanges are nearly in contact. An AT-7511 "B" ratchet wrench with a 1/2-inch socket may be used for convenience since the elastic stopnuts cannot be turned up by hand. Apply the AT-8390 "B" waveguide alignment wrench. Use of the alignment wrench and torque wrench is illustrated in Fig. 10. The wrench should be adjusted so that considerable force is required to close the handles. Torque each of the nuts to 160 inch-pounds. If a Sturtevant Model P.S. 200-1 torque wrench (factory preset to 160 inch-pounds) is used, a distinct "click" will be emitted when the proper torque has been reached.

2.13 Pressurize the waveguide with nitrogen to a pressure of 5 PSI. Soap the waveguide joint most recently made and check it for leakage. The joint should show no gas leakage before subsequent operations are started. Repeat the joining and leak testing procedures for each length of waveguide until all have been assembled.

2.14 Pull up the waveguide until the pulling head is just below the hanger plate assembly. Remove the split plate from the hanger plate assembly, leaving the 3/4-inch studs in position. At the same time, remove the four 5/16-18 x 2-inch bolts from the split plate and save them for reuse in Par. 2.16.

2.15 Raise the waveguide run until the topmost flange is about 3 inches above the top of the 3/4-inch studs. Orient the split plate as shown in Fig. 1 and bring the two pieces together around the waveguide. The square nuts which support the split plate on the studs should be approximately 4 inches above the structural members of the support platform as shown in Fig. 11.

Caution: *These four nuts should be at the same level so that when the split plate rests on them as shown in Fig. 11, it will be parallel to the waveguide flange. Since the weight of the entire run of waveguide is supported by the topmost flange of the waveguide, a uniform loading of this flange is necessary.*

2.16 Lower the waveguide run until the upper flange is in contact with the split plate as shown in Fig. 12. In doing this, turn the waveguide so that the heads of the bolts holding the pulling head to the waveguide flange will recess into the

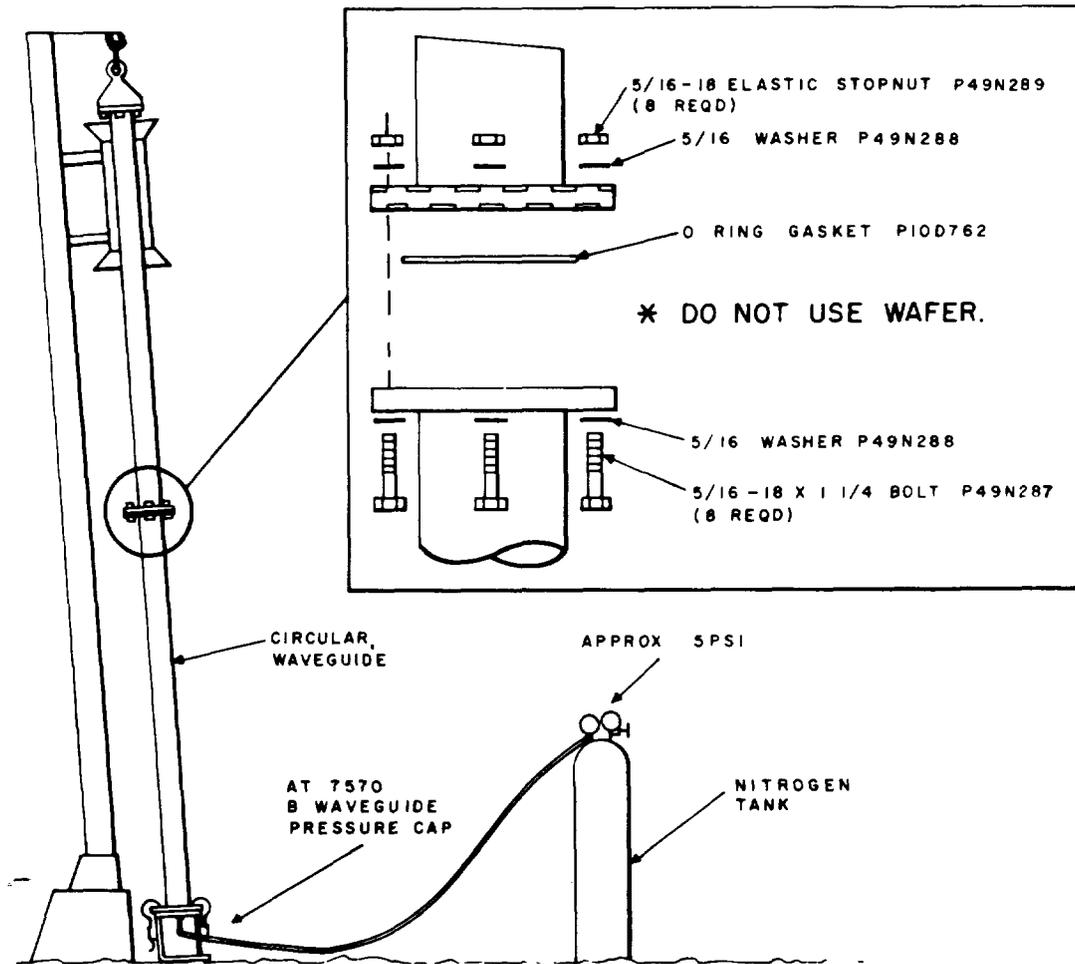


Fig. 7—Joining Circular Waveguide Sections—One Flange With Integral Gasket Groove

large holes in the split plate. Check and, if necessary, adjust the four nuts under the split plate to ensure that the flange is in contact with the split plate at all points around the edges. Replace the four 3/4-inch square nuts on the studs and lock them down against the split plate. Remove the pulling head by removing the four bolts which secure it, using a long 1/2-inch socket. Secure the waveguide, using the four bolts, nuts, and washers originally supplied with the split plate and set aside in Par. 2.14. Install these bolts through the small holes in the split plate. Place a plastic cover over the end of the waveguide to prevent accidental damage to the flange or the entry of foreign objects.

3. METHOD OF INSTALLATION—CIRCULAR FLEXIBLE WAVEGUIDE

Caution: *Circular flexible waveguide must be handled carefully. Dents or distortion of the waveguide will impair its transmission characteristics.*

Note: The method of installation described in this section supersedes the installation procedure of all previously dated sections.

- 3.01** Raise the circular flexible waveguide to the tower platform before removing it from the

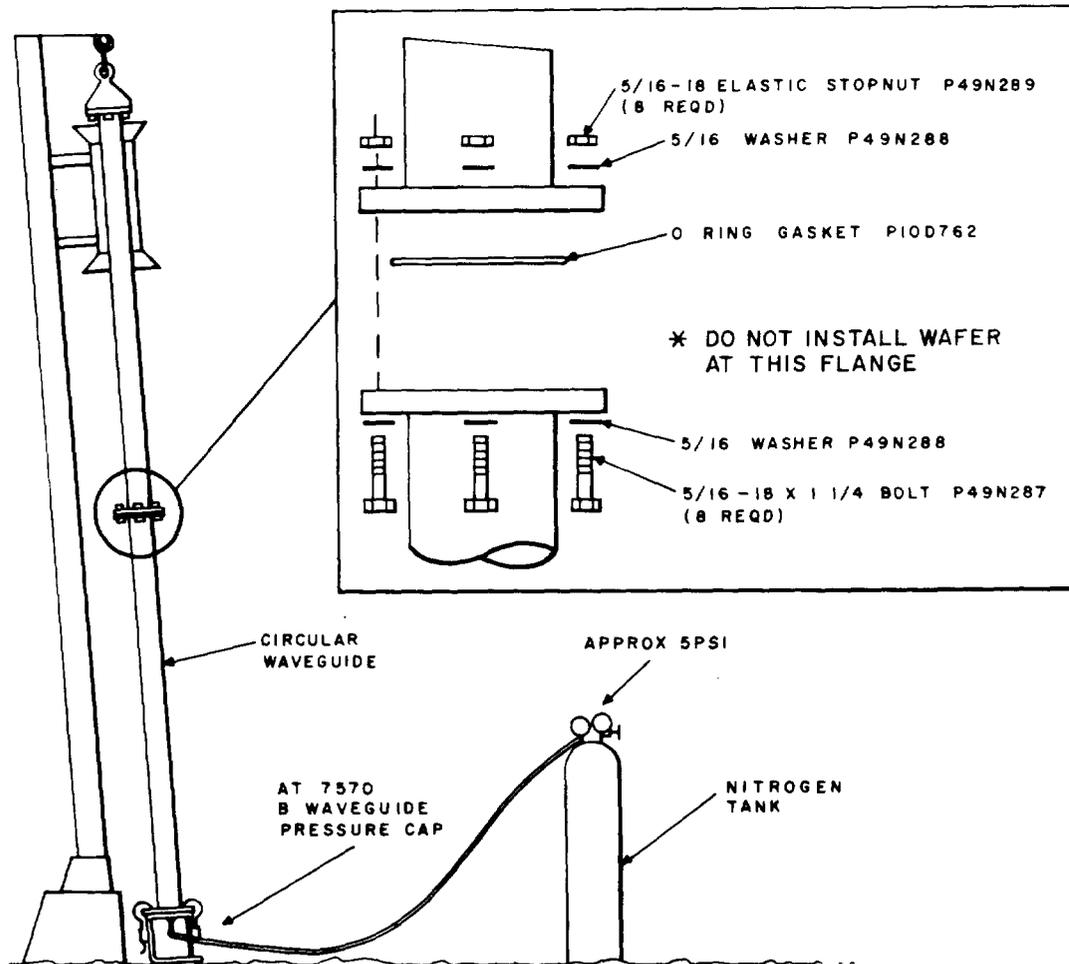


Fig. 8—Joining Circular Waveguide Sections—Both Flanges With Integral Gasket Grooves

crate. **Never raise flexible waveguide directly in a rope sling.**

3.02 Using the hardware supplied with the waveguide, attach the flexible waveguide to the antenna feedhorn as shown in Fig. 13.

Caution: Do not install a wafer at this joint as transmission will be impaired.

The shoulder bolts at this joint **must** enter from the top of the feedhorn flange as shown in Fig. 13. Use the AT-8390 waveguide alignment wrench to position the flanges properly before tightening the nuts at this joint.

3.03 Adjust the nuts supporting the hanger plate so that the upper flange of the rigid waveguide

exactly meets the bottom flange of the flexible waveguide.

Caution: Do not stretch the flexible waveguide while attempting to mate the two flanges. Damage will occur to the flexible waveguide if it is stretched. Conversely, excessive bow resulting from too little spacing should be avoided.

Proper adjustment of the hanger plate is made by first loosening the four locknuts on top of the plate, and then alternately turning the four square support nuts equally and not more than 1/4 turn each at any one time until the plate and the attached flange have been raised (or lowered) to the desired level.

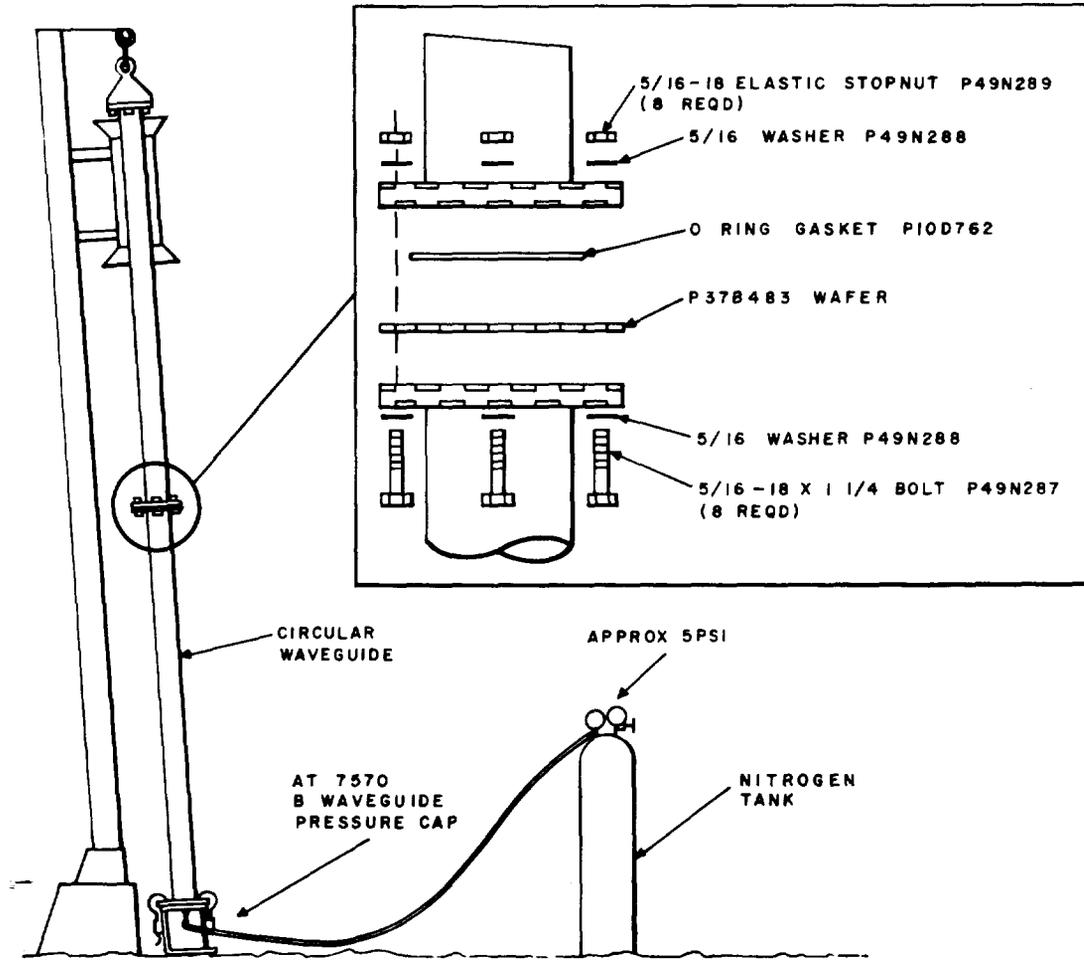


Fig. 9—Joining Circular Waveguide Sections—Forged Flanges

3.04 Form the flexible waveguide into a smooth curve and mate the flanges. Using the hardware supplied with the flexible waveguide, connect the two flanges as shown in Fig. 14.

Caution: Do not use a wafer at this joint.

Note: The B-539678 shoulder bolts must enter from the bottom of the rigid waveguide

flange through the large clearance holes in the split plate.

3.05 Tighten the shoulder bolts before tightening the 2-inch long hex-head bolts. Using the torque wrench, torque all nut-bolt combinations to 160 inch-pounds.

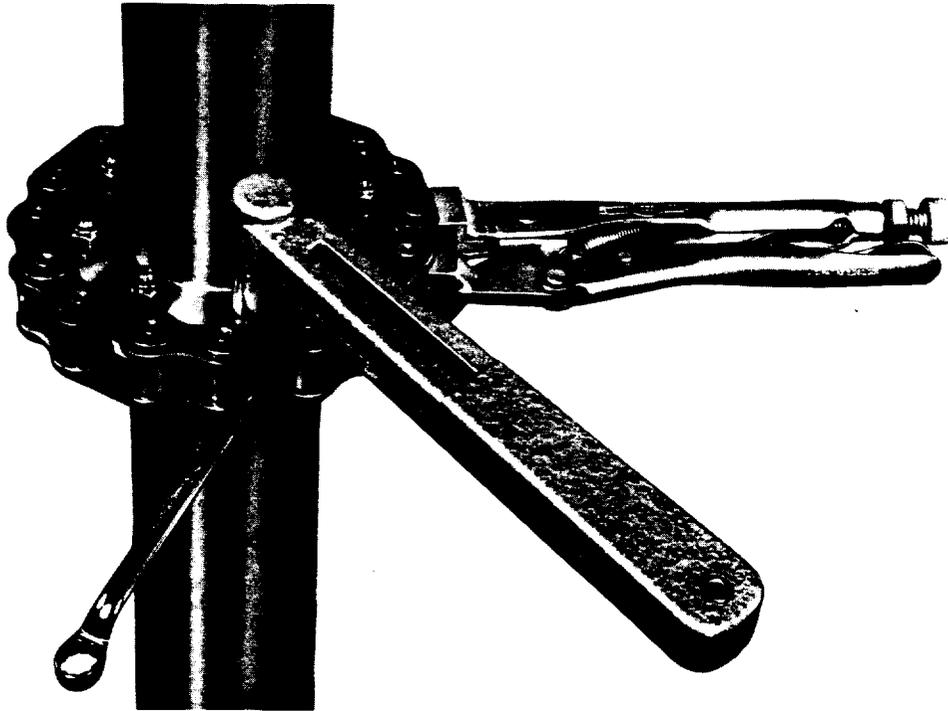


Fig. 10—AT-8390B Waveguide Alignment Wrench and Torque Wrench

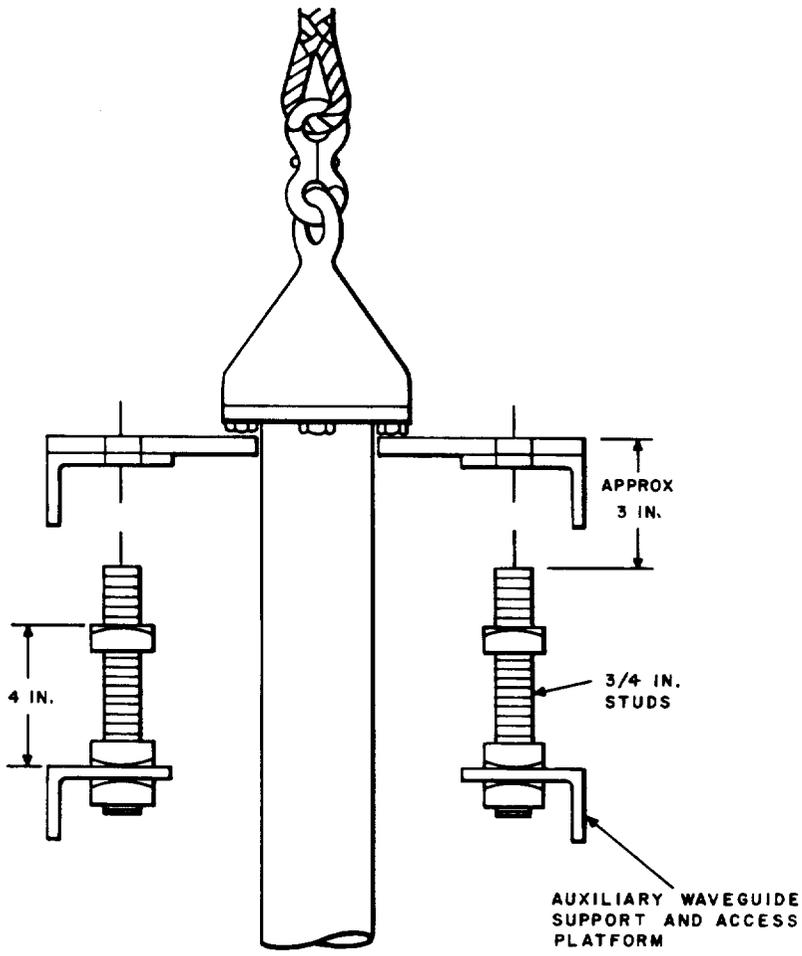


Fig. 11—Installation of Split Hanger Plate

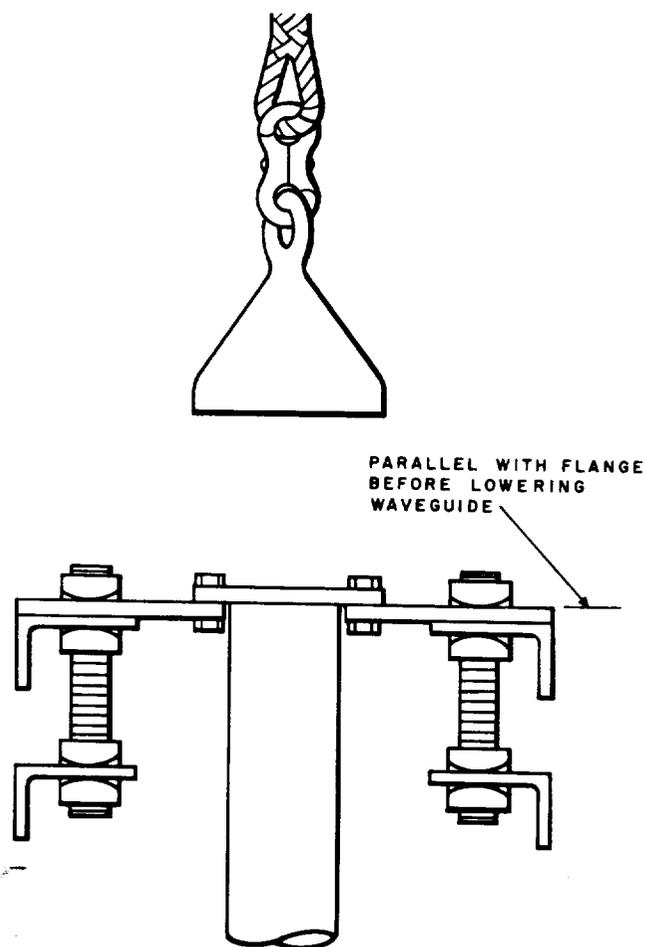


Fig. 12—Securing Circular Waveguide

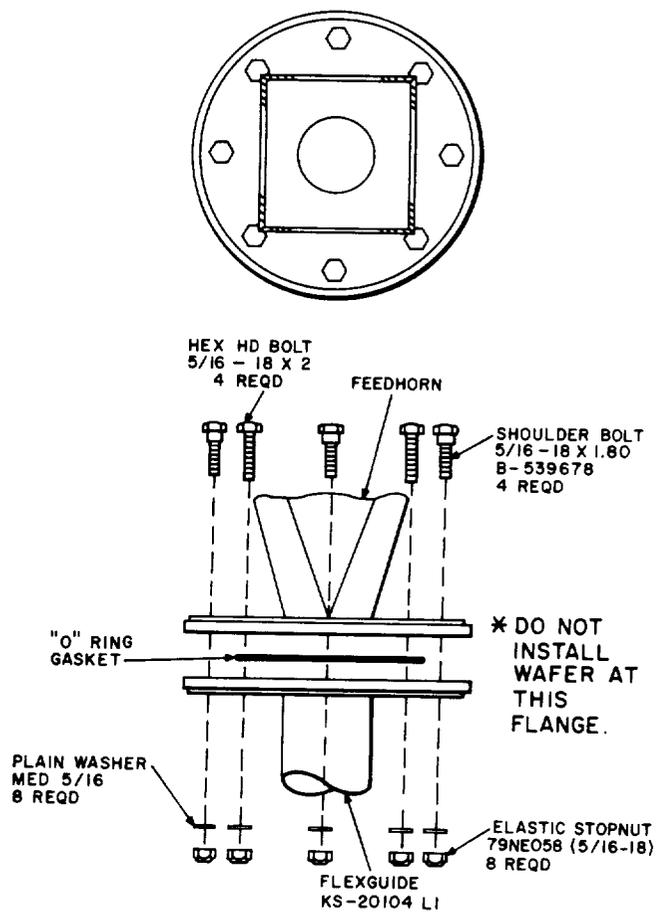


Fig. 13—Installation of Flexible Waveguide at Feedhorn

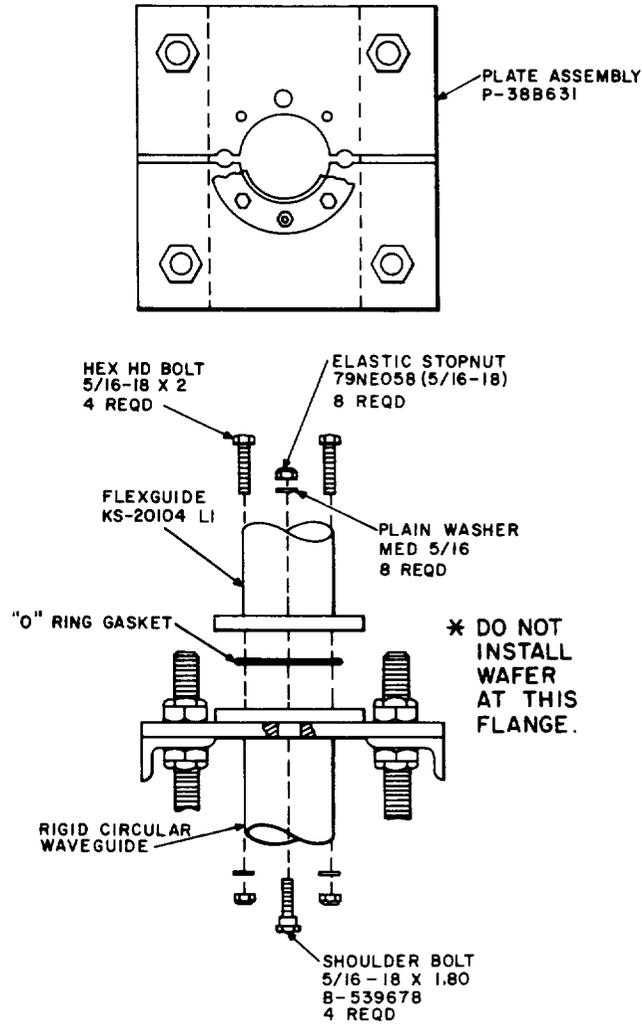


Fig. 14—Installation of Flexible Waveguide at Hanger Plate