HARRIS CORPORATION
TYPE FML
CIRCULAR POLARIZED FM ANTENNA

1-5/8 INTER BAY LINE

ELECTRONICS RESEARCH, INC
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SECTION -1- INSTALLATION

1.1 Check all components carefully on receipt to ascertain if any damage has been sustained during shipment. If any parts are damaged, notify the carrier promptly. In addition, the Harris Customer Service Department should be notified of any damage or shortages so that replacement parts may be shipped promptly to avoid delay in the installation.

NOTE: PROTECT THE TRANSMISSION LINE AND ANTENNA FEED BLOCKS FROM DIRT AND MOISTURE PRIOR TO INSTALLATION. EXERCISE CARE IN ERECTION TO AVOID DAMAGING THE TRANSMISSION LINE AND ANTENNA ELEMENTS.

1.2 The sections of rigid coaxial line supplied with the antenna are designed to space the antenna elements approximately one wavelength apart. During assembly, made certain that "O" rings (round neoprene gaskets) are installed between sections of transmission line and also between the transmission line and the antenna feed blocks.

1.3 One six foot transformer section is supplied to be attached to the bottom antenna line block, as marked. This coaxial line section has a standard 1-5/8" EIA female flange to accommodate standard EIA 50 ohm feed line. (the mating 1-5/8" heliax 50 ohm EIA flange is the Andrew Type 87R used with the Andrew Type 34660 inner connector).

1.4 The mounting brackets normally supplied allow for the use of two brackets for each section of 1-5/8" coaxial interconnecting line between antenna bays. The lower bracket for each bay should be mounted approximately 12 inches below each line block. The upper bracket for each bay should be mounted 12 inches above each line block. An additional brace bracket is included for each FML antenna bay. This bracket goes between the inter bay coax and the FML support tube.

1.5 Insure that all antenna elements are attached in the same manner. The red bands on the vertical sections of each antenna bay must face downward to assure proper phase relationship between the stacked bays.

1.6 In multiple bay installations, each antenna section has a number marked on the flange which attaches the antenna element to the line block. The element with the smaller number should always be on top. When the antenna has been completely assembled, the numbers on the flanges will read consecutively from the top to the bottom of the antenna.

1.7 Numbers have been marked on each end of each section of the interconnecting coaxial line. As the antenna is assembled, the numbers on the inter bay coax should match with the numbers marked on each element, i.e., the No. 1 line section should be bolted to the No. 1 antenna element etc. All feeds of all elements will be on the bottom side of the antenna if this procedure is followed.

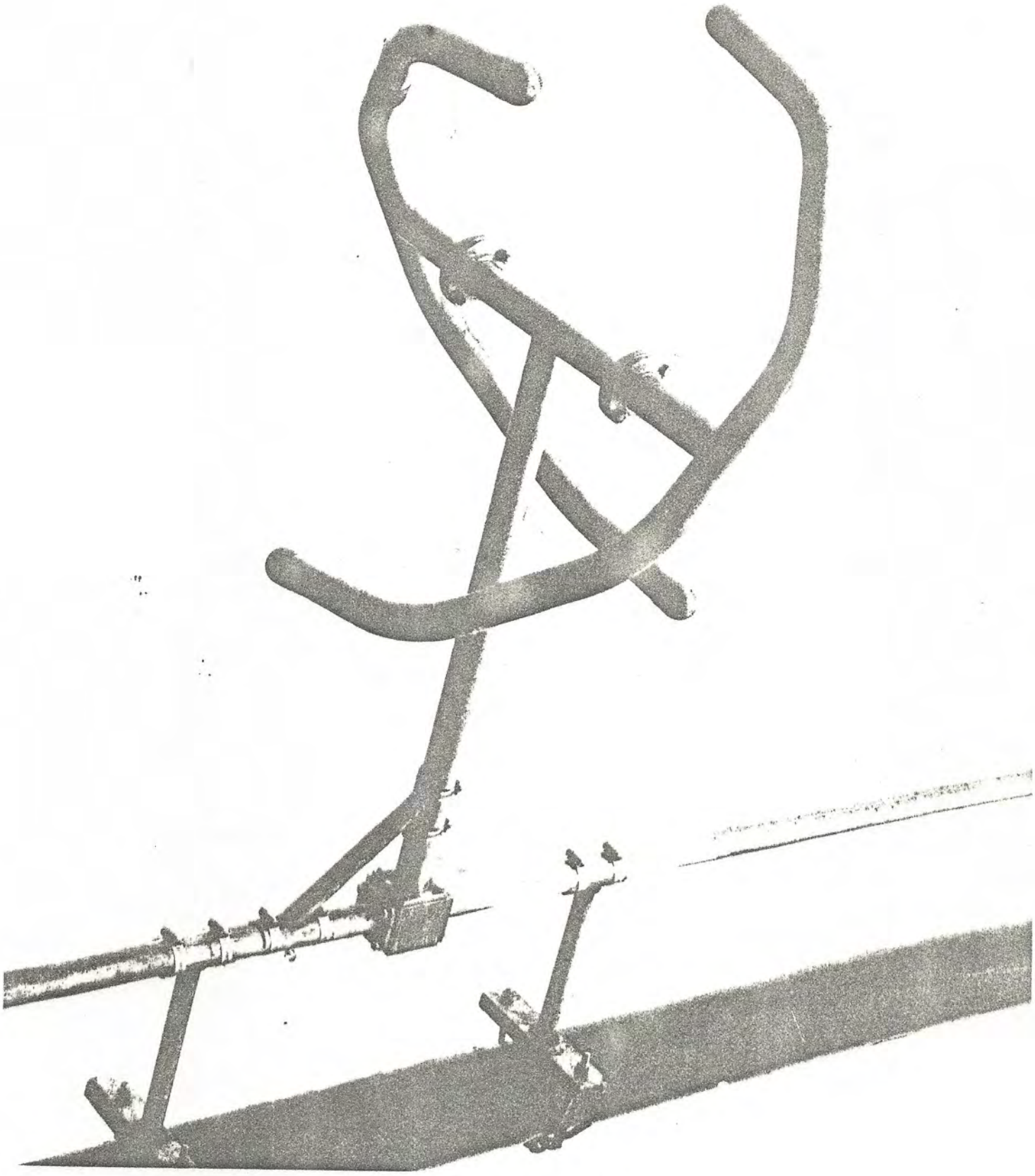
FOREWARD

This Instruction Book provides the necessary information for application installation, operation, adjustment, and maintenance of the Model FML-(No. of bays) E, Class A, Circularly Polarized FM Antenna.

This antenna provides the broadcaster with all the electrical advantages of higher power installations, while maintaining a compact, low silhouette configuration for minimum windloading.

GENERAL

Before the antenna and associated transmission line are placed in service, tests should be made to insure that the overall system is operating properly. This is important in order to detect any errors which may have been made during installation. A VSWR of less than 1.5 to 1 at the operating frequency is to be expected. If a higher VSWR is observed, there may be a mechanical defect in the transmission line or antenna.



SAFETY NOTICE

WARNING: THE CURRENTS AND VOLTAGES IN THIS EQUIPMENT ARE DANGEROUS AND UNDER CERTAIN CONDITIONS, COULD BE FATAL.

This manual is intended as general guidance for trained and qualified installation, operating, maintenance and service personnel who are familiar with and aware of the dangers inherent in handling potentially hazardous electrical and/or electronic circuits. It is not intended to contain a complete statement of all safety precautions which should be observed by personnel in using this or other electronic equipment.

THE INSTALLATION, OPERATION, MAINTENANCE AND SERVICING OF THIS EQUIPMENT INVOLVES RISKS TO BOTH PERSONNEL AND EQUIPMENT, AND MUST BE PERFORMED ONLY BY PROPERLY TRAINED AND EXPERIENCED PERSONNEL EXERCISING DUE CARE. PERSONNEL MUST FAMILIARIZE THEMSELVES WITH SAFETY REQUIREMENTS, SAFE HANDLING AND OPERATING PRACTICE, AND RELATED FIRST-AID PROCEDURES (E.G., FOR ELECTRICAL BURNS AND ELECTRICAL SHOCK).

HARRIS CORPORATION Broadcast Equipment Division shall not be responsible for injury or damage resulting from improper installation, operation, maintenance or servicing, or from the use of improperly trained or inexperienced personnel in the performance of such tasks, or from the failure of persons engaged in such tasks to exercise due care.

As with all electronic equipment, care should be taken to avoid electrical shock in all circuits where substantial currents or voltages may be present, either through design or short circuit. Caution should also be observed in lifting and hoisting equipment, especially regarding large structures, during installation.

LIABILITY LIMITATION

The procedures outlined in this Manual are based on the information available at the time of publication and should permit the specified use with minimum risk. However, the manufacturer cannot assume liability with respect to technical application of the contents and shall, under no circumstances, be responsible for damage or injury (whether to person or property)resulting from its use.

The manufacturer is specifically not liable for any damage or injury arising out of failure to follow the instructions in this Manual or failure to exercise due care and caution during installation, operation, maintenance and service of this equipment.

CAUTIONARY NOTICE

Always disconnect power before opening covers, doors, enclosures, gates, panels or shields. Always use grounding sticks and short out high voltage points before servicing. Never make internal adjustment, perform maintenance or service when alone or when tired.

Never remove, short-circuit or tamper with interlock switches on access covers, doors, enclosures, gates, panels or shields. Keep away from live circuits, know your equipment and don't take chances. Proper training of experienced personnel and observing the above guidelines will help assure safe and continued operation of this equipment.

TABLE 3.1

TECHNICAL DATA FOR MULTIPLE BAY INSTALLATIONS - CENTER OR OFF CENTER FEED

HARRIS TYPE	POWER GAIN Horizontal	POWER GAIN Vertical	db GAIN Horizontal	db GAIN Vertical	FIELD GAIN[1] Horizontal	FIELD GAIN[1] Vertical	POWER RATING	APPROX LENGTH	WGT[2] LBS.	WIND[3] LOAD
FML-2C	0.9971	0.9971	-0.0128	-0.0128	0.9985	0.9985	12kw	10	152	302
FML-3C	1.5588	1.5588	1.9278	1.9278	1.2485	1.2485	12kw	20	207	412
FML-4C	2.1332	2.1332	3.2903	3.2903	1.4605	1.4605	12kw	30	262	523
FML-5C	2.7154	2.7154	4.3384	4.3384	1.6478	1.6478	12kw	40	317	633
FML-6C	3.3028	3.3028	5.1888	5.1888	1.8174	1.8174	12kw	50	372	744
FML-7C	3.8935	3.8935	5.9034	5.9034	1.9732	1.9732	12kw	60	427	854
FML-8C	4.4872	4.4872	6.5197	6.5197	2.1183	2.1183	12kw	70	482	964
FML-9C	5.0826	5.0826	7.0608	7.0608	2.2545	2.2545	12kw	80	537	1075
FML-10C	5.6800	5.6800	7.5435	7.5435	2.3833	2.3833	12kw	90	592	1185
FML-11C	6.2783	6.2783	7.9785	7.9785	2.5057	2.5057	12kw	100	647	1295
FML-12C	6.8781	6.8781	8.3747	8.3747	2.6226	2.6226	12kw	110	702	1406

1. To obtain the effective free space field intensity at one mile in MV/M for one kilowatt antenna power, multiply field gain by 137.6.

2. The weights given are with brackets, and the interbay transmission line and transformer section are all included in the weight.

3. Windload based on 50 psf on flat surfaces and 33 psf for cylindrical surfaces (actual wind velocity 110 mph). Computed for a 100 MHz antenna with mounting brackets.

TABLE 3.1

TECHNICAL DATA FOR MULTIPLE BAY INSTALLATIONS - END FED

HARRIS TYPE	POWER GAIN Horizontal	POWER GAIN Vertical	db GAIN Horizontal	db GAIN Vertical	FIELD GAIN[1] Horizontal	FIELD GAIN[1] Vertical	POWER RATING	APPROX[2] LENGTH	WGT[3] LBS.	WIND[4] LOAD
FML-1E	0.4611	0.4611	-3.3623	-3.3623	0.6790	0.6790	9kw		63	116
FML-2E	0.9971	0.9971	-0.0128	-0.0128	0.9985	0.9985	9kw	10	118	226
FML-3E	1.5588	1.5588	1.9278	1.9278	1.2485	1.2485	9kw	20	173	337
FML-4E	2.1332	2.1332	3.2903	3.2903	1.4605	1.4605	9kw	30	228	447
FML-5E	2.7154	2.7154	4.3384	4.3384	1.6478	1.6478	9kw	40	283	557
FML-6E	3.3028	3.3028	5.1888	5.1888	1.8174	1.8174	9kw	50	338	668
FML-7E	3.8935	3.8935	5.9034	5.9034	1.9732	1.9732	9kw	60	393	779
FML-8E	4.4872	4.4872	6.5197	6.5197	2.1183	2.1183	9kw	70	448	890

1. To obtain the effective free space field intensity at one mile in MV/M for one kilowatt antenna power, multiply field gain by 137.6.

2. When determining coax length, add six feet to antenna length.

3. The weights given are with brackets, and the interbay transmission line and transformer section are all included in the weight.

4. Windload based on 50 psf on flat surfaces and 33 psf for cylindrical surfaces (actual wind velocity 110 mph). Computed for a 100 MHz antenna with mounting brackets.

SECTION 2 - EXAMINATION PRIOR TO OPERATION

2.1 The transmission line and antenna system should be purged prior to placing the system in service, or at any other time that moist air may enter the line. This is accomplished by pressurizing the line at the transmitter end to approximately 5 to 10 lbs./sq. in. The system may now be bled by temporarily loosening the four bolts in the brass plate on the top of the upper most antenna line block. Retighten the four bolts to seal the system and repressurize. Repeat this procedure three times to assure complete purging.

NOTE: LEAKS IN A TRANSMISSION LINE ARE OFTEN AUDIBLE, IF THE LEAK IS LARGE AND THE LINE IS UNDER SUFFICIENT PRESSURE (APPROXIMATELY 15 LBS. P.S.I.). SMALL LEAKS MAY BE LOCATED BY THE USE OF BUBBLE LIQUID WHICH MAY BE BRUSHED ON THE SUSPECTED LEAK AREAS.

2.2 After purging the transmission line feeding the antenna system should be kept filled with dry air or nitrogen at a pressure of 3 to 5 pounds per square inch. There is no advantage in pressurizing the system in excess of 5 lbs./sq. in. However, the system should be pressurized so that changes in temperature will not cause moisture condensation from outside air, thereby impairing the electrical efficiency of the antenna system.

2.3 The antenna elements and transmission line do not require painting. Only the antenna brackets require painting.

NOTE: SHOULD ANY OF THE ANTENNA ELEMENTS EVER BE PAINTED, CARE SHOULD BE TAKEN TO KEEP THE PAINT OFF THE INSULATED SURFACES.

1.8 Care should be exercised in assembling the inner conductor of the coaxial line to the inner conductor connector, or bullet. The inner conductor should be perfectly centered on the bullet as it is being installed in order to prevent bullet damage. The bullet should fit firmly in the inner conductor to assure a minimum R.F. resistance connection. Many antenna troubles have been traced to improper installation of bullets between the inner conductors of the transmission line.

GENERAL

1.9 A sufficient quantity of hardware and neoprene gaskets is supplied with the antenna to effect an airtight assembly of the coaxial line to the antenna element line blocks. It is advisable to apply a small quantity of non-melting silicone dielectric lubricant (such as Dow-Corning No. 4 Compound) sparingly to the neoprene gaskets during assembly.

NOTE: TO INSURE PROPER ANTENNA INSTALLATION, CARE MUST BE EXERCISED TO SEE THAT NO UNDUE STRESS IS PLACED ON THE ANTENNA ELEMENTS WHICH MIGHT BEND OR DISTORT THEM. WHEN THE INSTALLATION IS COMPLETED, THE SECTIONS OF INTERCONNECTING COAXIAL CABLE BETWEEN ANTENNA BAYS AND THE ANTENNA ELEMENTS SHOULD ALL BE IN ALIGNMENT RESPECTIVELY.

1.10 The Low Power Antenna has been carefully assembled and pretuned to the station's operating frequency before leaving the Harris factory. The input impedance is 50 ohms. Adjustments have been made to obtain the optimum VSWR at the station's frequency with the entire antenna assembled. Tests have also been conducted, using air pressure, to insure that the antenna system is free from gas leaks.

INSTALLATION INSTRUCTIONS

HELIAX COAXIAL CABLE

ANDREW

BULLETIN 17800A

This publication contains installation instructions for HELIAX flexible RF cables. The instructions cover air and foam dielectric types of both jacketed and unjacketed cables.

HELIAX CABLE NOMINAL DIAMETER IN INCHES	MAJOR DIAMETER OVER JACKET IN INCHES	APPROXIMATE WEIGHTS—jacketed CABLE PER 100 FEET – IN POUNDS		RADIUS of MINIMUM ALLOWABLE BEND IN INCHES	VOLUME AIR DIELECTRIC CABLE PER 100 FEET IN CUBIC FEET
		AIR DIELECTRIC	FOAM DIELECTRIC		
1/4	.290	7	6	2.5	0.005
3/8	.435	14	12	3.75	0.01
1/2	.580	27	24	5	0.08
7/8	1.115	53	42	10	.353
1-5/8	2.000	104	135	20	1.44

Air dielectric cable is supplied pressurized in bulk quantities or when furnished with factory attached connectors. An air inlet valve is included with each pressurized length: a service tee and gauge are added with factory attached connectors. Inner connectors, gaskets, silicone grease, connecting hardware, and assembly instructions are also packed with flange connectors. A carefully planned and executed installation will assure long and trouble-free operation: Read the instructions thoroughly before installation.

1. PREPARATION AND INSPECTION

The transmitting equipment and antenna should be installed prior to the cable. Inspect the cable for possible shipping damage and pressure loss. NOTE: The cable and connector assemblies have been pressure tested at the factory before shipping. The maximum allowable pressure drop for an assembly over 20 feet long is 1 PSI in 24 hours from an initial pressure of 20 PSI. For a shorter assembly, allowable pressure drop is 1 PSI in 24 hours from an initial pressure of 12 PSI. Each assembly is pressurized to 10 PSI prior to shipping and the result of a factory pressure test is recorded on an inspection tag tied to the assembly.

A tire gauge can be used to check the bulk cable pressure. If the cable has a pressure loss, check all joints for possible leaks especially at the pipe threads where most leaks are found. Refer to Chapter 6 for pressure information. Notify the ANDREW Service Department if a leaky condition cannot be corrected. Do not install the cable if the pressure loss is in excess of the standard rates stated above.

Factory attached flange connectors are shipped with a blank flange attached to maintain pressure during shipment. Do not remove the blank flange until after the cable is installed as it also affords protection to the connector face and prevents accidental entry of foreign matter.

When bulk cable is used, field attachment of the connector at the antenna end must be completed before hoisting. Remove the pressurizing cap just prior to use. Attach the connector to the end of the bulk cable in accordance with the connector instructions received. Be very careful to keep all connector parts perfectly clean. If an adaptor is needed to match the cable connector with the antenna input, attach it to the connector. Pressure test the assembly prior to hoisting.

2. HOISTING

Obtain a suitable hoist line that will adequately support the weight of the cable. Refer to the table for approximate weights per 100 foot lengths of the various sizes.

Provide a strong pulley high enough on the tower to allow the cable to be raised sufficiently to make a proper antenna connection. Most lengths can be hoisted manually; however, a winch is recommended for lifting several hundred feet of the larger cables. Position the reel so the cable pays off from the bottom toward the tower and support it on an axle to permit free rotation. The cable unreels as it is being hoisted. Uncoil the short lengths which are not on reels along the ground and away from the tower until completely uncoiled.

(Continued on Reverse Side)

Place a protective covering over the connector to prevent damage during hoisting. Attach a cable grip or rope sling approximately 18 inches below the connector, then add the hoist line. A rope sling may be used in lieu of a cable grip for very short lengths of cable only. Use cable grips in accordance with the instructions received with the ANDREW hoisting kit. When installing lengths more than 200 feet long, additional cable grips at 150 to 200 foot intervals are required.

Additional tying is done above and below the cable grips to keep the weight on the hoist line and to avoid unnecessary stresses on the cable. Make certain to allow slack in the cable when tying and that the slack is maintained during hoisting. Tying is accomplished with a strong fiber-reinforced tape or similar material applied generously at 50 foot intervals as the cable is raised.

Hoist the cable slowly. To prevent kinking, rotation of the reel must be retarded to control payout of the cable as required.

If it will be necessary to drag the cable over sharp edges of buildings and tower members, protective measures must be taken. Particular care must be exercised to avoid snags when hoisting or routing cable through and around tower members. Careless handling can cause kinks, dents, and scrapes. To avoid possible permanent damage to the cable, do not attempt to make bends shorter than the recommended minimum bending radius shown in the table. Care must be taken to apply an even pressure when forming the cable. When routing is confined and shorter bends are required, an elbow should be used.

3. ANCHORING

After the cable has been raised to the correct height, anchor it to the tower leg beginning near the antenna. Direct attachment to the tower leg is facilitated by the flexibility characteristic which nullifies the effects of thermal expansion and contraction.

Attachment to lighting conduit or vertical angle iron runs is recommended in installations where tower members do not provide adequate or convenient hanger support. Cables subject to vibration from wind must not be left unsupported.

Space hangers one foot apart for the first three at the top of the vertical run and three feet apart thereafter. Allow enough cable at the antenna end to accommodate changes in the antenna position and prevent strain at the antenna input connection. Maintain the hoist line pressure until the anchoring is well under way. Copperweld tie wires, Wraplock, hose clamps, or standard HELIAX cable hangers are used for anchoring. Insulated hangers are required when the cable is installed on a "hot" AM tower that is used as a radiator.

If tie wires are used for anchoring, wrap them around the cable once with two twists, then around the tower leg making as many turns as possible. Twist the end together at least four times. Use gas pliers for twisting. Refer to the illustration. The sharp wire ends can be dangerous to personnel; cover or bend them out of the way. Tie wires can also be attached to the cable at three-foot intervals while the cable is on the ground. A couple of twists will hold the wires in place during hoisting. NOTE: Tie wires are not recommended for 1-5/8 inch diameter cable. When using Wraplock, hose clamps, or standard hangers, be careful not to tighten excessively to avoid deforming the cable. Dents or deformations can cause degradation in the electrical performance. The entire length of cable should be inspected for possible damage as it is being anchored.

If the jacket has been cut, apply vinyl tape to the damaged area. The top and bottom of the cable should be grounded to the tower by low impedance conductors or to a suitable "down" conductor physically separated from the cable if the tower is non-metallic. In addition to the minimum, the cable should be grounded at a point where it enters the transmitter building especially if there is a long horizontal run. Some installers ground the cable at least every 50 feet along the entire run. Local building codes may have other requirements which should be investigated. The antenna input connection can usually serve as the top ground. Those that are planned for 50 foot intervals can be prepared during the hoisting operation. Follow grounding instructions as outlined in the ANDREW grounding kit.

4. HORIZONTAL RUNS

Route the cable from the base of the tower to the station. It can be buried or supported above the ground. Attach the above-ground cable to a messenger or other horizontal support member using the same type anchors and three-foot intervals as in the vertical run. Exposed horizontal runs must be protected from the weight of accumulated ice and damage from falling ice or other objects.

HELIAX jacketed cable can be used in any environment such as salt air, direct burial or underwater. The jacket eliminates the effects of galvanic and corrosive action. Buried cable should be below the area frost line and at least three feet deep for protection against damage from heavy vehicles. A four inch layer of sand under and over the buried cable is usually adequate to protect the jacket from stones or other sharp objects.

Splices on buried jacketed cables must be thoroughly covered with a plastic cement and tape. Refer to the instructions contained in the ANDREW splice wrap kit. Markers should be placed at convenient intervals over buried cables especially at splices.

An ANDREW feed-thru flange is recommended for the cable path through the station roof or wall. Install the flange in accordance with the instructions received.

5. CABLE CONNECTIONS

Remove the protective covering from the ends of the cable. If there are flange terminations, remove the blank flanges attached for shipment. Before the cable connections are begun, a continuity check should be made. Make a short circuit across the inner and outer conductors at one end of the cable. An ohmmeter across the conductors at the opposite end should read zero or nearly zero for a satisfactory indication. The meter should read at least 1000 megohms when the short circuit is removed.

To make a flange connection at the antenna end of the cable, start by inserting an inner connector into the inner conductor of the antenna input. See that a full engagement is made. Next, seat an "O" ring gasket into the gasket groove of the cable connector. The gasket and mating surfaces of the flanges must be perfectly clean to insure a pressure-tight connection. Use acetone, vythene, or carbon-tetrachloride on a clean cloth. A thin coating of silicone grease on the gasket and in the gasket grooves will aid in keeping the gasket in place. Push the cable into position so the end of the inner connector, extending from the antenna input, engages with the inner conductor of the cable. Be sure the gasket remains in place and the inner connector insulator seats properly in the flanges. Rotate the swivel flange on the cable connector so the

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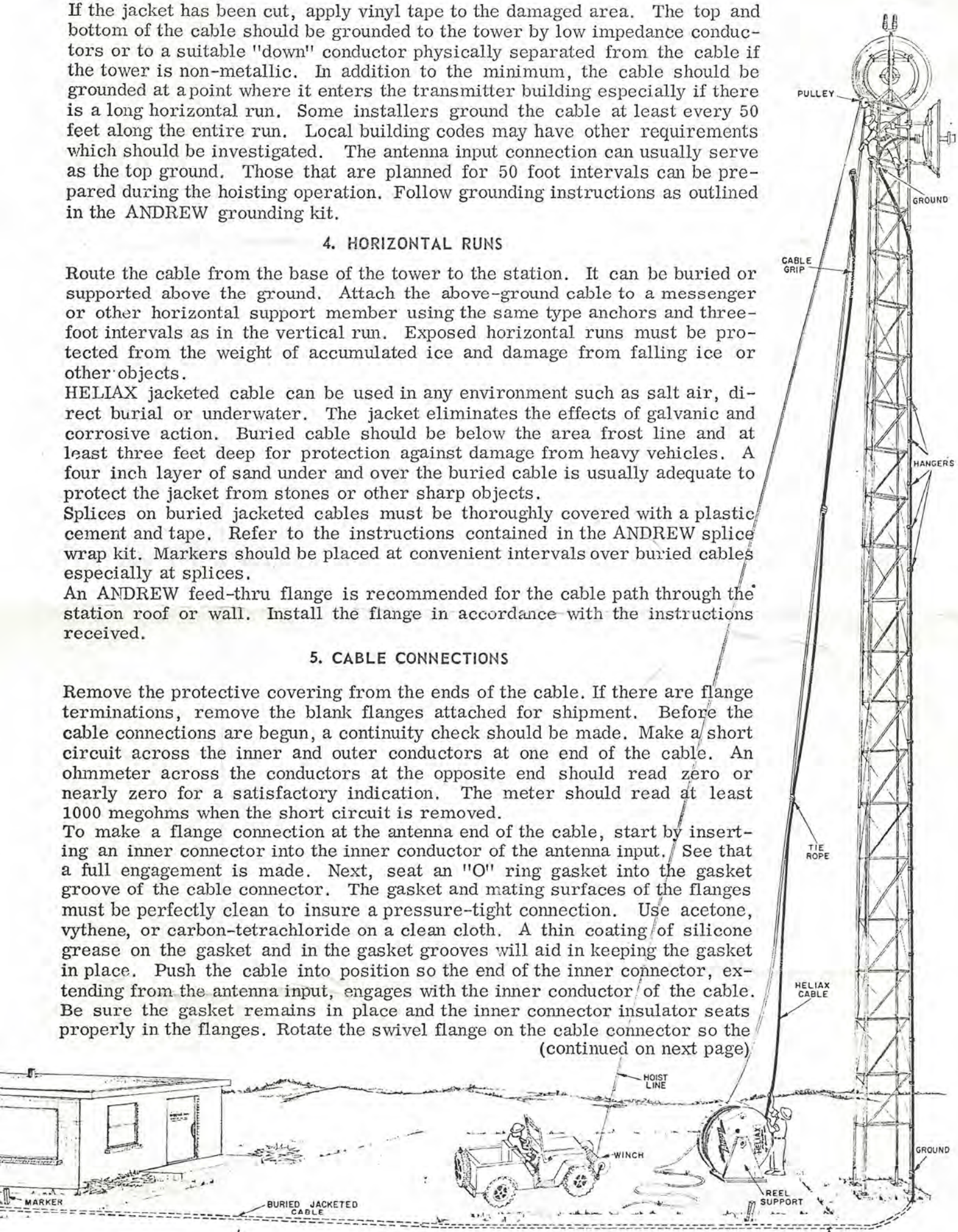

alignment pins are opposite the alignment holes, then join the flanges. Add the connecting hardware and bolt the flanges together, tightening the bolts evenly.
If the cable has a solid dielectric type cable connector (Type N, UHF, LC, etc.) remove the dust cap and make the connection to the antenna. Use silicone grease inside the connector to fill in any voids so moisture cannot form. Weatherproof the connection further by applying several layers of good waterproofing tape.
Repeat the above procedure for connecting the transmitter end of the cable to the output connection at the equipment rack. Where possible, the flexible cable from the antenna is connected directly to the transmitter without any short interconnections.
If at this time the cable length must be changed, cut the cable to the appropriate length and reassemble the connector in accordance with proper connector assembly instructions. Be especially careful not to damage the gasket or insulator inside the connector.
When bulk cable is being installed, attach the connector after the required cable length has been determined. Follow connector assembly instructions. Replace the pressurizing cap and repressurize the remaining bulk cable.

6. PRESSURIZATION

After all connections have been completed, pressurize the air dielectric cable. Changes in temperature can cause moisture from any outside air that enters the cable to condense and seriously impair the efficiency. For this reason the cable should be under pressure at all times. If moist air has entered, it must be purged. This is done by removing the gas port plug located on the connector at the antenna end of the cable and releasing the air. After the air is released, replace the plug and repressurize the cable with dry air applied at the transmitter end. Repeat the procedure three times. Another method is to adjust the line pressure regulator until the pressure indicates 10 PSI, then allow an air volume of three times the air volume of the cable to escape at the antenna end. An alternative method is to pressurize to 10 PSI and let the air escape at the transmitter end of the cable. This procedure is also repeated three times allowing an hour each time for the air to mix.
Pressurization can be accomplished by manual or automatic means depending upon the amount of cable in use at the station and whether or not the site is attended. A dry air hand pump is satisfactory for attended sites using a relatively small amount of cable. Automatic electric dehydrators are recommended for unattended sites or those where larger amounts of cable are employed. A cylinder of compressed air can also be used. Gauge pressures of 5 to 10 PSI are adequate for most installations. NOTE: HELIAX cable assemblies are not hermetically sealed and may exhibit a low leakage rate; consequently, cable installations not having an automatic air supply must be inspected periodically.
Dry air is normally used for pressurizing. Dry nitrogen may also be used, in which case, oil pumped nitrogen should be specified. When pressurizing equipment is connected to the gas port on the cable connector, or whenever pipe fittings are reassembled, the threads must be covered with pipe compound to insure a leak-proof connection. Be sure to replace the valve cap securely.
A manifold assembly is used to provide a number of pressure outlets for various transmission line requirements. The outlets branch from a single pressure inlet using only one dehydrator for the system. Each outlet has a valve and gauge to provide individual pressure readings. Instructions for installation of pressurizing equipment and manifolds are included with the respective units.
After the initial installation, the waveguide connections should be checked for leaks. Use a commercial leak detector or brush on a full strength liquid detergent over all joints and check for bubbles. Maintain an unbroken soap film over the entire joint for several minutes to detect very small leaks.
Unpressurized air dielectric cable installations should be avoided whenever possible. If due to unusual circumstances the cable is to be used without pressure, a hole must be provided at the lowest point in the system to allow the condensate to drain. This should be done by filing a notch through the outer conductor at the underside of the cable using a triangular file. Do not punch a hole in the cable, as this would leave undesirable burrs inside the outer conductor.

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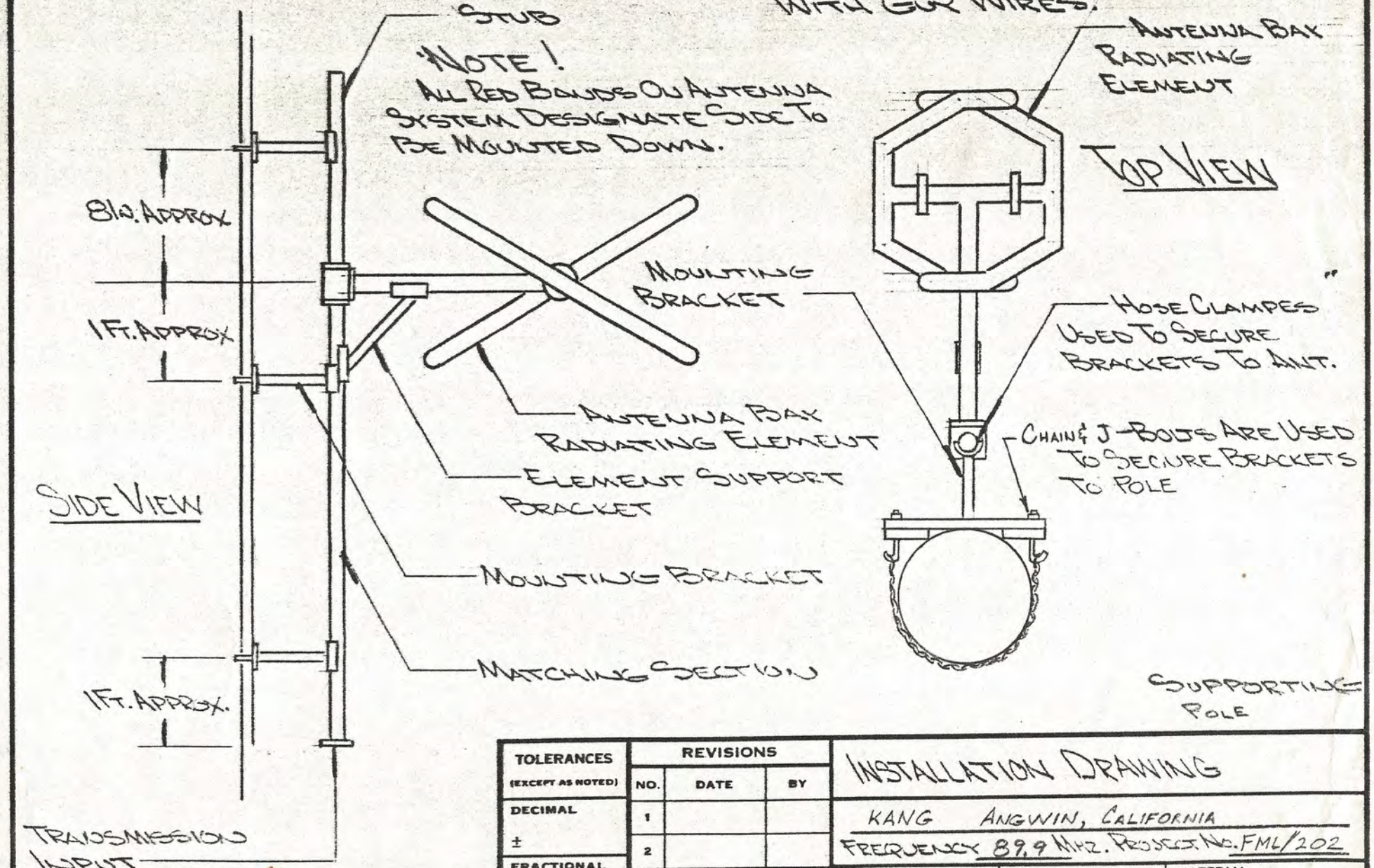
NOTE! BRACKETS MAY BE ROTATED ON TOWER LEG TO AVOID CONFLICT WITH GUY WIRES.



TOLERANCES (EXCEPT AS NOTED)	REVISIONS		
	NO.	DATE	BY
DECIMAL ±	1		
	2		
FRACTIONAL ±	3		
	4		
ANGULAR ±	5		

INSTALLATION DRAWING

KANG ANGWIN, CALIFORNIA

FREQUENCY 89.9 MHz. PROJECT NO. FML/202

DRAWN BY P. ROSE	SCALE No	MATERIAL No
CHK'D	DATE 7-20-79	DRAWING NO.
TRACED	APP'D	