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PERFORMANCE SPECIFICATION

ANTENNA GROUP OE-254/GRC

This specification is approved for use within the Communications-Electronics Command, Department of the Army and is available for use by all Departments and Agencies of the Department of Defense.

1. SCOPE

1.1 Scope. This specification covers production engineering, test and production of a broadband omni-directional VHF antenna system to be designated Antenna Group OE-254/GRC. The OE-254 is also referenced herein as: the antenna system.

2. APPLICABLE DOCUMENTS

2.1 General. The documents listed in this section are specified in sections 3 and 4 of this specification. This section does not include documents cited in other sections of this specification or recommended for additional information or as examples. While every effort has been made to ensure the completeness of this list, document users are cautioned that they must meet all specified requirements documents cited in sections 3 and 4 of this specification, whether or not they are listed.

Beneficial comments (recommendations, addition, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Commander, U.S. Army Communications-Electronics Command, ATTN: AMSEL-LC-LEO-E-EP, Fort Monmouth, New Jersey 07703-5023 by using the Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

AMSC N/A FSC 5985

2.2 Non-Government publications. The following document(s) from a part of this document to the extent specified herein. Unless otherwise specified , the issues of the documents which are DoD adopted are those listed in the issue of the DODISS cited in the solicitation. Unless otherwise specified, the issues of documents not listed in the DODISS are issues of the document cited in the solicitation (see 6.2)

Electronic Industries Associated Standard

RS-329	Minimum Standards for Land-Mobile Communications Antennas, Part I - Base or Fixed Station Antennas, Dec. 1966

(Applications for copies should be address to the Electronics Industries Association, 2500 Wilson Boulevard, Arlington, VA 22201-3834)

2.3 Order of precedence. In the event of a conflict between the text of this document and the references cited herein (except for related associated specification or specification sheets), the text of this document takes precedent. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained .

3. REQUIREMENTS

3.1 First Article. Unless otherwise specified by the contract or purchase order, the contractor shall furnish First Article units in accordance with 4.2.

3.2 Dimensions. The outline characteristics of the Antenna Group, OE-254/GRC shall be in accordance with figures 3 and 4 of this specification to ensure proper interface and dimensional requirements for compatibility with the family of antenna groups.

3.3 Parts, materials and processes. The contractor shall select the parts, materials and process but these materials shall be capable of meeting all of the operational and environmental performance requirements specified herein.

3.4 Configuration. The configuration of every Antenna Group OE-254/GRC on order shall include the following:

ITEM	QUANTITY
Antenna AS-3166 ( )/GRC	1 each
Transmission Line	1 each
Mast AB-1244 ( )/GRC	1 each
Accessory Items	1 of each
Bag	1 each
Running Spares	1 set

3.4.1 Transmission Line. The transmission line shall be Cable Assembly, Radio Frequency CG-1889 C/U (80 ft. 0 in) in accordance with the dimensional and interface requirements of Data List A3003195. The cable assembly shall consist of RG-213/U Cable terminated at each end with RF Coaxial Connector M-39012/01-007. (See 4.12.2)

3.5 Basic Antenna. The basic antenna shall be a radio biconical design having three equally spaced elements angles upward and three equally spaced elements angled downward from a feedcone structure. A field mast assembled from mating sections shall elevate the antenna and the antenna feed arrangement. The system shall be capable of continuous duty.

3.6 Electrical Requirements. The following electrical requirements apply to the completely assembled Antenna System, including the transmission line, unless otherwise stated.

3.6.1 Bandwidth. The assembled antenna system shall comply with all the following electrical characteristics, at all frequencies within the specified range of frequency coverage, without electrical tuning, switching, or physical adjustment.

3.6.2 Frequency Range. The frequency range of the antenna system shall be at least from 30 to 88 Mhz.

3.6.3 Impedance. The reference load impedance for all measurements, at the end of the transmission line opposite the antenna, shall be 50 ohms, unbalanced to ground.

3.6.4 Free Space VSWR. Free space voltage standing wave radio for the complete antenna system, including the transmission line, shall not exceed 3.0 to 1 in the frequency range of 30 to 88 Mhz (see 4.15.1)

3.6.5 Antenna Gain. Antenna Gain over the required frequency range shall be no less than 3 dB below the gain of the reference dipole antenna. (see 4.14.4).

3.6.6 Radiation Pattern. In accordance with the Electronic Industries Association Standard RS-329 over the frequency range of 30 to 84 MHz. Over the frequency range of 84 to 88 Mhz, the relative gain in any azimuth direction shall not vary from the mean value by more +3 dB for 360 degrees of rotation. (see 4.11.4)

3.6.7 RF Power Level. Continuous duty RF power capability of the complete antenna system shall be 350 watts (see 4.15.3)

3.6.8 Dielectric Withstanding Voltage. Insulation material in the feedcone structure and the insulating extension shall show no visible effects or evidence of dielectric breakdown due to an applied voltage of 10,000 volts after the system has been subjected to environmental stresses of the service conditions specified herein. (see 4.15.5).

3.6.9 Balun.

3.6.9.1 Power Rating. The balun shall be capable of continuous duty operation with a continuous wave input power of 350 watts, over the frequency range specified herein. (see 4.15.4).

3.6.9.2 Coupling Loss. Coupling loss through the balun shall not exceed 0.5 dB. (see 4.15.4).

3.6.9.3 Balun VSWR. VSWR at the input of the balun connector shall not exceed 2.0 : 1 in the frequency range 30 to 88 Mhz to be consistent with the free space VSWR requirements of paragraph 3.6.4 for the complete system, when tested in accordance with paragraph 4.14.3. (see 4.15.4).

3.7 Mechanical Requirements. The following mechanical requirements shall apply.

3.7.1 Gages, Jigs and Fixture. (see 4.13.4)

3.7.1.1 Gages. The contractor shall employ the following government furnished gages to test mechanical dimensions of the applicable threaded items.

GAGE LIST	APPLICABLE ITEM
SC-GL-3232064	Feedcone Structure Sockets
SC-GS-57620	MS-117/A
SC-SM-A-57621	MS-116/A
SC-GL-57626	AB-24/GR

3.7.1.2 Fixtures. The contractor shall furnish fixtures for measuring cone angle of the feedcone structure and for performing the structural integrity test of the feedcone.

3.7.2 Height. Height for the assembled antenna system from the mast base plate to the vertical center of the feedcone structure shall be no less than 30 feet and no greater than 32 feet.

3.7.3 Weight. Weight of the complete antenna system, with all parts and the technical manual stowed in the bag, shall not exceed 45 pounds, 8 ounces. Weight of the feedcone structure, including the balun, shall not exceed 3 pounds, 6 ounces. (see 4.13.1)

3.7.4 Transport size. The outside dimensions of the closed bag, with all items properly stowed, shall not exceed 42 inches in length and 40 inches in perimeter. (see 4.13.2)

3.7.5 Interchangeability. The system shall provide for two-way interchangeability of parts. Selection of tolerances as shown on the drawings shall permit any part selected from one system, to be substituted into any other system of those on order without any problem of function or fit. (see 4.13.4)

3.7.6 Feedcone Structural Integrity. The feedcone shall be capable of withstanding, without damage or indication of separation, a tensile force of 2000 pounds applied in a manner to separate the two cones. This 2000 pound force shall be reduced to 1500 pounds for all Group “C” environmental post-tests. The feedcone structure shall also be capable of withstanding a tensile force of 250 pounds applied at the balun unbalanced connector and to the two cones in a manner tending to separate the balun from the feedcone structure. (see 4.13.5)

3.7.7 Air Pressure. The feedcone assembly shall be capable of maintaining an air pressure, applied at the air pressure test vent to test the balun seal points, to within 0.01 psi. (see 4.12.4)

3.8 Service Conditions. As a result of being subjected to the following environmental conditions, according to the methods set forth in the test schedules, the antenna system shall not exhibit any effect which would be harmful to performance or reliability. The parts of the system shall not be deformed, defaced, frayed in any manner or exhibit evidence of corrosion. Corrosion is any visible degradation that can be attributed to flaky, pitted, blistered or otherwise loosened finish or metal surface. Harmful electrical performance is performance below the test limits stated herein. (see 4.14)

3.8.1 Temperature.

3.8.1.1 High Temperature. (see 4.14.1)

3.8.1.1.1 Operating. The antenna system shall be operable without degradation in specified performance and shall sustain no physical deterioration, at ambient air temperature as high as +71^{0}C (+160^{0}F). This includes effects of solar radiation at a rate of 360 BTU/ft x ft/hr.

3.8.1.1.2 Storage and Transportation. The antenna system shall withstand exposure to ambient temperatures as high as +71^{0}C (+160^{0}F).

3.8.1.2 Low Temperatures. (see 4.14.2)

3.8.1.2.1 Operating. The antenna system shall be operable without degradation in specified performance and shall sustain on physical deterioration at ambient air temperatures as low as -45.6^{0}C (-50^{0}F).

3.8.1.2.2 Storage and Transportation. The Antenna system shall withstand exposure to ambient temperature as low as -57^{0}C(-70^{0}F).

3.8.2 Humidity. The antenna system shall be operable without degradation in specified performance and shall sustain no harmful physical deterioration, during and after prolonged exposure to extreme high humidity levels encountered in tropical areas. (see 4.14.3)

3.8.3 Fungus. The antenna system shall show no evidence of viable fungus or corrosion when subjected to environmental conditions which would be favorable to their development, namely high humidity, warm atmosphere, and presence of inorganic salts.

3.8.4 Salt Fog. The antenna system shall be capable of operation for extended periods in the saline atmospheres of a seacoast environment without harmful structural deterioration, without degradation in specified performance, without insulator breakdown and without electrical flashover. (see 4.11.2)

3.8.5 Dust. The antenna system shall be capable of operating for extended periods in a dry, windy (17 knots), sandy environment without harmful structural deterioration, without degradation in specified performance, without insulator breakdown and without electrical flashover. (see 4.11.3)

3.8.6 Bounce, Loose Cargo. The antenna system, disassembled and stowed in its bag, shall be capable of withstanding shocks and exposure to wear induced during field transport as loose cargo. Some wear to the bag is expected as a result of the test of 4.11.5. However, the bag shall not be frayed or torn to the extent that it ceases to perform its function of containing and protecting its contents.

3.8.7 Drop. The antenna system, disassembled and stowed in its bag, shall be capable of being repeatedly dropped a distance of 30 inches onto any surface or edge without harmful damage to any component or to the bag. (See 4.14.5)

3.8.8 Wind/ice Load. The antenna system, when erected for field operation according to the instructions, shall be capable of withstanding 90 mile per hour winds without ice load and 60 mile per hour winds with 1/2 inch of radial ice and remain erected, without harmful damage to the feedcone structure, to the balun, or to the mast including the guy system. (Note that the test specified herein is for 90 mph winds only since this is easier to implement and performs essentially the same purpose as a combined wind/ice load test). (See 4.14.6)

3.8.9 Immersion. The antenna system, stowed in its bag (less Technical Manual and Cable Assembly CG-1889 C/U), shall be capable of being immersed to a covering of 3 feet of fresh water for a period of 2 hours. The immersion shall not result in any form of physical deterioration, loss of fit, or reduction in electrical performance below specified limits. (See 4.14.7)

3.9 Running Spares. A set of running spares shall be furnished as specified in the contract or purchase order.

3.10 Systems Safety Engineering.

3.10.1 Personnel Hazards. Personnel hazards shall be kept to a minimum. Tasks and efforts such as selection of parts, the complete manufacturing and assembly process, and any product baseline configuration changes that may be implemented during the course of the contract. Verification that compliance with this requirement has been achieved shall be verified through visual inspection.

3.10.2 Corona. The feedcone structure shall be free of sharp edges and points.

3.10.3 Radioactive Materials. Radioactive materials shall not be used (e.g. luminous dials/markings, electron tubes, surge arrestors and lenses).

3.10.4 Edge Rounding Exposed. Exposed edges shall be rounded to a minimum of 0.04 inch (1 mm), and exposed corners to a minimum of 0.5 inch (13 mm).

3.11 Workmanship. Standards of workmanship shall be such that components will meet all requirements of this specification and any referenced drawings when inspected in accordance with Section 4. The equipment shall be fabricated in such a manner as to be uniform in quality and shall be free from defects that will affect their life, serviceability, interchangeability, or appearance. (See 4.12.1)

4. VERIFICATION

4.1 Classification of inspection. Inspection shall be classified as follows:

a. First article inspection (see 4.2).

b. Conformance inspection (see 4.3).

4.2 First article inspection. This inspection shall consist of the inspection specified in Table I and shall include inspection specified in subsidiary documents and the supplementary tests. Order and quantity of equipments to be subjected to First Article Testing shall be as specified in Table I.

4.2.1 Standard of workmanship. Standard of workmanship, 3.11, shall be established during the Visual Inspections of 4.12.1.

TABLE I. First article test schedule.

			SEQUENCE				
TITLE	RQT PARA	INSP PARA	UNIT 1	UNIT 2	UNIT 3	UNIT 4	UNIT 5
Visual Inspection	3.11	4.12.1	1	1	1	1	
Transmission Line	3.4.1	4.12.2	2	2	2	2	2
Balun VSWR	3.6.9.3	4.12.3	3	3	3	3	3
Air Pressure	3.7.7	4.12.4	4	4	4	4	4
Item Count	3.4, 3.9	4.12.5	5	5	5	5	5
						6	
Weight	3.7.3	4.13.1	6	6	6	7	6
Transport Size	3.7.4	4.13.2	7	7	7	8	7
Coupling Loss	3.6.9.2	4.13.3	8	8	8	9	8
Interchangeability	3.7.5	4.13.4	9	9	9		9
High Temperature	3.8.1.1	4.14.1		10			
Low Temperature	3.8.1.2	4.14.2		11			
Humidity	3.8.2	4.14.3				10	
Antenna Gain	3.6.5	4.14.4	11	13		11	10
Drop	3.8.7	4.14.5				12	
Wind Load	3.8.8	4.14.6		15		13	
Immersion		4.14.7	14	17			
Salt Fog		4.11.2					1
Dust		4.11.3					
Radiation Pattern	3.6.6	4.11.4	10				
Bounce Loose Cargo	3.8.6	4.11.5		12			
Fungus	3.8.3	4.11.1	12				
Feedcone	3.7.6	4.13.5		14			
Structural					10		
Integrity			13	16	11	14	11

4.2.2 Procedure in the Event of Failure During the First Article Inspection. The procedure for failures in first article inspection shall be as specified in the contract or purchase order.

4.3 Conformance Inspection. The contractor shall perform the inspection specified in 4.3 and 4.5 through 4.8. This does not relieve the contractor of his responsibility for perform any additional inspection which is necessary to control the quality of the product and the assure compliance with all specification requirements.

4.4 Group A Inspection. Each unit on contract or purchase order shall be inspected for conformance to the inspections specified in Table II. Discrete lots shall be formed from units that pass this inspection.

TABLE II. Group A inspection.

TITLE	REQUIREMENT PARAGRAPH	INSPECTION PARAGRAPH
Visual Inspection	3.11	4.14.1
Transmission Line	3.4.1	4.14.2
Balun VSMS	3.6.9.3	4.14.3
Air Pressure	3.7.8	4.14.4
Item Count	3.4	4.14.5

4.4.1 Procedure in the event of failure during Group A inspection. In the event of failure to pass any Group A inspection item, the unit shall be corrected as necessary and then resubmitted to Group A inspection.

4.5 Group B inspection. This inspection shall conform to Table III, with sampling per Table IV and Table V, as appropriate. Group B inspection shall normally be performed on inspection lots that have passed Group A inspection and on samples selected from units that have been subjected to and met Group A inspection. Each lot shall be subjected to sampling inspection in accordance with Tables IV and V.

4.5.1 Order of inspection within Group B. Group B inspection shall be performed in any order which is satisfactory to the Government.

TABLE III. Group B inspection.

TITLE	REQUIREMENT PARAGRAPH	INSPECTION PARAGRAPH
Weight	3.7.3	4.13.1
Transport Size	3.7.4	4.13.2
Coupling Loss	3.6.9.2	4.13.3
Interchangeability	3.7.5	4.13.4
Feedcone Structural Integrity	3.7.6	4.13.5

TABLE IV. Sampling plan for Group B inspection.

Lot Size	Sample Size
2 to 25	3
26 to 50	5
51 to 90	6
91 to 150	7
151 to 280	10
281 to 500	11
501 to 1200	15
1201 to 3200	18
3201 to 10,000	22
10,001 and over	29

NOTE: The Acceptance Number in all cased is ZERO.

TABLE V. Group B Sampling Plan.
(for Interchangeability inspection only)

Lot Size	Sample Size
2 to 15	2
16 to 25	3
26 to 50	5
51 to 90	5
91 to 150	6
151 to 280	7
281 to 500	9
501 to 1200	11
1201 to 3200	13
3201 and over	15

NOTE: The Acceptance Number in all cases is ZERO.

4.5.2 Procedure in the event of failure during Group B inspection. In the event of failure to pass any Group B inspection item, the unit shall be corrected as necessary and then resubmitted to Group B inspection. After successful retest, the same correction shall be applied to all other uncovered systems on order.

4.6 Group C inspection. This inspection shall be as specified in Table VI and shall be performed on units that met Group A and Group B inspection.

TABLE VI. Group C inspection.

TITLE	REQUIREMENT PARAGRAPH	INSPECTION PARAGRAPH	SUB GROUP
Immersion	3.8.9	4.14.7	II
High Temperature	3.8.1.1	4.14.1	II
Low Temperature	3.8.1.2	4.14.2	II
Humidity	3.8.2	4.14.3	III
Antenna Gain	3.6.5	4.14.4	IV
Drop	3.8.7	4.14.5	IV
Wind Load	3.8.8	4.14.6	IV
Salt Fog	3.8.4	4.11.2	IV
Dust	3.8.5	4.11.3	IV
Bounce Loose Cargo	3.8.6	4.11.5	IV
Fungus	3.8.3	4.11.1	IV

4.6.1 Sampling for inspection of equipment. Units selected for each Group C inspection shall be selected without regard to their quality in accordance with the following:

a. Subgroup II. For this subgroup, two units for the first 50 production units shall be selected for this Group C inspection. For subsequent Group C inspections, two units from each successive 500, or two every two months, if less than 500 are produced during a two month period.

b. Subgroup III. For this subgroup, two units from the first 50 production units shall be selected for the first Group C inspection. For subsequent Group C inspections, two units shall be selected from each successive 600, or two every three months, if less than 600 are produced during this three month period.

c. Subgroup IV. For this subgroup, two units from the first 50 production units only shall be selected. Subsequently, two units shall be tested every six (6) months until completion of production.

4.6.2 Procedure in the event of failure during Group C inspection. The procedure shall be as specified in the contract or purchase order.

4.6.3 Reinspection of conforming Group C sample units. Unless otherwise specified, sample units which have been subjected and passed Group C inspection may be accepted on the contract or order provided all damage is repaired and the sample units are resubjected to and pass Groups A and B inspections.

4.7 Supplementary tests. Supplementary tests are defined as those tests herein which are only conducted as a pretest and/or post test to a first article or Group C test.

4.8 Standard test conditions. Unless otherwise specified, the following standard test conditions shall prevail during testing.

Condition	Value/Tolerance
Temperature	Prevailing Ambient
Altitude	Ground Level

4.9 Test equipment. The 350 watt RF power source for balun testing may be any unmodulated generator capable of adjustment to the required power level, capable of adjustment to the designated test frequency, and having a harmonic content of less than 10%.

4.10 Reference dipole antenna. The reference dipole antenna for gain measurements shall be vertically polarized balanced dipole. Length of the dipole shall be continuously adjustable. At each test frequency, length shall be adjusted to half-wave length resonance, considering end effects (usually 95% to 97% of one half wave length). When so adjusted, free space VSWR shall be less than 2.0 to 1. The coupling balun shall be a 1 to 1 impedance ratio. Balun coupling loss shall be less than 1 dB. The transmission line shall be the same line or an identical line to that of the antenna under test. Free space VSWR of the antenna and coupling loss of the balun shall be measured over the frequency range of the antenna under test. A typical antenna for this purpose is shown in Figure 1.

4.11 Initial Visual Inspection. The equipment shall be visually inspected for compliance with the requirements of this specification to include: radiating elements, feedcone structure, corona notice, balun, reparability, air pressure test vent, protective cap, insulating extension, transmission line, Mast AB-1244 ( )/GRC, connector adapter, anti-corrosion compound, construction, straps, compartmentation, instructions, height, ground area, galvanic corrosion, casting, impregnation of aluminum castings, uniformity, resistance to precipitation, marking, system safety engineering, human engineering, workmanship.

4.11.1 Fungus. As a pretest, the antenna system shall be subjected to the free space VSWR test, 4.15.1. The system shall be installed in the chamber but the radiating elements and support mast sections removed to the extent required to accommodate the chamber size. Other parts and the bag shall be arranged in the chamber so that the other parts are unprotected by the bag. This test should not be conducted after a salt fog test or a sand and dust test. A heavy concentration of salt may affect the germinating fungal growth, and the sand and dust can provide nutrients, thus leading to a false indication of the biosusceptibility of the test item. Twenty-eight days is the minimum test period to allow for fungal germination, breakdown of carbon molecules, and degradation of material. The equipment in the assembled and ready for delivery condition or representative samples subject to approval of the procuring agency shall be subject to the fungus test. After 28 days based on visual examination, the equipment or samples shall show no more than sparse micobial growth with restricted tuberal growth development in an area 10% or less of the total area and no more than six unrelated minute colonies with mycelial development in noncritical areas. Critical areas include terminal spacing, CCA'S, etc. The equipment shall fail if it shows more than the growth specified herein.

After exposure, the following shall be conducted: RF power capability, 4.15.3, Dielectric withstanding voltage, 4.15.5, Air pressure, 4.12.4, Free space VSWR, 4.15.1, and Inspection for physical condition, 4.12.1. During Inspection for physical condition the items of the system shall be examined for evident of fungus growth or damage. (3.8.3)

4.11.2 Salt fog. As a pretest, the antenna system shall be subject to the free space VSWR test, 4.15.1. The system shall be installed in the chamber but with radiating elements and support mast section removed to the extent required to accommodate the chamber size. Other parts and the bag shall be arranged in the chamber so that the other parts are unprotected by the bag. The salt fog test should be conducted after other climatic tests, especially fungus and humidity. Sand and dust testing should following salt fog testing. A minimum exposure period of 48 hours is recommended, followed by a 48 hour drying period. Alternating 24 hour periods of salt fog exposure and standard ambient (drying) conditions for a minimum of four 24 hour periods provides a realistic exposure and a higher damage potential then continuous exposure to a salt atmosphere. The 48 hour period shall be constant wetting. Use gentle wash in running water not warmer than $+38^0$ C ($+100^0$ F) and drying. There shall be no corrosion of finishes or metals. Corrosion shall be defined as any attributed to flaky, pitted blistered or otherwise loosened finished on metal surfaces. There shall be no clogging or binding of moving mechanical parts. After exposure, the following shall be conducted: RF power capability, 4.15.3; dielectric withstanding voltage, 4.15.5; Air pressure, 4.12.4, Inspection for physical condition, 4.12.1 and free space VSWR, 4.15.1. (3.8.4)

4.11.3 Dust. As a pretest, the antenna system shall be subjected to the free space VSWR test, 4.15.1. This test can produce a dust coating of the test item which could influence the results of Fungus tests, Humidity tests and Salt Fog tests. This test should be performed following test tests and also following the High Temperature test. The test should be conducted at the operating or storage temperature of the test item. The test chamber relative humidity shall not exceed 30%. The air velocity for the blowing dust should be 300 ft/min and a high air velocity of 1750 ft/min. For blowing dust tests, six hours at 23^{0}C (73^{0}F) and six hours at high storage or operating temperature is required. The test item shall be considered to have failed the dust test if dust has penetrated the test item in sufficient quantity to bind or block moving parts, nonoperation of relays, conductive bridges to cause shorts or accumulation of dust to collect water vapor. The air velocity shall be 200 ±100 feet per minute. The air temperature shall be adjusted to +63^{0}C(+145°F). The equipment shall be reoriented periodically to expose all its sides to the dust stream. After exposure, the following shall be conducted without cleaning other than due to necessary handling of equipment: RF power capability, 4.15.3; Dielectric withstanding voltage, 4.15.5; Air pressure, 4.12.4, Inspection for physical condition, 4.12.1 and free space VSWR, 4.15.1.(3.8.5)

4.11.4 Radiation Pattern. The test method shall be in accordance with Electronic Industries Association Standard RS-239 except the antenna under test shall be full scale size (3.6.6).

4.11.5 Bounce, Loose Cargo. The antenna system, with all components stowed in the bag, and without any additional container, shall be subjected to the bounce, loose cargo test. As a pretest, the antenna shall be subjected to the Free space VSWR test, 4.15.1. The test item shall be secured in its transit case. The tester shall be operated at 1 inch double amplitude and 284 rpm for a total of 3 hours. At the end of each 1/2 hour period, turn the test item to a different face so that after 3 hours, that test item will have rested on each of its six faces. At the end of the 3 hour period, the following tests shall be conducted: RF power capability, 4.15.3; Free space VSWR, 4.15.1; Air Pressure, 4.12.4; and Inspection for physical condition, 4.12.1 (3.8.6)

4.12 Group A Inspection.

4.12.1 Visual Inspection. (Note: The first article visual inspection must be complete before the following test can be conducted.) Visual inspection is performed, item by item. The First Article Test units subjected to visual inspection of 4.11.1, shall serve as a reference. In-process inspection records shall be checked. (3.11)

4.12.2. Transmission Line. A reflectometer shall be used to test for correct impedance continuity. (3.4.1)

4.12.3 Balun VSWR. A 200 ohm dummy load* shall be placed across the balanced terminals of the balun. VSWR shall be measured at the balun unbalanced connector using commercially available equipment having a load impedance of 50 ohms and having the capability of displaying VSWR over the complete required frequency range. VSWR shall be observed over the complete range and recorded at the frequency having the largest VSWR. (3.6.9.3)

*DUMMY LOAD - Resistive
RP = 200 ohms(+ 10%)
CP = + 0.2 Picofarads (when measured with a Boonton 250A RX meter or equivalent)

4.12.4 Air Pressure. An air pressure of 1 1/2 pounds per square inch ± 1/4 psi shall be applied at the air pressure test vent so as to test balun seal points. Pressure shall be applied for 1 minute during which time there shall be no more than 0.01 psi change in pressure. (3.7.7)

4.12.5 Item Count. Each item required to complete the antenna system shall be inventoried as it is placed in its assigned position in the bag. (3.4)

4.13 Group B Inspection.

4.13.1. Weight.

Step I. The bag shall be weighed with all items of the system contained therein. (3.7.3)

Step II. The feedcone structure, with balun attached, shall be weighed. (3.7.3)

4.13.2 Transport size. The bag shall be closed and fastened with all system items in place. Length and perimeter shall be measured. (3.7.4)

4.13.3 Coupling Loss. For convenience of test instrumentation, two balun are employed in the test with the balanced sides joined together by the shortest possible connections. Test results are adjusted to account for the doubling of effects of the test. Power from a radio frequency source having a 50 ohm output impedance shall be fed to the unbalanced side of one balun through an in-line RF wattmeter. The unbalanced side of the second balun shall be connected to an RF wattmeter having a 50 ohm load impedance. The signal source shall be adjusted to supply a fixed forward power at the in-line wattmeter. Power at the load wattmeter shall be measured and loss computed. (3.6.9.2)

4.13.4 Interchangeability.

a Method when conducted as part of First Article testing. (3.7.1, 3.7.5)

Step 1. Contractor gages shall be employed to test threads of the feedcone structure and Mast Sections MS-116A, MS-117A and AB-24/GR. The cone angled of the feedcone structure shall also be measured with the appropriate fixture.

Step 2. Within each system all parts not included in Step 1, and required by the design to be fitted together, shall be assembled or fitted together. Observation for correctness of fit shall be conducted. These parts shall then be interchanged among other fist article samples and assembled or fitted together. Observation of correctness of fit shall be repeated.

b. Method when conducted as part of Group B Acceptance tests. (3.7.1, 3.7.5)

Step 1. Same as Step 1 above.

Step 2. Within each antenna system under Group B test, parts not included in Step 1 shall be designated by the Government Quality Assurance Representative for interchangeability test. These parts shall be interchanged two ways with like parts in the accepted First Article sample in the custody of the Government QAR. Observation of correctness of fit in both systems shall be observed.

4.13.5. Feedcone Structural Integrity. (3.7.6)

Step 1. A manufacturer's fixture shall be arranged which is capable of attaching individually to each cone and then apply a tensile force tending to separate the cones from the joining insulator. A force of 2000 pounds shall be applied for 1 minute. This force shall be reduced to 1500 pounds for all Group C environmental post tests.

Step 2. Manufacturer's fixture shall be arranged which is capable of attaching to the two cones and to the balun unbalanced connector and then applying a tensile force tending to separate the balun form the feedcone structure. A force of 250 pounds shall be applied for 1 minute.

Pretest/post test. Pretest and post test shall be visual inspection. Any indication of damage or indication of separation of the assembly shall constitute failure.

4.14 Service conditions.

4.14.1 High Temperature. As a pretest, the antenna shall be subjected to the Free space VSWR test (4.15.1). Raise the internal chamber temperature to + 63^{0}C. Maintain for six hours at + 63^{0}C. Raise internal chamber temperature to +71^{0}C with a time period of one hour and maintain at that temperature for four additional hours. The balun shall be subjected to the Balun Power test, 4.15.4, for 2 minutes. During the test all items of the antenna system shall be stored in the bag except for the balun. After exposure, conduct the following tests, Free Space VSWR, 4.15.1, Air Pressure, 4.12.4, Feedcone Structural Integrity 4.13.5, and Inspection for Physical Condition 4.12.1 (See 3.8.1.1)

4.14.2 Low Temperature. As a pretest, the antenna shall be subjected to the Free space VSWR test 4.15.1. Lower the inter chamber temperature to -57^{0}C for a period of not less than 2 hours following stabilization of the equipment or until 24 hours have elapsed whichever occurs first. The chamber temperature shall be adjusted to -45.6^{0}C for not less than 4 hours after stabilization of the test item. The balun shall be subjected to the Balun power test, 4.15.4, for 2 minutes. During the test, all items of the antenna system shall be stored in the bag except for the balun. After exposure, conduct the following test, Free Space VSWR, 4.15.1, Air Pressure 4.12.4, Feedcone Structural Integrity 4.13.5 and Inspection for Physical Condition 4.12.1. (see 3.8.1.2)

4.14.3 Humidity.(see 3.8.3). The number of temperature - humidity cycles (total test time) is critical in achieving the purpose of the test. A minimum of 10 cycles is recommended to reveal potential test item problems. After a short period of testing has elapsed, the test item shall be given a visual inspection and operational checkout and a decision made to continue or stop the test. A complete test cycle is still required on the test item but is not recommended for the some failed unit. The test procedure to be used is as follows:

a. The equipment shall be arranged in the test chamber with the balloon, feedcone structure and the six innermost radiating elements assembled together. Other radiating element shall be assembled in pairs as in use. Other parts and the bag shall be arranged in the chamber so that the parts are unprotected by the bag. As a pretest, the antenna shall be removed from the chamber and subjected to the Free Space VSWR test of 4.15.1. Following the VSWR test the equipment shall be returned to the chamber.

b. Gradually raise the internal chamber temperature to 60^0C (140^0F) and the relative humidity to 95% ± 5% over a period of two hours.

c. Maintain the conditions for not less than six hours.

d. Maintain 85% relative humidity and reduce the internal chamber temperature in eight hours to 30^0C (86^0F) and 95% ± 5% relative humidity.

e. Maintain the 30^0C (86^0F) and 95% ± 5% relative humidity for an additional eight hours. Repeat steps b, c, d and e for a total 10 cycles.

f. At the end of the fifth and tenth cycle operate the test item and obtain and record results.

The equipment shall be removed from the chamber and the following test conducted: RF power capability, 4.15.3, Dielectric withstanding voltage 4.15.5, Air Pressure 4.12.4, Free Space VSWR, 4.15.1. The equipment shall also be subjected to feedcone structure integrity 4.13.5, and to the Inspection for Physical Condition 4.12.1. Particular attention shall be given to the effectiveness of anti-corrosion compound used on mast section threaded joints and to the effectiveness of corrosion resistant design at the joint between the mast sections and the feedcone structure. (3.8.2)

4.14.4 Antenna Gain. The gain of the antenna is the ratio of the radiation intensity of the antenna in a given direction, usually on the horizon, to the maximum radiation intensity of a lossless reference antenna, usually a half-wave dipole, with same input power. Method is in accordance with Electronic Industries Association Standards RS-239 except that the standard antenna shall conform to 4.12 and the antenna under test shall be full scale size. Test frequencies shall be at least every 2 MHz over the required frequency range and shall be sufficient so that a plot of gain no frequency will faithfully involve maximum and minimum points within the range (3.6.5)

4.14.5 Drop. The antenna system with all components stored in the bag shall be subjected to the drop test. After pretest, the antenna shall be subjected to the Free Space VSWR test 4.15.1. The test item shall be in its transit case and the floor receiving the import shall be 2 inch plywood looked by concrete. The test item shall be dropped 48 inches on each face, edge and corner for a total of 26 drops. After completion of the test, conduct the following tests, RF power capability, 4.15.3, Free Space VSWR, 4.15.1, Air Pressure, 4.12.4, Feedcone structural integrity, 4.13.5, and Inspection for Physical Condition 4.12.2. (3.8.7)

4.14.6 Wind Load. The antenna system shall be subjected to the load test of Figure 2. Inspection for physical condition, 4.12.1, shall be conducted as pretest and post test (3.8.8)

4.14.7 Immersion. Remove technical manual, cable assembly CG-1889C/U, electrical tape, and anti-corrosion compound. As a pretest the antenna system shall be subjected to the Free Space VSWR Test, 4.15.1. After pretest the antenna system shall be stowed in its bag and immersed in water so that the uppermost point of the bag is at least 36 inches below the surface of the water. Immersion shall continue for at least 2 hours. On removal from the water, the antenna system shall be subjected to post test procedures without being dried in any manner other than induced by necessary handling. Post tests shall be completed within 4 hours after removal. Post tests, to be done in the following sequence, shall be: RF Power Capability, 4.15.3, inspection 4.12.2, and Free Space VSWR, 4.15.1. During Inspection for physical condition the balun shall be checked for leakage of moisture by opening the air test vent and orienting the balun to allow drainage. Presence of moisture shall constitute a failure.

4.15 Supplementary Tests.

4.15.1 Free Space VSWR. This test is to be conducted where otherwise specified as part of service condition tests. Method of measurement is in accordance with Electronic Industries Association Standard RS-239 except that the measurement shall be performed with a vector impedance meter or other instrument or equivalent accuracy. (3.6.4)

4.15.2 Inspection for Physical Condition. Inspection is to be conducted where otherwise specified as part of service condition tests by visual inspection. Method is by visual inspection.

4.15.3 RF power capability. This test is to be conducted where otherwise specified as part of service condition tests. The feedcone structure, balun, insulating extension and uppermost support mast section shall be connected together. A load impedance shall be connect across the two sections of the feedcone structure. The load shall be such that VSWR, referenced to 50 ohms, is less than 3 to 1 at the balun unbalanced connection. Since the manner of the test set-up may introduce stray inductance or capacitance, load reactance may be tuned out. Electrically include the insulating extension in the test, a ground connection shall be completed between the support mast section and the ground side of the unbalanced balun connector. Three hundred fifty watts of power shall be applied to the assembly at the balun unbalanced connector. The power source shall be a continuous wave, radio frequency source having a nominal output impedance of 50 ohm. The test frequency shall be at the high end of the specified frequency range. Power shall be applied for period of 2 minutes. During the period when power is applied, the insulation material shall be observed for evidence of RF flashover or leakage. After power is removed the insulation material shall be inspected for evidence of RF flashover or leakage. Evidence of RF flashover or leakage shall constitute a failure. The test shall be completed within 1 hour of the time of completion of exposure to the environmental condition tests of 4.15.1, 4.15.5, 4.11.6, 4.11.1, 4.11.2, 4.11.3 (3.6.7)

4.15.4 Balun Power. This test is to be conducted where otherwise specified as part of service condition tests. For convenience of test instrumentation, two baluns are employed in the test with the balanced sides joined together by the shortest possible connections. Both baluns are subjected to the service condition tests of 4.12.2, 4.12.3, 4.12.4, 4.11.1, 4.11.2, 4.11.3,4.11.5 and the results are adjusted to account for the doubling of effects of the test. Power from a radio frequency source having a 50 ohm output impedance shall be fed to the unbalanced side of one balun through an in-line RF Wattmeter capable of measuring forward and reverse power. The unbalanced side of the second balun shall be connected to an RF Wattmeter having a 50 ohm load impedance. The signal source shall be adjusted to supply 350 watts forward power at the in-line wattmeter. VSWR shall be measured at the in-line wattmeter and coupling efficiency shall be observed by measuring power at the load wattmeter. (3.6.9.1, 3.6.9.2, 3.6.9.3)

4.15.5 Dielectric Withstanding Voltage. To be conducted where otherwise specified as part of service condition tests. (3.6.8)

5. PACKAGING

5.1 Packaging. For acquisition purposes, the packaging requirements shall be as specified in the contract or order (see 6.2). When actual packaging of material is to be performed DoD personnel, these personnel need to contact the responsible packaging activity to requisite packaging requirements. Packaging requirements are maintained by the Inventory Control Point’s packaging activity within the Military Department of Defense Agency, or within the Military Department’s System Command, Packaging data retrieval is available from the managing Military Department’s or Defense Agency’s automated packaging files, CD-ROM products, or by contacting the responsible packaging activity.

6. NOTES

(This section contains information of a general or explanatory nature that may be helpful, but is not mandatory.)

6.1 Intended use. Antenna Group OE-254( )/GRC is intended for use with Radio Sets AN/VRC-12, AN/VRC-43 through AN/VRC-49, AN/VRC-53, AN/VRC-64, AN/GRC-125, AN/GRC-160, and SINCGARS.

6.2 Acquisition requirements. Acquisition documents must specify the following:

a. Title, number, date of this specification.

b. Issue of DODISS to be cited in the solicitation, and if required, the specific issue of individual documents referenced (see 2.1)

c. Packaging requirements (see 5.1)

d. Place of first article inspection

6.3 First Article. When first article inspection is required, the contracting officer should provide specific guidance to offerors whether the items(s) should be a preproduction sample, a first article sample, a first production items, a sample selected from the first production items, a standard production item from the contractor's current inventory (see 3.2), the number of items to tested as specified in 4.2. The contracting officer should also include specific instructions in the acquisition documents regarding arrangements for examinations, approval of first article test results, and disposition of first article. Invitations for bids should provide that the Government reserves the right to waive the requirement for samples for first article inspection to those bidders offering a product which has been previously acquired or testing by the Government, and that bidders offering such products, who wish to rely on such production or test, must furnish evident with the bid that prior Government approval is presently appropriate for the pending contract. Bidder should not submit alternate bids unless specifically requested to do so in the solicitation.

6.4 Group C inspection. Approval to ship may be withheld, at the discretion of the Government, pending the decision from the Contracting Officer on the adequacy of corrective action.

6.5 Government-furnished property. The contracting officer should arrange to furnish the property listed in 3.7.1.1.

6.6 Subject term (key word) listing.

cable assembly
gages
mast assembly
mast section

6.7 References.

DRAWING	
DL-SM-B944750	Antenna Group OE-254/GRC

6.8 Changes from previous issue. Marginal notations are not used in this revision to identify changes with respect to the previous issue due to the extensiveness of the changes.

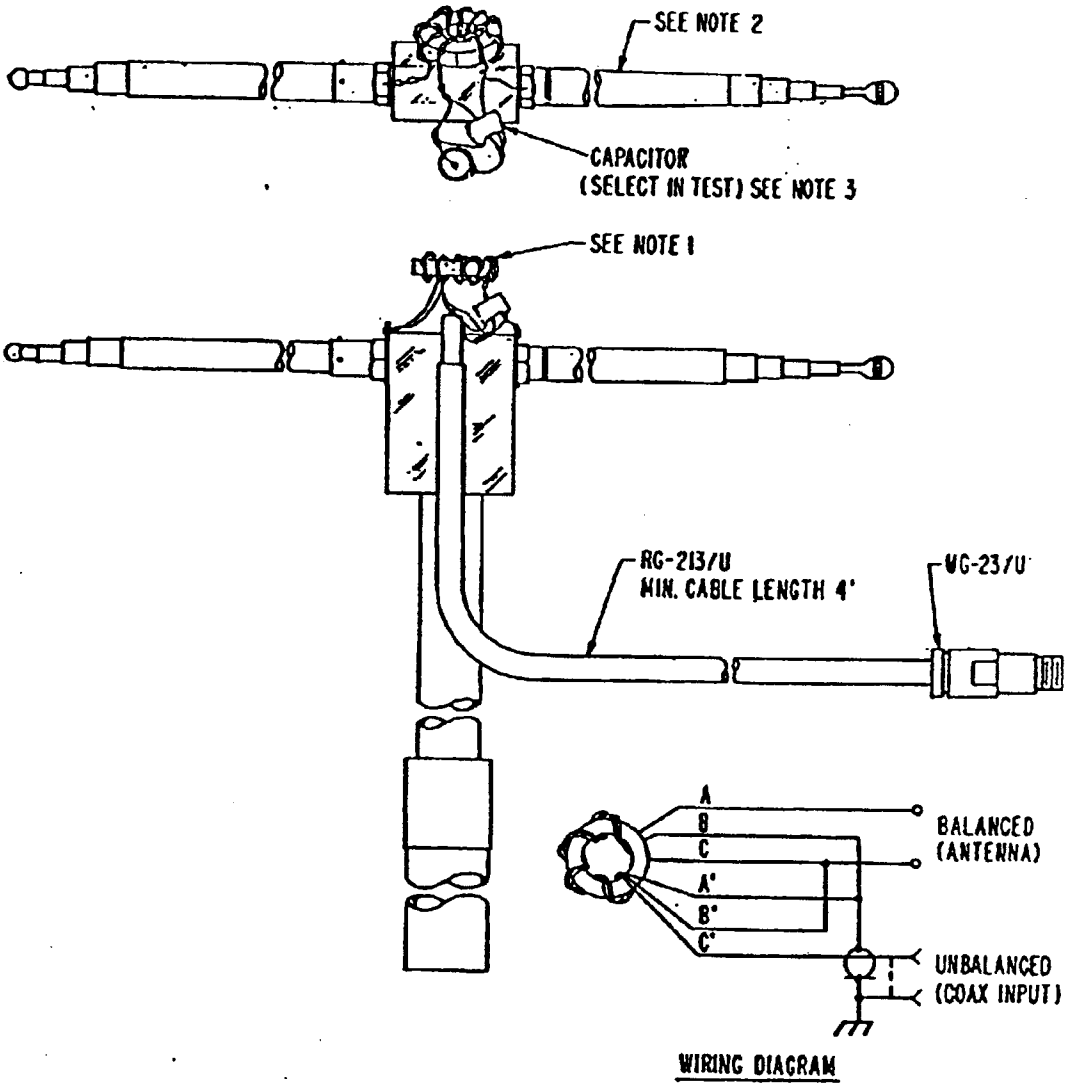
Custodian

Army - CR

Preparing Activity

Army - CR

Project 5985-1085



NOTES:

1- INDIANA GENERAL PART # F624-19,02, FERRAMIC TOROID OR EQUAL WITH 10 TURNS # 18 ENAMELED WIRE, TRIFILAR WINDING.
2- WHIP SECTIONS MUST EXTEND ANYWHERE FROM 2.5 FEET TO 8.5 FEET TO ADJUST TO FREQUENCY OF MEASUREMENT.
3- VALUE OF CAPACITOR TO BE SELECTED SO AS VSWR OF THE BALUN IS H ACROSS THE FREQUENCY RANGE OF THE BALUN.

Figure 1. Reference Dipole Antenna

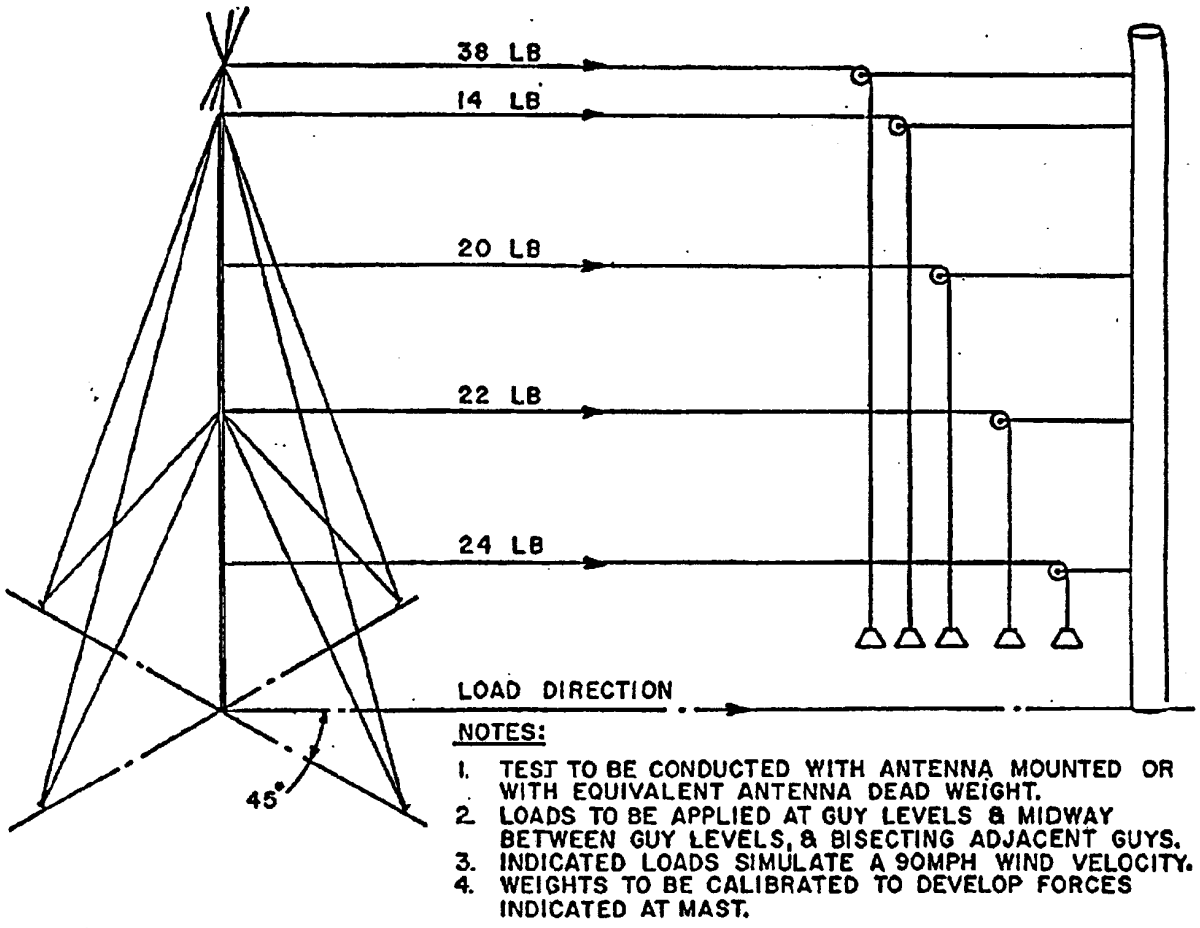


Figure 2. Antenna Group OE-254( )/GRC Wind Load Test

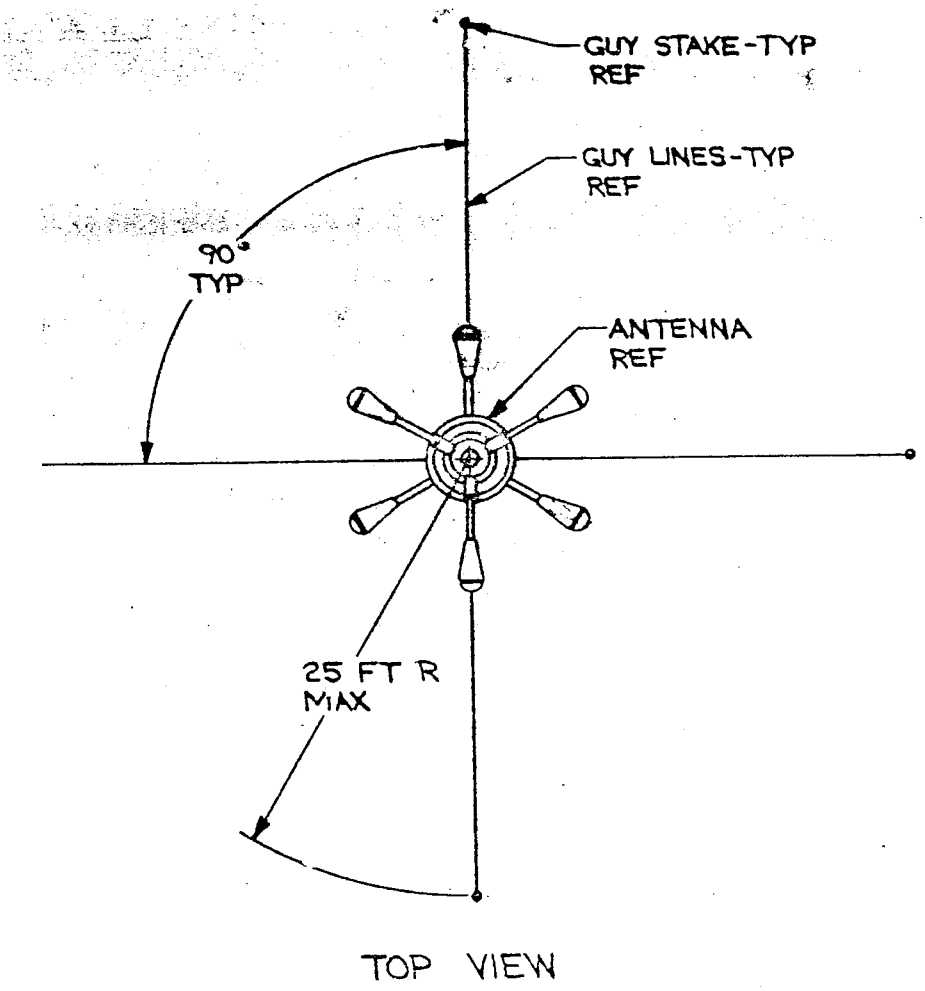


Figure 3. Erection View - OE-254/GRC

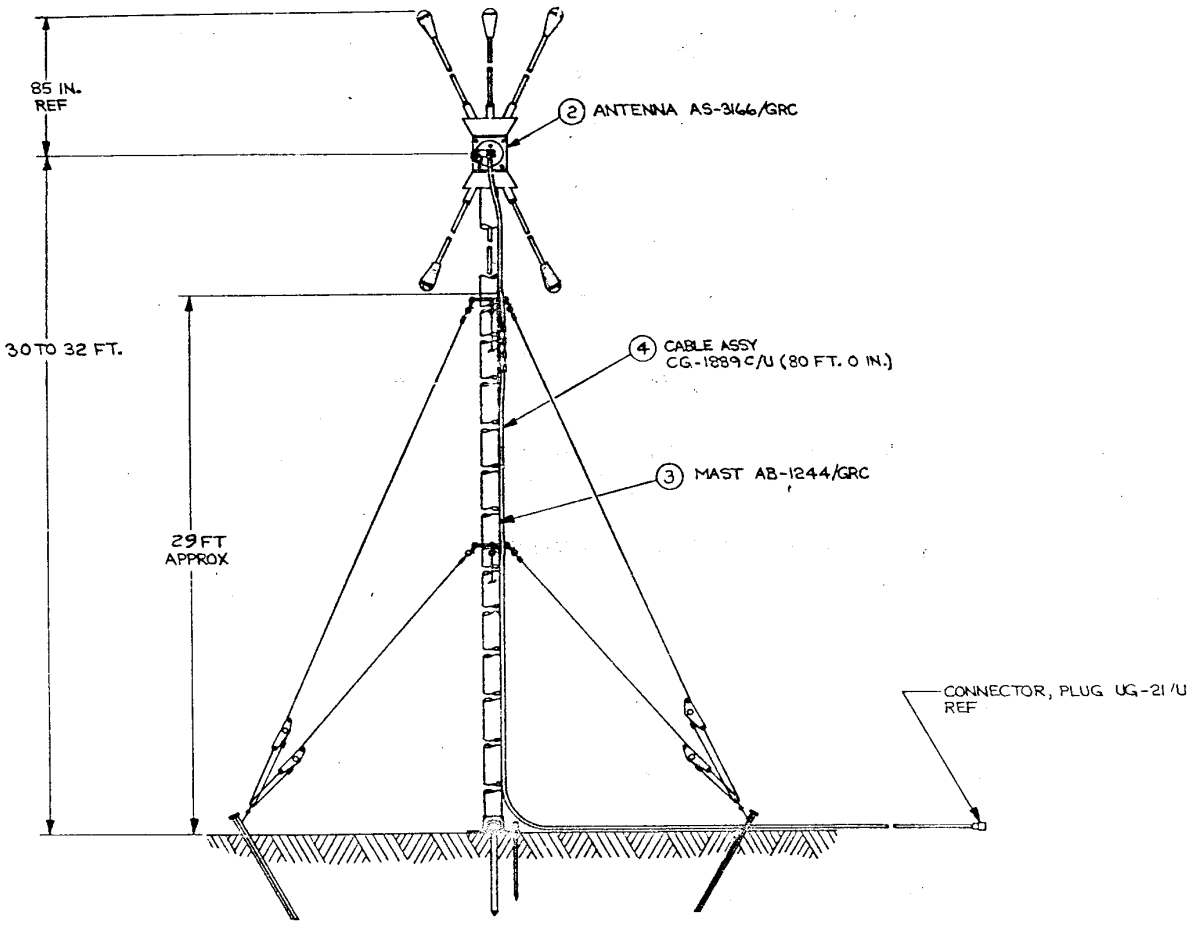


Figure 4. Erection View - OE-254/GRC

STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

INSTRUCTIONS

1. The preparing activity must complete blocks 1, 2, 3, and 8. In block 1, both the document number and revision letter should be given.

2. The submitter of this form must complete blocks 4, 5, 6, and 7.

3. The preparing activity must provide a reply within 30 days from receipt of the form.

NOTE: This form may not be used to request copies of documents, nor to request waivers, or clarification of requirements on current contracts. Comments submitted on this form do not constitute or imply authorization to waive any portion of the referenced document(s) or to amend contractual requirements.

I RECOMMEND A CHANGE:	**1. DOCUMENT NUMBER** MIL-PRF-49204B	**2. DOCUMENT DATE (YYMMDD)** **970519**

3. DOCUMENT TITLE **Antenna Group OE-254/GRC**

4. NATURE OF CHANGE (Identify paragraph number and include proposed rewrite, if possible. Attach extra sheets as needed.)

5. REASON FOR RECOMMENDATION

6. SUBMITTER

a. NAME (Last, First, Middle initial)	b. ORGANIZATION	
c. ADDRESS (Include Zip Code)	d. TELEPHONE (Include Area Code) (1) Commercial (2) AUTOVON (If applicable)	7. DATE SUBMITTED (YYMMDD)

8. PREPARING ACTIVITY

a. NAME US Army Communications-Electronics Command	b. TELEPHONE (Include Area Code) (1) Commercial (908) 427-3441 (2) AUTOVON 987-3441
c. ADDRESS (Include Zip Code) ATTN: AMSEL-LC-LEO-E-EP Fort Monmouth, NJ 07703-5023	**IF YOU DO NOT RECEIVE A REPLY WITHIN 45 DAYS, CONTACT:** Defense Quality and Standardization Office 5203 Leesburg Pike, Suite 1403, Falls Church, VA 22041-3466 Telephone (703) 756-2340 AUTOVON 289-2340

DD Form 1426, OCT 89 Previous editions are obsolete 198/290