MILITARY SPECIFICATION

RESTORATION

SHIPBOARD ELECTRONIC EQUIPMENT

F, 1N AND 2N COGNIZANCE

1. SCOPE

1.1 Scope. This specification covers the general requirements applicable to the restoration of electronic equipment and associated and auxiliary electronic apparatus furnished as part of a complete system intended for Naval ship applications. The intent of this specification is to set forth the ambient conditions within which equipment shall operate satisfactorily and reliably; the general material, the process for selection and application of parts, and to detail the means by which equipment as a whole will be tested to determine whether it will so operate. Throughout the restoration of the equipment, maximum effort shall be made to retain the basic design objectives in that the equipment will meet the needs of the Naval service. Requirements applicable to individual equipments shall be as specified in the following:

(a) Equipment technical manuals.
(b) Equipment or assembly overhaul and repair manuals (O and R manuals).
(c) Electronics installation and maintenance books (EIMB), NAVSHIPS 0967-000-0000.
(d) Electronics installation Bulletin (EIB), NAVSHIPS 0967-001-XXXX.
(e) NAVSHIPS technical manual, NAVSHIPS 0901-000-0020.

1.1.1 Basic restoration philosophy. The restoration philosophy for Naval electronic equipment is to utilize the latest production techniques with the objective of increasing reliability, making the equipment easier to maintain and to reduce overall cost.

1.2 Classification. Electronic equipment covered by this specification shall be of the following classes:

Class 1 - Temperature operating range minus 54° to plus 65°C. (ambient) shore exposed.
Class 2 - Temperature operating range minus 28° to plus 65°C. (ambient) ship exposed.
Class 3 - Temperature operating range minus 40° to plus 50°C. (ambient), ship and shore, sheltered, unheated.
Class 4 - Temperature operating range 0° to plus 50°C. (ambient), ship and shore, housed heated.

2. APPLICABLE DOCUMENTS

2.1 The following documents of the issue in effect on date of invitation for bids or request for proposal, form a part of the specification to the extent specified herein.

SPECIFICATIONS

FEDERAL

F-P-300	- Filter, Air Conditioning, Viscous-Impingement and Dry Types, Cleanable.
L-P-387	- Plastic Sheet, Laminated, Thermosetting (for Designation Plates).
FF-B-171	- Bearings, Ball, Annular, (General Purpose).
FF-B-185	- Bearings, Roller, Cylindrical; and Bearings, Roller, Self-Aligning.
FF-B-187	- Bearing, Roller, Tapered.
FF-S-85	- Screw, Cap, Slotted and Hexagon-Head.
FF-S-86	- Screws, Cap, Socket-Head.
FF-S-92	- Screws, Machine: Slotted Cross-Recessed or Hexagon Head.
FF-S-103	- Setscrews.
FF-S-107	- Screws, Tapping and Drive.
QQ-A-591	- Aluminum Alloy Special Shaped Section.
QQ-A-596	- Aluminum Alloy Permanent and Semipermanent Mold Castings.
QQ-A-601	- Aluminum Alloy Sand Castings.
QQ-C-320	- Chromium Plating (Electrodeposited).
QQ-N-290	- Nickel Plating (Electrodeposited).
QQ-P-416	- Plating, Cadmium (Electrodeposited).
QQ-S-365	- Silver Plating, (Electrodeposited, General Requirements for.
QQ-S-763	- Steel Bars, Wire Shapes, and Forgings, Corrosion-Resisting.
QQ-Z-325	- Zinc Coating, Electrodeposited, Requirements for.

...CIFICATIONS

FEDERAL (Cont.)

TT-C-490 - Cleaning Methods and Pretreatment of Ferrous Surfaces for Organic Coatings.
TT-E-485 - Enamel, Semi-Gloss, Rust-Inhibiting.
TT-P-664 - Primer, Coating, Synthetic, Rust-Inhibiting, Lacquer Resisting.
CCC-C-428 - Cloth, Duck, Cotton; Fire, Water, Weather, and Mildew Resistant.

MILITARY

MIL-E-1 - Electron Tubes, General Specification for.
MIL-C-5 - Capacitors, Fixed, Mica-Dielectric, General Specification for.
MIL-I-10 - Insulating Materials, Electrical, Ceramic, Class L.
MIL-M-14 - Molding Plastics and Molded Plastic Parts, Thermosetting.
MIL-B-18 - Batteries Dry.
MIL-T-27 - Transformers and Inductors (Audio, Power and High Power Pulse) General Specification for.
MIL-S-61 - Shunts, Instrument, External, 50-Millivolt (Lightweight Type).
MIL-W-80 - Window, Observation, Acrylic Base, Antielectrostatic, Transparent (for Indicating Instrument).
MIL-I-631 - Insulation, Electrical, Synthetic-Resin Composition, Nonrigid.
MIL-T-713 - Twine, Impregnated, Lacing and Tying.
MIL-B-857 - Bolts, Nuts and Studs.
MIL-S-867 - Steel Castings, Corrosion Resisting, Austenitic.
MIL-R-900 - Rubber Gasket Material, 45 Durometer Hardness, for Moderately Low Temperature Service.
MIL-C-915 - Cable, Electrical, Special Purpose, General Specification for.
MIL-T-981 - Transformer, Power, Voltage Regulating.
MIL-M-2130 - Motor-Generators, General Purpose (Naval Shipboard Use).
MIL-C-2194 - Cables, Power and Control, Reduced Diameter Types (Shipboard Use).
MIL-R-2765 - Rubber Sheet, Strip, Extruded, and Molded Shapes, Synthetic, Oil Resistant.
MIL-M-3171 - Magnesium Alloy; Processes for Pretreatment and Prevention of Corrosion On.
MIL-I-3190 - Insulating Sleeving, Electrical, Flexible Treated.
MIL-S-3786 - Switches, Rotary (Circuit Selector, Low Current Capacity), General Specification for.
MIL-C-3871 - Capacitors Fixed, Electrolytic (A.C., Dry-Electrolytic, Non-polarized).
MIL-S-3950 - Switches, Toggle, General Specification for.
MIL-C-5015 - Connectors, Electric, "AN" Type.
MIL-P-5425 - Plastic, Sheet, Acrylic, Heat Resistant.
MIL-C-5541 - Chemical Films and Chemical Film Materials for Aluminum and Aluminum Alloys.
MIL-F-5591 - Fasteners; Panel.
MIL-R-5757 - Relays (Electrical(Excluding Thermal) for Electronic and Communication-Type Equipment), General Specification for.
MIL-R-6106 - Relays, Electric, Aircraft, General Specification for.
MIL-I-7444 - Insulation Sleeving, Electrical, Flexible.
MIL-I-7798 - Insulation Tape, Electrical, Pressure-Sensitive Adhesive, Plastic.
MIL-T-7928 - Terminals, Lug: Splices, Conductor: Crimp Style, Copper, General Specification for.
MIL-P-8585 - Primer Coatings, Zinc Chromate, Low-Moisture-Sensitivity.
MIL-A-8625 - Anodic-Coatings, for Aluminum and Aluminum Alloys.
MIL-S-8805 - Switches, and Switch Assemblies, Sensitive and Push (Snap Action) General Specification For.
MIL-S-8834 -Switches, Toggle, Positive Break, Aircraft, General Specification for.
MIL-M-10304 - Meters, Electrical Indicating, Panel Type, Ruggedized, General Specification for.
MIL-C-11693 - Capacitors, Feed Through Radio-Interference Reduction, AC and DC (Hermetically Sealed in Metallic Cases.) General Specification.
MIL-P-15024 - Plates, Identification, Information and Marking for Identification of Electrical, Electronic and Mechanical Equipment.
MIL-B-15072 - Batteries, Storage, Lead-Acid, Portable, General Specification for Naval Shipboard Use.

SPECIFICATIONS

MILITARY (Cont.)

- MIL-E-15090 - Enamel, Equipment, Light-Gray (Formula No. 111).
- MIL-I-15126 - Insulation Tape, Electrical, Pressure Sensitive Adhesive and Pressure Sensitive Thermosetting Adhesive.
- MIL-F-15160 - Fuses, Instrument, Power and Telephone.
- MIL-S-15291 - Switches, Rotary, Snap Action.
- MIL-P-15328 - Primer (Wash), Pretreatment, Blue (Formula No. 117-B for Metals).
- MIL-C-15370 - Couplers, Directional. (Coaxial and Waveguide) General Specification for.
- MIL-B-15395 - Brazing Alloys, Silver.
- MIL-F-15733 - Filters, Radio Interference, General Specification for.
- MIL-B-16540 - Bronze, Phosphor: Castings.
- MIL-F-16552 - Filters, Air Environmental Control System, Cleanable, Impingement (High Velocity Type).
- MIL-W-16878 - Wire, Electrical, Insulated, High Temperature.
- MIL-W-16878/1 - Wire, Electrical, Type B, 105°C., 600 Volts, (Insulated, High Temperature).
- MIL-W-16878/2 - Wire, Electrical, Type C, 105°., 1000 Volts, (Insulated, High Temperature).
- MIL-W-16878/3 - Wire, Electrical, Type D, 105°C., 3000 Volts, (Insulated, High Temperature).
- MIL-M-17059 - Motors, 60 Cycle, Alternating-Current, Fractional HP (Shipboard Use).
- MIL-M-17060 - Motors, 60 Cycle, Alternating-Current, Integral Horsepower (Shipboard Use).
- MIL-M-17413 - Motor, Direct Current, Integral H.P., Shipboard Use.
- MIL-E-17555 - Electronic and Electrical Equipment, Accessories, and Repair Parts; Packaging and Packing of.
- MIL-M-17556 - Motor Direct-Current, Fractional HP (Shipboard Use).
- MIL-B-17931 - Bearings, Ball, Annular, for Quiet Operation.
- MIL-F-18327 - Filters: High Pass, Low Pass, Band Pass, Band Suppression, and Dual Functioning.
- MIL-C-18388 - Coils, Tube Deflection; and Coils, Tube Focusing.
- MIL-M-19097 - Motor-Generators, DC to AC, Shipboard Service.
- MIL-S-19500 - Semiconductor Devices. General Specification for.
- MIL-R-19648 - Relays, Thermal, Time Delay, Hermetically Sealed. General Specification For.
- MIL-S-20708 - Synchros, 60 and 400 cycle, General Specification.
- MIL-A-21180 - Aluminum-Alloy Castings, High Strength.
- MIL-F-21346 - Fuseholders, Block, Plug and Shroud Type, and Associated Fuse Clips, General Specification For.
- MIL-S-21604 - Switches, Rotary, Multipole and Selector Type, 1 to 10 Amperes.
- MIL-S-22473 - Sealing, Locking and Retaining Compounds: Single Component.
- MIL-S-22710 - Switches, Rotary, (Printed Circuit), General Specification For.
- MIL-S-22885 - Switch, Push Button, Illuminated, General Specification for.
- MIL-N-25027 - Nut, Self-Locking, 250°F., 450°F., and 800°F., 125 KSI FTU, 60 KSI FTU, and 30 KSI FTU.
- MIL-G-45204 - Gold Plating, Electrodeposited.
- MIL-I-46058 - Insulating Compound, Electrical (For Coating Printed Circuit Assemblies).
- MIL-T-55164 - Terminal Boards, Molded, Barrier, Screw and Stud Fuses, and Associated Accessories, General Specification For.

STANDARDS

MILITARY

- MIL-STD-200 - Electron Tubes; Selection and Use of.
- MIL-STD-242 - Electronic Equipment Parts (Selected Standards).
- MIL-STD-275 - Printed Wiring for Electronic Equipment.
- MIL-STD-454 - Standard General Requirements for Electronic Equipment.
- MIL-STD-681 - Identification Coding and Application of Hookup Wire.
- MIL-STD-701 - Lists of Standard Semiconductor Devices.
- MIL-STD-736 - Unitized Equipment Design.
- MIL-STD-749 - Preparation and Submission of Data For Approval of Nonstandard Electronic Parts.
- MS 24693 - Screw, Machine, Flat Countersunk Head, 100°, Cross Recessed, UNC-2A and UNF-2A.

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MILITARY
MIL-HDBK-216 - R.F. Transmission Lines and Fittings.

PUBLICATION

NAVAL ORDNANCE SYSTEMS COMMAND
OP-1303 - U.S. Navy Synchros; Description and Operation.

(Copies of specifications, standards, drawings, and publications required by suppliers in connection with specific procurement functions should be obtained from the procuring activity or as directed by the contracting officer.)

3. REQUIREMENTS

3.1 Restoration objectives. The basic restoration objectives are that the equipment will meet the needs of the Naval service and that the final product will have maximum reliability consistent with the state of the art and be easy to install and maintain.

3.1.1 Needs of the Naval Service. The equipment shall be restored to withstand continuous use for long periods under Naval service conditions, without benefit of overhaul and with limited maintenance. The environmental conditions are outlined herein and the functional and performance requirements are set forth in the individual equipment technical manual, O and R manual EIMB and EIB.

3.1.2 Reliability. Equipment reliability studies continue to verify that the majority of equipment failures can be traced to the improper selection and application of parts, failure to establish standard procedures and the use of inadequate industrial processes. To assure that the equipment will meet the requirements of Naval service, it is imperative that reliability of operation be considered of prime importance in the restoration of the equipment. The restoration activity shall employ all methods possible in the process of restoration which will assure quality and maximum reliability consistent with the state of the art.

3.1.3 Process. Because a restored equipment must meet the criteria for new equipment in all respects, the methods and standards by which it is restored must necessarily reflect procedures oriented to a manufacturing type of operation rather than a custom repair type of operation. The requirements specified hereinafter, while neither all inclusive nor restrictive, provide the general requirements for the restoration of electronic equipment.

3.2 Equipment for restoration. All equipment authorized for restoration shall be complete as specified in the applicable equipment technical manual. The complete equipment shall include ancillary items, special installation hardware, wire, cable, coaxial cable, tools and connectors. The equipment shall not include common installation hardware, wire, cable, coaxial cable, solid coaxial lines, waveguide and fittings unless specified by the Restoration Program Manager.

3.3 Disassembly. All equipment shall be completely disassembled prior to restoration. The disassembled equipment, units, assemblies and parts shall be critically examined for conformance and suitability for reuse.

3.4 Parts and modular assemblies. All defective parts and modular assemblies shall be replaced with new parts possessing the physical, functional and reliability characteristics of the original parts and modular assemblies. Selection of replacement parts and modular assemblies shall be as specified hereinafter (see 3.4.1 through 3.4.35).

3.4.1 In the functional application of parts to equipment circuits, the restoration activity shall:

(a) Take the necessary precautions to assure the part is being applied within its thermal, mechanical and electrical ratings.
(b) Provide the necessary deratings in order to assure equipment reliability under the specified operating conditions.

3.4.2 Selection of parts. All parts used in the restoration of F, 1N and 2N Cognizance electronic equipment shall be in accordance with the requirements specified herein. The selection of parts in accordance with the following order is mandatory:

(a) The equipment technical manual, O and R manual, EIMB or EIB.
(b) MIL-STD-242.

3.4.3 Nonstandard parts. All nonstandard parts shall be approved by the Restoration Program Manager prior to use.

3.4.4 Individual selection. The performance of restored equipment shall not be dependent on the selection of individual electron tubes or other parts, except as specified in the equipment technical manual, O and R manual, EIMB or EIB.

3.4.5 Tolerances. In the selection of parts, other than those specified in 3.4.2, the widest tolerances permitted by the individual part specification commensurate with the particular long term stable circuit application requirement shall be used. However, in the restoration of the equipment, it is permissible to substitute parts of closer tolerances as long as interchangeability is not affected, provided such parts are available in the supply system.

3.4.6 Miniature parts. The use of miniature parts to the maximum degree practicable is desired, in order to achieve overall reduction in the size and weight of equipments. Where such parts are not set forth in Military specifications, the vendor shall supply to the restoration activity the data shown in MIL-STD-749, including environmental and electrical test data to establish the suitability of such parts for use in the specific electronic equipment. These parts shall be capable of being replaced, unless such parts are contained in unrepairable assemblies.

3.4.7 Batteries. Batteries required by the individual equipment shall be arranged for rigid mounting and adequate provision shall be made for removal and replacement of deteriorated batteries without damage to the equipment. Adequate protection shall be provided so that no injury to the equipment will result either in normal or deteriorated state. The battery compartment shall be marked to indicate connections, polarity, voltage, and manufacturers' or military type designation of batteries required. Batteries shall not be installed in restored equipment but shall be packed separately.

3.4.7.1 Dry. Dry batteries shall conform to MIL-B-18.

3.4.7.2 Wet. Portable wet cell storage batteries shall conform to MIL-B-15072.

3.4.8 Bearings. Bearings shall be in accordance with requirement 6 of MIL-STD-454 and as specified in 3.4.8.1 through 3.4.8.4.

3.4.8.1 Bearings, ball. Ball bearings shall be in accordance with FF-B-171. They shall be applied and installed in accordance with the recommendations of that specification.

3.4.8.2 Bearings, roller. Roller bearings shall be in accordance with FF-B-185 or FF-B-187 and shall be applied and installed in accordance with the recommendations of these specifications.

3.4.8.3 Bearings, sleeve-type. Sleeve-type bearings, when used, shall be constructed of oil-impregnated phosphor bronze. Means for replenishing oil reserves as required by the intended service shall be provided in accordance with the bearing manufacturers' recommendations.

3.4.8.4 Bearings, quiet operation. Where required, quiet operation bearings shall conform to MIL-B-17931.

3.4.9 Wire and cable.

3.4.9.1 Wiring and harnesses. All hook-up wire and wire harnesses in restored equipment shall be replaced if:

(a) The existing wire does not meet or exceed the requirements of MIL-W-16878.
(b) The existing wire has been performing in ambient operating temperatures equal to or exceeding 80 percent of its permissible temperature limit.
(c) The existing wire is burned, brittle frayed, worn or otherwise defective.
(d) There is any reason to doubt that the existing wire will not perform satisfactorily in all respects for an additional period of 5 years.

3.4.9.2 Hook-up wire. Hook-up wire shall conform to MIL-W-16878. Type B of MIL-W-16878/1 shall have a nylon cover over the insulation. Types C of MIL-W-16878/2 and D of MIL-W-16878/3 shall have a nylon cover over the insulation when bound into a harness or tight assembly which operates near the permissible temperature limit. For other applications, the use of the nylon jacket shall be at the option of the restoring activity.

3.4.9.3 Identification (color) coding. Identification (color) coding shall be used for all chassis wiring and shall duplicate the identification (color) coding used in the existing wiring or conform to MIL-STD-681 except in digital equipments where signal carrying miscellaneous wires shall be solid colors. The use of solid white wire stenciled to indicate color coding is acceptable.

3.4.9.4 Interconnecting cable. Interconnecting cables shall be replaced on all equipment, units, subassemblies and assemblies that are normally installed so as to be exposed to salt water spray and stack gases. Replacement cables for all interconnections, power, audio and similar applications shall be of the same type originally installed or a substitute selected from MIL-C-915 or MIL-C-2194 and shall meet the requirements specified therein.

3.4.10 Capacitors.

3.4.10.1 Fixed capacitors.

3.4.10.1.1 Dry-electrolytic (aluminum foil). Consideration for the use of dry-electrolytic (aluminum foil) capacitors shall be restricted to power filter applications. If used, dry-electrolytic (aluminum foil) capacitors shall be of the plug-in type with a retaining device. These capacitors shall not be used where the equipment is required to operate in an ambient temperature of less than minus 40°C.

3.4.10.1.2 Electrolytic (a.c. dry-electrolytic, nonpolarized). A.c. dry-electrolytic, nonpolarized capacitors shall conform to MIL-C-3871. They shall be used only when required by the equipment technical manual.

3.4.10.1.3 Mica-dielectric (molded case, molded case potted, and ceramic case potted). Mica-dielectric capacitors (molded case, molded case potted, and ceramic case potted) shall be in accordance with MIL-C-5. For frequencies between those listed in MIL-C-5, applicable current ratings may be had by interpolation.

3.4.10.1.4 Paper-dielectric (nonmetallic cases). Paper-dielectric (nonmetallic cases) capacitors shall not be used.

3.4.10.1.5 Radio interference. Feed-through radio interference capacitors shall conform to MIL-C-11693.

3.4.10.2 Variable capacitors.

3.4.10.2.1 Air-dielectric variable (tuning). Air-dielectric variable capacitors shall be in accordance with requirement 2 of MIL-STD-454.

3.4.10.2.2 Mica compression types. Mica compression type (spring type) capacitors shall not be used.

3.4.11 Clamps. All electron tubes and other plug-in parts shall be secured with positive holding clamps and shall be capable of being easily released for replacement. These clamps shall be sufficiently sturdy to retain the parts in their proper position under the shock and vibration conditions of Naval ships as specified in the individual equipment specification.

3.4.12 Terminal boards and connectors. Stud type terminal boards and screw type barrier terminal boards shall be in accordance with MIL-T-55164.

3.4.12.1 Electrical connectors. Electrical connectors shall be in accordance with requirement 10 of MIL-STD-454.

3.4.12.1.1 Connectors, general. The mating connectors shall be furnished with all receptacles or plugs as specified in the equipment technical manual. All external mounted connector receptacles shall be provided with a suitable protective cap to prevent damage to the connector when the mating connector is not installed. The protective cap shall be affixed adjacent to the connector receptacle. The backend accessory hardware necessary to provide the moisture seal to single jacketed cable shall be furnished with each mating external connector plug.

3.4.12.1.2 Connectors, internally mounted. Connectors internal to the equipment shall be selected from the equipment technical manuals, MIL-STD-242 or shall be in accordance with MIL-C-5015.

3.4.12.1.3 Banana plugs. Banana plugs shall not be used.

3.4.12.1.4 Connectors, radio frequency. R.f. connectors shall be selected from the equipment technical manual or MIL-STD-242 from the following series: Series BNC, N, C, ODL, pulse, TPS and miniatures.

3.4.12.2 Mounting. Connectors, terminal boards, terminal strips, standoff insulators and tube sockets shall be secured only by machine screws; shall be capable of ready removal and replacement; and shall be mounted in the position that will best facilitate the testing of the equipment.

3.4.12.3 Marking. All terminal strips and boards shall be adequately marked in a permanent manner so as to identify individual terminals and facilitate replacement of connections to terminal boards. When space limitations prohibit marking on the terminal strip or board, the marking shall be on the chassis adjacent to the terminal strip or board.

3.4.13 Couplers, directional. Directional couplers shall conform to MIL-C-15370.

3.4.14 Filters.

3.4.14.1 Air. Air filters for air conditioning and ventilating systems of electronic equipment shall be of the cleanable type.

3.4.14.2 High velocity. For air velocities 550 feet per minute and over, the filters shall conform to MIL-F-16552.

3.4.14.3 Low velocity. For air velocities below 550 feet per minute, the filters shall conform to F-F-300.

3.4.14.4 Radio interference. Power line radio interference filters shall conform to MIL-F-15733.

3.4.15 Fuseholders, block and plug type, and associated electrical clips. Block and plug type fuseholders shall conform to MIL-F-21346.

3.4.16 Gaskets. Wherever practicable, surfaces designed for the application of gaskets shall have metal-to-metal contact, so that the amount of gasket compression can be accurately controlled. The inside radius of gaskets at corners of square or rectangular enclosures shall be the maximum value that will not restrict access. The minimum radius shall be consistent with the gasket material.

3.4.16.1 Material.

3.4.16.1.1 Nonoil resistant applications. Gasket material for static seals for nonoil-resistant applications (between set or unit case and cover) shall conform to MIL-R-900.

3.4.16.1.2 Oil-resistant applications. Gasket material for oil resistant applications shall conform to MIL-R-2765.

3.4.16.2 Dial window. All gaskets for dial windows shall be a continuous band of a circumference less than the glass, and shall be so arranged that when stretched over the glass, it will form over the edge and the faces of the glass in such a manner as to protect the window from mechanical shock, and also maintain the watertight integrity of the enclosure in which the dial window is mounted.

3.4.16.3 Watertight joints. All gaskets for watertight joints subjected to sea pressure, shall be so constructed as to prohibit lateral flow of the gasket material when the two members between which the gasket forms a seal are forced together by the hydrostatic pressure.

3.4.17 Inserts and pins, metallic.

3.4.17.1 Securing. Metallic inserts shall be staked in position, or secured by knurling or other method, to preclude their rotation. Inserts shall be of such design that tightening of the screw or studs, which they are intended to secure, will not result in the loosening or movement of the inserts.

3.4.17.2 Pins. Pins or slotted tubular spring pins and inserts shall be of austenitic corrosion-resistant steel, nickel-copper alloy (Monel metal), or other corrosion-resistant metal so that corrosion does not occur and affect disassembly. When a nonmagnetic material is required, austenitic corrosion-resistant steel shall be used.

3.4.17.3 Dowel pins. Dowel pins for securing aluminum or aluminum alloy parts together shall be of aluminum alloy. Dowel pins for securing materials other than, or in combination with, aluminum or aluminum alloy shall be austenitic corrosion- resistant steel.

3.4.18 Meters, electrical indicating. Electrical indicating meters shall be selected from MIL-STD-242, unless restoration requirements necessitate use of other sizes, in which case, specific approval shall be obtained from the restoration program manager.

3.4.18.1 Meters, ruggedized. Indicating meters for use in equipment required to withstand the shock of shipboard service shall be ruggedized in accordance with MIL-M-10304.

3.4.18.2 Adjustment. All panel indicating meters shall have external zero adjusters.

3.4.18.3 Meters containing radioactive material. Meters containing radioactive materials such as self-luminous markings, shall not be used.

3.4.19 Shunts. External instrument shunts shall conform to MIL-S-61.

3.4.20 Motors. Motors shall conform to service A of MIL-M-17059, MIL-M-17060, MIL-M-17413 or MIL-M-17556.

3.4.20.1 Motor rotation. All motors used shall be marked in a permanent manner to show direction of rotation where applicable to the function of the equipment.

3.4.21 Motor generators. Motor generators shall conform to MIL-M-19097 or MIL-M-2130.

3.4.22 Relays. Armature type relays shall conform to MIL-R-5757 or MIL-R-6106. All other types of relays shall be hermetically sealed with solder terminations.

3.4.22.1 Thermal time delay relays shall conform to MIL-R-19648.

3.4.22.2 Relays containing mercury in any form shall not be used (see 3.5.2.4.1).

3.4.23 Switches.

3.4.23.1 Vacuum. Vacuum switches shall be in accordance with the requirements specified in the individual equipment technical manual.

3.4.23.2 Rotary.

3.4.23.2.1 High current. High current switches shall conform to MIL-S-15291 (snap action)or MIL-S-21604 (selector).

3.4.23.2.2 Low current. Low current (up to 2 ampere) switches shall conform to MIL-S-3786.

3.4.23.2.3 Terminal identification.

3.4.23.2.3.1 Open-frame construction. Each switch section shall be marked with a dot of contrasting color on or near the periphery of the section between terminal number one and two, on the plane facing the viewer, when viewed from the rear end of the switch. The front plate shall be similarly marked on the same plane and in the same relative position. Each switch, whose sequence is arranged in a counterclockwise direction when viewed from the rear end of the switch, shall be marked with numbers designating the terminals. The terminal numbers shall be visible when viewed from the rear end of the switch. When a terminal marking plate is used, it shall also be marked with a dot of the same color, on the same plane, and in the same relative position as the individual switch sections.

3.4.23.2.3.2 Closed construction. Switches, whose sequence is arranged in a counterclockwise direction, shall be marked with numbers designating the rows of identically numbered terminals. The marking shall be visible when viewed from the rear end of the switch.

3.4.23.3 Switch assemblies and actuators; push (snap action) and limit. Switch assemblies and actuators shall be in accordance with MIL-S-8805.

3.4.23.4 Push (snap action) and limit. Push (snap action) and limit switches shall be in accordance with MIL-S-8805.

3.4.23.5 Sensitive. Sensitive switches shall be in accordance with MIL-S-8805.

3.4.23.6 Toggle. Toggle switches shall be in accordance with MIL-S-3950 or MIL-S-8834.

3.4.23.7 Push button, illuminated. Illuminated push button switches shall be in accordance with MIL-S-22885.

3.4.23.8 Printed circuit. Printed circuit switches shall be in accordance with MIL-S-22710.

3.4.23.9 Coaxial. Coaxial switches shall be selected from MIL-HDBK-216 and shall conform to the latest issue of the specification and drawings referenced therein.

3.4.23.10 Thermal. Thermal switches shall have a bi-metal sensing element and shall be factory calibrated and sealed for temperature settings. The opening and closing of contacts as to temperature shall be legibly marked on the switch or frame, as applicable.

3.4.24 Synchros. Synchros (60-and 400-cycle) shall conform to the requirements of MIL-S-20708.

3.4.25 Hardware. All hardware shall be repaired and replaced with a similar item.

3.4.25.1 Threaded devices. Threaded bolts, nuts, screws and studs employed in the restoration of equipment shall conform to FF-S-85, FF-S-86, FF-S-92, FF-S-103, FF-S-107, MIL-B-857, and MIL-N-25027.

3.4.25.1.1 Material. All screws, studs, and spade bolts and nuts shall be of an austenitic corrosion-resistant steel, a nickel-copper alloy or cold-rolled carbon steel material cadmium plated in accordance with type II, class 3 of QQ-P-416, except in those cases where the magnetic or conductivity properties of these materials are detrimental to the operation of the equipment. In such cases, brass or a nonferrous alloy of comparable strength and conductivity which is protected against corrosion shall be employed. No aluminum nuts shall be used. These requirements do not apply to parts or assemblies wherein the use of threaded devices is governed by the part or assembly.

3.4.25.2 Thread engagement. Screws and bolts in tapped parts other than nuts shall enter and have full thread engagement for an axial distance at least equal to the diameter of the externally threaded fastener without bottoming.

3.4.25.3 Thread pitch for nonstandard diameter sizes. In the case of threaded parts other than bolts, studs, screws, and nuts, which require threads of special diameter and pitch, such as for use in thin-walled tubes or screwed covers or plugs, the special pitch of 16 threads to the inch shall be employed where practicable. In case a finer pitch than 16 threads to the inch is necessary, one of the following shall be selected: 20, 28, 36, 44 or 56.

3.4.25.4 Threaded aluminum. Fine threads in aluminum alloys shall not be used, and the threading of aluminum alloy into aluminum alloy parts shall be avoided. Where aluminum alloy parts are assembled by threading, and it is necessary to take them apart in service, austenitic corrosion-resistant steel inserts shall be provided. Threaded parts (cable fittings, cap, and similar devices) shall be treated with an acceptable antiseize compound. A compound made up of equal parts by weight of petrolatum and zinc dust (200-mesh fineness) will be considered an acceptable antiseize compound.

3.4.25.5 Thread projection. Screws, secured by nuts, or other retaining devices which permit projection beyond the retaining device, shall be of such length to permit a minimum projection of 1-1/2 threads and a maximum projection of 1/8 inch plus 1-1/2 threads for screws up to and including 1 inch in length and 1/4 inch plus 1-1/2 threads for screws over 1 inch in length. These requirements shall not be construed as precluding the use of screws assembled in blind tapped holes in castings, as spacers, or where the assembly restrictions require that the screw length be such as to require that the threaded portion of the screw be flush with the retaining device.

3.4.25.6 Nonmetals. Where screw threads engage tapped holes in nonmetals, such tapped holes shall be provided with metallic inserts secured by knurling or other method which will preclude their movement.

3.4.25.7 Tapping screws. Thread-cutting screws shall not be used, except as direct replacement. The use of thread-cutting cadmium-plated steel screws is acceptable when used to secure identification plates to the equipment. These screws shall be in accordance with FF-S-107.

3.4.25.8 Spade bolts. Spade bolts may be used where applicable, but the method used to attach the spade bolts shall be such that failure of the rivets, bolts, or spot welds used for attachment purposes shall not occur prior to failure of the material of either the bolt or the part to which it is attached.

3.4.25.9 Socket-head set-screws. Socket-head set-screws shall conform to FF-S-103. The use of other than the hexagon socket set-screw, type III, shall require the approval of the Restoration Program Manager. Unless a specific type of point is required for the application, the style 4 cup point shall be used. All set-screws used in a set shall have one type of head. Two set-screws not less than 90 degrees nor more than 125 degrees apart shall be used for each application. The standard length of set-screws shall be 3/16 inch, 1/4 inch, 5/16 inch, 3/8 inch, 7/16 inch, 1/2 inch, 5/8 inch, 3/4 inch, 1 inch, 1-1/4 inch, 1-1/2 inch.

3.4.25.10 Head styles and drive. The head styles and drives of externally threaded fasteners shall be as follows:

(a) Bolts. Plain (solid) hexagon for external wrenching; socket, hexagon, for internal wrenching.
(b) Cap screws Plain (solid) hexagon for external wrenching; socket, hexagon, for internal wrenching.
(c) Machine screws. Pan head, cross-recessed drive; flat head, countersunk (80 to 82 degrees), cross-recessed drive; flat head, countersunk (99 to 101 degrees), cross recessed drive. For flat head machine screws, preference shall be given to the 100 degree included angle of recess conforming to MS 24693, except where an included angle of 60 degrees or less is required.

3.4.25.10.1 Flat head screws shall not be used in sheet or thin material, the thicknes of which is less than one and one-half times the head height. Wherever flat head screws are used, the head shall be completely seated in a countersunk or dimpled recess having an included angle corresponding to that of the screw head.

3.4.25.11 Panel and cover plate retaining devices. Screws or similar devices employed for retaining front panels or removable cover plates shall be of captive types, and shall employ slotted heads or knurled and slotted heads. They shall be of such design as to be capable of definite individual loosening prior to movement of the part to which they are captive. Design and construction shall be such as to provide for their self-alignment with their retaining nuts, blocks or inserts without sticking and without damage to their threads. Since the body of a captive screw is often reduced to less than the root diameter of the threads, the screw acts only in tension and carries no shear load. For heavy chassis, sufficient friction is seldom present between the front panel and the frame to prevent movement during vibration and shock conditions. In order to eliminate this possible source of trouble, the use of a combination captive screw and guide pin is encouraged. Satisfactory assemblies incorporating this feature are commercially available. Quarter-turn fasteners may be used as panel, other than front panel, and cover plate retaining devices for nonstructural applications and shall conform to MIL-F-5591. (Panels and chassis on drawer slides are considered structural applications.)

3.4.25.12 Nuts. Hexagonal nuts are preferred for general usage. Square nuts may be used only when they are captive or floating as part of a fastening device.

3.4.25.13 Self-locking. Self-locking nuts shall conform to MIL-N-25027. (Where required, nuts for screws larger than number 8 or the coarse thread series may be utilized.) When nonmetallic inserts are employed as the locking medium, only nylon (polyamide) shall be used. The use of self-locking nuts with nylon inserts shall be limited to a maximum temperature of 250°F. Self-locking nuts of the fibre binding type shall not be used. For temperatures in excess of 250°F, all metal self-locking nuts shall be used. Self-locking nuts shall not be used for ground connections.

3.4.25.14 Clinch nuts. Clinch nuts, when used, shall be securely mounted so as to be incapable of rotating or moving with respect to the surface in which they are mounted.

3.4.25.15 Panel-mounting screws. Panel-mounting screws shall be limited to the panhead or flat cross recessed-head screws. Round-head screws shall not be used for panel mounting.

3.4.25.15.1 Rack-mounted panels. Rack-mounted panels shall be held by oval head screws with cup type washers.

3.4.26 Thread-locking devices. All thread-locking devices, such as lockwashers, or their equivalent, shall conform to the requirements specified hereinafter.

3.4.26.1 Material. All thread-locking devices shall be fabricated of corrosion-resistant metals or shall be so treated as to resist the corrosive effects of a moist sea atmosphere.

3.4.26.2 Application. All nuts, other than self-locking nuts, and machine screws shall require a lockwasher, or equivalent, under the nut or under the screw head (except flat-head screws) if no nut is used. Flat-head screws not secured by nut and lockwasher combinations shall be secured by an application of liquid insulating material conforming to MIL-S-22473 or by upsetting metal into slot.

3.4.26.2.1 Lockwashers. External tooth lockwashers may be used for all applications up to a static load of 2 ounces per screw, except where space limitations, appearance or other special conditions necessitate the use of internal tooth or split-ring lockwashers. Internal tooth type lockwashers shall not be used with undercut binder-head screws. For static loads in excess of 2 ounces per screw, split-ring lock-washers shall be used. Screws or nuts with captive lockwashers will be permitted, provided that replacement may be made with commercially available screws and lockwashers or nuts and lockwashers. Self-locking nuts will not require additional locking by means of lockwashers. The static load to which a screw is subjected is determined by dividing the weight of the part to be fastened by the number of screws used to fasten the part.

3.4.26.2.2 Where lockwashers are used externally for securing to an aluminum part, a flat washer shall be provided to prevent marring the protective coating.

3.4.26.2.3 All lockwashers and flat washers shall be fabricated of corrosion resistant metals or shall be so treated as to resist the corrosive effects of a moist sea atmosphere.

3.4.26.3 Shock-absorbing washers. Shock-absorbing washers shall be employed to absorb the stress set up in glass, ceramics, or other similar materials, wherever the construction and use of such materials warrants this precautionary measure and wherever sufficient tolerance is available to prevent misalignment of associated parts. Shock-absorbing washers shall be of plastic, or equivalent material which does not take a permanent set under compression. No fibrous materials shall be used. The arrangement of shock-absorbing washers, when used, shall be such as to minimize breakage or damage to the protected parts during assembly or from severe shock, vibration, or temperature changes encountered under shipboard service conditions. When shock-absorbing washers are used, only the threads of the securing fastener shall be coated with an application of metal activated, retaining, sealing compound conforming to MIL-S-22473.

3.4.26.4 Miscellaneous thread-locking devices. Castellated nuts with cotter pinning and safety wiring in connection with thread-locking devices may be used as direct replacements.

3.4.27 Transformers, inductors and choke.

3.4.27.1 Audio, power and pulse. All (audio, power and pulse) transformers, inductors, and saturable reactors shall conform to requirement 14 of MIL-STD-454 for grade, class and life expectancy.

3.4.27.1.1 Power transformers shall have electrostatic shields. For metal cased transformers, the nonstandard case sizes and mountings designated as "YY" shall not be used. The class of the transformer or inductor shall be such that the maximum operating temperature, for that class, as given in the transformer specification, will not be exceeded when the equipment is subjected to the applicable ambient conditions.

3.4.27.1.2 Standard transformers in accordance with MIL-STD-242 shall be used to the maximum extent possible. Where transformers, inductors and chokes are not available on the Qualified Products List of MIL-T-27 and the number of identical units needed is less than 100, it will not be necessary to qualify formally these items for inclusion on the Qualified Products List of MIL-T-27. The procedures specified in 3.4.27.1.2.1 will be accepted as sufficient quality assurance in lieu of formal qualification. The data required by 3.4.3 shall be submitted with a request for approval under any of the following procedures.

3.4.27.1.2.1 Procedure. Transformers shall be procured from a source appearing on the Qualified Products List which has been approved for the same or similar units. Similar units are defined as follows:

(a) Same grade, same class of operation; for use at same or higher altitudes; same or higher nominal ambient temperature; and same or higher nominal operating temperature.
(b) Same external and internal mountings; similar shape; same case construction; nominal wall thickness within 25 percent when a case is used; linear case dimensions not greater than 150 percent nor less than 70 percent of the corresponding dimensions; total volume of case not greater than 250 percent. (For molded or encapsulated units the envelope dimensions shall be considered as the case dimensions.)
(c) Same terminal construction and material, including insulating and gasketing parts; same or greater terminal-strength requirement for the same size of terminals; same or greater dielectric-strength requirement for the same size of terminals; same or greater current rating for corresponding terminals; same or lesser spacing between corresponding terminals; and between corresponding terminals and the case wall or other grounded surfaces.
(d) Same or smaller wire size and same coating material.
(e) Same processing and material for case, finish, marking, potting, insulation, and impregnating.

3.4.27.2 Low level pulse transformers. Pulse transformers having peak power of less than 300 watts and average powers of less than 5 watts shall conform to requirement 14 of MIL-STD-454.

3.4.27.3 Power transformers, automatic voltage stabilizing. All power transformers of the automatic voltage stabilizing type shall conform to MIL-T-981.

3.4.27.4 Intermediate and r.f. transformers and choke coils. Intermediate and r.f. transformers and choke coils shall conform to requirement 14 of MIL-STD-454.

3.4.27.5 Tube deflection and focusing coils. Tube deflection and focusing coils shall conform to MIL-C-18388.

3.4.27.6 Filters, high pass, low pass, band pass, band suppression and dual functioning. High pass, low pass, band pass, band suppression and dual functioning filters shall conform to MIL-F-18327.

3.4.28 Electron tubes and semiconductor devices. Electron tubes shall conform to the requirements of MIL-STD-200 and Navy Supplement-1 with respect to choice and application and comply with MIL-E-1 with respect to performance. Semi-conductor devices shall be selected from MIL-STD-701 and shall conform to MIL-S-19500 with respect to performance.

3.4.28.1 Approval for nonstandard electron tubes and semiconductor devices. Nonstandard tubes and semiconductor devices for equipments to be restored under this specification shall not be ordered until the restoration activity has received written approval from the Restoration Program Manager.

3.4.29 Electron tube sockets. All tubes, except subminiatures, shall utilize tube sockets. Electron tube sockets shall be of the single unit type. Gang type sockets shall not be used. The socket contacts shall be made of silver-plated beryllium-copper or silver-plated phosphor bronze. Tube socket body material shall be one of the following:

(a) Ceramic, grade L411, or any other grade which is numerically larger than L411, conforming to MIL-I-10.
(b) Very low dielectric loss molded plastic conforming to type MFE of MIL-M-14.

3.4.30 Electron tube shields. Heat dissipating tube shields shall be used on all miniature and subminiature tubes.

3.4.31 Waveguide assemblies. Waveguide assemblies shall be selected from MIL-HDBK-216, and shall conform to the latest issue of the specifications and drawings referenced therein.

3.4.32 Vibrators. Vibrators shall not be used except as direct replacement.

3.4.33 Mounting of parts with pigtail leads. Parts provided with pigtail leads, such as small resistors and capacitors, other than those mounted on printed wiring boards shall be secured between solder-type terminals on part mounting boards whose general design and material are as specified herein. The arrangement of these parts shall be such as to limit the number of leads terminating at any one terminal to three. The attachment and number of leads shall be in accordance with requirement 5 of MIL-STD-454. The clearance between the soldered connection and the body of the part shall be not less than 3/16 inch. These basic requirements shall predicate that:

3.4.33.1 Leads. Parts with axial leads (pigtail) shall not be mounted by means of the wire leads unless other mechanical support is provided, except that parts whose weight does not exceed 1/2-ounce may be secured by only their leads if the total length of both leads from the part to the terminals to which the leads are secured does not exceed 1 inch.

3.4.33.2 Replacement. The arrangement of parts shall be such that replacement of any part is possible without removal of or damage to adjacent parts.

3.4.34 Printed wiring. Printed wiring shall be in accordance with requirement 17 of MIL-STD-454.

3.4.34.1 Coatings shall be in accordance with MIL-I-46058, and shall be used only where necessary to equipment performance or when required by MIL-STD-275. When used in repairing assemblies, such coatings shall be grade S of MIL-I-46058 or shall be easily removable by means of a soldering iron without damage to the printed wiring board.

3.4.35 Modular assemblies. Modular assemblies shall be in accordance with MIL-STD-736.

3.5 Material.

3.5.1 General requirements. The materials used in the restoration of electronic equipment and the methods of application shall be as specified herein. Additional requirements for particular equipment are specified in the individual equipment technical manual.

3.5.2 Unacceptable materials.

3.5.2.1 Toxic materials. Materials which are capable of producing dangerous gases or other harmful toxic effects under conditions, including fire, encountered in Naval service shall not be used, unless suitable nontoxic material is not available. These materials shall not be used in restored equipment without prior approval of the Restoration Program Manager.

3.5.2.2 Flammable materials. Requirement 3 of MIL-STD-454 applies for flammable materials.

3.5.2.3 Fragile materials. Cast iron, semi-steel, die casting ebony asbestos, porcelain, and other fragile materials shall not be used, unless specific approval is obtained from the Restoration Program Manager.

3.5.2.4 Other materials. The following types or kinds of material shall not be used, except where such materials are fabricated into completed parts and the use of the material(s) is acceptable to the Restoration Program Manager.

Linen.
Cellulose acetate.
Cellulose nitrate.
Regenerate cellulose.
Wood.
Jute.
Leather.
Cork.
Paper and cardboard.
Organic fiberboard.
Hair or wool felts.
Plastic materials using cotton linen or wood flour as a filler.

3.5.2.4.1 Mercury and radioactive material shall not be used in any form, except in certain electron tubes as specified in MIL-E-1 and electronic parts as specified in MIL-STD-242. The use of tubes and parts containing mercury or radioactive material except as direct replacement shall be only upon approval of the Restoration Program Manager.

3.5.3 Tape, lacing. Lacing tape for cable harnesses and other applications shall conform to type P, waxed, class 2 of MIL-T-713.

3.5.4 Metals. Metal parts shall be of a corrosion-resisting material or of a material given a corrosion-resistant treatment or coating.

3.5.4.1 Aluminum. Where the use of lightweight metal is desired, aluminum alloy shall be used insofar as practicable. Aluminum alloys, except castings, shall conform to ASTM standards. Aluminum alloy casting shall conform to QQ-A-591, QQ-A-596, or alloy 43, temper F or alloy 356 or 195 of QQ-A-601. Where aluminum alloy castings for high strength and high quality applications are required, they shall conform to MIL-A-21180.

3.5.4.2 Ferrous alloys. Ferrous alloys shall be in accordance with requirement 15 of MIL-STD-454. Where enclosures, cases, frames, panels, brackets, and miscellaneous hardware are fabricated of steel, such material shall be treated in accordance with 3.5.4.5 to prevent corrosion. Corrosion-resisting steel castings shall conform to MIL-S-867.

3.5.4.3 Nonferrous material (except aluminum). Nonferrous materials, except aluminum, shall conform to commercial standards.

3.5.4.4 Zinc. Zinc shall not be used where the increased electrical resistance of the surface, due to the protective treatment, has a deleterious effect on electrical performance.

3.5.4.5 Corrosion resistance. The requirements for corrosion resistance of ferrous alloys shall be as specified in requirement 15 of MIL-STD-454.

3.5.4.5.1 Equipment subject to sea water immersion. Materials subject to continuous or intermittent immersion in sea water shall be resistant to corrosion, or shall have an external surface treatment or coating which shall be effective in inhibiting corrosion in sea water. Uncoated corrosion-resisting steel is not resistant to corrosion when immersed in sea water. The material, the surface treatment, or the coating will not be acceptable if maintenance services required to keep these parts of the equipment free from harmful corrosion must be performed at intervals of less than 3 years.

3.5.4.5.2 Corrosion-resisting metals. The following are considered corrosion-resisting metals:

(a) Bronze.
(b) Copper-nickel alloy.
(c) Nickel-copper alloy.
(d) Copper-beryllium alloy.
(e) Copper-nickel-zinc alloy.
(f) Nickel-copper silicone alloy.
(g) Nickel-copper-aluminum alloy.
(h) Austenitic corrosion-resisting steels 302, 303, 304, 304L, 309, 310, 316, 316L, 321, 322, 322A, and 347.

3.5.5. Plastics. Plastics shall be in accordance with requirement 11 of MIL-STD-454, except as otherwise specified herein.

3.5.5.1 Dials and transparent and translucent parts. Plastic for dials and other transparent and translucent applications shall be in accordance with MIL-W-80. Material conforming to MIL-P-5425, may be used, provided it is treated with an antielectrostatic coating.

3.5.6 Silver brazing alloy (silver solder). Silver brazing alloy shall conform to MIL-B-15395.

3.5.7 Cotton duck and webbing. Cotton duck used for protective enclosures shall conform to type II of CCC-C-428. Unless otherwise specified, medium texture No. 4 shall be used for heavy duty service, hard texture No. 8 for truck covers, and hard texture No. 12 for services requiring lightweight. Color of the duck shall be the same as that originally used.

3.5.8 Electrical tapes. Electrical tape shall conform to MIL-I-631. Electrical pressure-sensitive adhesive tape shall conform to MIL-I-7798 or to type APT, EF-9, EF-20, MFT-2.5, MF-2.5 or MFT-3.5 of MIL-I-15126. Fabric or texture pressure-sensitive (adhesive or friction) tape shall not be used.

3.5.9 Electrical tubing and sleeving. Non-rigid tubing shall conform to MIL-I-631. Sleeving shall conform to MIL-I-3190 or MIL-I-7444.

3.6 Coating and treatments.

3.6.1 All machining operations (such as drilling and tapping) shall be completed before the corrosion-resistant treatment is applied.

3.6.2 Plating. All hardware previously plated shall be identically replated to the extent necessary to function and appear as new. All bolts, nuts, flat washers, lock washers, and screws used to reassemble any item normally mounted so as to be exposed to salt water spray and stack gases shall be austenitic corrosion resisting steel 300 series (preferably 304, or 316) cadmium plated, and chemically treated to provide a chrome conversion coating conforming to MIL-C-5541. Electrodeposited metallic coatings shall be as specified hereinafter. The plating thickness in all cases shall be adequate to assure conductivity and corrosion resistance.

3.6.2.1 Zinc. Zinc coating shall conform to type II (supplementary chromate treatment), class 2 (0.00050 inch thick), of QQ-Z-325.

3.6.2.2 Nickel. Nickel plating shall conform to QQ-N-290.

3.6.2.3 Chromium. Chromium plating shall conform to type I of QQ-C-320, except that it shall have an undercoating of nickel 0.0012 inch minimum thickness, or nickel on copper 0.0012 inch minimum total thickness. The nickel coating on the copper undercoat shall be 0.0006 inch minimum thickness. All brass parts shall have a copper undercoat of 0.0003 inch minimum thickness. The nickel plus copper shall be 0.0012 inch minimum thickness.

3.6.2.4 Silver. Silver plating shall conform to QQ-S-365.

3.6.2.5 Gold. Goldplating, when used, shall be bright gold in accordance with type II, class 1 of MIL-G-45204.

3.6.2.6 Cadmium. Cadmium plating shall conform to type II, class 1, of QQ-P-416, except for threaded devices (see 3.1.25) which shall be type II, class 3 of QQ-P-416.

3.6.3 Protection of aluminum and aluminum alloys. Unpainted aluminum and aluminum alloy parts shall be anodized in accordance with MIL-A-8625. Where anodizing interferes with electrical properties, chemical treatment conforming to MIL-C-5541 may be used. Prior to painting, aluminum and aluminum alloys shall be anodized in accordance with MIL-A-8625 or chemically treated in accordance with MIL-C-5541.

3.6.4 Protection of magnesium and magesium alloys. Magnesium and magnesium alloys, when used, shall be finished in accordance with MIL-M-3171.

3.6.5 Enclosure and chassis. Damaged enclosures and chassis shall be repaired prior to refinishing. Any item beyond repair shall be replaced.

3.6.6 Painting. All restored equipment previously painted shall be repainted.

3.6.6.1 Internal shipboard mounted equipment. After all processing operations are completed, the exterior and interior surfaces of all enclosures shall have all rust or other visible corrosion products, flux and slag removed; shall be thoroughly cleaned of all grease, oil, and dirt by solvent wiping, vapor degreasing or caustic washing and rinsing; and shall then be painted as specified hereinafter.

3.6.6.1.1 Primer. Primer shall be applied in accordance with either of the following methods:

(a) One coat of wash pretreatment in accordance with MIL-P-15328 or Paladin Primer #12412 or equivalent applied as a continuous film 0.0002 to 0.0005 inch thick.
(b) A hot dip-tank phosphate treatment conforming to type I of TT-C-490 followed by one coat of primer in accordance with TT-P-8585 applied as a continuous film 0.0002 to 0.001 inch thick.

3.6.6.1.2 Enamel. Two coats of gray enamel, conforming to class 2 of MIL-E-15090 or polymerin baking enamel or equivalent shall be applied as continuous films approximately 0.001 to 0.002 inch thick, except as follows:

(a) Marine Corps equipment. For Marine Corps equipment, the enamel shall be Marine Corps green enamel conforming to TT-E-485.
(b) Portable shipboard equipment. For portable shipboard equipment, the enamel shall conform to class 1 of MIL-E-15090.

3.6.6.2 External mounted equipment. After all processing operations are completed, including anodizing or chemical treating (see 3.6.3) the equipment shall be painted as specified hereinafter.

3.6.6.2.1 Primer. Devran 201[1/] primer (buff or green) shall be applied in two evenly distributed coats 0.002 to 0.003 inch thick.

3.6.6.2.2 Finish coat. Devran 219[1/] haze grey or black, flat or Devran 209[1/] haze grey or black, gloss, shall be applied in two evenly distributed coats 0.002 to 0.004 inch thick.

3.6.7 Fasteners and assembly screws. All external fasteners and assembly screws which are manipulated, loosened, or removed in normal processes of installation and maintenance of equipment shall be of such color as to provide strong contrast with the color of the surface upon which they appear. Other external fasteners and assembly screws shall be of the same color as the surface upon which they appear. Metallic couples which will cause galvanic corrosion shall not be employed to obtain contrasting color.

3.6.8 Tropicalization. Equipment shall not receive tropicalization treatment, unless such a treatment is specifically authorized.

3.7 Safety. Safety shall be in accordance with requirement 1 of MIL-STD-454.

3.7.1 There shall be an indicator (illuminated jewel or globe), located in a position clearly visible to personnel, on the assembly or unit corelated with the safety interlock to indicate that it has been disabled.

3.8 Electrical assembly.

3.8.1 Primary power supply line voltage and frequency. The equipment shall be restored to operate from the primary power supply line voltage and frequency specified in the individual equipment technical manual. Unless otherwise specified, the equipment shall meet the performance limits of operation over the steady state tolerance of plus or minus 10 percent in voltage and plus or minus 5 percent in frequency from nominal value specified.

3.8.1.1 Transient voltage. Unless otherwise specified in the individual equipment technical manual, the equipment shall be capable of withstanding a voltage transient of plus or minus 20 percent of nominal from any point within the plus or minus 10 percent steady state tolerance band recoverable to the final steady state value tolerance band within 2 seconds. Momentary impairment of operation during the transient is permissible but the transient shall not cause failure of any part or prevent resumption of normal operation, or require the equipment to recycle when the transient has ceased.

3.8.1.2 Transient frequency. Unless otherwise specified in the individual equipment technical manual, the equipment shall be capable of operation during frequency transients of plus or minus 3 percent, of which not more than 1 percent is outside the steady state tolerance band of plus or minus 5 percent. The transient shall recover to a point within the steady state tolerance band within 2 seconds.

3.8.2 Interference reduction devices. Interference filters and capacitors employed for the reduction of interference shall be in accordance with the requirement specified in the individual equipment technical manual.

3.8.2.1 Filter networks, where necessary, shall be designed to provide attenuation to all energy above the power frequency, and shall be isolated from the interior of the equipment case.

3.8.2.2 Power leads between the filter network and the transformer terminals shall be physically and electrically isolated from the bundled or cabled interconnecting leads inside the equipment case to reduce coupling to a minimum.

3.8.2.3 Equipment operating in the sonic and very low frequency spectrum shall be restored with extreme care to insure that all conducted spurious energy shall be reduced to an absolute minimum so as not to degrade the sensitivity of the equipment.

3.8.3 Synchro systems. Synchro description and operational information is presented in Publication OP-1303. Synchro shafts shall not be machined, cut, drilled, or otherwise modified.

3.8.4 Primary power circuits. Primary power circuits shall not be directly grounded. Where capacitive type of grounding is necessary, such capacitance shall be as small as practicable. All leads from any primary power supply shall be individually protected against damaging overload between the service connection and any other part of the system, equipment, or unit, as applicable.

3.8.5 Overload protection. Overload protection, where used, shall be in accordance with class 1, requirement 8 of MIL-STD-454.

3.8.5.1 Fuses. Fuses shall conform to MIL-F-15160. All fuses shall be easily replaceable. One extra fuse of each type and rating used shall be supplied and attached at a convenient location on the equipment for replacement purposes, except for miniature equipment where this may not be feasible.

3.8.5.2 Blown fuse indicators. Requirements for blown fuse indicators shall be as specified in the individual equipment technical manual.

3.8.6 Electrical bonding. Protective finishes shall be omitted at those points where their presence would prevent proper electrical bonding as required for shielding or connection. Provision shall be made to assure permanence of electrical contact between the surfaces of all parts in contact over long periods of time or in the presence of humid saline atmospheres.

3.8.6.1 Cabinet bonding. All equipment cabinets shall be furnished with mounting holes or studs for bonding strap ground connector. The holes or studs for bonding strap connector shall not reduce the spraytight, dripproof or watertight characteristic. The holes or studs shall not interfere with the extraction or insertion of the equipment into the cabinet or the replacement of the cabinet in a rack or shock mounting, if required.

3.8.6.1.1 For thick walled (over 3/8-inch) cabinets, suitably placed 3/8-inch drilled and tapped (U.S.S. thread) holes shall be provided.

3.8.6.1.2 For thin walled cabinets, suitably spaced 3/8-inch (U.S.S. thread) studs shall be spot welded to the cabinet.

3.8.6.1.3 For aluminum cabinets, welded aluminum straps with two holes or studs are required to reduce contact resistance.

3.8.7 Internal cabling. Conductors shall be combined into a cable harness wherever possible and securely held by means of lacing tape or permanently mounted cable ducts. Individual conductors which are thus secured shall lie essentially parallel to one another and shall not entwine other conductors. This requirement should not be construed to prohibit the use of twisted pairs where required, for electrical reasons. Branched leads may cross other conductors if required. Long rigid conductor or cabled flexible conductors shall be securely anchored to the chassis with cable clamps. Twine shall not be used for this purpose. Where cable ducts are employed, provisions shall be made for the removal of any wire that may become faulty. For example, covers may be employed at intervals to aid in the removal of a faulty wire. Where a cable harness is employed between hinged parts, sufficient slack and protection shall be provided to prevent chafing or breaking of individual wires with repeated flexing. Where a three-dimensional cable harness is fabricated, the cable harness boards shall be designed to reflect the three dimensional characteristics of the wire warness.

3.8.7.1 Slack. For all flexible conductors, including those within cables terminating in multi-terminal headers or receptacles, sufficient slack shall be provided for at least two replacements of a defective part with the exception of certain radio frequency (RF) leads, the lengths of which shall be made as short as possible for electrical reasons.

3.8.7.1.1 When making connections to lugs or terminals normally intended to have some freedom to move (for example, tube socket contact lugs) care shall be exercised not only to leave sufficient slack but also to ensure that the intended freedom of motion is not impaired.

3.8.7.2 Insulation protection. Wherever wires are run through holes in metal partitions (shields and the like) less than 1/8 inch in thickness, the holes shall be equipped with grommets for mechanical protection of insulation otherwise subject to abrasion. Panels 1/8 inch or more in thickness shall have either grommets or the hole edges rounded to a radius equal to one-half the thickness of the material. Grommets for wires operating at RF potentials shall be of ceramic, styrene, or phenolic, except for coaxial cables which have outside protection, where rubber or neoprene is acceptable. Care shall be exercised in the running of wires to insure that they are not carried over or bent around any sharp corner or edge which might in time cut through the insulation.

3.8.8 Connections.

3.8.8.1 Mechanical connections. All connections shall be so supported as to obviate breakage and minimize changes in performance due to vibration, inclination, or shock encountered under the service condition of shipboard use.

3.8.8.2 Clamp contact connections. In no case shall electrical connections depend upon wires, lugs, terminals and the like clamped between a metallic member and an insulating pliable material. Such connections shall be clamped between metal members.

3.8.8.3 Shielded wire. Conductors using metallic shielding unprotected by an outer insulation shall be so secured as to prevent the shielding from coming into contact with exposed terminals or conductors. Shielding shall be terminated at a suitable distance from the exposed conductor and bonded to the chassis.

3.8.9 Wire terminations.

3.8.9.1 Soldering connections. Pigtails (wire leads which are permanently affixed to a part), studs (soldering posts which are permanently affixed to a part), soldering lugs (projections which solder to end of wires to facilitate attachments to solderless connections), and soldering terminals (items which are attached to the chassis, or insulating boards, strips, or posts to serve as a solder junction for two or more wires or leads) come under this heading. All soldering studs, lugs, and terminals shall be notched or otherwise provided with means for mechanically securing the wire or lead prior to the application of solder. All solder type studs and terminals shall be sturdily designed and shall be constructed of materials which will render them suitable for repeated soldering and unsoldering operations without breaking or loosening. All solder type studs shall be mounted in such manner as to preclude their loosening or rotation due to soldering operations or from strains due to attached wires or leads. No more than three wires, including wires from parts, shall terminate at any one terminal, except for double turret terminals which may terminate three wires per section.

3.8.9.2 Studs. Studs of parts shall conform to the applicable part specification. Studs of potted parts shall be so designed and fastened to the insulating strip or plate (or the enclosure itself if this conforms to insulation requirements) so as not to cause any degradation in the moisture-excluding property of the enclosure by the normal soldering and resoldering of external leads to the studs. Studs shall be so spaced as to assure a leakage resistance sufficiently high for the particular application under applicable service conditions of humidity.

3.8.9.3 Wire and connections. The ends of each wire (except for pigtail leads or parts requiring solder connections) shall be terminated by solderless crimp type lugs, subject to the following requirements:

(a) Insulated, solderless lugs are preferred and shall conform to MIL-T-7928.
(b) Where thermal or other considerations prevent the use of insulated lugs non-insulated solderless lugs conforming to MIL-T-7928 shall be used, provided they are covered with an insulating sleeve.

3.8.9.4 Grounding sheath connectors. Grounding sheath connectors of the two-piece compression type may be used to terminate braided wire cable shielding in any circuit application not exceeding 100 mc. per second. Such connections shall be made in accordance with the connector manufacturer's recommendations; shall be secure, and shall be free from any projecting shield wire ends. Solid wire leads shall not be used with these compression type connectors.

3.8.9.5 Coatings, wire terminations. No mercury or mercury containing compounds or alloys shall be used on any wire terminations (such as, pigtail leads, lugs and studs) (see 3.5.2.4.1).

3.8.10 Identification of conductors.

3.8.10.1 Color coding of conductors. In order to facilitate testing and locating of faults, all conductors other than printed wiring, shall be distinctly color coded and follow the same general pattern throughout. The color codes selected shall be the same as originally used in the equipment.

3.8.10.2 Identification of conductors. All noninsulated wire leads in excess of 4 inches shall be color coded by means of colored lacquer spotted near terminals, except when the leads terminate at marked terminals or when the terminal designations and the placement of the leads provide easy lead identification.

3.8.10.3 Terminal ends. The terminal ends of each conductor of a jacketed cable or hook-up wire harness may be marked for identification purposes by the use of tube markers in accordance with type P, grade a, form U, class I of MIL-I-631. All wire markings shall be clearly visible in the assembled equipment.

3.8.11 Soldering. All soldering, except on printed wiring boards, shall be in accordance with requirement 5 of MIL-STD-454. All soldering on printed wiring boards shall be as specified in MIL-STD-275.

3.8.11.1 Mechanical strength. Soft solder alone shall not be depended upon for mechanical strength. Where wires and terminals are joined for soldering, the wires shall be hooked, or otherwise secured to the terminals, prior to soldering. In cases where hooking would impair the desired operation (such as increasing minimum capacity in RF circuits), other mechanical means of securing prior to soldering shall be provided. The use of a combination of a flexible lead and a solid conductor without a support at their junction is not acceptable.

3.9 Mechanical assembly.

3.9.1 Gears. The design, manufacture, and assembly of gears shall be such as to provide smooth, continuous tooth contact without interference, tight spots, loose spots, or other irregularities. Every precaution shall be taken to reduce tooth pressures and backlash to a minimum. All gears fitted on shafts shall be secured thereto by means which will effectively prevent relative motion between the gear and the shaft.

3.9.1.1 Spur and bevel gears. Spur and bevel gears for heavy duty drives shall be made of corrosion-resistant steel conforming to class 414 of QQ-S-763 or of bronze conforming to MIL-B-16540. Fibre gears shall not be used, unless specifically approved by the Restoration Program Manager for each application. Aluminum alloys and nylon may be used for spur and bevel gears for light duty drive only.

3.9.1.2 Worm gearing. Worm gears transmitting an appreciable amount of torque shall be made of bronze conforming to MIL-B-16540. The use of aluminum alloys is considered satisfactory for worm wheels transmitting very low torque, such as drives for dials in synchro transmission systems. Worms shall be made of corrosion-resistant steel conforming to Class 414, or better, of QQ-S-763.

3.9.2 Mechanical operation. All moving parts shall operate smoothly and quietly, and shall not introduce any objectionable noise into any of the electronic parts of the equipment. Backlash and torque lash shall be kept to a minimum.

3.10 Supplementary requirements.

3.10.1 Field changes. All authorized field changes specified in the EIB or EIMB shall be installed during restoration. In the event any field change is not available in the supply system the restoring activity shall assemble the parts, material and documentation necessary to install the field change.

3.10.2 Identification plates and markings.

3.10.2.1 Equipment identification plates. Restored electronics equipment shall carry identification plates in accordance with MIL-P-15024, and shall be attached to each item to which an equipment identification plate was previously attached. When new equipment identification plates are fabricated the size, shape, lettering, coloring and format of the original plate shall be duplicated, except as specified hereinafter.

3.10.2.1.1 Serial numbers. Serial numbers shall be required for each item (system, set, group, unit and accessory) to which an identification plate is applied. If the original serial number cannot be ascertained, a local serial number shall be assigned. The method used to assign local serial numbers shall be approved by the Restoration Program Manager.

3.10.2.2 Restoration identification plates. Restored electronics equipment shall carry a restoration identification plate fabricated in accordance with MIL-P-15024. Restoration identification plates shall contain the following information:

(a) Name of restoring activity.
(b) Date of restoration.
(c) Applicable job order or contract number.

3.10.2.2.1 Restoration identification plates may be fabricated as an integral part of the equipment identification plate. In the event this option is exercised, the restoration identification plate shall be at the bottom of and duplicate the lettering and format of the equipment identification plate.

3.10.2.3 Field change identification plates. Field change identification plates shall be in accordance with MIL-P-15024 and shall be required whenever a complete system, set, or equipment is restored. Applicable field changes installed during restoration or previously installed field changes shall be certified and indicated as accomplished by the restoring activity. Field change identification plates shall be columnar in format and shall contain information as follows:

(a) F.C. No.
(b) Installed By.
(c) Date.
(d) Authority.

3.10.2.3.1 Field change identification plates shall contain a minimum of five blank spaces for future field changes.

3.10.2.4 Electronic assembly identification labels. Restored electronics assemblies shall carry an identification label fabricated from pressure sensitive material such as Scotch-cal, or equivalent. Electronic assembly identification labels shall provide information as follows:

(a) Nonenclature and serial number.
(b) Cognizant ICP control symbol and FSN.
(c) Restoring activity.
(d) Date restored.

3.10.3 Instruction plates. When attached to an individual equipment, instruction plates showing wiring and schematic diagrams, calibration charts, operating instructions, safety notices, lists of tools, lists of contents, and similar information shall meet the requirements specified hereinafter.

3.10.3.1 Lettering. Gothic type lettering shall be used.

3.10.3.2 Border. A border of 1/4 inch or more shall be provided on each edge of the instruction plate.

3.10.3.3 Legibility. Instruction plates shall be legible and shall be fabricated to remain so for the service life of the equipment on which they are mounted.

3.10.3.4 Materials and processes. One of the following materials and processes shall be used for instruction plates:

(a) Reverse etched, lithographed, printed, or silk screened marked on aluminum, nickel-copper-alloy, or corrosion-resistant steel plate.
(b) Printed on a good grade of white book paper and laminated between two sheets of clear transparent plastic, vinyl chloride or suitable copolymers thereof, or polyethylene terephthalate with lightfast copolymer or polyethylene adhesive systems, bonded together to seal against moisture.
(c) Laminated thermosetting plastic conforming to L-P-387.
(d) Etched on aluminum, nickel-copper-alloy, or corrosion-resistant steel plate and filled with permanent contrasting color.
(e) Photographed in accordance with type H of MIL-P-15024.

3.10.3.5 Rubber stamping and decalcomanias. Rubber stamping and decalcomanias shall not be used.

3.10.3.6 Instruction plate mounting. Instruction plates, shall be securely and permanently mounted using screws. The watertight integrity of the equipment shall not be impaired.

3.10.4 Silk screening and marking. Restored equipment and assemblies shall be marked by silk screen process. All chassis, enclosure and assembly markings shall be as specified in 3.10.5.

3.10.5 Parts identification by reference designations (symbol designations). In order to facilitate maintenance, each part assembled in a unit and set shall be identified by the appropriate reference designation originally used in the equipment.

3.10.5.1 Location of reference designations. The reference designations shall be located adjacent to each part and shall be marked on the chassis, back of the front panel, partitions or insulator strips. Reference designations shall not be marked on parts which are subject to replacement. The reference designations shall be marked in such a position as to physically locate the parts and yet be readily visible for purposes of maintenance without removal of other parts. The primary intent of this requirement is that removal of a part shall not result in loss of the identification of the physical location of that part. On those printed wiring boards where space does not permit the reference designations to be printed on the board, the designations shall be located on a surface adjacent to the board, or the information shall be included in chart form in the technical manual.

3.10.5.2 Enclosed parts. Reference designations for parts enclosed in separate and removable shields or compartments may be marked on the shields or supporting structures for such parts, provided that the replacements of such parts does not require destruction of the original shields or supporting structures and provided that such shields or supporting structures are not interchangeable with other shields or supporting structures within the unit. Reference designations shall not appear on electron tube shields.

3.10.5.3 Electron tube and socket identification. The type designation of each tube and the appropriate reference designation shall be marked adjacent to the tube socket on the tube side of the chassis or supporting structure for identification of the particular tube. The reference designation used to identify the tube socket and the type designation of the tube shall be marked on the reverse side of the chassis adjacent to the socket. If available space does not permit such marking of tube type designations and reference designations for tubes and tube sockets, a diagram showing the location of the tubes and sockets shall be placed where it is visible when viewing either the tubes or the bottom of the tube sockets.

3.10.5.4 Method of marking. Identification markings shall be permanent and legible. The markings on plastic or metallic materials shall be effected by engraving, stenciling and filling, with smudgeproof ink covered with a coat of clear lacquer, or silk screening. Paper labels or decalcomanias shall not be used.

3.10.5.5 Function identification. The function of each control, indicator, connector, and test point, shall be identified by symbols and abbreviations. The identification shall be adjacent to the control, indicator, connector and test point. All terminals for connection to transmission lines shall be marked with the nominal characteristic impedance of the line.

3.11 Reassembly. The equipment shall be reassembled using new or restored parts having a reliable life expectancy exceeding 3 years. Every reasonable effort shall be expended to insure that the equipment will be the equal in all respects to new. The synchro data transmission systems and limit switches for all rotating and stabilized antennas shall be set to zero.

3.12 Workmanship. Workmanship shall be in accordance with requirement 9 of MIL-STD-454.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. Unless otherwise specified in the contract or purchase order, the supplier is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified in the contract or order, the supplier may use his own or any other facilities suitable for the performance of the inspection requirements specified herein, unless disapproved by the Government. The Government reserves the right to perform any of the inspections set forth in the specification where such inspections are deemed necessary to assure supplies and services conform to prescribed requirements.

4.2 Inspection procedures.

4.2.1 Inspection. Restored equipment and assemblies will be examined and tested to insure conformance with this specification. Inspection shall be as specified hereinafter.

4.2.2 Surface examination. Equipment shall be examined for the following:

(a) Workmanship, assembly and fit, mechanical safety, and marking.
(b) Materials, parts, and finish.
(c) Treatment for prevention of corrosion.
(d) Treatment for tropicalization, when required.

4.2.3 Operating test. The restored equipment shall be energized and subjected to an operating test of not less than 8 hours to insure qualitatively the proper functioning of the equipment, including all operating controls and conformance with the safety requirements. The qualifying performance standards for restored equipment shall be the published performance standard (POMSEE). In the event a POMSEE has not been developed for an equipment or the published POMSEE does not provide adequate test data for a unit, subassembly or assembly of an equipment, a performance test criteria shall be developed by the restoring activity and approved by the Restoration Program Manager. The performance test criteria shall be based on performance data contained in the equipment technical manual, O and R manuals, EIMB, EIB and experience generated by the equipment's performance history.

4.2.3.1 Dynamic operating tests shall be conducted for all stabilized antennas.

4.2.3.2 Supply line voltage and frequency. The equipment shall be operated over the steady state range of voltage and frequency as specified in the individual equipment technical manual.

4.2.3.3 Reference measurements shall be made at nominal voltage and frequency.

4.2.3.4 Reference measurements shall be made with instrumentation whose calibration can be certified.

4.2.4 Electronic assemblies. Final tests shall be conducted for a sufficient length of time to insure that performance and reliability parameters are consistent with design objectives or as specified in the technical manual for the assemblies parent equipment.

4.2.5 Certification. All quality assurance examinations and tests shall be complete and adequate. The accuracy and integrity of such examinations and tests shall be certified by responsible personnel at the restoration activity, or by such personnel as selected and assigned by the Restoration Program Manager.

5. PREPARATION FOR DELIVERY

(The preparation for delivery requirements specified herein apply only for direct Government procurements.)

5.1 Sub-contracted material and parts. The preparation for delivery requirements of referenced documents listed in Section 2 do not apply when material and parts are procured by the supplier for incorporation into the equipment and lose their separate identity when the equipment is shipped.

5.2 Packing and preservation. Restored equipment will be packaged, packed and marked as specified in MIL-E-17555. Included with each equipment shall be the following:

(a) A copy of all test data.
(b) A minimum of one, but preferably two equipment technical manuals with all corrections.
(c) Two packing lists; one inside and one outside of packing case.
(d) Completed forms as follows (forms are stocked at NSC Norfolk and NSC Oakland):

(1) NAVSHIPS 536; FSN 0105-600-9800; Electronic History Record Card.
(2) NAVSHIPS 537; FSN 0105-601-4000; Record of Field Changes.
(3) NAVSHIPS 9670/15 (formerly NAVSHIPS 4545); FSN 0105-638-2500; Restored Equipment Tag.
(4) NAVSHIPS 9670/14 (formerly NAVSHIPS 4916); FSN 0105-638-2450; Notice of Installation.

(e) One copy of all field change bulletins for all field changes accomplished.

5.3 Use of polystyrene (loose-fill) material.

5.3.1 For domestic shipment and early equipment installation and level C packaging and packing. Unless otherwise approved by the restoration activity (see 6.1), use of polystyrene (loose-fill) material for domestic shipment and early equipment installation and level C packaging and packing applications such as cushioning, filler and dunnage is prohibited. When approved, unit packages and containers (interior and exterior) shall be marked and labelled as follows:

"CAUTION

Contents cushioned etc with polystyrene (loose-fill) material.
Not to be taken aboard ship.
Remove and discard loose-fill material before shipboard storage.
If required, recushion with cellulosic material bound fiber,
fiberboard or transparent flexible cellular material."

5.3.2 For level A packaging and level A and B packing. Use of polystyrene (loose-fill) material is prohibited for level A packaging and level A and B packing applications such as cushioning, filler and dunnage.

6. NOTES

6.1 Ordering data. Procurement documents should specify the title, number and date of this specification.

Preparing activity:

Navy - SH
(Project MISC-N575)

SPECIFICATION ANALYSIS SHEET

Form Approved
Budget Bureau No. 119-R004

INSTRUCTIONS

This sheet is to be filled out by personnel either Government or contractor, involved in the use of the specification in procurement of products for ultimate use by the Department of Defense. This sheet is provided for obtaining information on the use of this specification which will insure that suitable products can be procured with a minimum amount of delay and at the least cost. Comments and the return of this form will be appreciated. Fold on lines on reverse side, staple in corner, and send to preparing activity *(as indicated on reverse hereof)*.

SPECIFICATION

ORGANIZATION *(Of submitter)*

CITY AND STATE

CONTRACT NO.

QUANTITY OF ITEMS PROCURED

DOLLAR AMOUNT
$

MATERIAL PROCURED UNDER A

☐ DIRECT GOVERNMENT CONTRACT ☐ SUBCONTRACT

1. HAS ANY PART OF THE SPECIFICATION CREATED PROBLEMS OR REQUIRED INTERPRETATION IN PROCUREMENT USE?

A. GIVE PARAGRAPH NUMBER AND WORDING.

B. RECOMMENDATIONS FOR CORRECTING THE DEFICIENCIES.

2. COMMENTS ON ANY SPECIFICATION REQUIREMENT CONSIDERED TOO RIGID

3. IS THE SPECIFICATION RESTRICTIVE?

☐ YES ☐ NO IF "YES", IN WHAT WAY?

4. REMARKS *(Attach any pertinent data which may be of use in improving this specification. If there are additional papers, attach to form and place both in an envelope addressed to preparing activity)*

SUBMITTED BY *(Printed or typed name and activity)*

DATE

DD FORM 1 APR 63 1426 REPLACES NAVSHIPS FORM 4883, WHICH IS OBSOLETE
(NAVSHIPS OVPRT 12-66)

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