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MILITARY SPECIFICATION

FIRE CONTROL MATERIEL, MANUFACTURE AND INSPECTION, GENERAL SPECIFICATION FOR

This specification is approved for use by Armament Research and Development Center, 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 the general requirements for the procurement, manufacture and inspection of systems, components, and assemblies used in fire control materiel.

2. APPLICABLE DOCUMENTS

2.1 Government documents.

2.1.1 Specifications, standards and handbooks. Unless otherwise specified, the following specifications, standards, and handbooks of the issue listed in that issue of the Department of Defense Index of Specifications and Standards (DODISS) specified in the solicitation form a part of this specification to the extent specified herein.

SPECIFICATIONS

MILITARY

MIL-G-174	-	Glass, Optical
MIL-S-901	-	Shock Tests, H.I. (High Impact), Shipboard Machinery, Equipment and Systems, Requirements for (Navy)
MIL-C-6021	-	Castings Classification and Inspection Of
MIL-H-6088	-	Heat Treatment of Aluminum Alloys
MIL-H-6875	-	Heat Treatment of Steel (Aerospace Practice), Process For
MIL-B-7883	-	Brazing of Steels, Copper, Copper Alloys, Nickel Alloys, Aluminum and Aluminum Alloys

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document, should be addressed to: Commander, US Army Armament Research and Development Center, US Army Armament, Munitions and Chemical Command, ATTN: DRSMC-TST-S(D), Dover, New Jersey 07801 by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

MIL-S-13572 - Spring, Helical, Compression and Extension
MIL-W-13773 - Welding, Repair, Of Readily Weldable Steel Castings (Other than Armor), Metal-Arc, Manual
MIL-O-13830 - Optical Components for Fire Control Instruments; General Specification Governing the Manufacture, Assembly and Inspection Of
MIL-I-13857 - Impregnation of Metal Casting
MIL-S-19500 - Semiconductor Devices, General Specification For
MIL-W-22248 - Weldments, Aluminum and Aluminum Alloys
MIL-M-38510 - Microcircuits, General Specification For
MIL-S-45743 - Soldering, Manual Type, High Reliability, Electrical and Electronic Equipment
MIL-S-46844 - Solder Bath Soldering of Printed Wiring Assemblies
MIL-A-48611 - Adhesive System, Epoxy-Elastomeric, For Glass to Metal
MIL-B-48612 - Bonding with Epoxy-Elastomeric Adhesive System, Glass to Metal

STANDARDS

FEDERAL

FED-STD-H28 - Screw-Thread Standards for Federal Services
FED-STD-101 - Test Procedures for Packaging Materials

MILITARY

MIL-STD-22 - Welded Joint Design
MIL-STD-34 - Preparation of Drawings for Optical Elements and Optical Systems General Requirements For
MIL-STD-105 - Sampling Procedures and Tables for Inspection by Attributes
MIL-STD-109 - Quality Assurance Terms and Definitions
MIL-STD-130 - Identification Marking of US Military Property
MIL-STD-171 - Finishing of Metal and Wood Services
MIL-STD-194 - Systems for Painting and Finishing of Fire Control Material
MIL-STD-202 - Test Methods for Electronic and Electrical Component Parts
MIL-STD-275 - Printed Wiring for Electronic Equipment
MIL-STD-276 - Impregnation of Porous Nonferrous Metal Castings
MIL-STD-454 - Standard General Requirements for Electronic Equipment
MIL-STD-810 - Environmental Test Methods and Engineering Guidelines
MIL-STD-1450 - Lubrication of Fire Control Instruments
MIL-STD-1460 - Soldering of Electrical Connections and Printed Wiring Assemblies, Procedure For
DOD-STD-1866 - Soldering Process, General Specification For

HANDBOOKS

MILITARY

MIL-HDBK-204 - Inspection Equipment Design

(copies of specifications, standards and handbooks required by manufacturers in connection with specific acquisition functions should be obtained from the contracting activity or as directed by the contracting officer).

2.1.2 Other government documents, drawings and publications. The following other government documents form a part of this specification to the extent specified herein.

PUBLICATIONS

DSAM 4145.8 - Radioactive commodities in the DOD supply system

Code of Federal Regulations

CFR Title 10 - US Nuclear Regulatory Commission Rules and Regulations

CFR Title 49 - Dept of Transportation Regulations

(Application for copies should be addressed to Superintendent of Documents, US Government Printing Office, Washington, DC 20402).

2.2 Other publications. The following other documents form a part of this specification to the extent specified herein. The issues of the documents which are indicated as DOD adopted shall be the issue listed in the current DODISS and the supplement thereto, if applicable.

AMERICAN GEAR MANUFACTURER'S ASSOCIATION (AGMA)

AGMA 390.03 - Gear Handbook Volume 1: Gear Classification, Materials and Measuring Methods for Unassembled Gears

(Application for copies of AGMA publications should be addressed to American Gear Manufacturers Association, 1901 North Fort Myer Drive, Arlington, VA 22209).

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI B46.1 - Surface Texture (Surface Roughness, Waviness and Lay)
ANSI Y14.5M - Dimensioning and Tolerancing
ANSI Y14.36 - Symbols, Surface Texture

(Application for copies of ANSI publications should be addressed to the American Society of Mechanical Engineers, 345 E. 47th Street, New York, NY 10017 or The American National Standards Institute, 1430 Broadway, New York, NY 10018).

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

(Application for copies of ASTM publications should be addressed to ASTM, 1916 Race Street, Philadelphia, PA 19103).

2.3 Order of precedence. In the event of a conflict between the text of this specification and the references cited herein, the text of this specification shall take precedence.

3. REQUIREMENTS

3.1 General requirements.

3.1.1 Documents. The Government shall not be held liable for any expense incurred by the contractor through the use of any documents marked or similarly marked "FOR REFERENCE ONLY" since they are provided as advance notice and are intended only to aid in advance planning.

3.1.2 Sub-contracts. The contractor shall be responsible for compliance with all requirements of the contract, the drawings and specifications on the part of his sub-contractors, including those who supply raw materials; evidence of such compliance shall be supplied by the contractor.

3.1.3 Contractor radioactive data disclosure. In the event that requirements, of any US NRC License held by the Government, compel disclosure of data pertinent to that license by the contractor, the contractor shall comply upon request of the licensee.

3.2 Detailed requirements. Detailed requirements shall be as specified on pertinent drawings and specifications referenced in the contract. For the purposes of this specification, the term "specified" is intended as reference to "documents as applicable", i.e., specifications, drawings, Quality Assurance Procedures (QAP), etc.

3.2.1 Dimensions and tolerances. The contractor shall adhere to the dimensions and tolerances on the drawings; and in no case shall the drawings be scaled. Interpretation of tolerance symbols specified on drawings will be in accordance with the specifications listed on the drawing. Fire Control drawings have been generated to numerous standards over an extended period of time. For this reason, current revisions of standards presently in effect, such as ANSI Y14.5, may not be applicable to older drawings which have not been revised to comply with current standards. Conflicts arising as a result of specified standards or interpretation of symbology will be referred to the contracting officer for resolution. Tolerances specified on drawings have been selected for maximum producibility consistent with the intended function and level of interchangeability desired.

3.2.2 Special accuracy. Compliance with the requirements of this specification and of the applicable specification or drawing, as specified, shall be required notwithstanding that all tolerances on the drawings may have been met. Proper precaution shall be employed in the use of maximum drawing tolerances, since under certain conditions the tolerances can accumulate and result in an instrument that will not meet the requirements of the detail specification. Special care shall be taken in laying out, machining, and assembling those parts which require selective assembly and handfitting (e.g., worms, worm gears and journals) since the accuracy of these parts bears directly on the final performance of the instrument. Completed instruments, in which handfitting has been employed to such an extent as to remove from parts more material than that provided by the tolerances of the drawings for such fittings, shall be accepted only on approval of the contracting officer. Construction of a production pilot model has been found particularly helpful and is advised in the case of fire control instruments, to prove tolerances selected and the assembly methods employed, but is not required.

3.2.3 Incompatibility of requirements. The provisions of 3.2.3 shall not be construed as authorization to deviate in any manner from the dimensional limits imposed by applicable Government drawings. A dimensional incompatibility will be said to exist only if the component cannot be made to assemble or function properly even if manufactured to the most advantageous size within the specified tolerance range; or conversely, if, in order to assemble and function properly, the part cannot be manufactured so as to meet the detailed drawing requirements. If, under these criteria, an incompatibility is found to exist between functional or performance requirements and the detailed drawings, the Government shall be expeditiously advised in order that appropriate corrective action can be taken.

3.2.4 Interchangeability. All component parts, assemblies, and spares shall be interchangeable without modification, except those parts which must be fitted at assembly (see 3.2.3). Contractors may be required to participate in "interchangeability assessments", detailed instructions for which will be issued by the contracting officer. The interchange of parts may be required among manufacturers at the discretion of the Government.

3.2.5 Commercial quality. Parts and material specified as "commercial quality" or specified by merely a name in general commercial use, such as "steel", "forged steel", "bronze", "cast iron", "brass", "drill rod", "leather" and "wood", shall be of high quality and free from any defect that would render them unsuitable or inappropriate for its intended military application. Such parts and material shall not ordinarily be subject to tests or analyses; however, if there is reason to doubt the quality, the right shall be reserved to make such tests as the Government deems necessary. Nothing in this paragraph shall be interpreted to mean that applicable material specifications should be ignored.

3.2.6 Alternate parts and material. The preferred parts or material as specified on the applicable drawings or specifications shall be used. Alternate parts and material shall be used only if designated on the drawing or approval has been granted by the contracting officer.

3.2.7 Flat machined surfaces. Standards and classes of finish shall be in accordance with American National Standard ANSI B46.1. Unless otherwise specified, all parts of a flat machined surface shall be flat with respect to its reference plane within the limits specified in Table I, and illustrated in Figure 1.

SURFACE FINISH SPECIFIED	16	32	63	125	250
PERMISSABLE "A" INCH PER INCH VARIATION FROM REFERENCE PLANE	.0003	.0004	.0006	.0008	.0016

TABLE I

Permissible deviation of a machined surface from a true plane

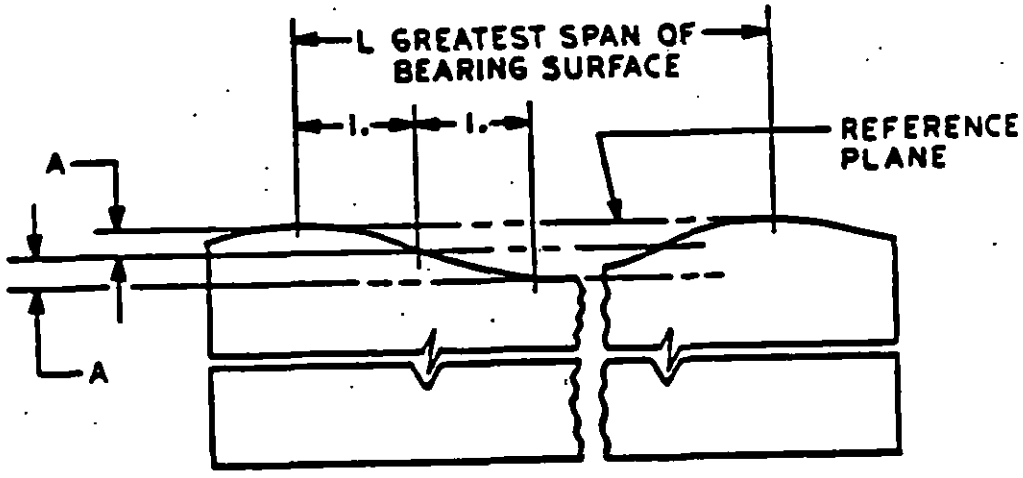

FIGURE 1
FLATNESS

3.2.7.1 Flatness of ends, faces, shoulders or turned parts. Unless otherwise specified, ends faces, shoulders and their extended surfaces shall be flat within .001 inches per inch of diameter. Reference will be perpendicular to the axis.

3.2.7.2 Alignment of plane surfaces. Unless otherwise specified, when a drawing indicates two or more machined plane surfaces to be in the same plane, the finished surfaces (determined on the assumption that the intermittent surfaces form a continuous surface) shall be within the limit specified in Table I.

3.2.8 Perpendicularity

3.2.8.1 Perpendicularity of intersecting surfaces. When two machined surfaces are shown on a drawing, intersecting at right angles (extended to intersect if necessary), the reference planes representing the finished surfaces shall be square within .001 inch per inch (unless otherwise specified) provided that the out-of-squareness does not cause dimensions to exceed the size tolerance. Where practicable, the short surface should be checked against the long surface.

3.2.8.2 Perpendicularity of a machined hole intersecting a machined surface. Unless otherwise specified, if a drawing shows a machined hole intersecting a machined surface at right (to intersect if necessary), the center line of the finished hole shall be square within reference plane representing the finished surface within .001 inch per inch of axial length. This does not apply to tapped or drilled holes.

3.2.8.3 Perpendicularity of holes drilled into a machined surface. Unless otherwise specified, if a drawing shows a hole drilled into a machined surface, the center line of the finished hole shall be square with the reference plane of the finished surface in accordance with Table II.

DIAMETER OF HOLE		SQUARENESS TOL PER IN, DRILL DEPTH
FROM	TO	
0	.040	.010 MAX
.040	.1249	.010
.125	.249	.008
.250	.499	.008
.500	.749	.006
.750	.999	.005
1.000	2.000	.005
OVER 2.000		.002

TABLE II

Permissible perpendicularity of a drilled hole from a machined surface

3.2.8.4 Perpendicularity of intersecting machined holes. When a drawing shows two machined holes with their center lines in the same plane and intersecting at right angles (extended to intersect if necessary), unless otherwise specified, the center lines of the finished holes shall be square within .001 inches per inch. This does not apply to drilled or tapped holes.

3.2.9 Parallelism

3.2.9.1 Parallelism of machined surfaces. If two machined surfaces are shown on a drawing as being parallel and one is located from the other, the reference planes representing the finished surfaces, unless otherwise specified, shall be parallel within .001 inch per inch. Where practical, the short length shall be checked against the long length. In no case shall the total lack of parallelism cause the actual measurement between the reference planes at the ends of the short surfaces to be outside the limits of the governing dimension.

3.2.9.2 Parallelism of a machined hole to a machined surface. Unless otherwise specified, if a machined hole is indicated on a drawing as being parallel to a machined surface, and located from it, the center line of the finished hole shall be parallel to the reference plane representing the finished surface within .001 inches per inch. This does not apply to drilled or tapped holes.

3.2.9.3 Parallelism of machined holes. Unless specified, when two machined holes are shown on a drawing as being parallel, and one is dimensioned with respect to the other, the center lines of the finished holes shall be parallel within .001 inch per inch of hole length. This does not apply to drilled holes.

3.2.10 Concentricity. Unless otherwise specified, two diameters shown concentric on a drawing shall not run eccentrically more that the arithmetical sum of the tolerances indicated on the drawing for those diameters when checked against each other.

3.2.11 Roundness. Unless otherwise specified, the out of roundness of the cylindrical features of parts shall not exceed the tolerances specified for that feature.

3.2.12 Standard machining requirements.

3.2.12.1 Chamfer on threads. All machine cut threaded ends, external and internal, except tapped holes are chamfered at 45°. Tapped holes are to be countersunk approximately 120°, angle included, to minimize the effect of the burr due to tapping, except where thin stock makes this impractical. See Table III for countersink hole diameters. Note: Counter sinks are to be concentric within .005 inch T. I. R.

TABLE III

Maximum countersink diameter for tapped holes to eliminate tapping burr

TAP SIZE	COUNTERSINK DIA
NO. 0	.080 MAX
1	.093
2	.109
3	.125
4	.140
5	.156
6	.171
8	.203
10	.234
¼	.296
OVER ¼ TO ½	TAP SIZE + .046

3.2.12.2 Square of threads. Unless otherwise specified, the axis of die or tap cut threads shall be square with the face or shoulder within .002 inch per inch of thread length; the axis of lathe cut threads shall be square within .001 inch per inch of thread length.

3.2.12.3 Corners, sharp edges and burrs. Unless otherwise specified, all corners and edges shown sharp shall be broken .005" to .030" radius or beveled 45°. Where parts fit or work together, the corners shall be so broken that there is no interference between parts. All sharp edges, burrs, and rough surfaces of threads shall be removed.

3.2.12.4 Tool relief for grinding to shoulders. Unless otherwise specified, a tool relief is permitted at external and internal shoulders. Undercut diameters may be .006" to .010" beyond the finished diameter. Width of undercuts shall not exceed .030". Maximum allowable roughness on undercuts is 125 CLA.

3.2.12.5 Spot facing. Unless otherwise specified, the minimum depth for spotfacing is the depth necessary to provide 75% cleanup of the spotface area, the maximum depth is .010" beyond 100% cleanup.

3.2.12.6 Tolerances for drilled or round punched holes. Unless otherwise specified, where a drawing states a hole size without specific tolerance, the tolerances of Table IV shall apply. Unless otherwise specified, holes may be either drilled or punched. Out of round tolerances must be within size tolerance. Maximum roughness for punched holes is 250 CLA and for drilled holes 125 CLA.

DIAMETER OF HOLE		VARIATION FROM BASIC SIZE
FROM	TO	
0	.040	+.001 - .000
.040	.1249	+.002 - .000
.125	.249	+.003 - .000
.250	.499	+.005 - .000
.500	.749	+.006 - .000
.750	.999	+.008 - .000
1.000	2.000	+.010 - .000
OVER 2.000		SPECIFIED ON DWG

TABLE IV

Permissible size tolerance for drilled or round punched holes

3.2.12.7 Turning centers. Unless otherwise specified, turning centers may remain on parts requiring turning. Turning centers shall not be permissible when a pinning operation is required within 3/16" from the end of a shaft or if turning centers interferes in any way with a pinning operation.

3.2.13 Electrical and electronic assemblies.

3.2.13.1 Electron tubes. Each assembly that is procured with electron tubes shall be furnished with the same tubes used when the assembly was tested during final acceptance. Unless separate packaging of tubes is specified, they shall remain in the respective sockets occupied during the test.

3.2.13.2 Semiconductor devices. Unless otherwise specified, semiconductor devices are to be procured in accordance with MIL-S-19500. Detail requirements, specific characteristics and other provisions which are sensitive to the particular use intended shall be as specified.

3.2.13.3 Microcircuits. Unless otherwise specified, monolithic, multichip and hybrid microcircuits are to be procured in accordance with MIL-M-38510. Detail requirements, specific characteristics and other provisions which are sensitive to the particular use intended shall be as specified.

3.2.13.4 Lead dress. Wires shall not be dressed or routed in any manner which will allow them to touch or come in close proximity to heat producing components which may cause damage to the wire insulation.

3.2.13.5 Soldering of electrical connections. Soldering of electrical connections shall be accomplished in accordance with the visual illustrations, procedures and standards outlined in MIL-S-45743 and MIL-STD-1460. Soldering of printed wiring assemblies shall be in accordance with MIL-S-46844.

3.2.14 Rivets. Riveted parts shall be tight and undamaged. Rivet heads shall be seated firmly against their surface. Loose, cracked, or badly formed rivets, including protruding countersunk rivet heads, will not be acceptable. Excess metal shall be removed from countersunk head rivets.

3.2.14.1 Ferrous rivets. When riveting is to be accomplished by the pressure method, ferrous rivets 3/8-inch diameter and smaller may be driven cold. Ferrous rivets larger than 3/8-inch diameter shall be driven hot unless special authorization is otherwise granted by the Contracting Officer.

3.2.14.2 Nonferrous rivets. Nonferrous rivets shall be driven cold. Age-hardened aluminum-alloy shall be driven by heavy blows or high pressure to avoid hardening of the surface before the head is formed and the hole completely filled. Quenched or refrigerated aluminum-alloy rivets shall be driven in accordance with recommended commercial practice.

3.2.15 Lubrication. General methods of lubricating fire control instruments during final assembly or component sub-assembly will be in accordance with the classification as defined in MIL-STD-1450. Special or delicate applications shall be as specified.

3.2.16 Welding. Surfaces to be welded shall be clean, free from rust, scale, corrosion, dirt, oil, paint or other foreign substances before welding operations are performed. Oxide films and other protective coating shall be removed to the degree necessary to assure good weldability. Welding practice shall be in accordance with MIL-STD-22, MIL-W-13773, MIL-STD-1261 and MIL-W-22248, Class 4 as applicable.

3.2.17 Brazing. Surfaces of parts to be brazed shall be clean and free of all grease, oil, dirt, oxides, and other foreign substances before the brazing operation is performed. The finished brazed joint shall show visual evidence of soundness by exhibiting a uniform distribution of the specified filler metal by capillary action. Brazing shall be performed in accordance with MIL-B-7883 unless otherwise specified.

3.2.18 Soldering, except electrical connections. Soldering, other than electrical connections, shall be as specified. Soldering other than electrical connections shall be in accordance with DOD-STD-1866.

3.2.19 Bonded joints. The bonding of optical glass components to their metal supports shall be in accordance with MIL-B-48612. Bonding of other than glass to metal shall be in accordance with the recommended practice of the material manufacturer unless specified techniques are prescribed on the drawings or referenced specifications.

3.2.20 Cleaning. All interior parts and bearing surfaces of instruments shall be thoroughly cleaned, dried, and free of dust, burrs, chips, and grinding compound before lubrication or assembly. Grinding compounds that will impregnate or adversely affect the specified finish shall not be used. Metal parts, after fabrication, shall be cleaned in accordance with good commercial practice, or as specified in applicable document. Cleaning processes shall have no visible or latent deleterious effect on the equipment. Corrosion shall be removed completely before parts are assembled into the equipment. After assembly, (or before assembly if necessary) components shall be cleaned thoroughly and shall be free from particles or solder, flux, and other foreign material.

3.2.21 Part identification and marking.

3.2.21.1 Identification criteria. Unless otherwise specified, parts shall be individually marked with the applicable identifying number in accordance with MIL-STD-130. The following types of items need not be marked:

a. Parts which do not have suitable or sufficient surface.

b. Unmodified commercial items.

c. Components of inseparable assemblies which are permanently brazed, welded, molded, riveted, nailed, sewn, glued, or bonded.

3.2.21.2 Identification application. Methods of identification application shall be in conformance to MIL-STD-130.

3.2.22 Heat treatment. Heat treatment will be performed in accordance with the requirements outlined in MIL-H-6875 or MIL-H-6088, as applicable, unless otherwise specified.

3.2.23 Castings. Unless otherwise specified, all castings shall conform to the requirements of MIL-C-6021, Class 4. This requires that all castings be subjected to sample inspection by either the magnetic particle or penetrant method, as may be appropriate, in accordance with the requirements and sample size table of MIL-C-6021. When impregnation is specified in the drawing, non-ferrous castings shall be impregnated in accordance with MIL-STD-276 and ferrous castings in accordance with MIL-I-13857, Type I. Final pressure testing of all castings shall be conducted in accordance with the requirements of MIL-STD-276.

3.2.24 Springs. Springs shall conform to the drawing requirements unless otherwise specified. In the absence of specific requirements the following minimum provisions shall apply.

3.2.24.1 Heat treatment. Springs made of materials that achieve their desired properties by heat treatment, such as copper-beryllium alloys, annealed carbon steels, CRES steels, or heat resisting alloys, shall be heat treated to the specified temper after forming.

3.2.24.2 Grain orientation. Flexure and forming of spring elements should be designed to occur perpendicular to the grain of the material. Deviation from the perpendicular shall not exceed 45 degrees. This requirement applies to springs whether heat treated or not.

3.2.24.3 Helical springs. Helical springs shall conform to MIL-S-13572.

3.2.25 Gears. Unless otherwise specified, gears shall conform to the applicable specifications and standards as defined by the American Gear Manufacturers Association (AGMA). The quality level shall be consistent with the performance requirements of the end item.

3.2.26 Optical glass coated with, or components containing radioactive material. Unless otherwise specified, all fire control components coated with or containing radioactive material shall conform to the Nuclear Regulatory Commission requirements, as provided in Title 10, CFR, US Nuclear Regulatory Commission Rules and Regulations.

3.2.27 Autocatalytic decomposition of polyvinylchloride material. Unless otherwise specified, vinyl and polyvinylchloride insulation, wiring sleeving, gasketing, etc., will not be used on fire control instruments because of their

fungus nutrient characteristics and the dangers of out gassing during storage. Outgassing proceeds under ambient temperature conditions but is accelerated at high temperature or low pressure and is especially serious in closed containers. These organics give off corrosive vapors which are active in attacking metals, plastics and elastomers and therefore are detrimental to equipment longevity.

3.2.28 Workmanship. Workmanship shall be of a quality consistent with the highest existing instrument production standards and practices. All finished surfaces shall be protected against corrosion or damage during manufacture prior to delivery. All fins and other excess material shall be removed from castings and forgings. All surfaces, including threads, shall be free from burrs and sharp edges. All material shall be sound, of uniform quality and condition, and free from seams, cracks, and other defects which may adversely affect the strength, endurance, or wear resistance of the part. Adhesives shall be carefully applied to all assemblies, especially where required for proper sealing and security. Material shall not be treated in any manner to conceal defects therein. Welding or other means for the repair of defects in materials shall not be performed unless specifically authorized by the contracting officer. In addition, the provisions of MIL-STD-454, Requirement 9 shall apply where applicable.

4. QUALITY ASSURANCE PROVISIONS.

4.1 Responsibility for inspection. Unless otherwise specified in the contract or purchase order, the contractor is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified in the contract or purchase order, the contractor 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 provisions for components and subassemblies.

4.2.1 Lot formation. Unless otherwise specified by the contracting officer, inspection lot sizes and lot formation shall be in accordance with MIL-STD-105.

4.2.2 Examination. Components and subassemblies shall be examined in accordance with the inspection requirements specified herein. The inspection requirements contained herein shall constitute the minimum inspection to be performed by the contractor prior to submission for Government acceptance. The Government reserves the right to inspect for any applicable requirement and to reject individual nonconforming items.

4.2.2.1 Components and subassemblies covered by QAPs and specifications. Where QAPs or component specifications are referenced in the contract, the examination and inspection provisions of the QAP or specification shall represent the government's minimum inspection requirements. Such inspection requirements do not relieve the contractor from meeting all other requirements of the drawing.

Where a QAP requires test data or certification for a specific characteristic, reports of certifications of objective tests performed on the material shall be properly authenticated by a responsible company official to attest to compliance with the requirements. Reports of certifications shall include positive identification of the material and part, the applicable requirements, the specific test performed and the results obtained. Results of each specimen or sample tested/inspected shall be included in the report or certification. Test reports/certifications shall support the First Article preproduction sample and production samples. Prior to inspection, the contractor shall determine from the test reports/certification as to material compliance with requirements. Components/material not complying shall be rejected.

4.2.2.2 Components and subassemblies not covered by QAPs or specifications.

4.2.2.2.1 Major defects. For components and subassemblies not covered by QAPs or specifications, all major characteristics delineated on drawings shall be subject to examination by the contractor. The minimum amount of inspection shall be determined in accordance with 4.2.2.4.2 and the following listing of types of defect characteristics which shall be classified as Major defects:

a. Performance requirements specified in notes appearing on drawings, such as torque, backlash, environmental-functional-requirements, output, phase relationship, signal-to-noise ratio, etc.

b. Linear or diametral dimensions having tolerances of 0.001 inch or less, or less than 0.0005 inch per inch.

c. Angular dimensions having a tolerance of 5 minutes of arc or less.

d. Machine finishes of 32 micro-inches RMS or finer.

e. Concentricity, true position or runout requirements of 0.001 inch or less.

f. Parallelism and perpendicularity requirements of 0.0005 per inch or less.

g. Screw threads, Class 3 or better.

h. Mandatory load requirements for springs.

i. Tooth-to-tooth and total composite error in AGMA Commercial Class 4 and Precision classes of gears.

j. Tooth-to-tooth and angular error, in gears, of less than 200 seconds of arc.

k. Worm lead accuracy when tolerance is 0.0005 inch or less.

l. Lubrication requirements including dry lubricant finishes.

m. Chemical analyses and physical properties of materials when specified on drawings.

n. Centering errors of lenses, 3 minutes or less.

o. Deviation angle of prisms, 3 minutes or less.

p. Surface quality of all reticles.

q. Resolution requirements of optical elements.

r. Back focal length of lenses.

4.2.2.2.2 Minor defects. Unless otherwise specified, defect characteristics not listed under 4.2.2.2.1 shall be classified as Minor defects.

4.2.2.2 Test methods and procedures. Test methods and procedures applicable to 4.2.2.2 defects shall be established by the contractor and included in his written inspection plan. Each defect shall be carefully analyzed, and a determination made as to the methods, procedures, equipment and sequence of inspections and tests that will best insure the acceptance of those products which meet the requirement, and the unequivocal rejection of those which do not conform.

4.2.2.4 Examination procedures.

4.2.2.4.1 Components covered by QAP. Where QAP are incorporated in the contract by reference, examination for Major and Minor defects shall be in accordance with MIL-STD-105, based on AQL specified in pertinent QAP. One hundred percent examination shall be performed for all critical defects. The following AQL's shall be applicable when no AQL's are specified in QAP. Major defects - AQL 0.65%. Minor defects - AQL 2.5%.

4.2.2.4.2 Components not covered by QAP. Components not covered by QAP shall be inspected in accordance with sampling plan tables of MIL-STD-105 and AQL's specified in 4.2.2.4.1 and in accordance with the Major and Minor defect classification of 4.2.2.2.1 and 4.2.2.2.2.

4.2.2.4.3 Disposition of nonconforming material. Nonconforming material shall be kept segregated from conforming material. Unless otherwise specified, the contractor may, at his option, elect to screen, rework or repair defective material. Government approval of any rework or repair procedure shall be obtained from the Procurement Contracting Officer. After corrections have been made and the Government inspector informed of the corrective action taken, the lot shall be resubmitted for acceptance as outlined in MIL-STD-105.

4.3 Environmental testing. Unless otherwise specified in the contract, environmental testing shall be performed as follows. Where functional requirements are specified on the drawing under conditions other than standard ambient conditions, i.e., low or high temperature, water immersion, high humidity, fungus, salt spray, etc., examination shall be performed on a control sample basis. A control sample shall consist of three selected from each month's production or from each 100 units produced, whichever occurs first.

4.3.1 Environmental test failure. Should environmental tests disclose failure to meet the specified requirements, acceptance of the product will be suspended by the Government until necessary corrections have been made by the contractor, and resubmitted samples have been approved.

4.4 Environmental tests. The following tests shall be performed to the extent specified for the equipment, or by other specific requirements of the contract:

a.	Temperature cycling	(Par 4.4.2)
b.	Humidity	(Par 4.4.3)
c.	Altitude	(Par 4.4.4)
d.	Fungus resistance	(Par 4.4.5)
e.	Solar radiation	(Par 4.4.6)
f.	Rain	(Par 4.4.7)
g.	Dust	(Par 4.4.8)
h.	Vibration	(Par 4.4.9)
i.	Shock	(Par 4.4.10)
j.	Leakage (immersion)	(Par 4.4.11)
k.	High potential	(Par 4.4.12)
l.	Insulation resistance	(Par 4.4.13)

4.4.1 Environmental test procedures.

4.4.2 Temperature cycling.

4.4.2.1 Purpose. The low temperature test is conducted to determine the effects of low temperature on equipment during storage (without protective packaging) or service use. Differential contraction of metal parts, loss of resiliency of packings and gaskets and congealing of lubricants are a few of the difficulties associated with low temperature. The high temperature test is

conducted to determine the resistance of equipment to elevated temperatures that may be encountered during service life either in storage (without protective packaging) or under service conditions. In equipment, high temperature conditions may cause the permanent set of packing and gaskets. Binding of parts may also result in items of complex construction due to differential expansion of dissimilar metals. Rubber, plastic and plywood may tend to discolor, crack, bulge or craze. Closure and sealing strips may partially melt and adhere to contacting parts.

4.4.2.2 Procedure I. The equipment shall be placed in the test chamber and the temperature reduced gradually (see 6.2.1) to minus -62.2°C (-80°F) and allowed to remain at this temperature for 4 hours (or as required by the detail specification) after thermal stabilization (see 6.2.2) is reached. The temperature shall be raised gradually to the specified condition (B,C, or D) of Table V and maintained for 4 hours (after thermal stabilization is reached, at which time, the equipment shall be tested to meet the specified requirements of the detail specification for this temperature. The temperature shall then be raised gradually to +71°C (+160°F) and held constant for 4 hours (after thermal stabilization). The temperature shall be reduced to the specified condition (E, F, or G) of Table V and held at this temperature for 4 hours (after stabilization) and then tested to meet requirements of the detailed specification. The temperature shall then be reduced to standard ambient temperature (see 4.5.2), held for 4 hours (after stabilization) and the equipment tested for all the requirements specified.

TABLE V
TEMPERATURE CONDITIONS-TEMPERATURE CYCLING

TEMPERTURE	CONDITION
-62.2°C. (-80°F.)	A
-54.0°C.(-65°F.)	B
-40°C.(-40°F.)	C
--31.6°C.(-25°F.)	D
+51.7°C. (+125°F.)	E
+51.7°C. (+125°F.) plus solar radiation 1/	F
+65.6°C. (+150°F.)	G
+71.1°C. (+160°F)	H

1/ For condition F, 360 Btu/sq. ft./hr. of solar radiation shall be introduced at the top surface of the equipment for a period of 4 hours following thermal stabilization at 51.7°C (+125°F). (Solar radiation shall consist of 50-60 percent of the total energy in wavelengths above 7600 angstroms, 4.5-6.0 percent in wavelengths below 3800 angstroms, and the balance in visible light.)

4.4.2.3 Procedure II. The equipment shall be placed in the test chamber and the temperature reduced gradually to the specified condition (A,B,C or D) of Table V until 4 hours after thermal stabilization is reached. The temperature shall then be raised gradually to the specified condition (E,F,G or H) of Table V and again held for 4 hours after thermal stabilization. The temperature shall be reduced to the standard ambient temperature (see 4.5.2) and, after 4 hours, the equipment shall be tested for all the requirements of the detail specification.

4.4.3 Humidity.

4.4.3.1 Purpose. The humidity test is applicable to all equipment and is conducted to determine the ability of equipment to resist the effects of exposure to a warm, highly humid atmosphere such as is encountered in tropical areas. This is an accelerated environmental test, accomplished by the continuous exposure of the equipment to high relative humidity at an elevated temperature. These conditions impose a vapor pressure on the equipment under test which constitutes the major force behind the moisture migration and penetration. Corrosion is one of the principle effects on humidity. Hygroscopic materials are sensitive to moisture and may deteriorate rapidly under humid conditions. Absorption of moisture by many materials results in swelling, which destroys their functional utility and causes loss of physical strength and changes in other important mechanical properties. Insulating materials which absorb moisture may suffer degradation of their electrical and thermal properties.

4.4.3.2 Procedure I. Distilled or demineralized water having a pH value between 6.5 and 7.5 at 25°C.(77°F.) shall be used to obtain the desired humidity. The equipment, prepared for normal operation, shall be placed in the test chamber so that it is no closer than 6 inches from the sides of the chamber, and is not being subjected to radiant heat. The humidity of the chamber shall be adjusted to 95 ± 5 percent and maintained at the value during the remainder of the test unless otherwise specified. The temperature of the chamber is raised at a linear rate for a period of 30 minutes until a temperature of 46 ± 1°C. (115 ± 2°F.) is reached and maintained at that temperature for a period of 4½ hours. The temperature of the test chamber is reduced at a linear rate for a period of 1.0 hour until a temperature of 27 ± 1°C. (80 ± 2°F.) is reached. The chamber temperature shall then be varied ± 5°C. (± 9°F.) at least once each hour for the next 6 hours; the rate of change shall be optional, consistent with maintenance of the maximum temperature not in excess of 20 minutes out of each hour. At least once each hour the relative humidity shall be 100 percent with condensation, the duration of which shall be optional and need not necessarily coincide with the maximum temperature phase of the hourly cycle. The above noted 12 hour cycle shall be repeated twenty times. During the low temperature period of the tenth and twentieth cycles, the equipment is returned to normal ambient temperature and tested as specified.

4.4.3.3 Procedure II. The equipment shall be placed in a test chamber and the temperature in the chamber raised from temperature between 20°C. and 38°C. (68°F. to 100°F.) to 71°C. (160°F) and at 95 percent relative humidity during a

2-hour period. The temperature of 71°C. (160°F.) and a relative humidity of 95 percent shall be maintained during the next 6-hour period. During the following 16-hour period, the temperature in the chamber must drop at a uniform rate of 20°C. to 38°C. (68°F. to 100°F.) which constitutes one cycle. The cycle shall be repeated a sufficient number of times to extend the total time of the test to 360 hours (15 cycles) or as specified. At the conclusion of the 360 hour period, the equipment shall be inspected for compliance with all requirements specified and a visual examination made in accordance with 4.4.2. Distilled or demineralized water having a pH value of between 6.5 and 7.5 at 25°C. (77°F.) shall be used to obtain the desired humidity.

4.4.3.4 Procedure III. The equipment shall be placed in a test chamber and the temperature in the chamber raised to 55°C. (131°F.) with a relative humidity no greater than 30 percent and maintained for a period of 24 hours. The performance of the equipment shall be checked and readjusted or realigned if necessary, to meet requirements specified only when realignment or readjustment is permitted by the standard operating procedure for such equipment and for which readily accessible controls are provided on the operating panels of the equipment. The equipment shall then by cycled in accordance with Method 106 of MIL-STD-202 starting with step 1, except that the relative humidity shall be 95 ± 5 percent wherever 90-95 percent RH is specified.

4.4.4 Altitutde (Low pressure).

4.4.4.1 Purpose. The altitude test is conducted to determine the effects of reduced pressure on equipment. This method is applicable for the purpose of determining the ability of equipment to withstand reduced pressure encountered during shipment by air and for satisfactory operation under those pressure conditions. Degrading effects may include leakage of gases or fluids from gasket-sealed enclosures and rupture of pressurized containers. Under low pressure conditions, low density materials may change their physical and chemical properties. Erratic operation of malfunction of equipment may result from arcing or corona. Greatly decreased efficiency of convection and conduction may occur as heat transfer mechanisms under low pressure conditions are encountered.

4.4.4.2 Procedure I. Ground. The equipment shall be placed with the test chamber and the internal absolute pressure reduced to 76.25KPa (22.58 inches) of mercury (corresponding to an altitude of 6000 feet above sea level) with the ambient temperature conforming to the specified condition (B, C or R) table VI. The duration of the test period shall be as specified. At the conclusion of this period and while the altitude and temperature conditions are maintained the equipment shall be inspected for compliance with all requirements specified.

4.4.4.3 Procedure II. The equipment shall be placed within the test chamber and the absolute internal pressure of the chamber reduced to 11.65KPa (3.44 inches) of mercury (corresponding to an altitude of 50,000 feet above sea level) and an ambient temperature of -54°C. (-65°F.). The equipment shall be maintained and,

if specified, operating, under these conditions for the period specified. At the conclusion of this period the equipment shall be returned to sea level at a temperature conforming to the specified condition (B or R) of tabe VI. The equipment shall be inspected for compliance with all requirements specified.

TABLE VI TEMPERATURE CONDITIONS - ALTITUDE

CONDITION	TEMPERATURE
A	-62°C. (-80°F.)
B	-54°C. (-65°F.)
C	-40°C. (-40°F.)
D	-32°C. (-25°F.)
R	Room temperature
E	+52°C. (+125°F.)
F	+65°C. (+150°F.)
G	+71°C. (+160°F.)

NOTE: See 6.2.1

4.4.5 Fungus resistance.

4.4.5.1 Purpose. The fungus test is used to determine the resistance of equipment to fungi and to determine if such equipment is adversely affected by fungi under conditions favorable for their development, namely high humidity, warm atmosphere, and presence of inorganic salts.

4.4.5.2 Fungus resistance test. The fungus resistance of the equipment shall be tested in accordance with Method 508.3, MIL-STD-810, including test organisms, stock culture maintenance, spore suspension, and inoculation and incubation. The total test period is to be 28 days.

4.4.5.2.1 Evaluation of results. At the end of the test period, the parts shall be inspected for compliance with all requirements of the detail specification.

4.4.6 Solar radiation.

4.4.6.1 Purpose. The sunshine test is conducted to determine the effects of solar radiation energy on equipment in the earth's atmosphere. For the

purpose of this test, only the terrestrial portion of the solar spectrum is considered. The limits and energy levels specified here in provide the simulated effects of natural sunshine. The ultraviolet portion simulates natural sunshine in a general way and is considered to be representative of irradiation in most geographical locations. The sunshine tests are applicable to equipment which may be exposed to solar radiation during service or unsheltered storage at the earth's surface or in the lower atmosphere. Sunshine heating effects may cause bending, differential expansion, bulging, cracking, crazing, softening, melting, overheating, binding, permanent set of gaskets, etc. Degradation from spectral energy input is manifested as fading of fabric colors, checking of paints and deterioration of natural rubber and plastic.

4.4.6.2 Solar radiation test. The equipment shall be mounted within the test chamber in the manner specified and subjected to radiant energy at the rate of 100 to 120 watts per square foot for a minimum of 4 hours or as specified; 50 to 60 percent of the total energy shall be in wave lengths above 7,600 angstrom units and 4.5 to 6 percent in wave lengths below 3,800 angstrom units and the balance in visible light. The test chamber temperature shall be maintained at 45° ± 2°C. (113° ± 4°F.) during the course of the test. Upon completion of the test period specified by the detail specification the equipment shall be inspected for compliance with all requirements specified.

4.4.7 Rain.

4.4.7.1 Purpose. The rain test is conducted to determine the effectiveness of protective covers or cases to shield equipment from rain. The test is applicable to equipment which may be exposed to rain under service conditions.

4.4.7.2 Procedure I. The equipment shall be mounted in the test chamber to simulate installation conditions. The rain test chamber temperature shall be maintained between 20°C. to 30°C. (68°F. to 86°F.) throughout the test period. A simulated rainfall of 4 + 0 inches per hour as measured at the surface of the equipment with a U.S. Weather Bureau type gage shall be produced by means of a water spray nozzle of such design that the water is emitted in the form of small droplets rather than a fine mist. The temperature of the water shall be maintained between 11°C. to 20°C. (52°F. to 68°F.). The rainfall shall be dispersed uniformly over the test area within the limits as specified above. The test item shall be periodically rotated to allow the simulated rainfall to contact all surfaces which are normally subjected to rain during actual use. Duration of the test shall be 2 hours at the completion of which the equipment shall be examined for evidence of water penetration or damage.

4.4.7.3 Procedure II. Equipment shall be mounted in a test chamber and exposed to a simulated 24 hour rainfall totaling 32 inches made up of the following intensities with the indicated durations and other properties, both air and rain, at 21°C. (70°F.):

Amount (in.) 1/	12	2	11 2/	7
Duration (hr:min.)	11:55	0:05	11:00	1:00
Rate (in./hr)	1	24	1	7
Drop Size (mm) Min.	2.55	4.0	2.25	3.2
Std Dev.	0.77	1.68	18	1.1
Min. ht. of fall (ft)	18	26	18	25.1

1/ As measured at the surface of the equipment with a U.S. Weather Bureau type gage.

2/ Wind speed of 40 mph during this portion of the cycle. The recommended method of measuring raindrop size is the flour pellet method as referenced in "The Relation of Raindrop Size to Intensity" by Laws and Parsons, Transactions of the American Geophysical Union, Part III, PPS 452 to 459,-1943.

4.4.8 Dust (fine sand).

4.4.8.1 Purpose. The dust test is used to ascertain the ability of equipment to resist the effects of a dry dust (fine sand) laden atmosphere and may serve as a substitute for falling snow. This test simulates the effect of sharp edged dust (fine sand) particles, up to 150 microns in size, which may penetrate into cracks, crevices, bearings, and joints. This test is applicable to all mechanical, electrical, electronic, electrochemical and electromechanical devices for which exposure to the effect of a dry dust laden atmosphere is anticipated. General effects resulting from the penetration of dust may cause a variety of damage such as fouling of moving parts, inoperative relays, formation of electrically conductive paths and resulting short circuits; and acting as a nucleus for the collection of water vapor, and hence a source of possible corrosion and malfunction. Many items, such as rifles, vehicles, and helicopters, will encounter sand particles up to 1,000 microns, as opposed to the 149 micron maximum for 140-mesh silica flour sand tests, that would require a much coarser formulation than that covered by this method.

4.4.8.2 Dust test. This test shall be performed in accordance with Method 510.2, Section I, of MIL-STD-810, including sand and dust composition and silica flour particle size distribution (see 6.4). The test shall be conducted while maintaining a dust density of 0.1 to 0.5 grams per cubic foot of test space, a relative humidity not to exceed 30 percent during the course of the test and a dust velocity through the test chamber of 200 ± 100 feet per minute or 2300 ± 500 feet per minute, as specified. This test is to be run at 25° ± 1°C. (77° ± 2°F.) and, if specified, at each of the temperature extremes of 71° ± 2°C. (160° ± 4°F.) and -17.8° ± 1°C (0° ± 1°F). The duration of the test is to be 6 hours at each temperature specified.

At the end of each temperature cycle extreme the equipment shall be allowed to temperature stabilize to room temperature and then examined for compliance with the requirements specified. Unless otherwise specified, the equipment is to be in operation during the course of the test.

WARNING NOTE: Silica flour may present a health hazard. When using silica flour, assure that the chamber is functioning properly and not leaking; if a failure of containment is noted and people might have been exposed, air samples should be obtained and compared to the current threshold limit values of the American Conference of Government and Industrial Hygienists. Chamber repair and/or other appropriate action should be taken before continuing use of the chamber. Care should be taken during all steps where exposure of people to the silica dust is possible.

4.4.9 Vibration.

4.4.9.1 Purpose. The vibration test is performed to determine if equipment is constructed to withstand expected dynamic vibrational stresses and to insure that performance degradations or malfunctions will not be produced by the service vibration environment.

4.4.9.2 Test item operation. Unless otherwise specified the equipment shall be operated during the test in accordance with directions as specified. If the equipment is not operated during the test period, then at the conclusion of the test the equipment shall be inspected for compliance with all requirements specified.

4.4.9.3 Temperature - vibration test. Vibration tests shall be performed under ambient, temperature conditions (see 4.5.2) unless a high or low temperature vibration test is specified, in which case the temperature extremes and time durations shall be as specified.

4.4.9.4 Mounting requirements. The test item shall be attached by its normal mounting means, either directly to the vibration exciter or transition table, or by means of a rigid fixture capable of transmitting the vibration conditions specified herein. Precautions shall be taken in the establishment of mechanical interfaces to minimize the introduction of extraneous responses in the test setup. The test load shall be distributed as uniformly as possible on the vibration exciter table to minimize the effects of unbalanced loads. Input control sensing device(s) shall be rigidly attached to the vibration table, or fixture if used, as near as possible to the attachment point(s) of the test item.

4.4.9.5 Procedure I. Helicopter vibration. The vibration shall be applied along each of the three mutually perpendicular axes of the test item. The vibratory acceleration levels or double amplitudes specified in Table VIII shall be maintained at the test item mounting points.

TABLE VIII Helicopter Vibration

FREQUENCY	ACCELERATION	DISPLACEMENT	TEST DURATION
5 - 14 HZ		.2 in. D.A.	3 HRS/AXIS
14 - 33 HZ	2G		
33 - 52 HZ		.036 in. D.A.	Sweeptime 36 min.
52 - 2000 HZ	5G		5-2000-5 Logarithmic

At the conclusion of the test, the test item shall meet all of the requirements of the detail specification.

4.4.9.6 Procedure II. Tracked vehicle vibration. The vibration shall be applied along each of the three mutually perpendicular axes of the test item. The vibratory acceleration levels and double amplitudes specified in Table IX shall be maintained at the test item mounting points.

TABLE IX Tracked Vehicle Vibration

FREQUENCY	ACCELERATION	DISPLACEMENT	TEST DURATION
5-30 HZ	1.5 G		3 HRS/AXIS
30-50 HZ		.033 in. D.A.	Sweeptime 15 min.
50-500 HZ	4.2 G		5-500-5 HZ Logarithmic

At the conclusion of the test, the test item shall meet all of the requirements of the detail specification.

4.4.10 Shock.

4.4.10.1 Purpose. The shock test is conducted to determine the structural integrity and performance of equipment with respect to mechanical shock environments encountered during handling, transportation and service use.

4.4.10.2 Procedure I. This procedure shall be used to determine the equipment operating characteristics as well as its structural integrity under conditions of shock. The equipment shall be subjected to the shock conditions as normally used in service, including any shock mount assembly. The shock and time duration may be changes as specified. The test specimen shall be subjected to 18 impact shocks of 15G or as specified, each shock impulse having a time duration of 11 ± 1 milliseconds. The shock pulse amplitude shall be within ± 10% of the specified value when measured with an instrumentation system having a frequency response which is flat within 10% over the range from 4-2000 HZ min. The maximum G shall be reached in approximately 5½ milliseconds. The shock shall be applied in the following directions:

a. Vertically, 3 shocks in each direction.

b. Parallel to the major horizontal axis, 3 shocks in each direction.

c. Parallel to the minor horizontal axis, 3 shocks in each direction.

The test speciment shall not suffer damage or subsequently fail to provide the performance specified.

4.4.10.3 Procedure II. A high impact shock testing machine designed and fabricated according to MIL-S-901 shall be set up to produce the magnitude and duration of shock specified. The number of shocks and position of the test specimen shall be as specified. Functional tests shall be conducted during shock applications according to the requirements specified. There shall be no mechanical failures due to the applied shocks.

At the conclusion of the test the equipment shall be inspected for compliance with all requirements specified.

NOTE: The filtered shock pulse obtained as a result of the performance of the specified shock test shall have a wave form approximating a half sine or saw tooth wave as specified. The instrumentation system used to measure the shock pulse shall have a frequency response which is flat within 10% over the range of 4-2000 HZ min.

4.4.11 Leakage (immersion).

4.4.11.1 Purpose. The purpose of this test is to determine the ability of the equipment to be immersed in water without leakage of the water into the enclosure. Generally, air seepage in the form of bubbles would be an indication of defective equipment or poor workmanship. Water seepage into the equipment could cause corrosion or fouling of lubricants between moving parts.

4.4.11.2 Procedure I (gross leakage only). Where applicable, open and close doors, and remove and replace covers three times immediately before tests are performed. The temperature of the water shall be 18° ± 5°C (64° ± 0°F.) and the temperature of the test item shall be 45° ± 3°C (113° ± 5°F.). The water container shall be of sufficient capacity so that the immersion of the test item will not raise the temperature of the water more than 3°C. (5°F.). The test item shall be immersed (covers closed on field transported items) in water so that the uppermost point of the test item is 36 ± 5 inches below the surface of the water. The test item shall remain immersed for 120 ± 5 minutes. Upon completion of the test period, remove the test item from the water and wipe the exterior surfaces of the test item dry. Open the test item and examine the interior and contents for evidence of leakage.

4.4.11.3 Procedure II (slight leakage, pressurized or non-pressurized equipment). Actuate doors and covers as indicated in Procedure I. The temperature of the water and test item shall be 23° ± 10°C. (73° ± 18°F.). The test item shall be completely immersed so that the uppermost part of the test item is 2 ± 1 inches below the surface of the water. The absolute pressure of the air above the liquid shall be reduced to 1, 19, or 25 inches of mercury (absolute) or as specified and maintained for 1 minute, or until air bubbles substantially cease to be given off by the water, whichever is the longer time. The absolute pressure above the liquid shall then be increased to 2.5, 20 or 26 inches of mercury, respectively, and maintained for 60 minutes. Bubbles coming from within the equipment shall be considered a leakage, however, bubbles which result from trapped air on the various exterior surfaces of the test item shall not be considered a leak.

4.4.11.4 Procedure III (pressurized equipment). The temperature of the water, pressurizing gas, and the test item shall be 23° ± 10°C. (73° ± 18°F.). The gas used for pressurizing (e.g., air, nitrogen, or helium) shall be clean and dry with a dewpoint of at least -32°C. (-25°F.). The equipment shall be

completely immersed in water so that the uppermost part of the test item is 2 ± 1 inches below the surface of the water. The equipment shall be internally pressurized from a minimum to 125 percent of the maximum operating pressure, as specified and maintained for a minimum of 60 minutes at each pressure. Bubbles coming from within the equipment shall be considered a leakage, however, bubbles which result from trapped air on the various exterior surfaces of the test item shall not be considered a leak.

NOTE: In lieu of Procedures II and III, a helium or halogen leak detector (equal or superior in sensitivity to these immersion test methods) may be used upon approval of the procuring activity.

4.4.12 High potential. The high-potential test shall be performed in accordance with MIL-STD-202, Method 301, and following procedure indicated in 4.4.12.1 or 4.4.12.2 as applicable.

4.4.12.1 Procedure I. A potential of 750 volts (RMS) plus twice the rated voltage shall be applied instantaneously for a period not less than 5 seconds nor more than 30 seconds.

4.4.12.2 Procedure II. Same as Procedure I, except that test voltage shall be 1000 volts (RMS) plus twice the rated voltage applied for the same period of time.

4.4.13 Insulation resistance. The insulation-resistance test shall be performed in accordance with MIL-STD-202, Method 302 and following procedure indicated in 4.4.13.1.

4.4.13.1 Procedure. Insulation resistance shall be measured between the mutually insulated points and between insulated points and ground, as specified. Measurements shall be made by utilizing apparatus suitable for the characteristics of the component to be measured such as a megohm bridge, megohmeter or insulation resistance tester, at a D.C. potential of 500 volts ± 10%. The insulation resistance shall not be less than 10 megohms.

4.4.14 Post environmental inspection. After required environmental exposure, the equipment shall be inspected to detect evidence of deterioration, corrosion or other damage of both internal and external components which could in any manner prevent the equipment from meeting functional requirements or reduce its intended service life. Any such damage shall be considered a failure of the test to which it was subjected.

4.5 Test facilities.

4.5.1 Test chambers. Where a test chamber is required in test procedures, the volume of the chamber shall be such that, unless otherwise specified, the volume of the equipment under test shall not exceed 50 percent of the volume of the test chamber. No portion of the equipment under test shall be less than 6 inches from any surface of the chamber.

4.5.2 Standard ambient test conditions. Unless otherwise specified herein or in the individual specification, standard ambient tests shall be performed at a temperature of 15°C. (60°F.) to 32°C. (90°F.), at a barometric pressure of 28 to 32 inches of mercury, and a relative humidity not greater than 80 percent.

4.5.3 Test conditions measurements. All measurements shall be made with instruments whose accuracy has been certified. If tests are conducted at the contractor's plant the accuracy of the instruments and test equipment shall be certified periodically.

4.5.3.1 Tolerances. The maximum allowable tolerances on test condition measurements shall be as follows unless otherwise specified:

a. Temperature: Plus or minus 2°C.

b. Altitude: Plus or minus 5 percent in feet.

c. Humidity: Plus or minus 5 percent relative.

d. Vibration amplitude: Plus or minus 5 percent. This tolerance applicable only to the amplitude measuring instruments.

e. Vibration frequency: Plus or minus 2 percent. This tolerance applicable only to the frequency measuring instruments.

4.5.4 Test and evaluation of components containing radioactive material. Unless otherwise specified, sampling, testing and evaluation of fire control components containing radioactive material shall be in accordance with the requirements of MIL-STD-105 and MIL-G-174.

5. Packaging.

5.1 Packaging, packing and marking. Packaging, packing and marking shall be in accordance with the applicable requirements of documents specified in the contract. Where applicable, all packing material will meet the test criteria outlined in FED-STD-101. In the absence of contractual requirements, the requirements of ASTM D3951 shall apply.

5.2 Systems, components and assemblies containing, or coated with, radioactive material. Fire control systems containing, or components coated, with radioactive material shall be packaged, packed and marked in accordance with the requirements of DSAM 4145.8.

5.2.1 Shipping and transportation of material containing radioactivity. Fire control systems, components or assemblies, which contain radioactive material, shall be shipped and or transported in accordance with the requirements of Department of Transportation Regulations, Title 49, CFR and DSAM 4145.8.

6. Notes.

6.1 Intended use. This specification is intended for use in connection with procurement, manufacture/inspection of fire control materials covered by a detailed specification and other material (components and assemblies) not covered by detail specification. Detail specifications invoking this specification should specify selection of methods or procedures wherein options are defined in this specification and documents referenced herein.

6.2 Definitions.

6.2.1 Gradual temperature change. The requirement for gradual temperature change is for protection of the manufacturer and may vary as warranted within broad limits depending on how equipment is affected by thermal shock. See applicable specification or drawing for rate of temperature change (i.e. plastic periscope rate of change shall not exceed 20°F. per HR). This provision is provided to expedite testing and applies wherever gradual is specified.

6.2.2 Thermal stabilization. Thermal stabilization has been reached when the temperature of the largest internal mass centrally located in the equipment does not vary more than 1°C. from the ambient temperature. (For a given set of conditions soaking time may be determined by trial run using an appropriate temperature indicator).

6.2.3 QAP. quality assurance provision. Quality assurance provisions are documented requirements, procedures and criteria necessary for demonstrating that components and assemblies conform to user requirements, and that material and associated processes conform to approved designs and procedures.

6.2.4 Radioactive material. Radioactive material means any item or material which is in itself radioactive or which contains radioactive material giving readings in excess of background radiation as measured on an instrument designed specifically for the type of radiation being emitted.

6.3 Abbreviations. SME and STE appearing on QAP forming a part of this specification are defined as follows:

6.3.1 Standard measuring equipment (SME). Standard measuring equipment (SME) is defined as the common hand-type measuring devices which are usually stocked by commercial supply houses for ready supply (shelf items), and which are normally used by an inspector to perform dimensional inspection of items under procurement. This category also includes commercial testing equipment such as meters, optical comparators, etc.

6.3.2 Special test equipment (STE). Special testing equipment is defined as special inspection fixtures, instruments and modified standard measuring equipment.

6.4 Silica flour. 140-mesh silica flour, as produced by the Ottawa Silica Co., Ottawa, IL, or equal, is satisfactory for use in the performance of the dust test.

6.5 Use of government drawings. When Government drawings, specifications or other data are used for any purpose other than in connection with a definitely related Government procurement operation, the United States Government thereby incurs no responsibility nor any obligation whatsoever; and the fact that the Government may have formulated, furnished or any other way supplied the said drawings, specification or other data is not to be regarded by implication or otherwise as in any manner licensing the holder or any other person or corporation, or conveying any rights or permission to manufacture, use or sell any patented invention that may in any way be related there to.

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

Custodian
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Preparing activity
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(Project 12GP-A003)

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(See Instructions – Reverse Side)

1. DOCUMENT NUMBER	2. DOCUMENT TITLE
MIL-F-13926B (AR)	Fire Control Materiel, Manufacture & Inspection, General Spec For

3a. NAME OF SUBMITTING ORGANIZATION	4. TYPE OF ORGANIZATION (Mark one)
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	☐ USER
b. ADDRESS (Street, City, State, ZIP Code)	☐ MANUFACTURER
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5. PROBLEM AREAS

a. Paragraph Number and Wording:

b. Recommended Wording:

c. Reason/Rationale for Recommendation:

6. REMARKS

7a. NAME OF SUBMITTER (Last, First, MI) – Optional	b. WORK TELEPHONE NUMBER (Include Area Code) – Optional
c. MAILING ADDRESS (Street, City, State, ZIP Code) – Optional	8. DATE OF SUBMISSION (YYMMDD)

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