

MIL-S-12928G  
17 March 1986  
SUPERSEDING  
MIL-S-12928F  
15 December 1977

## MILITARY SPECIFICATION

### SEPARATORS, OIL AND WATER, COMPRESSED AIR

This specification is approved by the Assistant Administrator,  
Office of Federal Supply and Services, General Services  
Administration, for the use of all Federal agencies.

#### 1. SCOPE

1.1 Scope. This specification covers wall-mounted separators designed to remove oil, water, and foreign particles from compressed air and to regulate the delivery pressure of air used for spray painting and similar operations.

#### 1.2 Classification.

1.2.1 Classes. Separators covered by this specification shall be of the following classes, as specified (see 6.2.1):

Class 1 - One regulator, two outlets  
Class 2 - Two regulators, four outlets

#### 2. APPLICABLE DOCUMENTS

##### 2.1 Government documents.

\* 2.1.1 Specifications and standards. The following specifications and standards form a part of this specification to the extent specified herein. Unless otherwise specified, the issues of these documents shall be those listed in the issue of the Department of Defense Index of Specifications and Standards (DoDISS), and supplement thereto, cited in the solicitation.

#### SPECIFICATIONS

##### FEDERAL

PPP-B-601 - Boxes, Wood, Cleated-Plywood.

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, ATTN: SMCAR-EST-S (R), Rock Island, IL 61299-7300 by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

AMSC N/A

FSC 4940

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- PPP-B-621 - Boxes, Wood, Nailed and Lock-Corner.
- PPP-B-636 - Boxes, Shipping, Fiberboard.
- PPP-B-640 - Boxes, Fiberboard, Corrugated, Triple-Wall.
- PPP-F-320 - Fiberboard: Corrugated and Solid, Sheet Stock (Container Grade), and Cut Shapes.

## MILITARY

- MIL-P-116 - Preservation, Methods of.
- MIL-R-2765 - Rubber Sheet, Strip, Extruded, and Molded Shapes, Synthetic, Oil Resistant
- MIL-C-5501 - Caps and Plugs, Protective, Dust and Moisture Seal, General Specification for.

## STANDARDS

### FEDERAL

- FED-STD-H28 - Screw-Thread Standards for Federal Services.
- FED-STD-376 - Preferred Metric Units for General Use by the Federal Government.

### MILITARY

- MIL-STD-105 - Sampling Procedures and Tables for Inspection by Attributes.
- MIL-STD-129 - Marking for Shipment and Storage.
- MIL-STD-130 - Identification Marking of US Military Property.
- MIL-STD-889 - Dissimilar Metals.

\* 2.1.2 Other Government documents. The following other Government documents form a part of this specification to the extent specified herein. Unless otherwise specified, the issues shall be those in effect on the date of the solicitation.

### US DEPARTMENT OF LABOR

- OSHA 2206 - General Industry, OSHA Safety and Health Standards (29 CFR 1910).

(Copies of specifications, standards, and documents required by contractors in connection with specific acquisition functions should be obtained from the contracting activity or as directed by the contracting activity.)

\* 2.2 Other publications. The following document(s) form a part of this specification to the extent specified herein. Unless otherwise specified, the issues of the documents which are DoD adopted shall be those listed in the issue of the DoDISS specified in the solicitation. Unless otherwise specified, the issues of documents not listed in the DoDISS shall be the issue of the nongovernment documents which is current on the date of the solicitation.

### AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

- ASTM D3951-82 - Standard Practice for Commercial Packaging.

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(Application for copies should be addressed to the American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103.)

(Nongovernment standards and other publications are normally available from the organizations which prepare or which distribute the documents. These documents also may be available in or through libraries or other informational services.)

\* 2.3 Order of precedence. In the event of a conflict between the text of this specification and the references cited herein (except for associated detail specifications, specification sheets, or MS standards), the text of this specification shall take precedence. Nothing in this specification, however, shall supersede applicable laws and regulations unless a specific exemption has been obtained.

### 3. REQUIREMENTS

\* 3.1 First article. When specified in the contract or purchase order, a sample shall be subjected to first article inspection (see 4.3 and 6.2.1).

\* 3.2 Design. The separators shall be new and of the manufacturer's latest design which shall meet the performance requirements specified herein. The separators shall be capable of removing oil, water, and other foreign matter from compressed air and capable of regulating the delivery pressure of that air. The design shall be such that parts subject to wear, breakage, or distortion shall be accessible for adjustment, replacement, or repair without modification, distortion, or damage to the separators or any separator part or component.

\* 3.2.1 Measurement system. The US Customary System of Units (US) or the International System of Units (SI) may be used in the design and construction of the separators. In this specification, all measurements, dimensions, sizes, and capacities are given in the US system. These measurements may be converted to the SI system by using the conversion factors and methods specified in FED-STD-376.

\* 3.2.2 Threads. Threads shall conform to FED-STD-H28 and the applicable Detailed Standard section referenced therein.

\* 3.2.3 Interchangeability. All parts shall be manufactured to definite standards, clearances, and tolerances in order that any such parts of a particular type or model may be replaced, interchanged, and adjusted without modification of the replacement parts or any other parts of the unit. When practical, all parts shall be permanently and legibly marked in accordance with MIL-STD-130.

\* 3.2.4 Safety and health requirements. The separators shall comply with the general safety and health requirements promulgated under OSHA 2206 that are applicable to the separators themselves. Exceptions and additional requirements for safety and health shall be as specified in the contract (see 6.2.1 and 6.4).

\* 3.3 Material. Materials not specifically designated herein or in the contract shall be of a quality commensurate with commercial practice within the producing industry, shall be suitable for the intended purpose in the design of the end item, and shall meet all requirements specified herein. Materials shall be free from defects which would adversely affect the performance or maintainability of the individual components or the overall assembly. It shall not be

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permissible to use reclaimed parts as is, or rebuilt from scrap or other used equipment. When dissimilar metals are used in contact with each other, suitable protection against galvanic corrosion shall be applied in accordance with MIL-STD-889.

\* **3.4 Construction.** The separators shall be furnished complete so they can be used for the operations specified herein. Parts used in fabricating the separators shall be new and free of defects. All part surfaces shall be clean and free of extraneous materials. External surfaces shall be smooth and free of sharp edges. Functional surfaces shall be free from burrs and defects affecting performance.

\* **3.4.1 Castings and forgings.** Castings shall be free from visible blowholes, porosity, hard spots, shrinkage defects, cracks, or other defects. Forgings shall be free from visible scale, inclusions, cold shuts, mismatching, sharp edges, or other defects. Castings and forgings shall be free from any properties adversely affecting their strength, durability, or suitability. Reclaiming or repair of major castings and forgings shall be permitted if the repair is not on a critical surface.

\* **3.4.2 Welding, brazing, and soldering.** Welding, brazing, and soldering shall be of a quality which shall sustain all requirements of the welded, brazed, or soldered parts. These operations shall not be employed as repair measures for defective parts.

\* **3.4.3 Fastening devices.** Screws, pins, bolts, and similar parts shall be installed with means for adjustment and for preventing loss of tightness. The methods for adjustment and for preventing loss of tightness shall be in accordance with accepted engineering standards and practices. All such parts when subject to renewal or adjustment shall not be swaged, peened, staked, or otherwise deformed.

**3.5 Capacity and performance.** The capacity and performance requirements specified herein shall apply to both class 1 and class 2 separators unless otherwise indicated.

\* **3.5.1 Class 1 separator.** With an inlet pressure of 100 pound-force per square inch gage (psig) and regulated pressure of 60 psig, the regulated air pressure gage shall record a drop of not more than 11 psig when the regulated air outlet valve is opened, to permit air passage at the rate of 20 cubic feet per minute (cfm) free air, for a period of 30 seconds. With the inlet and the regulated pressures as above, the regulated air pressure gage shall record a drop of not more than six psig when the regulated air outlet valve is opened to permit air passage at the rate of 11 cfm free air for a period of 30 seconds. The separator shall be capable of extracting 95 percent by volume of the oil and water contained in oil and water saturated air at 100 psig at an air flow rate of not less than 75 cfm free air while operating at an ambient temperature of 72  $\pm$  5 degrees Fahrenheit ( $^{\circ}$ F).

**3.5.2 Class 2 separator.** Performance requirements for the class 2 separator shall be identical to the requirements for the class 1 separator (see 3.5.1) except that the requirements shall apply for each of the two regulators, individually, while being operated simultaneously.

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\* 3.5.3 Regulator pressure range capacity. Each pressure regulator shall be adjustable for delivery of air at any pressure from 20 to 100 psig, minimum. The differential pressure shall not be more than five psig from inlet to outlet over the range of regulation.

3.5.4 Anticreep requirement. With an inlet pressure of 175 psig and a regulated pressure of 20 psig, the regulated air pressure gage shall show an increase in pressure of not more than two psig when the regulated air outlet valve is closed for a period of five minutes. The regulator shall be capable of repeating the performance at gage settings of 40, 60, and 80 psig.

3.5.5 Separator pressure overload resistance. Each separator, with the regulator handle, or handles, fully turned in and with the pressure gages removed and the gage openings plugged, shall be capable of withstanding an inlet overload pressure of 250 psig for a period of one minute, without leakage and with no evidence of damage to the separator or regulator, at a maximum operating temperature of +100°F.

\* 3.5.6 Working pressure. The separator assembly and its component parts shall be suitable for use with a 200 psig working pressure at a maximum operating inlet temperature of +160°F.

\* 3.6 Components. The principal components of the class 1 separator shall be a head, filtering unit, reservoir, drain valve, pressure regulator, "regulated air" pressure gage, at least one regulated filtered air outlet valve, and one supply line pressure filtered air outlet valve with necessary fittings. The class 2 separator shall be equipped with two pressure regulators, two "regulated air" pressure gages, a minimum of four air outlet valves (at least two of which shall be regulated filtered air and at least one shall be for supply line pressure), filtered air, and necessary fittings.

3.6.1 Separator head. The separator head shall be a forging, casting, or weldment made of corrosion-resistant metal. All regulators, gages, and outlet valves shall be mounted to the separators and located in convenient positions to facilitate separator operation. In addition to the necessary threaded outlets, a female air inlet with 0.50 inch NPT thread shall be provided. The separator head shall incorporate provisions for wall-mounting the separator.

\* 3.6.2 Filtering unit. The filtering unit shall consist of a condensing chamber with baffles or nozzles, and a filter. The unit shall be made of corrosion-resistant material. The filter shall be of the cleanable or replaceable type capable of removing 10 micron or finer, particle contamination. The wet pressure drop shall not exceed three psig. The filter shall require no maintenance except for cleaning.

\* 3.6.3 Separator reservoir assembly. The reservoir of the separator shall be made of corrosion-resistant metal, shall have a capacity of at least one-third pint, and shall incorporate a drain valve for removing collected oil and water. The one-third pint reservoir capacity in the chamber shall be in addition to the space occupied by the filter and the baffles. Construction of the separator shall be such that disassembly for the purpose of cleaning the filter unit and reservoir can be accomplished without requiring the removal of any gages, regulators, air valves, or valve fittings.

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3.6.4 Pressure regulator. The body of the pressure regulator shall be made of brass, bronze, zinc, aluminum, or other corrosion-resistant metal. The pressure regulator shall be of such design that the regulated air pressure cannot exceed the pressure range of the regulated air pressure gage, precluding the possibility of overload damage to the gage. The pressure regulator shall be capable of passing a minimum of 20 cfm of free air with a supply pressure of 100 psig and a regulated pressure of 60 psig.

3.6.4.1 Springs. The diaphragm spring and the valve spring shall be made of stainless steel or other inherently corrosion-resistant metal, or of metals treated to resist corrosion.

3.6.4.2 Diaphragm. The diaphragm shall be made of rubber or corrosion-resistant material. If made of rubber, the rubber shall be sheet synthetic rubber conforming to MIL-R-2765.

3.6.4.3 Regulator valve. The valve mechanism for adjusting regulated air pressure shall be operated by a handle constructed for adjustment. All parts of the pressure regulator not otherwise specified shall be made of corrosion-resistant materials, or of metals treated to be corrosion resistant.

3.6.5 Pressure gage. The pressure gage case and bezel ring shall be made of corrosion-resistant metal or steel electroplated to resist corrosion. The pressure gage crystal shall be made of glass with a minimum thickness of .062 inch. The pressure gage and bezel ring may be painted black at the manufacturer's option.

3.6.5.1 Pressure gage dial. Dial faces shall be not less than two inches in diameter and shall be marked plainly and permanently in the English system. Markings shall be black on white background or white on a black background.

3.6.5.2 Dial markings. The supply line pressure gage shall have a minimum pressure range of from 0 to 200 psig and shall be marked in minor graduations of 2 to 5 psig, and in major graduations of 20 to 25 psig with numerical values at the major graduations. The regulated air pressure gage shall have a minimum pressure range of from 0 to 100 psig, and shall be marked in minor graduations of 2 to 5 psig and in major graduations of 10 psig, with numerical values at the major graduations.

3.6.5.3 Bourdon tube. A Bourdon tube made of phosphor bronze or beryllium copper shall provide the movement which shall be accurate within two percent in the mid 50 percent range of the scale, and to within three percent in the low range 25 percent and high range 25 percent of the scale. The Bourdon tube may be copper alloy at the manufacturer's option.

3.6.6 Outlet valves and fittings. Outlet valves and fittings shall be made of brass or other suitable corrosion-resistant metal. All outlet valves shall have .250-18NPSH thread, with a tapered seat having a 60 degree included angle for a female hose connection.

\* 3.7 Protective finishes. Exposed metal and working surfaces, except when the parts involved are inherently corrosion resistant, shall be protected with an electrochemical or chemical conversion finish.

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3.8 Product identification. The separators shall be marked for product identification in accordance with MIL-STD-130 and, unless otherwise specified (see 6.2.1), shall include the National Stock Number.

3.9 Workmanship. Standards of workmanship shall assure that the separators shall have the stability, strength, durability, safety, and efficient operating characteristics found in the best commercial units and as specified in Section 3.

#### 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.

\* 4.1.1 Responsibility for compliance. All items must meet all requirements of Sections 3 and 5. The inspection set forth in this specification shall become a part of the contractor's overall inspection system or quality program. The absence of any inspection requirements in the specification shall not relieve the contractor of the responsibility of assuring that all products or supplies submitted to the Government for acceptance comply with all requirements of the contract. Sampling in quality conformance does not authorize submission of known defective material, either indicated or actual, nor does it commit the Government to acceptance of defective material.

4.2 Classification of inspection. The inspection requirements specified herein are classified as follows:

- (a) First article inspection (see 4.3).
- (b) Quality conformance inspection (see 4.4).

\* 4.3 First article inspection. When required, first article inspection shall be applied to a preproduction model or initial production item (see 3.1). Unless otherwise specified (see 6.2.1), first article inspection shall consist of the examination in 4.5 and all tests under 4.6. Failure of the first article to pass the examination or any of the tests shall be cause for rejection.

\* 4.4 Quality conformance inspection. Quality conformance inspection shall be applied to production items offered for acceptance under the contract. Quality conformance inspection shall consist of (a) through (f) below. Failure of any item to pass an examination or test shall be cause for rejection of the item.

- (a) Product examination (see 4.5).
- (b) Pressure gage accuracy test (see 4.6.1).
- (c) Pressure drop test (see 4.6.2).
- (d) Regulator flow rate test (see 4.6.5).
- (e) Packaging inspection (see 4.7).



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\* 4.4.1 Sampling. Sampling for quality conformance inspection shall be in accordance with MIL-STD-105, using the following Inspection Levels and Acceptable Quality Levels (AQL):

<u>Inspection or Test</u>	<u>Inspection Level</u>	<u>AQL</u>
Product examination	II	1.0
Pressure gage accuracy test	II	1.0
Pressure drop test	II	1.0
Regulator flow rate test	II	1.0
Packaging inspection	S-4	4.0

\* 4.5 Product Examination. Visually and manually examine the separators to determine conformance with the requirements of 3.2 through 3.4.3 and 3.6 through 3.9. Visual examination shall include verification of completeness of manufacture and assembly, conformance to specified standards, adequacy of markings, proper cleaning, and freedom from defects. Manual examination shall include the operation of movable parts by hand to assure proper functioning. The examination provisions may be applied at the earliest practical point in manufacture at which it is feasible to inspect for acceptance without risk of change in the characteristic by subsequent operations. Failure of the contractor to provide objective evidence that the separators have passed the examinations prescribed for them by the contractor's inspection system shall be cause for rejection.

#### 4.6 Tests.

4.6.1 Pressure gage accuracy. The gage shall be tested for accuracy at all major graduations by comparison with an air pressure measuring device having an over-all accuracy of 0.25 percent. The gage shall be accurate within two percent in the mid-range, and three percent in the high range and low range (see 3.6.5.3).

#### 4.6.2 Pressure drop.

4.6.2.1 Class 1 separator. The separator shall be connected to an air supply source capable of delivering a minimum of 59 cfm free air at a pressure of 100 psig. The regulated air outlet valve shall be closed and the pressure regulator shall be adjusted to 60 psig delivery pressure. A metered orifice or an applicable flow-meter permitting passage of air at the rate of 20 cfm free air shall be connected to the outlet valve. If a metered orifice is used, the outlet valve shall be fully opened for a period of 30 seconds. If a flow-meter is used, the outlet valve shall be opened to a premarked position permitting a meter reading of 20 cfm free air for a period of 30 seconds. The pressure drop recorded on the regulated air pressure gage during the 30 second period shall not exceed 11 psig. The test shall be repeated as above, except that a metered orifice or flow-meter permitting 11 cfm airflow shall be used and the pressure drop shall not exceed six psig (see 3.5.1).

4.6.2.2 Class 2 separator. The class 2 separator shall be tested as specified in 4.6.2.1, except that the tests shall be applied to each of the two pressure regulators individually while they are being operated simultaneously (see 3.5.2).



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4.6.3 Pressure creep. The separators shall be connected to an air supply source providing an inlet pressure of 175 psig. The regulated air outlet valve shall be opened and the pressure regulator shall be adjusted to 20 psig delivery pressure. The outlet valve shall then be closed and the recorded regulator gage pressure noted. At the end of a five minute period, the regulated air pressure gage shall not show an increase in pressure exceeding two psig. The test shall be repeated at indicated pressures of 40, 60, and 80 psig (see 3.5.4).

4.6.4 Separator pressure overload. With the regulator handle or handles fully turned in, outlet valves closed, the pressure gage or gages removed, and the gage openings securely plugged, the separator shall be subjected to an inlet pressure of 250  $\pm$  5 psig for a period of one minute. Following this, the unit shall be inspected for evidence of damage and tested in accordance with 4.6.3 (see 3.5.5).

4.6.5 Regulator flow rate. With an inlet pressure of 100 psig and a regulated pressure of 60 psig, the regulated air outlet shall be opened and the flow rate shall be measured through each regulator outlet for a period of one minute. The flow rate shall be a minimum of 20 cfm free air (see 3.6.4).

\* 4.6.6 Working pressure test. With an air inlet pressure of 200 psig, the air at  $+160^{\circ}\text{F}$ , and with regulated pressure of 60 psig, the regulated air outlet valve shall be opened to permit air passage at the rate of 20 cfm free air for a period of not less than 30 seconds. The test of 4.6.2.1 or 4.6.2.2, as applicable, and the test of 4.6.3 shall be repeated. Failure of the separators to meet the requirements of these two tests after the working pressure test shall be cause for rejection.

4.7 Packaging inspection. Packaging inspection shall be conducted before and after packaging to determine compliance with the requirements of Section 5.

## 5. PACKAGING

\* 5.1 Preservation. Preservation shall be military level A or industrial, as specified in the contract (see 6.2.1).

### 5.1.1 Military level A.

5.1.1.1 Cleaning and drying. Cleaning and drying of the separator shall be accomplished in accordance with any applicable process and procedure of MIL-P-116.

5.1.1.2 Unit packaging. Each separator shall be unit packed in accordance with method III of MIL-P-116. The valve mechanism and drain valve shall be closed with means provided. All remaining apertures of the separator shall be closed with cap or plugs conforming to MIL-C-5501. The separator shall be placed in a fiberboard box conforming to PPP-B-636, grade W5c. Fiberboard conforming to PPP-F-320, type CF, class weather-resistant, variety and grade optional, shall be formed into pads or cut shapes of sufficient thickness (minimum one inch) and used to prevent the separator from coming in contact with the inside surface of the box and to immobilize the item. Gages and any projecting parts shall be wrapped with cushioning (minimum one inch) conforming to PPP-C-843, type II, and taped in place with PPP-T-60 tape. The unit container shall not be used as a shipping container. Technical data issued with the separator shall be packed in

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accordance with method IC-1 of MIL-P-116 and placed inside the unit container. Box closure shall be in accordance with the appendix to the box specification.

\* 5.1.2 Industrial. Industrial preservation shall be as specified in ASTM D3951-82.

\* 5.2 Packing. Packing shall be military levels A or B or industrial, as specified in the contract (see 6.2.1).

5.2.1 Military level A. A quantity of unit packaged separators shall be packed in a snug fitting box conforming to PPP-B-601, overseas type, or PPP-B-621, class 2. Box closure shall be in accordance with the applicable container specification and the appendix thereto. The gross weight of the exterior shipping container shall be governed by the weight limitations of the container specification.

\* 5.2.2 Military level B. Separators shall be packed as specified in 5.2.1 except the shipping containers shall conform to PPP-B-601, domestic type, PPP-B-621, class 1, or PPP-B-640, class 2.

\* 5.2.3 Industrial. Industrial packing shall be as specified in ASTM D3951-82.

\* 5.3 Marking. Marking shall be military or industrial, as specified in the contract (see 6.2.1).

\* 5.3.1 Military marking. Military marking shall be as specified in MIL-STD-129.

\* 5.3.2 Industrial marking. Industrial marking shall be as specified in ASTM D3951-82.

## 6. NOTES

6.1 Intended use. The separators covered by this specification are intended for use in connection with spray painting, spray applications, and air-operated tools.

## 6.2 Ordering data.

\* 6.2.1 Acquisition requirements. Acquisition documents should specify the following:

- (a) Title, number, and date of this specification.
- (b) Class required (see 1.2.1).
- (c) First article when required (see 3.1).
- (d) Exceptions and additional safety/health requirements when required (see 3.2.4 and 6.4).
- (e) Product identification if different (see 3.8).
- (f) First article inspection when required (see 4.3).
- (g) Level of preservation, packing, and marking required (see 5.1, 5.2, and 5.3).

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6.3 Contract data requirements. Required technical data such as operator's manuals, parts lists, and other instructions for operation and maintenance, as identified on a numbered DD Form 1664, should be specified on a DD Form 1423 incorporated in the contract.

\* 6.4 Safety and health requirements. In order that equipment integrated into the user's operational environment will comply with OSHA limitations and control of noise levels, radiation, electromagnetic emission, noxious vapors, heat, etc., as applicable, specific requirements concerning such points of operation, and other health and safety requirements, should be specified by the user.

6.5 Changes from previous issue. The margins of this specification are marked with asterisks to indicate where changes (additions, modifications, corrections, deletions) from the previous issue were made. This was done as a convenience only and the Government assumes no liability whatsoever for any inaccuracies in these notations. Bidders and contractors are cautioned to evaluate the requirements of this document based on the entire content irrespective of the marginal notations and relationship to the previous issue.

## Custodians:

Army - AL  
Navy - YD  
Air Force - 99

## Preparing activity:

Army - AL  
Project No. 4940-0468

## Review activities:

Navy - MC  
Air Force - 82

## User activity:

Navy - CG

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

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