

MIL-F-15618F(SHIPS)
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 SUPERSEDING
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MILITARY SPECIFICATION

FILTER-SEPARATORS AND FILTER ELEMENTS, FLUID, PRESSURE, AVIATION AND DIESEL FUEL, NAVAL SHIPBOARD

1. SCOPE

1.1 Scope - This specification covers filter-separators and filter elements which are suitable for removal of both entrained water and solids from aviation petroleum fuels conforming to MIL-G-5572 and MIL-F-5624, and Diesel fuel oil conforming to MIL-F-16884, These filter-separators are hereinafter referred to as filters. The filters are for shipboard use.

1.2 Classification - Filters shall be of the following classes, as specified (see 6.1).

- Class 1 - With automatic drain and fuel shut off controls,
- Class 2 - Without automatic drain and fuel shut off controls.

2. APPLICABLE DOCUMENTS

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

SPECIFICATIONS

FEDERAL

- D-F-499 - Flux, Brazing, Silver Alloy, Low Melting Point
- QQ-A-620 - Aluminum Bronze, Plate, Bar, Sheet, and Strip
- QQ-B-679 - Bronze, Aluminum, Rod, Flat Products with Finished Edges (Flat Wire, Strip, and Bar) Shapes and Forgings
- QQ-C-593 - Copper-Silicon Alloy Castings
- W-K-220 - Kerosene, Water-white, Deodorized (For Use in Insecticides)
- PPP-B-636 - Box, Fiberboard
- PPP-T-60 - Tape, Pressure -Sensitive-Adhesive, Waterproof-For Packaging and Sealing

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- MIL-P-116 - Preservation, Methods of
- MIL-R-196 - Repair Parts for Internal Combustion Engines
- MIL-B-857 - Bolts, Nuts, and Studs
- MIL-S-901 - Shockproof Equipment, Class HI (High-Impact), Shipboard Application, Tests for
- MIL-D-963 - Drawings, Electrical, Hull and Mechanical Equipment for Naval Shipboard Use
- MIL-R-1149 - Rubber Sheets, Strips, and Gaskets; Solid, Synthetic, Medium and Medium Hard
- MIL-F-1183 - Fittings, Tube; Cast Bronze, Silver-Brazing
- MIL-R-2765 - Rubber Sheet, Strip, Extruded and Molded Shapes, Synthetic Oil Resistant
- MIL-D-2940 - Dampeners, Fluid Pressure, Gage Protection
- MIL-C-3955 - Cans, Fiber, Spirally Wound
- MIL-P-5516 - Packings and Gaskets; Preformed, Petroleum Hydraulic Fluid Resistant
- MIL-G-5572 - Gasoline, Aviation: Grades 80/87, 91/96, 100/130, 115/145
- MIL-J-5624 - Jet Fuel, Grades JP-3, JP-4 and JP-5

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- MIL-G-6183 - Gaskets and Sheet Gasket Material; Synthetic Rubber and Cork Composition
- MIL-R-6855 - Rubber Synthetic, Sheet, Molded and Extruded, for Aircraft Applications
- MIL-F-8901 - Filter-Separators, Aviation and Motor Fuel, Ground and Shipboard Use, Performance Requirements and Test Procedures for
- MIL-P-15024 - Plates, Identification --- Information and Marking for Identification of Electrical, Electronic and Mechanical Equipment
- MIL-M-15071 - Manuals, Equipment and Systems
- MIL-P-15137 - Provisioning Technical Documentation for Repair Parts for Electrical and Mechanical Equipment (Naval Shipboard Use)
- MIL-V-15358 - Valve, Automatic Regulating, Pressure (Diaphragm Actuated and Controls, for Hi-Octane Gasoline Systems 125 PSI Maximum W. P. 140° F. Minimum)
- MIL-B-15395 - Brazing Alloys, Silver
- MIL-C-15726 - Copper-Nickel-Alloy, Rod and Flat Products (Flat Wire, Strip, Sheet, Bar and Plate)
- MIL-G-16356- Gages, Boiler-Water
- MIL-T-16420- Tube, 70-30 and 90-10, Copper-Nickel Alloy, Seamless and Welded
- MIL-F-16884 - Fuel Oil, Diesel Marine
- MIL-C-17516 - Copper -Silicon Alloy Rod, Wire, Shapes, Forgings and Flat Products (Flat Wire, Strip, Sheet, Bar and Plate)
- MIL-G-18997 - Gages, Pressure, Dial Indicating, Bourdon Tube
- MIL-F-20042 - Flanges, Pipe, Bronze (Silver-Brazing)
- MIL-C-20159 - Copper-Nickel Alloy (70-30 and 90-10): Castings

STANDARDS

MILITARY

- MIL-STD-10 - Surface, Roughness, Waviness, and Lay
- MIL-STD-105 - Sampling Procedures and Tables for Inspection by Attributes
- MIL-STD-129- Marking for Shipment and Storage
- MIL-STD-278 - Welding and Allied Processes for Machinery for Ships of the United States Navy
- MIL-STD-758 - Packaging Procedures for Submarine Repair Parts Utilizing Transparent, Flexible, Heat Sealable Film

DRAWINGS

BUREAU OF SHIPS

- 5000 -S4800- F-841177 - Pressure Gage Piping and Connections
- 810-1385714 - Valves, Composition, Union End Gate
- 810-1385722 - Valves, Composition, Union End, Globe Angle and Cross

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

2.2 Other publications. - The following documents form a part of this specification to the extent specified herein. Unless otherwise indicated the issue in effect on date of invitation for bids shall apply.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

- B-21 Naval Brass Rod, Bar and Shapes
- B-36 Brass Plate, Sheet, Strip and Rolled Bar
- B-103 Phosphor Bronze Plate, Sheet, Strip and Rolled Bar
- B-148 Aluminum Bronze Sand Castings
- B-150 Aluminum Bronze, Rods, Bars and Shapes
- B-164 Nickel Copper Alloy Rods and Bars
- B-169 Aluminum Bronze, Plate, Sheet, Strip and Rolled Plate

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

OFFICIAL CLASSIFICATION COMMITTEE
Uniform Freight Classification Rules

(Application for copies should be readdressed to the Official Classification Committee 1 Park Avenue at 33rd Street, New York 16, N.Y.)

AMERICAN SOCIETY OF MECHANICAL ENGINEERS
Boiler Construction Code for Unfired Pressure Vessels

(Application for copies should be readdressed to the American Society of Mechanical Engineers, 20 W. Thirty-Ninth Street, New York, New York).

3. REQUIREMENTS

3.1 Qualification. - Elements furnished under this specification shall be products which have passed the qualification tests specified herein and have been listed or approved for listing on the applicable qualified products list. Elements may be a manufacturer's own qualified product or the qualified product of another manufacturer. Qualification requirements do not otherwise apply to complete filters.

3.2 General requirements. - The filters shall consist of one or more shells containing replaceable coalescer and separator elements which have been tested and approved for inclusion on QPL- 15618. The coalescer and separator elements shall be suspended vertically from the element mounting plate.

3.2.1 Inlet and outlet connections (see 3.5.1, 5) shall be on the same horizontal centerline and shall be arranged so that the influent will enter the coalescer elements from the top and the effluent will leave the separator elements from the top. Elements in each stage shall be replaceable without having to dismount elements from the other stage. The coalescer element stage shall be separated from the separator element stage by a hydrophobic wire mesh screen if both are in the same case (not required for Diesel oil filters).

3.2.2 If two cases are used, the interconnecting piping shall be located to minimize contaminant carryover into the separator housing and the velocity in the piping shall not exceed that specified in 3.4.8. The mountings (assembly supports) shall be acceptable to the bureau or agency concerned (see 3.5.1.4). Each filter case shall include a water receiving sump. Class 1 filters shall be equipped with automatically operated valves to scavenge the sump of water and to reduce or stop the filter discharge as necessary to allow all water entering the filter to leave via the sump drain (see 3.4.3, 3.5.1.3 and 3.5.2.1).

3.2.3 Pressure sensing valve actuating connections to the filter case shall have strainers, external to the case, which may be cleaned without disassembly of the filter case. Closure of shells may be accomplished by closure plates using pressure sealing gaskets, by flanged joints and dished heads using flat or pressure sealing gaskets, or by the use of hinged closures (see 3.5.1.6, 3.5.1.7 and 3.5.1.8).

3.3 Materials. -

3.3.1 Materials for aviation fuel filters. -

3.3.1.1 All materials entering into the construction of the filter which will be in contact with aviation fuel shall be as follows: (The use of ferrous materials is not permitted).

- (a) All wrought parts shall be copper -nickel in accordance with composition 90-10 of MIL-C-15777 or aluminum bronze in accordance with ASTM B-150, alloy 3 or ASTM B- 169, alloy D, soft.
- (b) All cast parts shall be copper nickel in accordance with composition 70-30 of MIL-C-20159; or aluminum bronze in accordance with ASTM B-148, alloy 9A or 9B.
- (c) Materials for pressure gage piping and connections shall conform to Drawing 5000-S4800-F-841177.

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3.3.1.2 All metal entering into the construction of the filter which is not in contact with aviation fuel shall be as follows:

- (a) Wrought and cast parts shall be as specified in 3.3.1.1 or of steel provided the material is readily accessible for painting and is furnished protected by painting.
- (b) Bolts, nuts and studs which must be removed to service equipment shall be of Naval brass in accordance with ASTM B-21, alloy B, half hard; aluminum bronze in accordance with composition 5 of QQ-B-679; copper silicon alloy in accordance with composition 1 or 2 of MIL-C-17516; phosphor bronze in accordance with ASTM B-103, alloy A, or nickel copper alloy in accordance with ASTM B-164, class A for bolts and studs, and in accordance with ASTM B-164, class A or B for nuts.

3.3.2 Materials for Diesel fuel filters. - Materials for Diesel fuel filters shall be in accordance with 3.3.1 through 3.3.1.2 except that ferrous materials may be used in construction of the filter shell, tube sheet structural members and similar articles. Where these parts are of ferrous material, they shall be completely coated with suitable materials as approved by the bureau or agency concerned.

3.3.3 Materials for element mounts. - All metal entering into the construction of element mounts shall be as specified in table I (see figure 1).

3.3.4 Materials for filter elements. - All metal entering into the construction of filter elements shall be of copper silicon alloy in accordance with either MIL-C-17516 or QQ-C-593; nickel copper alloy in accordance with ASTM B-164, class A or B; phosphor bronze in accordance with ASTM B-103, alloy A, aluminum bronze in accordance with QQ-A-620, composition 5, or red brass in accordance with ASTM B-36, alloy 3. Ferrous metals are not acceptable.

3.4 Function design. -

3.4.1 Solids removal.- When operated up to capacity, with or without water contamination, and solids contaminants (Fisher Scientific Company number I-116 ferric oxide, or equivalent) are injected into the fuel supply at rates up to 80 milligrams per liter, the average weight of solids in the effluent samples shall not exceed 0.7 milligrams per liter and the weight of solids in any single sample shall not exceed 1.5 milligrams per liter.

3.4.2 Solids retention. - The filter shall be capable of removing solids and water as specified in 3.4.1 and 3.4.3 while having injected therein solids contaminants (Fisher Scientific Company Number I-116 ferric oxide, or equivalent) of a total amount in grams equal to 20 times the gallons per minute (g. p. m.) rating.

3.4.3 Water removal. -

3.4.3.1 Class 1. - The filter shall automatically separate water from fuel under operating conditions which may vary as follows: Water contamination, 0 to 100 percent; relet pressure, 20 percent of design pressure or 20 pounds per square inch (p.s. i.), whichever is greater, to 100 percent of design pressure; flow rate, 10 percent to 100 percent of rated flow. When operated at the design pressure, the filter shall continuously remove water from fuel at water contamination rates up to 10 percent or 50 g. p. m. of water, whichever is less, without reducing relet flow below 100 percent of rated flow. With water contamination rates exceeding 10 percent or 50 g. p. m. , whichever is less, the flow may be reduced by actuation of automatic shut off. The effluent fuel shall contain no free water. Water drained from sump shall not contain over 1.5 percent fuel.

3.4.3.2 Class 2. - At water contamination rates up to 3 percent, the effluent fuel shall contain no free water.

3.4.4 Working and test pressure. - The filters shall be designed to operate at pressures up to the specified maximum working pressure (see 6.1) and shall be capable of withstanding a test pressure of 150 percent the maximum working pressure.

Table I - Materials for element mounts.

Piece number	Name	Number required	Material	Specification	Remarks
1 ^{1/}	Tube	1	Cu-Ni-90-10 or Cu-Si or Al Bronze	MIL-T-16420, MIL-C-17516 or QQ-B-679 Comp. 5	1.315 outside diameter, 1.185 inside diameter
2	End cap	1	Cu-Si or Al bronze	QQ-C-593 or ASTM B-148 Alloy 9A or 9B	-----
3	Base Cap	1	Cu-Si or Al bronze	QQ-C-593 or ASTM B-148 Alloy 9A or 9B	-----
4	Stud	1	Cu-Si Ph bronze, Al bronze or Ni-Cu	MIL-C-17516 ASTM B-103 Alloy A QQ-B-679 or ASTM B-164 Class A or B	1/2 stud
5	End plug	1	Cu-Si or Al bronze	MIL-C-17516 QQ-B-679 Comp. 5	Silver solder in tube piece number 1
6	Friction washer	1	Cu-Si Al bronze	MIL-C-17516 QQ-A-620, Comp. 5	17/32 inside diameter by 15/16 outside diam- eter by 1/16 thick
7	Stud gasket	1	Synthetic rubber	MIL-G-6855, Class I, grade 80	17/32 inside diameter by 15/16 outside diam- eter by 1/16 thick

^{1/} Pieces 3 and 5 shall be silver brazed to piece 1 using alloy IV in accordance with MIL-B-15395. The Brazing flux used shall be type A in accordance with O-F-499 (Handy and Harman special flux, type A-1 or equivalent only). Other suitable methods of securing these pieces may be used when approved by the bureau or agency concerned.

3.4.5 Pressure drop. - With clean elements and flowing dry fuel at rated flow, the pressure drop between relet and outlet connections to the filter (not including automatic shut off valve) shall not exceed 5 p.s.i.

3.4.6 Shipboard performance. - Filters shall be suitable for shipboard use. Filters shall be capable of operating in accordance with all requirements of this specification when inclined up to 15 degrees in any direction.

3.4.7 Purging and cleaning. - The assembled filter including elements, shall be capable of complete purging by inert gas at 10 p.s.i. or by saturated steam at 15 p.s.i. from either the inlet or outlet connections without injury to or damage of any of its parts or reduction in its effectiveness after such treatment and venting.

3.4.8 Velocity of flow. - The velocity of flow at any point in the filter, exclusive of the elements, shall not exceed 0.25 feet per second.

3.4.9 Drainage of the shell. - The filter shall be capable of being completely drained.

3.5 Structural and mechanical design. -

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3.5.1 Structural. - The filter shells, closures, flanges, and similar items, shall be designed and constructed in accordance with the ASME Boiler Construction Code for Unfired Pressure Vessels.

3.5.1.1 Size. - Unless otherwise specified in the contract or order, the size of the assembled filter and controls shall be the minimum consistent with good design to meet the specified flow capacity and other requirements specified herein.

3.5.1.2 Shape. - The shape or form of the filter body is optional. Where intersections of cylinders occur, the intersection shall be reinforced to develop the strength of the joint. Cross bracing within the body may be used to develop stiffness and reduce bending and distortion. Where the length requires angle bands around the body or other suitable stiffening shall be provided to maintain shape under dead load of the fluid contained as well as from pressure and shock loads.

3.5.1.3 Sump. -

3.5.1.3.1 In class 1 filters, the automatic drain and shut-off controls shall maintain the water level at least 4 inches below the bottom of the elements, with the filter in the vertical operating position. The sump shall be fitted with a vortex breaker to prevent discharge of fuel with the water.

3.5.1.3.2 In class 2 filters, the sump capacity shall be at least 6 percent of the rated flow (gpm) of the filter. The drain line shall be sized so that with maximum water contamination (see 3.4.3) and with the drain valve wide open the bottom of the elements will be at least 4 inches above the high water level with the filter in the vertical operating position. The sump shall be fitted with a vortex breaker to prevent discharge of fuel with the water.

3.5.1.3.3 If more than one filter case is used, the high water level shall be at least 4 inches below inter connecting piping in addition to the requirements in 3.5.1.3.1 and 3.5.1.3.2.

3.5.1.4 Mountings. - The mountings, for the assembled filter, shall be as specified herein for shock-proofness and shall also be suitable for installation in the ship on the foundation to be provided by the Government.

3.5.1.5 Inlet and outlet connections. - Inlet and outlet connections shall be horizontal. The inlet and outlet shall be flanged in accordance with MIL-F-20042 of the pressure class suitable for the designed working pressure (see 6.1). The flange faces shall have a phonographic or serrated finish with 30 to 80 serrations per inch, with serration depth of 0.002 to 0.010 inch and serration tips not exceeding 0.010 inch in width. Inlet and outlet piping shall not require disconnecting in order to replace elements.

3.5.1.6 Body heads or covers. - On filters rated at 400 g. p. m. and less, the covers, heads or other parts weighing over 90 pounds which must be removed to service the elements shall be supported by the equipment so as to not require the use of external weight handling devices. On larger filters, the parts which must be removed to service elements shall be conveniently arranged for removal with the assistance, if necessary, of external supports or weight handling devices. On filters of 400 g.p.m. Capacity, or less, the elements shall be capable of being replaced without having a person enter the unit.

3.5.1.7 Shell and cover flanges. - Shell and cover assembly flanges, where employed, shall be of the hub type, or if of the plate type, shall have a minimum plate thickness equal to that calculated under ASME Boiler Construction Code for Unfired Pressure Vessels for end closure plates. All shell assembly flanges shall be grooved or slotted for use of pressure sealing rings or employ a tongue and groove joint for flat Buns "N" rubber cork gaskets. The tongue and groove joint shall be so designed that the depth of the groove will be greater than 1/8 inch and that the gasket will, when under compression, be deflected not more than 40 percent, nor not less than 25 percent of 1/8 inch thickness. The groove shall be as close to the bolt holes as possible, maintaining a wall of metal between the groove and the bolt hole. The thickness of the flange as measured across this under-cut shall be not less than that specified herein. The dimensions of the slots, grooves or recesses shall conform to the type of gasket used and shall be such as to seal the joint under the required bolting load. Flange faces in the flat gasket area shall have a phonographic or serrated finish with 30 to 80 serrations per inch, with serration depth of 0.002 to 0.010 inch and serration tips not exceeding 0.010 inch in width. Flanges for pressure sealing rings shall have a finish of RHR 63 maximum in grooves and RHR 125 maximum on flange faces with RHR finishes in accordance with MIL-STD-10.

3.5.1.8 Gaskets. -

3.5.1.8.1 Where flat gaskets are used they shall be not less than 1/8 inch thickness, and shall have a bearing width of not less than 3/4 inch.

3.5.1.8.2 Flat gaskets shall be Buna "N" cork in accordance with class I, grade firm of MIL-G-6183. The gasket should be considered to perform a seal when compressed 30 percent of its minimum thickness, which is equivalent to a gasket load of 500 p.s.i unit load.

3.5.1.8.3 Pressure sealing rings shall be in accordance with MIL-R-2765 of class 5 MIL-R-1149. The ring shall be of such dimensions as to fill the flange groove when compressed under test and line service conditions. The physical dimensions shall conform to MIL-P-5516.

3.5.1.8.4 Element and seal gaskets shall be synthetic rubber in accordance with MIL-R-2765 or MIL-G-6855, class I, grade 60.

3.5.1.9 Welding. - Welding shall be in accordance with MIL-STD-278.

3.5.1.10 Element mounts. - All element mounts shall conform to figure 1. Element mounts shall be threaded into the mounting plate and the joint shall be sealed by litharge and glycerine or other sealant approved by the bureau or agency concerned.

3.5.1.11 Filter elements. - Only the elements specified in table II may be utilized. All filters shall be of a two state design employing coalescing elements in the first stage and separating elements in the second stage,

Table II - Filter elements.

Purpose (see 6.1)	Flow direction (see 6.1)	Nominal Length (see 6.1)	Maximum diameter	Aviation fuel flow rating	Diesel fuel flow rating	Minimum solids retention	Minimum element spacing
		Inches	Inches	G. p. m.	G. p. m.	Grams	Inches
Coalescer	In/out ^{1/}	20	3-3/4	17.5	6	250	4-1/8
Coalescer	In/out	24	3-3/4	21	7	300	4-1/8
Coalescer	Out/in ^{1/}	24	3-3/4	15	5	400	4-1/8
Separator	Out/in ^{1/}	17-1/2	4-1/4	26	9	---	4-5/8
Separator	Out/in	24	4-1/4	35	12	---	4-5/8

^{1/} For use in existing filter-separators only. Not to be used in procurements of complete filter-separators.

3.5.1.11.1 Elementing. - The element length specified herein is a nominal length only. The actual length shall be that which will satisfactorily seal and function when retained between the element mount sealing surfaces having dimensions as shown in figure 1. Solids retention is the number of grams of iron oxide, (Fisher Scientific Company Number I-116 ferric ~~oxide~~ or equivalent) the coalescer element shall be required to retain and perform as required. Gaskets shall be furnished with and attached to or be an integral part of each element. A stud gasket, piece 7 shown in table I (see figure 1) shall be packaged with each element. All elements shall have a metal protective cover having a minimum thickness of 24 gage (Brown and Sharpe). Pore size of separator elements shall not exceed 0.002 inch. All elements shall be self centering on the 1.315 inch diameter mount support tube (see figure 1) within 1/32 inch of centerline.

3.5.1.11.2 Element selection. - Elements supplied may exceed the performance requirements specified in table II. In the design of a filter for a specified capacity (see 6.1) and solids retention (see 3.4.2) no credit shall be taken for this added capability. Accordingly, the number of coalescer elements to be used

^{1/} Fisher Scientific Company Number I-116 ferric oxide has a particle size distribution on a weight basis as follow: 100 percent less than 10 microns, 98.9 percent less than 5 microns, 94.1 percent less than 1 micron, 77.7 percent less than 0.5 micron and 44.8 percent less than 0.25 micron.

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shall be calculated based upon the minimum values of flow rating and solids retention shown in table II. For example, a 300 g.p.m. filter is required (see 3.4. 2) to retain 6000 grams of solids (20 times its 300 g. p. m. rating). Twenty-four inch inside/outside flow coalescing elements are rated at 21 g.p.m. and 300 grams solid retention (see table II). Fifteen elements would satisfy the flow rating (300/21) but 20 elements are required in order to satisfy the solids retention requirements (6000/300). The use of minimum element ratings (see table II) rather than actual performance of a Particular manufacturer's elements will insure proper filter performance with replacement elements which may be provided from another source.

3.5.1.12 Bolts and nuts. - Bolts and nuts shall be sized in accordance with the load requirements and Spacing. Calculations shall provide a factor of safety of not less than three based on the yield strength of the material used when considering the root area of the bolt. The bolts and nuts shall be in accordance with MIL-B-857.

3.5.1.13 Sump gage connections, gages and gage valves. - A sump gage (sight glass), plain, flat glass, double, type A, class I, in accordance with MIL-G- 16356 and gage cut-out valves, shall be fitted on the sump to permit a visible indication of the cleavage line between the fuel and the water in the sump over the complete range of high to low water level indication. Gage connections on the sump shall conform to figure 2.

3.5.1.14 Pressure gage connections, gages and gage valves. - Pressure gages shall be provided to indicate the filter-separator inlet and discharge pressures and the pressure drop across each stage. These gages shall be 3-1/2 inch pressure gages in accordance with ML-G-18997, except that the pressure drop across each filter stage shall be read by a differential pressure gage arranged to indicate either pressure as selected by the operator. Plugged testing tees, pulsation dampeners, in accordance with MIL-D- 2940, and gage cut-out valves shall be fitted on the filter-separator. Differential pressure gages shall not utilize lubricated bearings as a pressure seal. The pressure gage shall be Barton Instrument Company model 226 or equal, with a zero to 30 p.s.i. range as approved by the bureau or agency concerned. Gage connections on the filter shall conform to figure 2. Pressure gage piping and connections shall conform to Drawing 5000-S4800-F-841177.

3.5.1.15 Gage locations. - Sump gage (sight glass) and all pressure gages shall be located on the filter case so as to be readable from one location.

3.5.1.16 Sampling connection. - A 1/4 inch sampling connection and valve shall be provided at the filter outlet for drawing effluent samples.

3.5.1.17 Pipe joints. - No threaded pipe joints shall be used except for pressure gages and pulsation dampeners. Permanent joints shall be silver brazed. Silver brazing fittings shall conform to MIL-F-1183, Joints required for disassembly shall be flanged or silver brazing union.

3.5.2 Mechanical. -

3.5.2.1 Controls. - Class 1 filters shall have a suitable control system for automatically draining water collected in the sump or for reducing or shutting off the filter discharge when water enters the unit in an amount exceeding the sump drain capacity. Materials used in construction of valves and controls shall conform to the materials listed for like parts in MIL-V-15358. Where no like parts exist, materials shall be of the same order as those used for similar parts. Design of the fuel discharge valve shall be such that failure of diaphragms, where used, or controlling springs shall cause it to shut. This is applicable to the sump drainage valve, also. Design of automatic valves and their control system shall be approved by the bureau or agency concerned.

3.5.2.2 Manual valves, where used, shall be in accordance with Drawings 810-1385714 and 810-1385722.

3.5.2.3 The design and construction of the filters shall be as light and compact as practicable consistent with the requirements of this specification.

3.5.3 Shock requirements. - The equipment shall be capable of withstanding high impact shock in accordance with MIL-S-901 and continue to perform its function when tested as specified in 4.3.2.1 and 4.3.2.1.1.

3.5.3.1 The equipment shall be designed to withstand shock as shown on figure 3 without failure or permanent def ormation of the base; holding down bolts, and similar items. These shocks are understood to be applied to the points of attachment to the hull structure, Equipment shall not be rigidly supported from

more than one plane. Resilient mountings are not to be utilized unless approval is obtained from the bureau or agency concerned.

3.5.3.2 Bolts designed to be stressed in shear shall be installed in holes with a minimum of clearance to reduce impacting.

3.5.3.3 The static yield point of the material shall be used as the basis of allowable stress, in conjunction with the values of "G" shown on figure 3.

3.5.3.4 In design of equipment, the shock loads shall be in addition to the loads normally considered in the design of the component or item.

3.5.3.5 The equipment shall be designed to avoid damage by resonant vibration in the range of frequencies caused by propeller blade excitation up to 1500 c.p.m.

3.6 Repair parts and special tools. - Repair parts shall be furnished in accordance with MIL-P-15137. One set of onboard repair parts consisting of 100 percent of the following items shall be provided for each filter:

- (a) Coalescer elements
- (b) Separator elements
- (c) O-ring seals
- (d) Flat gaskets
- (e) Stud (pt. 4) friction washer (pt. 6) for each filter element mount (see figure 1).

3.6.1 Special tools for servicing of the filter and control valves, if required shall be furnished in the quantity specified (see 6.1) or one set per filter if not specified. When practicable, brackets or other means of stowage shall be provided on the filter. Special tools are defined as those tools not listed in the Federal Supply Catalog, (Copies of this Catalog may be consulted in the office of the Government inspector).

3.7 Drawings. - Drawings shall be furnished unless the equipment is the same as that furnished on a previous contract or order. Drawings may be prepared in accordance with the supplier's usual commercial practice. They shall contain details of components, assemblies showing relationship of components to each other, lists of materials, installation and mounting information, and certification data sheets. Certification data sheets shall be in accordance with ML-D-963.

3.7.1 Preliminary drawings shall be submitted to the bureau or agency concerned for approval prior to starting fabrication. On receipt of the drawing approval letter, manufacture of equipment may be started after incorporation of all changes, if any, contained therein.

3.7.2 Final drawings shall include all changes required by the drawing approval letter, those found necessary during fabrication and the information indicating validation by the cognizant approval activity.

3.7.3 Within 2 weeks after approval of the preliminary drawings by the bureau or agency concerned, one set of approved preliminary drawings or, at the option of the supplier, a sketch containing the following as applicable shall be forwarded for use by installing activities to destinations furnished by the bureau or agency concerned.

- (a) Overall dimensions
- (b) Mounting dimensions
- (c) Piping and wiring connections
- (d) Weight
- (e) Center of gravity

3.8 Manuals. - Manuals shall be furnished in accordance with type III of MIL-M-15071 in the quantities specified (see 6.1).

3.9 Identification plates. - An identification plate conforming to type B of MIL-P-15024 shall be permanently attached to the filter in a location plainly visible from the location from which gages are normally

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viewed. The identification plate shall be of nickel-copper, size 25 and shall contain the following information:

- (a) Name of the unit.
- (b) Specification MIL-F-15618.
- (c) class.
- (d) Federal stock number.
- (e) Name of manufacturer.
- (f) Manufacturer's serial number.
- (g) Inspection block (to be stamped by the Government inspector).
- (h) Contract or order number.
- (i) Flow rate and type fuel.
- (j) Weight, wet/dry:
 - (1) Working pressure.
 - (2) Test pressure.
- (k) Instructions relative to element replacement.
- (l) U.S.

3.9.1 In addition to the requirements specified in 3.9 the filter shall have permanent marking of connections and other parts which should be identified for operating personnel. The marking may be in the form of metallic tags secured by adhesive.

3.9.2 Each element shall be suitably marked with the following information in a permanent manner:

- (a) Type of element (coalescer, separator).
- (b) Direction of flow (inside/out, outside/in).
- (c) Manufacturer.
- (d) Manufacturer's model number.
- (e) Federal stock number.

3.9.2.1 Marking may be by means of an indelible stencil or by an identification tag similar to that specified in 3.9.

3.10 Workmanship. - Filters shall be free from defects affecting their appearance or that may affect their operation. Surfaces of mounting pads or feet need not be machined provided that they are cast smooth and true. The workmanship shall be first class in every respect.

4. QUALITY ASSURANCE PROVISIONS

4.1 Unless otherwise specified in the contract or purchase order, the supplier is responsible for the performance of all inspection requirements as specified herein. 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 Qualification tests^{1/}. - Qualification tests shall be conducted on coalescer and separator elements of each size at a laboratory satisfactory to the Bureau of Ships. Qualification tests shall consist of the tests specified in 4. 2.1 through 4.2.2.3.

4.2.1 Coalescer element tests. - Unless otherwise specified in the contract or order, tests shall be conducted with kerosene in accordance with W-K-220. A single coalescer element shall be mounted in the lower section of the test equipment shown on figure 4. The element effluent shall be passed upward through the vertical section. The cross section area of the vertical section is such that the velocity of upward flowing effluent is approximately 12 inches per minute when the element is being flowed at rated capacity (see table II). The water in the lower section shall be manually drained to prevent the water coming into contact with the element. Analytical equipment and methods shall conform to MIL- F-8901.

4.2.1.1 Coalescer element test procedures. - The test shall consist of three separate runs of single elements. In each run the solids contaminant, Fisher Scientific Company Number I-116 ferric oxide, or

^{1/}Application for qualification Tests shall be made in accordance with "Provisions Governing Qualification" (see 6.2 and 6.2.1).

equivalent, shall be added to the influent at a contamination rate of 80 mg. per liter, Ferric oxide shall be injected in the dry state, (for example, no water shall be used in preparing the contaminant). The solids shall be added as close as practicable to the element undergoing test. Run one shall be made without water contamination. Runs two and three shall be made with water contamination at the rates of 0.5 percent and 3 percent by volume. Each run shall continue until the total amount of solids required to be retained by the element has been added (see 3.5.1.11).

4.2.1.1.1 Runs one through three shall be continued until breakthrough starts to occur. The total amount of solids added and the pressure drop across the element shall be recorded.

4.2.1.2 Coalescer element performance test. - The average weight of solids in the samples of fuel effluent leaving the settling chamber shall not exceed 0.7 mg. per liter, and the weight of solids in any single sample shall not exceed 1.5 mg. per liter. Effluent samples from inside/out coalescer element tests shall show no evidence of undissolved water. The amount of undissolved water in effluent samples from outside/in coalescer elements shall not exceed 0.045 ml. per liter with 0.5 percent water contamination and 0.10 ml. per liter with 3 percent water contamination.

4.2.1.2.1 When the total amount of solids to be retained (see 3.5.1.11) has been added, the pressure drop across the element shall not exceed 40 psi.

4.2.2 Separator element tests. - Unless otherwise specified in the contract or order, tests shall be conducted with kerosene in accordance with VV-K-220. Each of the three sample elements shall be tested for pore size as specified in 4.2.2.1 and shall also be flow tested as specified in 4.2.2.2 at rated flow to insure that water will not be forced through the element by excessive pressure drop. Analytical equipment and methods shall conform to MIL-F-8901,

4.2.2.1 Separator element pore size test procedures. - The element shall be submerged in test fluid not more than 1 inch below the surface. After allowing the element to become saturated, air pressure shall be internally applied to the element. The air pressure shall be gradually increased until breakthrough of air occurs. The pore size shall be determined from the formula $D \text{ (inches)} = 0.00063 \frac{Aa}{Pa}$ (dynes per cm.) per Pa (inches of water) where D is pore diameter, Aa is surface tension of fuel and Pa is air pressure applied when breakthrough occurs.

4.2.2.2 Separator element flow test procedures. - The test case shall be as shown on figure 5. Test fluid shall be flowed through the element at its rated flow. A blank run of at least 5 minutes duration on dry fuel shall show no free water and not over 1.0 mg. per liter of solids in the fuel entering the test case. With fuel at rated flow passing through the element, water at 1 percent of the element rating shall be sprayed into the fuel approximately 1 inch upstream from the element at the top of the case. The water and fuel run shall be of 30 minutes duration, Three samples of effluent shall be taken at 10-minute intervals.

4.2.2.3 Separator element performance test. - Element pore size as determined in 4.2.2.1 shall not exceed 0.002 inch. When flow is tested in accordance with 4.2.2.2, the element effluent shall contain no free water.

4.3 Preproduction inspection. - As soon as practicable after approval of the preliminary drawings and prior to the beginning of production, the contractor shall furnish a complete filter for the examination of 4.5.1.1 and the tests of 4.3.2 (see 6.3).

4.3.1 Production of filters prior to approval of the preproduction unit shall be at the contractor's risk. Approval of the preproduction unit does not relieve the contractor of his obligations to supply equipment conforming to the requirements of this specification.

4.3.2 Preproduction tests. -

4.3.2.1 Shock test. - The filter shall be shock tested complete with elements and all appurtenances installed on the medium weight shock machine. Tests shall be conducted with the filter filled with fresh water or test fluid. Filters having a total weight (including liquid) not exceeding the capacity of the medium weight shock machine shall be tested as a complete unit. Where the filter weight exceeds the capacity of the medium weight shock machine critical components, such as elements and mounts, shall be tested utilizing the light weight shock machine, unless previously tested. A cluster of at least four elements and mounts and a typical section of a mounting plate shall be used. Test of the filter shall be type A and test of the element and mount cluster shall be type B in accordance with MIL-S-901.

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4.3.2.1.1 Failure of tank welds, derangement of elements and mounts or other attached equipment, breakage of piping connections or leakage at flanged joints shall be cause for rejection. After completion of shock tests, a hydrostatic test pressure equal to 150 percent of the maximum working pressure shall be applied to check the integrity of the filter case. In the element cluster test, derangement of element shock mounts or damage to the elements shall be cause for rejection.

4.3.2.2 Operational tests. - The filter shall be subjected to operational tests. Operational tests shall be conducted using kerosene in accordance with VV-K-220, if the filter is intended for aviation fuel use, and with Diesel fuel in accordance with MIL-F-16884 if for Diesel fuel use. Analytical equipment and methods shall be in accordance with MIL-F-8901 except as modified herein. Correction weight obtained during blank runs for solids determination shall not exceed 1 mg. per liter.

4.3.2.2.1 Pressure drop. - With clean elements and flowing dry fuel at rated flow, the pressure drop between relet and outlet connection to the filter case (not including automatic shut off valve) shall not exceed 5 p.s.i.

4.3.2.2.2 Water removal runs (class 1 filters only). - A 5 minute run shall be made at rated flow with fuel contaminated with 10 percent water. The flow shall not be reduced by actuation of flow control valves. One effluent fuel sample and one water drain sample shall be taken at the end of the 5 minute run. A 5 minute run shall then be made at rated flow with water contamination increased at least five times during this run as necessary to actuate the flow control valve. A sample of effluent fuel shall be taken at the end of this run. Effluent fuel samples shall not contain free water. The water drain sample shall not contain over 1.5 percent fuel.

4.3.2.2.3 Water and solids runs. - Two separate runs with both water and solids contamination shall be conducted. Water contamination of 0.5 percent shall be added continuously during the first run and 3.0 percent water contamination shall be added continuously during the second run. The solids contaminant, Fisher Scientific Company Number I-116, ferric oxide, or equivalent, shall be added to the influent in each run at the rate of 80 mg. per liter until the total amount of solids required to be retained (see 3.4.2) has been added. The solids shall be added in the form of a mixture with fuel. Samples of the effluent shall contain no free water and an average of not more than 0.7 mg. per liter of solids, with no sample exceeding 1.5 mg. per liter of solids,

4.4 Quality conformance inspection. - Quality conformance inspection shall be conducted on both complete filter units and filter elements. Filters shall be examined and tested as specified in 4.5.1. Sample filter elements selected in accordance with 4.4.2 shall be subjected to the examination and tests specified in 4.5.2. Inspection may be at the place of manufacture or at other facilities acceptable to the Government,

4.4.1 Lot. - A lot shall consist of all filters or filter elements, or both, of the same class, design, and size offered for delivery at the same time,

4.4.2 Sampling of elements. - Samples shall be selected at random as specified in tables III, IV and V in accordance with MIL-STD-105. These sampling procedures apply to elements supplied with filters as well as replacement elements. Tightened or reduced inspection shall apply in accordance with MIL-STD-105.

Table III - Sampling for examination of filter elements
(AQL = 0.4 inspection level II (ordinary)).

Lot size	Sample size	Accepted	Rejected
2-8 (A)	2	0	1
9-15 (B)	3	0	1
16-25 (C)	5	0	1
26-40 (D)	7	0	1
41-65 (E)	10	0	1
66-110 (F)	15	0	1
111-180 (G)	25	0	1
181-300 (H)	35	0	1
301-500 (I)	50	1	2
501-800 (J)	75	1	2

Table III - Sampling for examination of filter elements
(AQL = 0.4 inspection level II (ordinary))—cont'd.

Lot size	Sample size	Accepted	Rejected
801-1300 (K)	110	1	2
1301-3200 (L)	150	2	3
3201-8000 (M)	225	3	4
8001-22000 (N)	300	4	5

Table IV - Sampling for (coalescer element) operational test
(AQL = 1.0 inspection level L-5 (small sample)).

Lot size	Sample size	Accepted	Rejected
2-8 (A)	2	0	1
9-15 (A)	2	0	1
16-25 (A)	2	0	1
26-40 (A)	2	0	1
41-65 (A)	2	0	1
66-110 (B)	3	0	1
111-180 (B)	3	0	1
181-300 (C)	5	0	1
301-500 (C)	5	0	1
501-800 (D)	7	0	1
801-1300 (E)	10	0	1
1301-3200 (F)	15	0	1
3201-8000 (G)	25	1	2
8001-22000 (H)	35	1	2

Table V - Sampling for (separator element) pore size and
integrity test (AQL = 1.5 inspection level L-8
(small sample)).

Lot size	Sample size	Accepted	Rejected
2-8 (A)	2	0	1
9-15 (A)	2	0	1
16-25 (B)	3	0	1
26-40 (B)	3	0	1
41-65 (C)	5	0	1
66-110 (D)	7	0	1
111-180 (E)	10	0	1
181-300 (E)	10	0	1
301-500 (F)	15	1	2
501-800 (G)	25	1	2
801-1300 (H)	35	1	2
1301-3200 (I)	50	2	3
3201-8000 (J)	75	3	4
8001-22000 (K)	110	4	5

4.5 Examination and tests. -

4.5.1 Filters. -

4.5.1.1 Examination. - Each filter shall be examined to verify conformance with the requirements of this specification regarding physical arrangement of components, proper dimensions of connections and components, application of approved materials, and similar requirements not involving tests.

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4.5.1.2 Strength AND tightness tests. - Each filter assembled without elements shall be tested hydrostatically to 150 percent of the maximum working pressure as a strength test. This pressure shall be maintained for one hour with no evidence of leakage during that time. After completion of this test, each compartment of the filter shall be tested with air at 40 percent of the maximum working pressure. All joint, welds and connections shall be panted with soap suds to detect the presence of leaks. Any evidence of leakage shall be cause for rejection.

4.5.2 Elements. -

4.5.2.1 Examination. - Sample elements selected in accordance with 4.4.2 shall be examined to verify conformance with the requirements of this specification not verified by tests.

4.5.2.2 Air bubble test. - Each separator element shall be tested to determine its condition before shipment. This shall be accomplished by means of an air bubble test in which the element is submerged in test fluid and air is introduced into it in the reside-to-outside direction. A sound element will be evidenced by the absence of any streams of air bubbles and a sudden breakthrough of very fine air bubbles causing a foamy condition on the element surface. Any element found defective shall not be offered for delivery.

4.5.2.3 Coalescer element operational test. - Sample coalescer elements selected in accordance with 4.4.2 shall be subjected to two runs of 5 minutes duration each with water contamination only of 0.5 and 3.0 percent in accordance with the test procedures of 4.2.1. Effluent fuel shall contain no free water.

4.5.2.4 Separator element pore size test. - Sample separator elements selected in accordance with 4.4.2 shall be tested in accordance with the pore size test procedure specified in 4.2.2.1. Element pore size test as determined shall not exceed 0.002 inch. Holes in the element, as evidenced by localized leakage of air bubbles at pressures less than that corresponding to a pore size of 0.002 inch is cause for rejection.

4.5.2.5 Integrity test. - Before installation into a complete filter unit, each element shall have its integrity verified by the filter manufacturer. The tests shall be in accordance with MIL-T-23445 or by any other equal means.

4.6 Waterspray test of package. - An element packaged in accordance with 5.1.2 shall be subjected to a water spray test. The spray shall consist of a spray of water covering the complete upper surface of the container. There shall be a minimum free fall of spray of 5 feet. The average fall of water shall be at the minimum rate of 2 gallons per square foot per hour. The spray shall be continuous for 4 hours. There shall be no visual evidence of moisture or water inside the can when opened.

5. PREPARATION FOR DELIVERY

5.1 Domestic shipment and early equipment installation and for storage of onboard repair parts. -5.1.1 Basic equipment and accessories. -

5.1.1.1 Preservation and packaging. - Preservation and packaging of basic equipment except filter elements shall be sufficient to afford adequate protection against corrosion, deterioration and physical damage during shipment from the supply source to the using activity and until early installation and may conform to the supplier's commercial practice.

5.1.1.2 Packing. - Packing shall be accomplished in a manner which will insure acceptance by common carrier, at lowest rate, and will afford protection against physical or mechanical damage during direct shipment from the supply source to the using activity for early installation. The shipping containers or method of packing shall conform to the Uniform Freight Classification Rules and Regulations or other carrier regulations as applicable to the mode of transportation and may conform to the supplier's commercial practice.

5.1.1.3 Marking. - Shipment marking reformation shall be provided on interior packages and exterior shipping containers in accordance with the contractor's commercial practice. The information shall include nomenclature, Federal stock number or manufacturer's part number, contract or order number, contractor's name and destination.

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5.1.2 Filter elements. -5.1.2.1 Preservation and packaging. - Filter elements shall be individually packaged as follows:

- (a) Filter elements shall be packaged in spirally wound fiber cans conforming to the construction requirement for type 1, grade B of MIL-C-3955 as modified below. The element shall be held firmly in place within the fiber can by means of a centering device and cushioned to prevent damage during handling, shipment and storage. The can closure shall be metal, minimum 28-gauge cap with lip, slip-on-cover type. Cans shall be sealed with a minimum of 1-1/4 inch wide tape conforming to type II of PPP-T - 60 wound evenly 1 -1/3 times around the juncture with half its width above and half below the juncture line.
- (b) Alternatively, filter elements may be individually packaged in fiber cans conforming to type II, grade B of MIL-C-3955. Elements shall be positioned as specified in (a). Closure and sealing shall be as specified in the fiber can specification.
- (c) Unless otherwise specified (see 6. 1), quantity of 12 unit packages shall be placed in a fiber-board box conforming to type I or II of PPP-B-636. Box closure shall be as specified in the appendix to the box specification. The 12 filter elements pack shall meet the rough handling tests specified in MIL-P-116.

5.1.2.2 Packing. - Filter elements shall be packed in accordance with the requirements of 5.1.1.2.

5.1.2.3 Marking. - In addition to any special marking requirement interior packages and exterior shipping containers shall be marked in accordance with MIL-STD-129.

5.1.2.4 Filter element packaging tubes and over packing shall be plainly marked "FRAGILE HANDLE WITH CARE" .

5.1.3 Onboard repair parts. -5.1.3.1. Preservation and packaging. -

5.1.3.1.1 Filter elements. - Elements shall be preserved and packaged in accordance with the requirements of 5.1.2.1.

5.1.3.1.2 Other onboard repair parts (see 3. 6) shall be preserved and packaged Level A in accordance with MIL-R - 196.

5.1.3.1.3 Submarine repair parts. - The level A preservation and packaging methods (see 5.1.3.1.2) shall be modified in accordance with MIL-STD-758.

5.1.3.2 Packing. - Onboard repair parts shall be packed in accordance with the requirements in 5.1.1.2.

5.1.3.3 Marking. - In addition to any special marking requirements, interior packages and exterior shipping containers shall be marked in accordance with MIL-STD-129.

5.2 Domestic shipment and storage or overseas shipment. - The requirements, and levels of preservation, packaging, packing and marking for shipment shall be specified by the procuring activity (see 6.1).

(5.2.1 The following provides various levels for protection during domestic shipment and storage or overseas shipment, which may be required when procurement is made.

5.2.1.1 Preservation and packaging. -5.2.1.1.1 Level A.-

5.2.1.1.1.1 Filters. - Filters shall be flushed or fog-sprayed with type P-2, P-7, P-8, P-9, or P-10 preservative of MIL-P-116. Openings in the filter shell shall be sealed with blank flanges of wood, plywood, metal or plastic secured in place. A thickness of barrier material conforming to grade A of MIL-B-121 shall be inserted between the wood, plywood or metal blank flanges and the shell body. Tape used to secure

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blank flanges shall conform to type I of PPP-T-60. When components of the filter are disassembled for shipment or components furnished as separate items, the components shall be packaged as follows

5.2.1.1.1.2 Valves and fittings. - Valves and fittings shall be preserved and packaged by level A in accordance with MIL-P-3.

5.2.1.1.1.3 Filter elements. - Filter elements shall be individually packaged as follows.

- (a) Filter elements shall be packaged in spirally wound fiber cans conforming to the construction requirements for type I, grade B of MIL-C-3955 as modified below. The element shall be held firmly in place within the fiber can by means of a centering device and cushioned to prevent damage during handling, shipment and storage. The can closure shall be metal, minimum 28-gauge cap with lip, slip-on-cover type. Cans shall be sealed with a minimum of 1-1/4 inch wide tape conforming to type II of PPP-T-60 wound evenly 1-1/3 times around the juncture with half its width above and half below the juncture line.
- (b) Alternatively, filter elements may be individually packaged in fiber cans conforming to type II, grade B of MIL-C-3955. Elements shall be positioned as specified in (a). Closure and sealing shall be as specified in the fiber can specification.
- (c) Unless otherwise specified (see 6.1), quantity of 12 unit packages shall be placed in a fiberboard box conforming to type I or II of PPP-B-636. Box closure shall be as specified in the appendix to the box specification. The 12 filter elements pack shall meet the rough handling tests specified in MIL-P-116.

5.2.1.1.1.4 Filter element mounting components (hardware). - Filter element mounting components (hardware) shall be packaged by method III of MIL-P-1 16.

5.2.1.3 Marking. - In addition to any special marking requirements, interior packages and exterior shipping containers shall be marked in accordance with MIL-STD-129.

5.3 Repair parts. -

5.3.1 Preservation and packaging. - Preservation and packaging shall be in accordance with 5.1.3.1.

5.3.2 Packing. - Repair parts shall be packed Level A or B as specified in accordance with MIL-R-196. Filter elements packed in fiberboard boxes conforming to class 2 of PPP-B-636 (see 5.2.1.1.1.3), and closed, banded and waterproofed with tape in accordance with the appendix to the box specification need not be overpacked.

5.3.3 Marking. - In addition to any special marking requirements, interior packages and exterior shipping containers shall be marked in accordance with MIL-STD-129.

5.4 Manuals. - Manuals shall be packaged and packed for the level specified in accordance with MIL-M-15071.

5.5 Element instructions. - Elements, when packaged in accordance with 5.1.2 shall have installation instructions packaged with the individual elements.

5.6 Element mount gaskets. - Elements, when packaged in accordance with 5.1.2, shall have one element mount end cap stud gasket, piece 7 of table I, packaged with each individual element.)

6. NOTES

6.1 Ordering data. - Procurement documents should specify the following:

- (a) Title, number and date of this specification.
- (b) Class required (see 1.2).
- (c) Maximum design working pressure required (see 3.4.4 and 3.5.1. 5).
- (d) Purpose, flow direction and nominal length of filter element (see table II),
- (e) Capacity of filter (see 3.5.1.11.2).
- (f) Quantity of special tools required (see 3.6.1).
- (g) Quantities of manuals required (see 3.8).

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- (h) Selection of applicable level of preservation, packaging and packing if other than as specified in 5.1 (see 5. 2).

6.2 With respect to products requiring qualification, awards will be made only for such products as have, prior to the time set for opening of bids, been tested and approved for inclusion in Qualified Products List QPL 15618, whether or not such products have actually been so listed by that date. The attention of the suppliers is called to this requirement, and manufacturers are urged to arrange to have the products that they propose to offer to the Federal Government tested for qualification, in order that they may be eligible to be awarded contracts or orders for the products covered by this specification. The activity responsible for the qualified products list is the Bureau of Ships, Department of the Navy, Washington 25, D. C., and reformation pertaining to qualification of products may be obtained from that activity. Application for Qualification tests shall be made in accordance with "Provisions Governing Qualification" (see 6.).

6. 2.1 Copies of "Provisions Governing Qualification" may be obtained upon application to Commanding Officer, Naval Supply Depot, 5801 Tabor Avenue, Philadelphia 20, Pennsylvania.

6.3 Preproduction. - invitation for bids should provide that the Government reserves the right to waive the requirement for preproduction samples as to those bidders offering a product which has been previously procured or tested by the Government, and that bidders offering such products, who wish to rely on such production or test, must furnish evidence with the bid that prior Government approval is presently appropriate for the pending procurement.

Notice. - 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 recurs no responsibility nor any obligation whatsoever; and the fact that the Government may have formulated, furnished, or in any way supplied the said drawings, specifications, 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 thereto.

Preparing activity:
Navy - Ships
(Project 4330-N014Sh)

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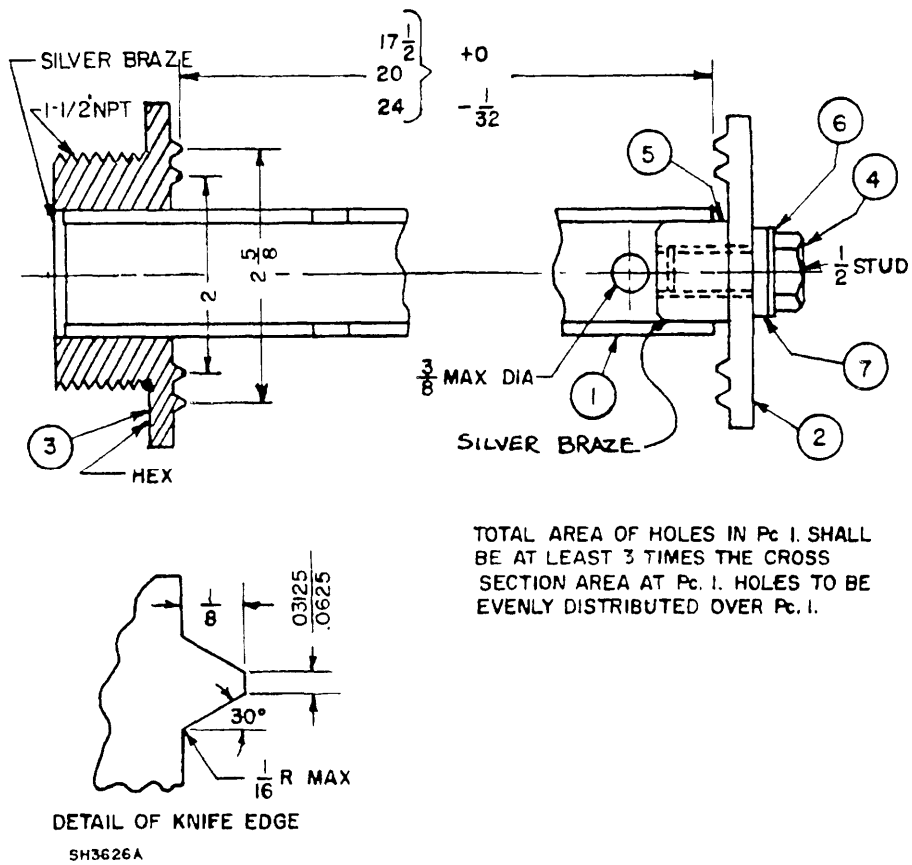
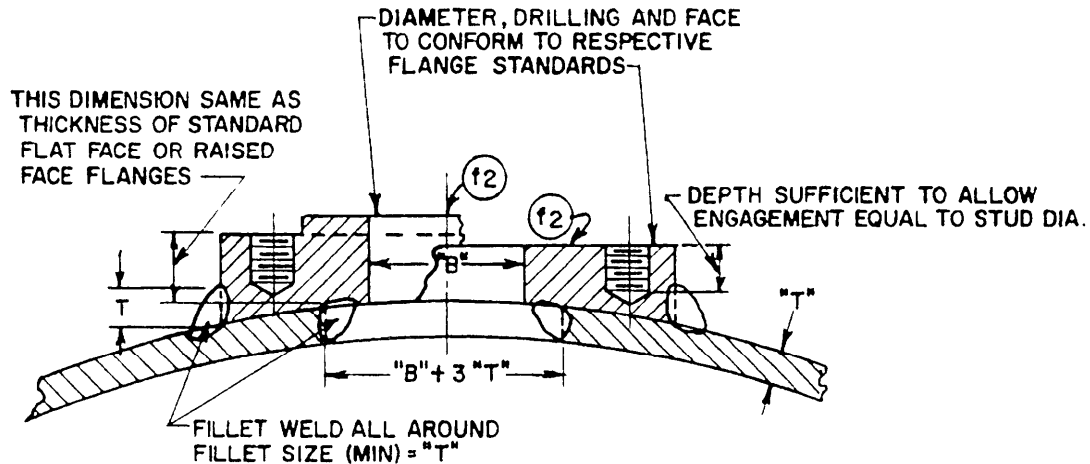


Figure 1 - Element mount.

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NOMINAL FLANGE SIZE (INCHES)	BORE "B" (INCHES)
$\frac{1}{4}$.410
$\frac{3}{8}$.545
$\frac{1}{2}$.710
$\frac{3}{4}$.920
1	1.185
$1\frac{1}{4}$	1.530
$1\frac{1}{2}$	1.770
2	2.245

SH3627

THE "f2" FINISH DESIRED FOR THE GASKET MATING SURFACES OF TUBE LAPS OR UPSETS, FLANGES, FLANGED FITTINGS AND VALVE FLANGES IS A SERRATED OR PHONOGRAPHIC FINISH WITH 60 TO 80 CUTS PER INCH OF FACE WIDTH, 0.002 TO 0.003 INCH DEEP CUT AT AN AVERAGE SPEED OF 50 FEET PER MINUTE

Figure 2 - Detail section of studding pads.

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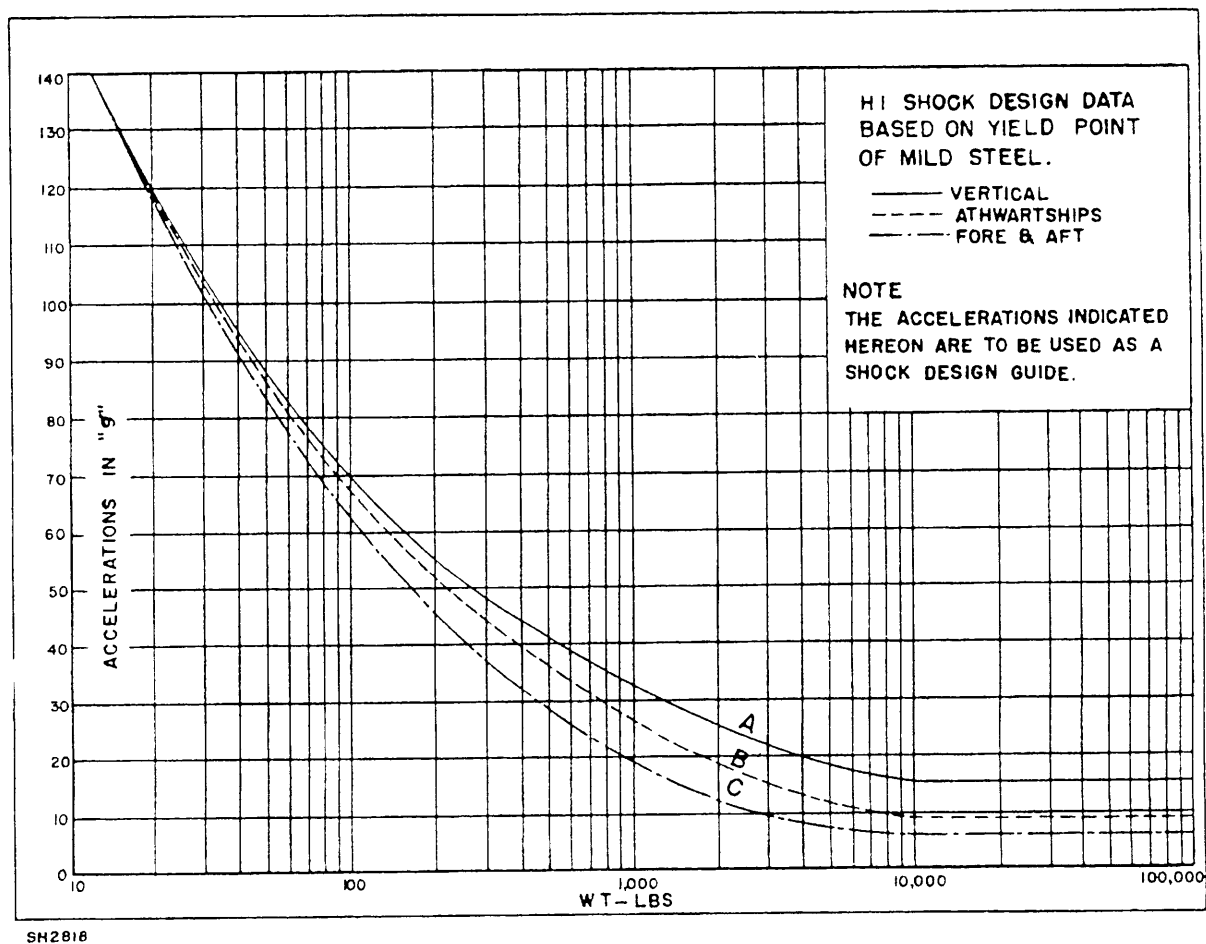


Figure 3 - HI shock design data.

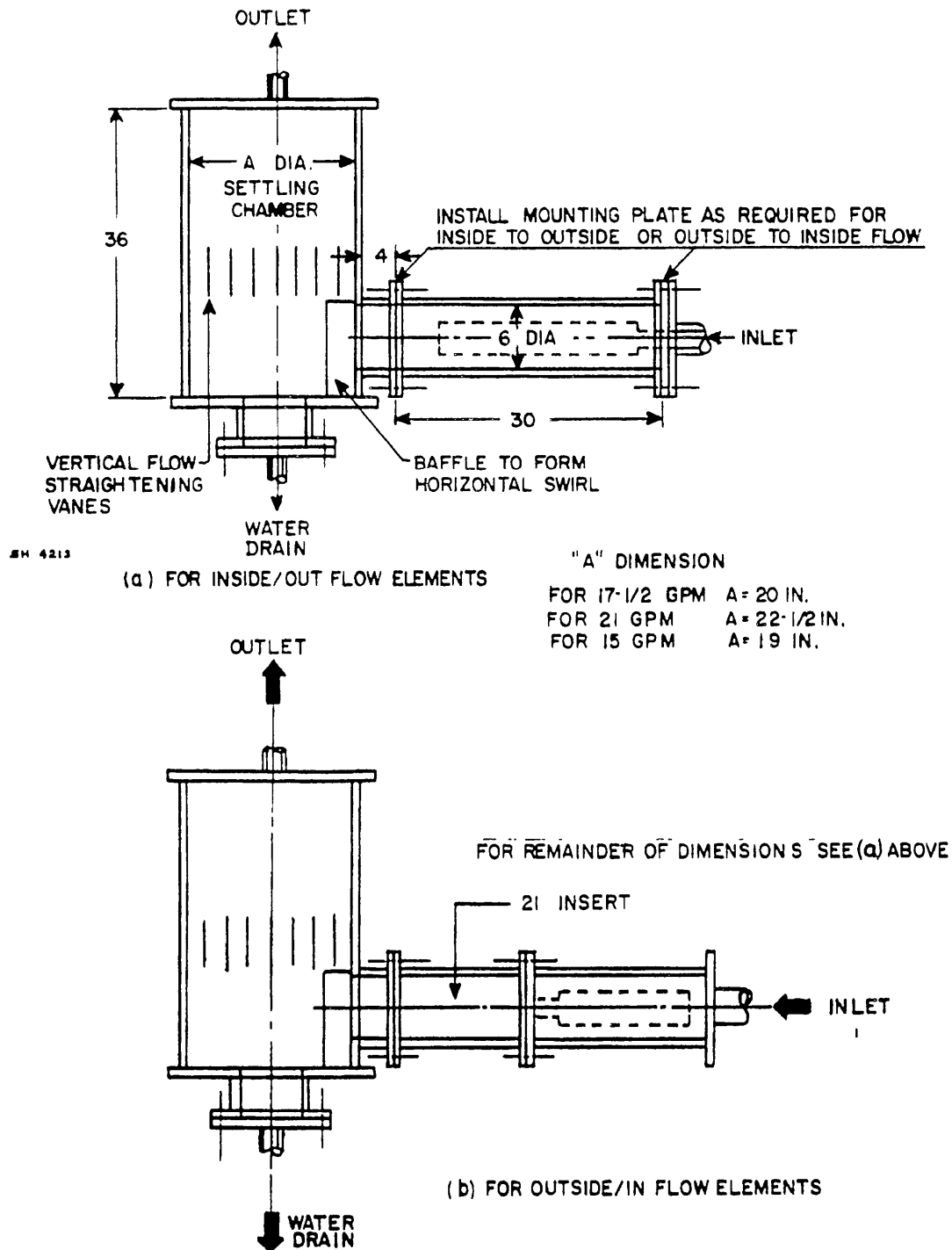


Figure 4 - For outside/in flow elements.

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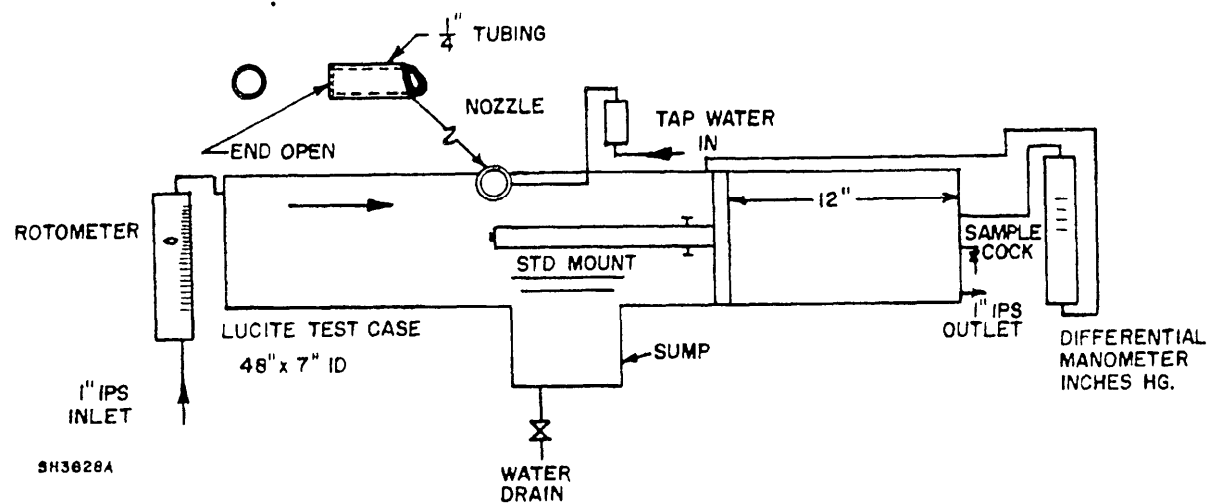


Figure 5 - Separator element flow test case.

SPECIFICATION ANALYSIS SHEET
NAVSHIPS-4863 (8-61)
INSTRUCTIONS

BUDGET BU. NO. 45-R309

This sheet is to be filled out by personnel either Government or contractor, involved in the use of the specification in procurement of products for ultimate use by the Bureau of Ships

This sheet is provided for obtaining information on the use of this specification which will insure that suitable products can be procured

with a minimum amount of delay and at the least cost.

Comments and the return of this form will be appreciated.

hold on dotted lines on reverse side, staple in corner, and send to Bureau of Ships, Specifications and Standardization Branch, Washington 25, D.C

 SPECIFICATION

ORGANIZATION

CITY

STATE

CONTRACT NO

QUANTITY OF ITEMS PROCURED

DOLLAR AMOUNT

\$

MATERIAL PROCURED UNDER A DIRECT GOVERNMENT CONTRACT

OR A SUBCONTRACT

1 HAS ANY PART OF THE SPECIFICATION CREATED PROBLEMS OR REQUIRED INTERPRETATION IN PROCUREMENT USE?
 a. GIVE PARAGRAPH NUMBER AND WORDING

b. RECOMMENDATIONS FOR CORRECTING THE DEFICIENCIES

2 COMMENTS ON ANY SPECIFICATION REQUIREMENT CONSIDERED TOO RIGID

3 IS THE SPECIFICATION RESTRICTIVE?

IF THE ANSWER IS "YES" IN WHAT WAY?

☐ YES

☐ NO

4 REMARKS (Attach any pertinent data which may be of use in improving this specification) PLACE THIS FORM AND PAPERS IN AN ENVELOPE AND SEND TO THE BUREAU

SUBMITTED BY (Print name and activity)

DATE

Fold

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