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MIL-S-16293G
18 January 1980
SUPERSEDING
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4 August 1972

MILITARY SPECIFICATION

STRAINERS, SEDIMENT: PIPELINE, WATER, AIR, GAS, OIL, OR STEAM

This specification is approved for use by all Departments and Agencies of the Department of Defense.

1. SCOPE

1.1 Scope. This specification covers removable basket-and-screen-strainers of various sizes for use in water, air, gas, oil, or steam pipe lines, as specified (see 6.2 and 6.4), to remove dirt, scale particles, and other foreign matter.

* 1.2 Classification. Strainers shall be of the following types, classes, styles, and sizes as specified (see 6.2):

Type I - Screwed connections.
Type II - Flanged connections.

Class 125 - 125 pounds per square inch gage (psig) pressure rating.
Class 250 - 250 psig pressure rating.

Style I - I pattern.
Style L - L pattern.
Style S - S pattern.
Style T - T pattern.
Style Y - Y pattern.

* 1.2.1 Sizes. Type I and II strainers shall be available in the following sizes (iron pipe size in inches):

Type I - 3/8, 1/2, 3/4, 1, 1-1/4, 1-1/2, 2, 2-1/2, and 3.
Type II - 2, 2-1/2, 3, 4, 5, 6, and 8.

* 1.2.2 Part number. The military part numbers for items in this specification will be identified as shown in 6.4.

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Commanding Officer (Code 156), Naval Construction Battalion Center, Port Hueneme, CA 93043, by using the self-addressed Standardization Document Improvment Proposal (DD Form 1426) appearing at the end of this document or by letter.

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2. APPLICABLE DOCUMENTS

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

SPECIFICATION

MILITARY

MIL-V-3 - Valves, Fittings, and Flanges (Except for Systems Indicated Herein); Packaging of.

STANDARDS

FEDERAL

FED STD H28 - Screw-Thread Standards for Federal Services.

MILITARY

MIL-STD-105 - Sampling Procedures and Tables for Inspection by Attributes.

(Copies of specifications, standards, and publications required by contractors in connection with specific acquisition 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 or request for proposal shall apply.

AMERICAN NATIONAL STANDARDS INSTITUTE, INC. (ANSI)

B16.1 - Cast-Iron Pipe, Flanges and Flanged Fittings, Class 25, 125, 150, and 800 Pounds.
B16.3 - Malleable-Iron Threaded Fittings.

(Application for copies should be addressed to the American National Standards Institute, 1430 Broadway, New York, NY 10018.)

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

A47 - Malleable Iron Castings.
A126 - Gray Iron Castings for Valves, Flanges and Pipe Fittings.
A167 - Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.
A276 - Stainless and Heat-Resisting Steel Bars, and Shapes.
A278 - Gray Iron Castings for Pressure-Containing Parts for Temperatures up to 650°F.
B16 - Free-Cutting Brass Rod, Bar, and Shapes for Use in Screw Machines.

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B21 - Naval Brass Rod, Bar, and Shapes.
B62 - Composition Bronze or Ounce Metal Castings.
B103 - Phosphor Bronze Plate, Sheet, Strip and Rolled Bar.

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

Technical society and technical association specifications and standards are generally available for reference from libraries. They are also distributed among technical groups and using Federal agencies.

3. REQUIREMENTS

3.1 Description.

3.1.1 Type I. Type I strainers shall have threaded connections and removable screens, and be of the class and style required. When specified (see 6.2), the strainers shall have rotating screens or scraper blades, manual or motor operated, for the purpose of cleaning screens without shutting down operation of the strainer. Unless specified as a twin or duplex type (see 6.2), strainers for placement in the inlets of pressure-reducing valves, traps, or heating system pumps shall be of the single type screen.

3.1.2 Type II. Type II strainers shall have flanged connections, be of the center or peripheral influent type of the class and style specified, and have removable straining elements. When specified (see 6.2), they shall have rotating screens or scraper blades, manual or motor operated, for purpose of cleaning screens without shutting down operation of the strainer. The number of straining elements shall be determined by the application in accordance with the best industrial standards.

* 3.2 Standard commercial product. Each strainer of the same classification shall, as a minimum, be in accordance with the requirements of this specification and shall be the manufacturer's standard commercial product. Additional or better features which are not specifically prohibited by this specification, but which are a part of the manufacturer's standard commercial product, shall be included in the strainers being furnished. Standard commercial product is a product which has been sold or is being currently offered for sale on the commercial market through advertisements or manufacturer's catalogs, or brochures, and represents the latest production model.

* 3.3 First article. When specified (see 6.2), the contractor shall furnish a strainer of the type, style, and size as required for first article inspection and approval (see 4.2.1 and 6.3).

* 3.4 Materials. Materials used shall be free from defects which would adversely affect the performance or maintainability of individual components or of the overall assembly. Materials not specified herein shall be of the same quality used for the intended purpose in commercial practice. Unless otherwise specified herein, all equipment, material, and articles incorporated in the work covered by this specification are to be new and fabricated using

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materials produced from recovered materials to the extent possible without jeopardizing the intended use. The term "recovered materials" means materials which have been collected or recovered from solid waste and reprocessed to become a source of raw materials, as opposed to virgin raw materials. None of the above shall be interpreted to mean that the use of used or rebuilt products are allowed under this specification unless otherwise specified.

3.4.1 Gray-iron castings. Gray-iron castings shall be made from material conforming to ASTM A126, class B or A278, class 30.

3.4.2 Malleable iron castings. Malleable iron castings shall be made from material conforming to ASTM A47, grade 35018.

* 3.4.3 Brass parts. Brass parts shall be made from material conforming to ASTM B21, copper alloy No. 464.

3.4.4 Bronze parts. Bronze parts shall be made from material conforming to ASTM B16, B62, or B103, alloy No. C52100.

* 3.4.5 Stainless steel parts. Stainless steel parts shall be made from material conforming to ASTM A167, type 304 or 316, or ASTM A276, type 304.

3.5 Threaded parts. All threaded parts shall conform to FED STD H28.

3.6 Interchangeability. All removable units and replacement parts of similar equipment shall be interchangeable with corresponding items or parts, and not require hand or machine fitting.

* 3.7 Connectors/adaptors. Unless otherwise specified (see 6.2), all strainers for pipe sizes up to and including 2 inches shall have threaded connections or be provided with adapters for thread connections.

3.8 Pressure-temperature ratings. Pressure-temperature ratings shall be not less than the following:

(a) Class 125 - 125 psig saturated steam pressure; and 175 psig at 150° Fahrenheit (F).
(b) Class 250 - 250 psig saturated steam pressure; and 400 psig at 150°F.

3.9 Hydrostatic test pressure. All strainers shall be capable of withstanding a hydrostatic shell test pressure equal to twice the primary steam service pressure (see 3.8).

3.10 Styles.

3.10.1 Styles I and L. Styles I and L strainers shall have the access opening in line with the filter element.

3.10.2 Styles S and T. Styles S and T strainers shall be designed for positioning the element vertically within the body. Unless otherwise specified (see 6.2), the access opening shall be located at the top of the body. A clean-out connection shall be tapped in a boss on the bottom of the body.

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3.10.3 Style Y. The branch leg of the Y pattern shall be inclined 30 to 60° from the straight run. The strainer element shall be located on the branch leg of the Y pattern and shall be removable through the end of the branch leg. The clean-out connection shall be tapped in the access cap or cover.

3.11 Construction.

3.11.1 Strainer bodies. Unless otherwise specified (see 6.2), the bodies shall be malleable iron conforming to ASTM A47, or cast iron conforming to ASTM A126, class B, or A278, class 30 and ANSI B16.3. The bodies shall be so designed that the flow is into the inlet and either to the inside or outside of the strainer element as specified (see 6.2), then through the strainer element to the outlet of the body and into and through the outlet connection.

3.11.2 Connections. All type I strainer connections shall be tapped with American National Taper Pipe threads. All type II strainer connections shall be flanged and drilled for bolts in accordance with ANSI B16.1.

3.11.3 Strainer element detail. The element shall be formed into a cylinder or frustrum of a cone with one or both ends open. The element shall be properly reinforced to prevent deformation result in by-passing sediment particles. All joints in the element shall be joined by silver brazing, soldering, riveting, welding, or crimping. Elements shall be constructed of perforated sheet metal or of woven wire mesh as specified (see 6.2).

3.11.4 Strainer element material. Strainer elements shall be of the following materials for the service specified (see 6.2):

(a) Steam, water, gas or air - Brass, bronze, nickel-copper-alloy, or stainless steel sheet metal; and phosphor-bronze, nickel, copper alloy or stainless steel wire mesh.
(b) Oil service - Iron or steel and the materials included in subparagraph (a) of 3.11.4.

3.11.5 Size of openings. Unless otherwise specified (see 6.2), elements shall have wire mesh openings, or perforations of 0.016 inch minimum for steam, 0.031 inch minimum for steam mixed with condensate, and 0.047 inch minimum for water or low-viscosity oil.

3.11.6 Ratio of net strainer area to pipe area. Unless otherwise specified (see 6.2), the ratio of the net effective strainer area to the cross-sectional flow area of standard weight pipe of the same nominal size as the strainer shall be not less than 2.50 to 1. When mesh and perforated metal are used together, the open area should be the result of multiplying the open areas of each together.

3.11.7 Access cover. Unless otherwise specified (see 6.2), the access cover shall be cast iron or malleable iron conforming to ASTM A47, A126, or A278 and shall be secured to the strainer body by means of through bolts, hinged bolts, yokes, cap screws, or studs of appropriate size and number. Whether screwed or bolted, the access cover may have a female pipe thread for a blow-down connection, in which shall be installed a brass pipe plug. The plug shall be tight under test and service conditions. Strainers of 3-inch pipe size and smaller may have a threaded access cover with either pipe threads and no gasket, or straight threads with a gasket.

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3.11.8 Cover gasket. Whether the access cover is screwed or bolted, a gasket shall be installed between cover and body to insure cover tightness under test and service conditions. The gasket shall be composed of a material suitable for the intended application and use, as specified (see 6.2). For type I, style Y, screwed connection strainers in size 2 inch and under, a gasket need not be furnished when the access cover is secured with NPT threads.

3.11.9 Bottom drain plug. If supplied, the plug shall be brass conforming to ASTM B62 or ASTM B16.

3.12 Marking.

3.12.1 Service marking. Each strainer shall bear the following service markings, cast integral with, stamped or otherwise permanently marked upon the body:

(a) "125" as pressure identification for class 125 strainers.
(b) "250" as pressure identification for class 250 strainers.
(c) An arrow or other appropriate mark to indicate flow direction.

* 3.12.2 Identification marking. Equipment, assemblies, and parts shall be marked for identification. The nomenclature of the item shall be "Strainer, Sediment". When specified (see 6.2), the strainer shall include the Federal Stock Number.

3.13 Spare parts and maintenance tools. When specified (see 6.2), spare parts and maintenance tools shall be furnished.

3.14 Workmanship. The strainers shall be clean, free from scale, smooth, round, straight, and of proper dimensions. Also, the strainers shall be free from injurious grooving, indentations, racks, flaws, slivers, spilly metal, or other harmful defects which would interfere with use of the material in the application for which it is intended.

3.14.1 Metal fabrication. Metal used in fabrication of equipment shall be free from kinks. Material shall be straightened by methods that will not cause injury to the metal. Shearing and chipping shall be done neatly and accurately. Flame cutting, with use of a tip suitable for the thickness of metal, may be employed instead of shearing or sawing, provided that exposed edges are smoothly made. All bends shall be made by controlled means to insure uniformity of size and shape. Precautions shall be taken to avoid overheating and heated metal shall be allowed to cool slowly.

3.14.2 Bolted connections. Bolt holes shall be accurately punched or drilled and shall have the burrs removed. All nuts, bolts, and screws shall be tight.

3.14.3 Riveted connections. Rivet holes shall be accurately punched or drilled and shall have the burrs removed. Rivets shall be of the explosive type or driven with pressure tools, and shall completely fill the holes. Rivet heads, when not countersunk or flattened, shall be of a shape approved by the contracting officer and of uniform size for the diameter of the rivet. Rivets shall completely fill the hole. Rivet heads shall be full, neatly made, concentric with the rivet holes, and in full contact with the surface of the member.

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3.14.4 Welding. Welding procedures shall be in accordance with a nationally recognized welding code. The surface of parts to be welded shall be free from rust, scale, paint, grease, or other foreign matter. Spot, tack, or intermittent welds for strength will not be permitted. Weld penetration shall be such as to provide transference of maximum design stress through the base metal juncture. Fillet welds shall be provided when necessary to reduce stress concentration.

3.14.5 Machine work. Tolerances for contact and bearing surfaces shall conform to standards prevailing among manufacturers normally producing strainers.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. Unless otherwise specified in the contract, the contractor is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified in the contract, 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 Classification of inspections. The inspection requirements specified herein are classified as follows:

(a) First article inspection (see 4.2.1).
(b) Quality conformance inspection (see 4.2.2).
(c) Packaging inspection (see 4.7).

* 4.2.1 First article inspection. First article inspection shall be performed on one complete strainer when a first article sample is required (see 3.3 and 6.2). This inspection shall include the examination of 4.5 and the tests of 4.6. The first article may be a standard production item from the contractor's current inventory, provided the strainers meets the requirements of this specification and is representative of the design, construction, and manufacturing technique applicable to the remaining strainers to be furnished under the contract.

* 4.2.2 Quality conformance inspection. Quality conformance inspection shall be performed on the sample strainer selected in accordance with 4.2.1. This inspection shall include the examination of 4.5 and the tests of 4.6.

* 4.3 Inspection lot. All units of the same types, classes, styles, and size offered to the Government at one time, shall be considered a lot for purpose of inspection. The sample unit shall be one complete strainer.

* 4.4 Sampling. A random sample of strainer shall be selected from each lot in accordance with MIL-STD-105.

* 4.4.1 Sampling for examination. Examination of the strainer shall be based on inspection level II, and an Acceptable Quality Level (AQL) of 2.5 percent defective.

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* 4.4.2 Sampling for tests Tests of the strainer shall be based on inspection level S-3 and an AQL of 4.0 percent defective.

* 4.5 Examination. Each strainer selected in accordance with 4.4.1 shall be examined for compliance with the requirements specified in Section 3 of this specification. Any redesign or modification of the contractor's standard product to comply with specified requirements, or any necessary redesign or modification following failure to meet specified requirements, shall receive particular attention for adequacy and suitability. This element of inspection shall encompass all visual examinations and dimensional measurements. Noncompliance with any specified requirements or presence of one or more defects preventing or lessening maximum efficiency shall constitute cause for rejection.

* 4.6 Tests. Each strainer selected in accordance with 4.4.2 shall be tested to determine compliance with this specification. Tests shall be conducted as specified in 4.6.1 and 4.6.2.

* 4.6.1 Pressure-temperature. Subject strainer to the applicable pressure-temperature ratings as specified in 3.8. Nonconformance to the requirements specified in 3.8 shall constitute failure of this test.

* 4.6.2 Hydrostatic pressure. Subject strainer to a hydrostatic pressure as specified in 3.9. Any seepage or leakage through the casting or at any connection or joint shall constitute failure of this test.

* 4.7 Packaging inspection. The preservation, packaging, packing, and marking of the strainers shall be inspected to determine conformance with the applicable requirements of Section 5 of this specification.

5. PACKAGING

5.1 Preservation, packaging, packing, and marking. The strainer shall be preserved, packaged, packed, and marked in accordance with MIL-V-3. The level of preservation and packaging and level of packing shall be as specified (see 6.2).

6. NOTES

6.1 Intended use. The strainers covered by this specification are intended for general service to protect regulating valves, orifices, pumps, and other piping equipment from damage or faulty operation which would result from entrained sediment particles.

6.1.1 Perforations and mesh. The following ranges of perforation sizes and wire mesh numbers are acceptable.

(a) Perforation diameters, inches (approximate):

0.020 to 0.023
0.027 to 0.033
0.040 to 0.050
0.057 to 0.063
0.090 to 0.105
0.120 to 0.130

(b) Mesh numbers - 20, 40, 60, 80, and 100.

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6.1.2 Ratio of net strainer area to pipe area. The ratio of the net effective strainer area to the area of the pipe is an indirect index of the resistance to flow through the strainer. The ratios listed in 3.11.6 are minimum values for the range of sizes covered by this specification. Many designs of strainers provide for higher area-ratios. The area-ratio is dependent upon the size of opening and the total surface area of the element, and varies with the size of the strainer. If a higher ratio is required, manufacturer's literature should be consulted to ascertain availability of the required area-ratio.

6.2 Ordering data. Acquisition documents should specify the following:

(a) Title, number, and date of this specification.
(b) Type, style, class, and size required (see 1.1, 1.2, 3.1.1, and 3.1.2).
(c) Whether a twin or duplex arrangement is required (see 3.1.1).
(d) When a rotating screen or scraper blade is required (see 3.1.1 and 3.1.2).
(e) When first article is required for inspection and approval (see 3.3, 4.2.1, and 6.3).
(f) Whether pipe size 3 inches and less will have threaded connections or be provided with adpaters for thread connections (see 3.7).
(g) Location of access opening if different (see 3.10.2).
(h) Material for body assembly required, and whether flow will be to the inside or the outside of the strainer element (see 3.11.1).
(i) Whether strainer element is to be wire mesh or perforated metal (see 3.11.3).
(j) Strainer element material required (see 3.11.4).
(k) Size of strainer element openings or net effective area ratio required, if other than specified (see 3.11.5 and 3.11.6).
(l) Material for access cover, if other than specified (see 3.11.7).
(m) Material for access cover gasket (see 3.11.8).
(n) When the Federal Stock Number is to be included (see 3.12.2).
(o) When spare parts and maintenance tools are required (see 3.13).
(p) When first article inspection does not include all examination and tests applicable to requirements of Section 3 (see 4.2.1).
(q) Level of preservation and packaging and level of packing required (see 5.1).

6.2.2 Contract data requirements. When this specification is used in an acquisition which incorporates a DD Form 14523 and invokes the provisions of paragraph 7-104.9(n) of the Defense Acquisition Regulation (DAR), the data requirements identified below will be developed as specified by an approved Data Item Description (DD Form 1664) and delivered in accordance with the Contract Data Requirements List (DD Form 1423) incorporated into the contract. When the provisions of DAR 7-104.9(n) are not invoked, the data specified below shall be delivered in accordance with the contract requirements.

6.3 First article. When a first article is required, it shall be tested and approved under the appropriate provisions of paragraph 7-140.55 of the DAR. The first article should be a first production item. The first article should consist of one unit. The contracting officer should include specific instructions in all acquisition instruments, regarding arrangement for examinations, tests, and approval of the first article.

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6.4 Definitive military specification part number. The military specification part number is a definitive part number which corresponds to the type, class, size, and style of strainers covered by this specification. The military specification number, the type and class code letter, and the size and style code numbers are combined to form a definitive military specification part number.

6.4.1 Cataloging data. For cataloging purposes, part numbers for the strainers are assigned as follows:

Military specification number	M16293
Type and class code letter	X
Size and style code number	XX

6.4.2 Type and class. The type and class of strainer (see 1.2) are identified by a single letter (see Table I).

TABLE I. Code letter to type and class.

	Type I	Type II
Class 125	A	B
Class 250	C	D

6.4.3 Size and style The size and style of strainer (see 1.2) are identified by a double digit number (see Table II).

TABLE II. Code number to size and style.

	STYLE				
Size	I	L	S	T	Y
3/8	01	02	03	04	05
1/2	06	07	08	09	10
3/4	11	12	13	14	15
1	16	17	18	19	20
1-1/2	21	22	23	24	25
1-3/4	26	27	28	29	30
2	31	32	33	34	35
2-1/2	36	37	38	39	40
3	41	42	43	44	45
4	46	47	48	49	50
5	51	52	53	54	55
6	56	57	58	59	60
8	61	62	63	64	65

6.5 Changes from previous issue. The margins of this specification are marked with an asterisk to indicate where changes (additions, modifications, corrections, deletions) from the previous issue were made. This was done as a

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Custodians:

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Air Force - 99

User activities:

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5. PROBLEM AREAS

a. Paragraph Number and Wording:

b. Recommended Wording:

c. Reason/Rationale for Recommendation:

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7a. NAME OF SUBMITTER *(Last, First, MI)* – Optional

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