

MIL-S-416D
 23 August 1979
 SUPERSEDING
 MIL-S-416C
 20 September 1974

MILITARY SPECIFICATION

STRAINERS, WELL, WATER, WIRE-WOUND

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

1. SCOPE

1.1 Scope. This specification covers 10-foot long, wire-wound, telescopic type strainers used in connection with water-well construction.

1.2 Classification.

1.2.1 Strainer designation. Strainers covered by this specification shall be designated in the following form (see 6.2 and 6.5).

Military Specification Number _____ M416 -X -X -X
 Size and type code number (see 1.2.2) _____
 Strainer opening code letter (see 1.2.3) _____
 Fittings code number (see 1.2.4) _____

1.2.2 Size and type. The size and type of strainer (see 3.5 through 3.9) are identified by a single digit number (see Table I).

TABLE I. Code number to size and type.

Strainer size (nominal)	Type of material			
	Type I	Type II	Type III	Type IV
4-inch	1	2	3	4
6-inch	5	6	7	8

FSC 4730

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: US Army Mobility Equipment Research and Development Command, ATTN: DRDME-DS, Fort Belvoir, VA 22060 by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

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- Type I - High corrosion-resistant, nonferrous.
- Type II - Mild corrosion-resistant, nonferrous.
- Type III - Galvanized steel.
- Type IV - Corrosion-resistant steel (stainless).

1.2.3 Strainer opening. The strainer opening (see 3.10 through 3.12) is identified by a single alphabetic character (see Table II).

TABLE II. Code letter to class of opening.

Code letter	Strainer opening
W	Class 1 (Wide)
N	Class 2 (Narrow)
F	Class 3 (Fine)

1.2.4 Fittings. Whether or not strainer is provided with fittings (see 3.13 and 3.14) shall be identified by a single digit number (see Table III).

TABLE III. Code number to optional fittings.

Code number	Fittings
0	Without fittings
1	With fittings

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.

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SPECIFICATIONS

FEDERAL

- QQ-S-781 - Strapping, Steel and Seals.
- PPP-B-601 - Boxes, Wood, Cleated-Plywood.
- PPP-B-621 - Boxes, Wood, Nailed and Lock-Corner.
- PPP-T-60 - Tape: Packaging, Waterproof.

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- MIL-P-116 - Preservation-Packaging, Methods of.
- MIL-B-121 - Barrier Material, Greaseproofed, Waterproofed, Flexible.

STANDARDS

FEDERAL

- FED-STD-H28/7 - American Standard Pipe Threads (except Dryseal and Hose Coupling Types).

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- 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-1188 - Commercial Packaging of Supplies and Equipment.

(Copies of specifications and standards 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 or request for proposal shall apply.

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AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

- A 276 - Stainless and Heat-Resisting Steel Bars and Shapes.
- A 386 - Zinc Coating (Hot Dip) on Assembled Steel Products.
- A 575 - Merchant Quality Hot-Rolled Carbon Steel Bars.
- A 580 - Stainless and Heat-Resisting Steel Wire.
- B 99 - Copper-Silicon Alloy Wire for General Purposes.
- B 584 - Copper Alloy Sand Castings for General Applications.

(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. The strainer shall consist of a wire-wound strainer section and the required bars and end fittings to provide a rigid assembly.

3.2 First article (first produced strainers). The contractor shall furnish one or more strainers as specified (see 6.2) for examination and testing within the time frame specified (see 6.2) to prove that his production methods and choice of design detail will produce strainers that comply with the requirements of this specification. Examination and tests shall be as specified in Section 4 and shall be subject to surveillance and approval by the Government (see 6.3).

3.3 Materials. Materials shall be as specified herein. Materials not specified shall be selected by the contractor and shall be subject to all provisions of this specification (see 6.7).

3.4 Construction. The strainer section shall be constructed of a continuous winding of wire around the outside of longitudinal spacer bars. The overall length of each strainer, excluding the fittings, shall be 10 feet, plus or minus 1 inch.

3.4.1 Spacer bars. The spacer bars shall support the turns of wire without unduly restricting the flow of water. The spacer bars shall be securely mounted on end coupling rings.

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3.4.2 Wires. The wire shall be wound around the spacer bars in one continuous length with a precisely regulated space between turns. The wire shall be brazed or welded to the bars, or calked into notches in the bars. The cross section of the wire shall be shaped so that the outside width of the slot formed between the adjacent turns of the wire shall be less than the inside width of the slot.

3.5 Threads. Strainer threads shall be American National taper pipe threads (NPT) conforming to FED-STD-H28/7 as follows:

Strainer size (nominal)	Strainer threads	Length of effective thread (minimum)
4-inch	3-inch NPT	1-inch
6-inch	5-inch NPT	1-inch

3.6 Type I, high corrosion-resistant. Type I high corrosion-resistant strainers shall be copper-silicon alloy wires and bars conforming to ASTM B 99, UNS C65100 or C65500, form and temper optional. The end coupling rings and bail plug shall be bronze conforming to ASTM B 584, UNS C90300.

3.7 Type II, mild corrosion-resistant. Type II mild corrosion-resistant strainers shall be brass wires and bars having not less than 83 percent copper and a tensile strength of not less than 53,000 pounds per square inch (psi). The end coupling rings and the ball plug shall be bronze conforming to ASTM B 584, UNS C90300.

3.8 Type III, galvanized steel. Type III galvanized steel strainers shall be carbon steel wires and merchant quality steel bars conforming to ASTM A 575, UNS G10100 or G10150. The wires and bars shall be galvanized after assembly in accordance with ASTM A 386. Other parts of the strainers shall be of the same material and galvanized as the wires and bars, except that threads shall not be galvanized.

3.9 Type IV, corrosion-resistant steel. Type IV corrosion-resistant steel strainers, including the end coupling rings and bail plugs, shall be corrosion-resistant steel conforming to ASTM A 276, UNS S30400 and ASTM A 580, UNS S30400 containing 18 percent chromium and 8 percent nickel.

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3.10 Class 1, wide opening. Class 1 wide opening strainers shall measure 0.065 inch, plus or minus 0.015 inch, at the narrow part of the slot opening between the wires forming the screen section. The inlet area (see 6.6.2) of the strainer shall be not less than 20 percent of the total surface area.

3.11 Class 2, narrow opening. Class 2 narrow opening strainers shall measure 0.030 inch, plus or minus 0.010 inch, at the narrow part of the slot opening between the wires forming the screen section. The inlet area (see 6.6.2) of the strainer shall be not less than 10 percent of the total surface area.

3.12 Class 3, fine opening. Class 3 fine opening strainers shall measure 0.015 inch, plus or minus 0.003 inch, at the narrow part of the slot opening between the wires forming the screen section. The inlet area (see 6.6.2) of the strainers shall be not less than 7 percent of the total surface area.

3.13 Size 6-inch strainers. The outside diameter (OD) of the strainer and coupling ring shall be not more than 5-3/4 inches to permit the strainer to be telescoped through a 6-inch inside diameter (ID) pipe. A 12-inch section of the strainer shall withstand a longitudinal compressive force of 30,000 pounds without permanent deformation, set, or decrease in size of slots. The end coupling rings shall be provided with internal strainer threads. A bail plug shall be provided. Unless otherwise specified (see 1.2.4), the strainer shall be provided with one each of the following fittings:

Adapter	- Steel, external strainer threads to 4-inch internal NPT threads (for connecting 6-inch nominal size strainer to 4-inch pipe).
Adapter	- Steel, external strainer threads to 6-inch external NPT threads (for connecting 6-inch nominal size strainer to 6-inch pipe).
Coupling	- Pipe, steel, 2-inch, with right-hand and left-hand NPT threads.
Nipple	- Pipe, steel, extra heavy, 4-inch, 6-inches long, with 4-inch NPT threads.

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Nipple	- Pipe, steel, 4-inch, 6-inches long, with right-hand and left-hand NPT threads.
Nipple	- Pipe, steel, 2-inch, 4-inches long, with right-hand and left-hand NPT threads.
Nipple	- Nipple shall be fabricated from the same material as the strainer with which it is provided and shall have external strainer threads to join two strainers in an internal flush-joint-type connection.
Packer	- Lead, made on a 4-inch steel ring having a 4-inch internal right-hand NPT on lower end and 4-inch internal left-hand NPT threads on upper end.
Plug	- Wood, lead-weighted, to fit in extra heavy 4-inch pipe nipple.
Shoe	- Bailing down, cast-iron, 4-inch internal NPT threads on lower end and external strainer threads on lower end and external strainer threads on upper end.
Valve	- Back pressure (wash-down bottom), steel or cast-iron, external strainer threads, and having a 2-inch internal left-hand NPT connection for wash-down line.

3.14 Size 4-inch strainer. The OD of the strainer shall be not more than 3-3/4 inches to permit the strainer to be telescoped through a 4-inch ID pipe. An 8-inch section shall withstand a longitudinal compressive force of 15,000 pounds without permanent set, deformation, or decrease in size of the slots. The end coupling rings shall be provided with internal strainer threads. A bail plug shall be provided. Unless otherwise specified (see 1.2.4), the strainer shall be provided with one each of the following fittings:

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- | | |
|----------|--|
| Adapter | - Steel, external strainer threads to 4-inch external NPT threads (for connecting 4-inch nominal size strainer to 4-inch pipe). |
| Adapter | - Steel, external strainer threads to 2-inch internal NPT threads (for connecting 4-inch nominal size strainer to 2-inch ID pipe). |
| Coupling | - Pipe, steel, 2-inch, with right-hand and left-hand NPT threads. |
| Nipple | - Pipe, steel, 2-inch, 4-inches long, with right-hand and left-hand NPT threads. |
| Nipple | - Nipple shall be fabricated from the same material as the strainer with which it is provided and shall have external strainer threads to join two strainers in an internal flush-joint-type connection. |
| Packer | - Lead, external strainer threads (to seal 4-inch nominal size strainer inside 4-inch ID pipe). |
| Valve | - Back pressure (wash-down bottom), steel or cast-iron, external strainer threads, and having a 2-inch internal left-hand NPT connection for wash-down line. |

3.15 Identification marking. Each strainer shall be identified in accordance with MIL-STD-130.

3.16 Workmanship. All parts, components, and assemblies of the strainer including castings, machined surfaces, and welded or brazed parts shall be clean and free from sand, dirt, fins, pits, sprues, scale, flux, and other harmful extraneous material. External surfaces shall be free from burrs, sharp edges, and corners except when sharp edges or corners are required.

3.16.1 Metal fabrication. Metals used in the fabrication of the strainer shall provide standard commercial surface finish and shall be free from kinks and sharp bends. Metal having eroded surface is not acceptable. The forming of material shall be done by methods that will not cause damage to the metal. Tapped and threaded parts shall be free from sharp edges and burrs. All bends of a major character shall be made with metal dies or fixtures to insure uniformity of size and shape.

3.16.2 Machine work. Tolerances for metal fits shall conform to the limitations specified herein.

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.

4.1.1 Component and material inspection. The contractor is responsible for insuring that components and materials used are manufactured, examined, and tested in accordance with referenced specifications and standards, as applicable.

4.2 Classification of inspections. Inspection requirements specified herein are classified as follows:

- (a) First produced strainer inspection (see 4.3).
- (b) Quality conformance inspection (see 4.4).
- (c) Inspection of packaging (see 4.6).

4.3 First produced strainer inspection.

4.3.1 Examination. The first produced strainer shall be examined as specified in 4.5.1. Presence of one or more defects shall be cause for rejection.

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4.3.2 Tests. The first produced strainer shall be tested as specified in 4.5.2. Failure of any test shall be cause for rejection.

4.4 Quality conformance inspection.

4.4.1 Sampling. Sampling for examination and tests shall be in accordance with MIL-STD-105.

4.4.1.1 Lot. For the purpose of inspection, a lot shall consist of all the strainers of the same type, class, and size offered for delivery at one time.

4.4.2 Examination. Samples selected in accordance with 4.4.1 shall be examined as specified in 4.5.1. AQL shall be 2.5 percent defective.

4.4.3 Tests. Samples selected in accordance with 4.4.1 shall be tested as specified in 4.5.2.1 through 4.5.2.4. AQL shall be 2.5 percent defective.

4.5 Inspection procedure.

4.5.1 Examination. The strainers shall be examined as specified herein for the following defects:

101. Material not as specified.
102. Construction not as specified.
103. Dimensions not as specified.
104. End connections not as specified.
105. Cross section of slot not as specified.
106. Fittings missing or not as specified.
107. Identification marking missing, incomplete, or illegible.
108. Workmanship not as specified.

4.5.2 Tests.

4.5.2.1 Thread. Threads of the strainer shall be tested with a gage of known accuracy. Nonconformance to 3.5 shall constitute failure of this test.

4.5.2.2 Telescoping tests.

4.5.2.2.1 Six-inch strainer. The 6-inch strainer shall be telescoped through a 6-inch (ID) pipe. Evidence of binding or restriction shall constitute failure of this test.

4.5.2.2.2 Four-inch strainer. The 4-inch strainer shall be telescoped through a 4-inch (ID) pipe. Evidence of binding or restriction shall constitute failure of this test.

4.5.2.3 Slot opening test. The slot openings of the strainers shall be measured at not less than four widely separate points. Nonconformance to 3.10, 3.11, or 3.12, as applicable, shall constitute failure of this test.

4.5.2.4 Inlet area test. The percent of inlet area of the strainers shall be determined by the number and size of slot openings. Nonconformance to 3.10, 3.11, or 3.12, as applicable, shall constitute failure of this test.

4.5.2.5 Compression tests.

4.5.2.5.1 Compression (6-inch strainer). A section 12 inches long shall be cut from the strainer. The section shall be subjected to a longitudinal compression of 30,000 pounds. Nonconformance to 3.13 shall constitute failure of this test.

4.5.2.5.2 Compression (4-inch strainer). A section 8 inches long shall be cut from the strainer. The section shall be subjected to a longitudinal compression of 15,000 pounds. Nonconformance to 3.14 shall constitute failure of this test.

4.6 Inspection of packaging.

4.6.1 Quality conformance inspection of pack.

4.6.1.1 Unit of product. For the purpose of inspection, a complete pack prepared for shipment shall be considered a unit of product.

4.6.1.2 Sampling. Sampling for examination shall be in accordance with MIL-STD-105.

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4.6.1.3 Examination. Samples selected in accordance with 4.6.1.2 shall be examined for the following defects. AQL shall be 2.5 percent defective.

- 109. Materials, methods, and containers not as specified for Level A or Level B. Each incorrect material, method, or container shall constitute one defect.
- 110. Preservation not as specified for Level A.
- 111. Packing not as specified.
- 112. Strapping not as specified for Level A.
- 113. Marking illegible, incorrect, incomplete, or missing for Level A, Level B, or Commercial.

5. PACKAGING

5.1 Preservation. Preservation shall be Level A or Commercial, as specified (see 6.2).

5.1.1 Level A.

5.1.1.1 Cleaning, drying, and preservative. Components of the strainers requiring a contact preservative shall be cleaned and dried in accordance with MIL-P-116. Preservative specified herein shall conform to the applicable specifications listed in, and shall be applied in accordance with MIL-P-116.

5.1.1.2 Strainers. Strainer screen sections, fittings, and accessories subject to corrosion shall be coated with Type P-7 preservative, and the parts and accessories individually wrapped with barrier material conforming to MIL-B-121, Type I, Grade A, Class 1 or 2. Class 2 barrier material shall be sealed with tape conforming to PPP-T-60, Type IV.

5.1.2 Commercial. Strainer screen sections, fittings, and accessories shall be preserved in accordance with MIL-STD-1188.

5.2 Packing. Packing shall be Level A, Level B, or Commercial, as specified (see 6.2).

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5.2.1 Level A. Each strainer with fittings and accessories shall be packed in a close-fitting box conforming to PPP-B-601, Overseas Type or PPP-B-621, Class 2. Strapping shall conform to QQ-S-781, Class 1, Type I or IV, size as applicable. Unless otherwise specified (see 6.2), strapping shall be Finish B. When specified (see 6.2), strapping shall be Finish A.

5.2.2 Level B. Each strainer with fittings and accessories shall be packed as specified in 5.2.1, except the box shall be Domestic Type or class as applicable. Strapping of boxes shall be as specified in the appendix of the applicable box specification.

5.2.3 Commercial. Each strainer with fittings and accessories shall be packed in accordance with MIL-STD-1188.

5.3 Marking.

5.3.1 Military packaging. Marking shall be in accordance with MIL-STD-129.

5.3.2 Commercial packaging. Marking shall be in accordance with MIL-STD-1188.

6. NOTES

6.1 Intended use. Water well strainers are used in a drilled well to assure a maximum supply of sand-free water.

6.2 Ordering data. Procurement documents should specify the following:

- (a) Title, number, and date of this specification.
- (b) Military specification part number required (see 1.2.1 and 6.5).
- (c) The time frame required for submission of the first produced strainer and the number of strainers required (see 3.2).
- (d) Degree of preservation and degree of packing required (see 5.1 and 5.2).
- (e) When strapping shall be Finish A (see 5.2.1).

6.3 First produced strainer. Any changes or deviations of production strainers from the approved first produced strainer during production will be subject to the approval of the contracting officer. Approval of the first produced strainer will not relieve the contractor of his obligation to furnish strainers conforming to this specification.

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6.4 Data requirements. The contracting officer should include requirements for such data as technical publications, instructional materials, illustrated parts lists, and contractors maintenance and operation manual to be furnished with each strainer if such information is required.

6.5 Definitive military specification part number. The military specification part number is a definitive part number which corresponds to the type, class, and size of strainer covered by this specification and defines the requirements of the options presented under this specification. The military specification code number (M416 for MIL-S-416) with a dash after it, the size and type code number, the strainer opening code letter, and the fittings code number are combined to form the definitive military specification part number (see 1.2.1).

6.6 Definitions.

6.6.1 Nominal size. Nominal size is the size stated allowing certain accommodations for manufacturing processes and interface connections. As used in this specification, it refers to the inside diameter of the well casing which is less than the numerical diameter of the casing.

6.6.2 Inlet area. Inlet area is the cross sectional area of the space on the cylindrical surface of the strainer through which liquid passes from the outside to the inside.

6.7 Recycled material. It is encouraged that recycled material be used, when practical, as long as it meets the requirements of this specification (see 3.3).

Custodians:
 Army - ME
 Navy - YD
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Preparing activity:
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DOCUMENT IDENTIFIER AND TITLE		
MIL-S-416D Strainers, Well, Water, Wire-Wound.		
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		MATERIAL PROCURED UNDER A
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