

MIL-H-29210A(NAVY)

27 May 1986

SUPERSEDING

MIL-H-29210(NAVY)

17 July 1981

MILITARY SPECIFICATION

HOSE ASSEMBLY, RUBBER, METAL LINED, WIRE REINFORCED,
250 PSIG, SATURATED AND SUPERHEATED STEAM SERVICE

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

1. SCOPE

1.1 Scope. This specification covers metal lined, wire reinforced, rubber-hose assemblies for conveyance of saturated and superheated steam. The working pressure of this hose is 250 pound-force per square inch gauge (psig) at a temperature of 450 degrees Fahrenheit (°F).

1.2 Classification. Hose covered by this specification shall be of one type:

1.2.1 Size. Hose covered by this specification shall be the inside diameter sizes listed in Table I, as specified (see 6.2.1).

1.2.2 Part number. Military specification part numbers for items described in this specification will be formulated as shown in 6.7.

2. APPLICABLE DOCUMENTS

2.1 Government documents.

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

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 Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

FSC 4720

DISTRIBUTION STATEMENT A. Approved for public release; distribution is unlimited.

AMSC N/A

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SPECIFICATIONS

MILITARY

MIL-P-775 - Packaging of Hose, Hose Assemblies; Rubber, Plastic, Fabric or Metal (Including Tubing); and Fittings, Nozzles, and Strainers.

STANDARDS

FEDERAL

FED-STD-H28 - Screw-Thread Standards for Federal Services.
FED-STD-151 - Metals; Test Methods.
FED-STD-162 - Hose, Rubber, Visual Inspection Guide For.

MILITARY

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

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

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

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

D380 - Testing Rubber Hose.
D518 - Rubber Deterioration - Surface Cracking.
D1149 - Rubber Deterioration - Surface Ozone Cracking in a Chamber (Flat Specimen).

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

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

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

3. REQUIREMENTS

3.1 First article. When specified (see 6.2.1), the contractor shall furnish a complete steam hose assembly for first article inspection and approval (see 4.2.1 and 6.4).

3.2 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 product covered by this specification are to be new and fabricated using materials produced from recovered materials to the maximum 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.

3.2.1 Metal liner. The metal inner liner shall be type 302, 304, 316, or 321 stainless steel.

3.2.2 Tube. The tube shall be butyl, chlorobutyl, bromobutyl, or ethylene-propylene-diene-terpolymer.

3.2.3 Wire reinforcement. Reinforcement wire shall be brass-plated high tensile carbon steel wire.

3.2.4 Coupling components. Unless otherwise specified (see 6.2.1), all coupling components, except washers and soft metal contact surface inserts, shall be cold-rolled steel bar stock or malleable iron, and shall be protected with a corrosion-resisting coating.

3.3 Length. The hose shall be furnished in nominal 25- or 50-foot lengths, exclusive of the couplings, as specified (see 6.2.1).

3.3.1 Tolerance. A tolerance of ± 1 percent shall be permitted when tested as specified in 4.5.1.1.

3.4 Construction. The hose assembly shall be constructed as specified in Tables I and II, and 3.4.1 through 3.4.3.

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TABLE I. Physical requirements for hose without liner.

Size, inside diameter (inches)	3/4	1	1-1/4	1-1/2	2
Tolerance, inside diameter, plus or minus (inch)	+0.039 -0.016	+0.047 -0.016	+0.063 -0.016	+0.063 -0.016	+0.063 -0.016
Outside diameter, minimum inches	1-9/32	1-9/16	1-27/32	2-1/16	2-5/8
Weight per foot, maximum pound	0.80	1.00	1.32	1.80	2.10

3.4.1 Hose body. The hose shall be made on a mandrel and shall consist of the following:

- a. A heat-resistant inner tube, properly compounded to resist saturated steam so as not to blister, pit, flake, or peel when tested as specified in 4.5.2.4.
- b. The hose shall be reinforced by two or more brass-plated high tensile carbon steel wire braids with a layer of rubber between each braid.
- c. A heat-resistant, abrasion-resistant, and ozone-resistant rubber cover.

3.4.2 Metal liner. The stainless steel metal inner liner shall be unpacked, fully interlocked, four-wall, flexible tubing. There shall be no sharp edges or burrs on the ends of the metal liner to cause damage to the tube during assembly or in service. The liner shall be allowed to float free within the hose. The physical requirements for the liner shall be as specified in Table II (see 6.5).

TABLE II. Physical requirements for metal liner.

Hose size, inside diameter (inches)	Metal liner, inside diameter minimum (inches)	Metal liner, thickness, minimum (inches)
3/4	9/16	0.010
1	13/16	0.010
1-1/4	1	0.010
1-1/2	1-1/4	0.013
2	1-3/4	0.015

3.4.3 End fittings. Unless otherwise specified (see 6.2.1), each length of hose shall have a male hose fitting on one end and a female hose fitting on the other end. The hose fittings shall be of the long shank, interlocking clamp type, having fingers or lugs on each half of the clamp to grip the collar on the stem in order to prevent the stem shank from being pulled forward in relation to the clamp. Each clamp half shall interlock with the other half. Coupling components shall consist of a serrated stem with a raised continuous collar, a swivel nut and spud (for female section), and two part interlocking type clamp with two bolts for the 3/4-inch size hose and four bolts for the larger size hoses. The seating surface of the female stem

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shall be round to fit the beveled copper insert in the female spud. There shall be no sharp edges on the nipples or the clamps to cause damage to the tube or cover. When assembled, there shall be provisions for additional takeup of clamps in service.

3.4.3.1 Special stem design. The male and female stems shall be designed with rib type right hand spirals at the end of the stem to screw into the stainless steel liners providing positive gripping and retention. The pitch of the rib type spirals shall be 0.312 inch for the 1-1/2 inch and 2 inch hose fittings and 0.250 inch for the 3/4 inch, 1 inch and 1-1/4 inch hose fittings. The spiral on the male and female stems shall be of sufficient length so that part of the metal liner is always under the clamp which provides additional gripping and retention when the clamps are torqued over the hose (see 6.6).

3.4.3.2 Threads. Unless otherwise specified (see 6.2.1), female threads on spud and male connections shall be American Standard Taper Pipe (NPT) meeting the requirements of FED-STD-H28. The female threads on the swivel shall be American Standard Straight Pipe (NPSM).

3.5 Strength.

3.5.1 Hydrostatic proof pressure. The hose assembly, complete with metal liner and couplings, shall withstand a proof pressure of 1250 psig without leakage or other indication of weakness when tested according to 4.5.1.2.

3.5.2 Hydrostatic burst pressure. The hose, without liner, shall not burst at a pressure less than 2,500 psig when tested in accordance with 4.5.2.5.

3.6 Ozone resistance. The rubber cover shall show no visible cracking under 7X magnification after testing in accordance with 4.5.2.3.

3.7 Steam resistance. When tested as specified in 4.5.2.4, the hose shall reveal no flaws, such as blistering, cracking of the cover, cracking, flaking, or pitting of the tube, and no delamination of body components, cracks through the cover exposing reinforcement, or weakness of the fittings.

3.8 Identification marking. Each length of hose shall be marked in a color that contrasts with the color of the hose cover. Marking shall be accomplished either by in-laying a rubber or suitable material brand or by applying a suitable composition ink, bonding the marking onto the cover so that the marking cannot be removed except by mechanical means. The marking shall consist of the manufacturer's name or trademark, the quarter and year of manufacture, "MIL-H-29210", "250 psig", and the word "steam". An alternate method of marking may be by the application of a continuous embossed strip along the entire length, vulcanizing the hose and by the subsequent removal of the strip, leaving a continuous relief identification area. When the marking is accomplished by this alternate method, no color contrast is required. Letters shall be at least 0.25 inch high.

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3.8.1 Marking tag. A marking tag shall be wired near each end fitting (two tags per length of hose), advising users of all safety precautions to be followed in the use of the hose. The following shall be included on the tag:

- a. Hose clamps shall be checked for proper application and shall be retightened, as necessary, prior to being placed into service. Be sure that clamps are interlocked over the collar on the nipple and that each clamp half interlocks with the other.
- b. Hose clamps shall be tightened after the first several hours of steaming of the hose and periodically thereafter.
- c. The importance of taking up evenly on all bolts to prevent cocking of the hose clamps shall be emphasized.
- d. Other operational and maintenance suggestions considered necessary by the hose and end fitting manufacturer's.

3.9 Workmanship. The finished hose shall be uniform in thickness. The inner tube shall be free from pits, cracks, and blisters. The cover shall be free from pits, cracks, and blisters. Couplings shall be securely attached to hose ends. The quality of workmanship shall be such as to produce hose that is in accordance with the requirements of this specification and is so constructed as to insure proper functioning of all parts of the unit.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. Unless otherwise specified in the contract or purchase order, the contractor is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified in the contract or purchase order, the contractor may use his own or any other facilities suitable for the performance of the inspection requirements specified herein, unless disapproved by the Government. The Government reserves the right to perform any of the inspections set forth in the specification where such inspections are deemed necessary to assure supplies and services conform to prescribed requirements.

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

4.1.2 Material inspection. The contractor is responsible for insuring that supplies and materials are inspected for compliance with all the requirements specified herein and in applicable referenced documents.

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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).

4.2.1 First article inspection. The first article inspection shall be performed on one hose assembly when a first article is required (see 3.1 and 6.2.1, and 6.4). This inspection shall include the examination of 4.4 and the tests of 4.5 (see 6.8). The first article may be either a first production item or a standard production item from the supplier's current inventory provided the item meets the requirements of the specification and is representative of the design, construction, and manufacturing technique applicable to the remaining items to be furnished under the contract. In addition to the first article, an additional 8-foot length of steam hose without metal liner for the tests of 4.5.2 and a 6-foot length of metal liner for the tests of 4.5.3 shall be submitted.

4.2.2 Quality conformance inspection. The quality conformance inspection shall include the examination of 4.4, the tests of 4.5 (see 6.8), and the packaging inspection of 4.6. This inspection shall be performed on the samples selected in accordance with 4.3.

4.3 Sampling. Sampling and inspection procedures shall be in accordance with MIL-STD-105. The unit of product shall be one hose length of hose assembly. All hose and hose assemblies offered for delivery at one time shall be considered a lot for the purpose of inspection. If an inspection lot is rejected, the contractor may rework it to correct the defects, or screen out the defective units, and resubmit for a complete reinspection. Resubmitted lots shall be reinspected using tightened inspection. If the rejected lot was screened, reinspection shall be limited to the defect causing rejection. If the lot was reprocessed, reinspection shall be performed for all defects. Rejected lots shall be separate from new lots, and shall be clearly identified as reinspected lots.

4.3.1 Sampling for examination. A random sample of hose lengths shall be selected from each lot in accordance with MIL-STD-105. Examination of the hose shall be based on inspection level II and an Acceptable Quality Level (AQL) of 2.5 percent defective for major defects and 4.0 percent defective for minor defects.

4.3.2 Sampling for tests.

4.3.2.1 Sampling for hydrostatic proof pressure and length measurement tests. A random sample of hose assemblies shall be selected from each lot in accordance with MIL-STD-105. Tests of the hose shall be based on inspection level S-3 with an AQL of 4.0 percent defective.

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4.3.2.2 Sampling for hose without metal liner tests. Unless otherwise specified (see 6.2.1), an additional 8-foot length hose, without liner, shall be provided for the tests on the hose without metal liner (see 4.5.2). This additional length of hose shall be manufactured of the same materials and under the same conditions as the hoses in the lot.

4.3.2.3 Sampling for metal liner tests. A 6-foot length of metal liner shall be provided for the tests on the metal liner (see 4.5.3). This length of metal liner shall be taken from the same lot of liner used in the manufacture of the hose.

4.4 Examination. Each hose length selected shall be visually and dimensionally examined to determine conformance to the requirements of this specification not involving tests. The classification of defects in FED-STD-162 shall be used to determine and evaluate defects through visual inspection.

4.5 Tests. Sample hose sections and metal liner selected shall be subjected to the applicable tests specified in 4.5.1 through 4.5.3.

4.5.1 Complete hose assembly tests.

4.5.1.1 Hose length measurement. Each hose selected shall be measured for length in accordance with ASTM D380 to determine conformance to 3.3.

4.5.1.2 Proof pressure. Samples of hose selected shall be subject to the hydrostatic proof test pressure specified in 3.5.1 in accordance with ASTM D380. Water shall be used as the test media. The proof pressure shall be held for 1 minute. Leakage or other evidence of defects shall be cause for rejection of the lot.

4.5.2 Hose without metal liner tests.

4.5.2.1 Hose size. Hose selected shall have the inside and outside diameter measured in accordance with ASTM D380 to determine conformance to 3.4.

4.5.2.2 Unit weight. The unit weight of hose selected shall be determined by weighing the hose without couplings. The readings shall be accurate to the closest tenth of a pound. The weight of the hose shall be divided by its length to determine conformance to 3.4.

4.5.2.3 Ozone resistance test. Specimens of the cover, prepared as described in Procedure A of ASTM D518, shall be mounted in a 20 percent elongated position and tested in accordance with ASTM D1149. After conditioning for 24 hours in an ozone-free atmosphere, the mounted specimen shall be exposed for 72 hours at $104^{\circ}\text{F} \pm 3.6^{\circ}\text{F}$ to an atmosphere containing 50 parts per hundred million of ozone.

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4.5.2.4 Steam resistance test. A 3-foot hose length sample removed from the additional 8-foot hose length submitted with the first article shall be used for the following steam test:

- a. The outer surface of the hose shall be visually examined for surface imperfections. The inner surface of the hose shall be examined for surface imperfections by use of a source of light which shall be held at one end while the hose is looked through from the other end. The condition of the tube surface shall be recorded.
- b. Clamp test hose horizontally between two steam manifolds similar to the manifolds shown in figure 1, and subject it to steam at 200 psig (388°F) for periods of 24 hours, until a total time of 1,000 hours has elapsed.
- c. At the end of each steaming period (not more than 24 hours), the pressure shall be released in order that pressure be returned to atmospheric conditions within a time of 1 minute or less. Care shall be taken to ensure that condensation will not be drained from the hose. The hose shall remain at atmospheric conditions for at least 30 minutes, after which the steam pressure shall again be raised to 200 psig and held another 24 hours during the steaming period. The above cycle shall be repeated until the hose has been subjected to 1,000 hours of steam pressure.
- d. Upon completion of 1,000 hours of steaming, the hose shall be removed from the test apparatus and the outer and inner tube surfaces shall be examined (see 4.5.2.4a.) for signs of damage. Except for indentation resulting from clamping, any flaking, peeling, blistering, or cracking of the cover or tube shall be cause for rejection.
- e. If the hose passes the above visual examination, the hose shall be cooled to $70^{\circ} \pm 5^{\circ}\text{F}$. The hose shall then be bent in a 180° arc around a 20-inch mandrel (see figure 2) and the outer cover examined for any signs of cracking.
- f. The length of hose shall be subjected to the burst test specified in 4.5.2.5.

4.5.2.5 Burst pressure. The hose sample shall be subjected to the hydrostatic straight bursting test of ASTM D380. Water shall be used as the test media. Any suitable coupling other than those specified in 3.4.3 may be used for this test. Failures occurring within a distance equal to the outside diameter of the hose from the end fittings shall be discounted and the test shall be repeated. Failure of the hose at a pressure below minimum burst pressure specified in 3.5.2 shall be cause for rejection.

4.5.3 Metal liner tests. Metal liner selected shall be subjected to the tests specified in 4.5.3.1 through 4.5.3.3 to determine conformance to 3.2.7.1 and 3.4.2.

4.5.3.1 Inside diameter. The inside diameter of the metal liner shall be measured in accordance with ASTM D380.

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4.5.3.2 Thickness. The thickness of the metal liner shall be measured in accordance with ASTM D380.

4.5.3.3 Chemical composition. The chemical composition of the metal liner shall be determined either by method 111.2 or method 112.2 of FED-STD-151. Failure to comply with the applicable composition specified in 3.2.1 shall be cause for rejection of the lot.

4.6 Packaging inspection. The preservation-packaging, packing, and marking of the hose shall be inspected to the requirements of Section 4 of MIL-P-775.

5. PACKAGING

5.1 Preservation-packaging, packing, and marking. The hose shall be preserved, packaged, packed, and marked in accordance with MIL-P-775 with the level of preservation-packaging and level of packing as specified (see 6.2.1).

6. NOTES

6.1 Intended use. Hose covered by this specification is intended for heavy-duty, high-pressure steam applications, such as temporary service from docks or barges to ships.

6.2 Ordering data. Acquisition documents should specify the following:

6.2.1 Acquisition requirements.

- a. Title, number, and date of this specification.
- b. Size of hose required (see 1.2.1).
- c. If first article is required for inspection and approval (see 3.1, 4.2.1, and 6.4).
- d. If different coupling arrangement is required; or if different couplings are required (see 3.2.4 and 3.4.3).
- e. Length of hose required (see 3.3).
- f. If different thread connections are required (see 3.4.3.2).
- g. If hose without metal liner tests shall be performed on other than additional length of hose (see 4.3.2.2).
- h. Level of preservation-packaging and level of packing required (see 5.1).
- i. Definitive Military Specification Part Number (see 6.7).

6.3 Data requirements. When this specification is used in an acquisition which incorporates a DD Form 1423, Contract Data Requirements List (CDRL) and invokes the provisions of DoD Federal Acquisition Regulations (FAR) Supplement 27.410-6, the data requirements will be developed as specified by an approved Data Item Description (DD Form 1664) and delivered in accordance with the approved CDRL (DD Form 1423) incorporated into the contract. When the provisions of DoD FAR 27.410-6 are not invoked, the data shall be delivered in accordance with the contract requirements.

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6.4 First article. When a first article inspection is required, the item will be tested and should be a first production item or it may be a standard production item from the contractor's current inventory as specified in 4.2.1. The first article should consist of one unit. The contracting officer should include specific instructions in acquisition documents regarding arrangements for examination, test, and approval of the first article.

6.5 Metal liner. The stainless steel interlocked, flexible tubing specified in 3.4.2 may be obtained from Able Metal Hose, Addison, IL., with the designation "Type UI Floppy Tubing" or from Federal Hose Manufacturing Corp, Painesville, OH., with the designation "Flexible Hose Stainless Steel."

6.6 End fittings. The end fittings with the special stem design specified in 3.4.3.1 may be obtained from Dixon Valve and Coupling Company, Chestertown, MD. The male fitting should be "Boss Style MX-16" and the female fitting should be "Boss Style X-34" with the addition of a dash three (-3) to the standard part number.

6.7 Definitive military specification part number. The military specification part number (see 6.2.1) is a definitive part number which will be formulated to identify each item covered by this specification. The part number will be formulated by selecting from the requirement options available in this specification as follows:

HOSE ASSEMBLY

Definitive Military Specification Part Number	M29210	XXX	XX	XX
Military Specification Number _____				
Hose Size Code Number (see 6.7.1) _____				
Hose End Fitting Code Letters (see 6.7.2) _____				
Length In Feet _____				

6.7.1 Hose size. Hose size is designated by a three digit code number (see Table III).

TABLE III. Hose size code number.

Hose size					
Code Number	075	100	125	150	200
Hose size, id	0.75	1.0	1.25	1.5	2.0
(inches)					

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6.7.2 Hose end fittings. Hose end fittings are designated by two code letters (see Table IV).

TABLE IV. Hose end fittings code letters.

End fitting Code letters	MF	FF	MM
End fitting Arrangement	Male one end Female other end	Female both ends	Male both ends

6.8 Alternative for steam resistance test. The test of 4.5.2.4 may be waived by the contracting officer provided the contractor furnishes actual test results which were submitted by the contractor and accepted by the Government under a previous contract for an identical item acquired to this specification (see 4.2.1 and 4.2.2.)

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

6.10 Subject term (key word) listing.

Rubber
Hoses
Steam hoses
Hydrostatic tests
Rubber products
Steam resistance tests
Metal liner

Custodian:

Navy - YD

Review Activities:

Navy - SH
DLA - CS

User Activity:

Navy - CG

Preparing Activity:

Navy - YD

(Project 4720-N652)

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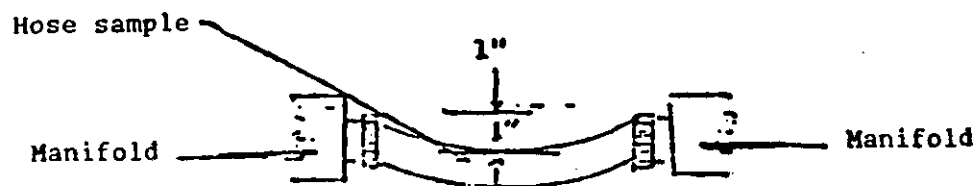


FIGURE 1. Horizontal steam rack.

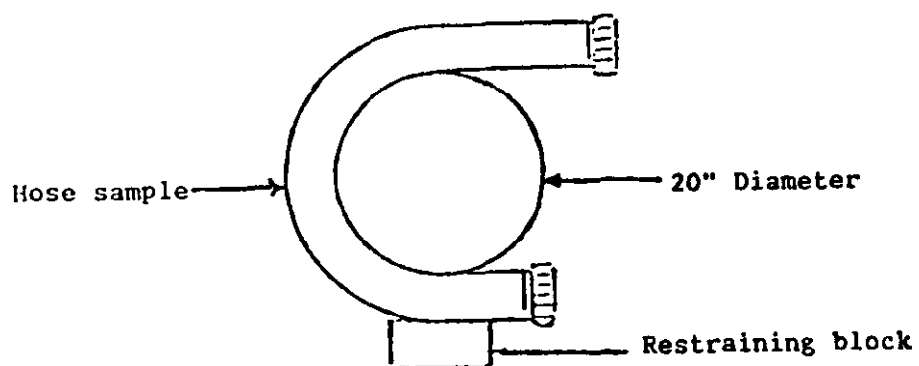


FIGURE 2. 180° bend.

STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL*(See Instructions - Reverse Side)*

1. DOCUMENT NUMBER MIL-H-29210A (NAVY)	2. DOCUMENT TITLE HOSE ASSEMBLY, RUBBER, METAL LINED, WIRE REINFORCED, 250 PSIG, SATURATED AND SUPERHEATED STEAM SERVICE
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3a. NAME OF SUBMITTING ORGANIZATION**4. TYPE OF ORGANIZATION (Mark one)**☐

VENDOR

☐

USER

☐

MANUFACTURER

☐

OTHER (Specify): _____

b. ADDRESS (Street, City, State, ZIP Code)**5. PROBLEM AREAS****a. Paragraph Number and Wording:****b. Recommended Wording:****c. Reason/Rationale for Recommendation:****6. REMARKS****7a. NAME OF SUBMITTER (Last, First, MI) - Optional****b. WORK TELEPHONE NUMBER (Include Area Code) - Optional****c. MAILING ADDRESS (Street, City, State, ZIP Code) - Optional****8. DATE OF SUBMISSION (YYMMDD)**