

ZZ-H-500C
September 10, 1987
SUPERSEDING
ZZ-H-500B
December 30, 1980
Amendment 1
July 8, 1982

FEDERAL SPECIFICATION

HOSE, RUBBER, AND HOSE ASSEMBLIES, RUBBER:
PNEUMATIC (YARN OR FABRIC REINFORCED)

This specification is approved by the Commissioner, Federal Supply Service, General Services Administration, for the use of all Federal agencies.

1. SCOPE AND CLASSIFICATION

1.1 Scope. This specification covers yarn, cord or fabric reinforced rubber pneumatic hose intended for light duty air applications.

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).

1.2.2 Specification part number. See 6.6 and table IV.

2. APPLICABLE DOCUMENTS

2.1 Government publications. 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.

Federal Specifications

WW-C-440 - Clamp, Hose (Low Pressure)

WW-C-633 - Coupling, Hose (Half), Pneumatic, Universal Type

AMSC N/A

FSC 4720

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

ZZ-H-500C

Federal Standard

FED-STD-162 - Hose, Rubber, Visual Inspection Guide for

(Activities outside the Federal Government may obtain copies of Federal specifications, standards, and commercial item descriptions as outlined under General Information in the Index of Federal Specifications, Standards, and Commercial Item Descriptions. The Index, which includes cumulative bimonthly supplements as issued, is for sale on a subscription basis by the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402.

(Single copies of this specification and other Federal specifications and commercial item descriptions required by activities outside the Federal Government for bidding purposes are available without charge from General Services Administration Business Service Centers in Boston, MA; New York, NY; Philadelphia, PA; Washington, DC; Atlanta, GA; Chicago, IL; Kansas City, MO; Fort Worth, TX; Houston, TX; Denver, CO; San Francisco, CA; Los Angeles, CA; and Seattle, WA.

(Federal Government activities may obtain copies of Federal Specification documents, and the Index of Federal Specifications, Standards, and Commercial Item Descriptions from established distribution points in their agencies.)

Military Specifications

- MIL-P-775 - Hose, Hose Assemblies, Rubber, Plastic, Fabric, or Metal (Including Tubing), and Fittings, Nozzles, and Strainers, Packaging of
- MIL-C-3486 - Coupling and Coupling Halves - Quick Disconnect, Air Hose, Bowes Type
- MIL-C-4109 - Coupling Assembly, Low Pressure, Air Hose, Quick-disconnect

Military Standard

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

(Copies of military specifications and standards 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 a specific issue is identified, the issue in effect on date of invitation for bids or request for proposal shall apply.

ZZ-H-500C

American Society for Testing and Materials (ASTM)

- D380 - Testing Rubber Hose
- D412 - Rubber Properties in Tension
- D413 - Rubber Property Adhesion to Flexible Substrate
- D471 - Rubber Property Effect of Liquids
- D518 - Rubber Deterioration - Surface Cracking
- D573 - Rubber Deterioration in Air Oven
- 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.)

(Non-Government 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, specifications 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), the supplier shall furnish a complete 6-foot hose length or hose assembly for the first article inspection and approval (see 4.2.1 and 6.5).

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 products 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 Rubber. Materials used for cover, tube, and intermediate layer or fabric friction shall be made from natural rubber and/or synthetic rubber and shall meet the requirements of this specification. Such material is hereafter referred to as rubber. Cover material shall be ozone and oil-resistant (see 3.10 and 3.11). The rubber compound used in construction of the hose shall be free from all substances that might affect the quality of the hose.

3.2.2 Reinforcement. The fabric, yarn, or cord used for reinforcement shall be made from high-grade cotton or synthetic fiber sufficiently strong to enable the hose to meet the hydrostatic burst test (see 4.5.2). The material shall be free from mechanical defects.

3.3 Construction.

3.3.1 Hose. The hose shall consist of:

- a. An inner rubber tube
- b. Reinforcement plies
- c. An outer rubber cover

3.3.2 Tube and cover. The tube and cover shall be smooth, free from pitting, uniform in quality and thickness, and free from injurious defects. This requirement is not intended to exclude a "wrapped finish" appearance or corrugated finish on the cover.

3.3.3 Reinforcement plies. Reinforcement plies of yarn or cord may be applied over the tube by braiding, knitting, or helical winding. When multiple plies of braided or knitted yarn or cord are used, a distinct layer of rubber compound shall be used between the plies to facilitate adhesion to one another and to the tube and cover. When plies of square woven fabrics are used, the plies shall be applied on a bias of approximately 45 degrees (°) and shall overlap not less than 0.5 inch. The plies of fabric shall be well frictioned with suitable rubber compound to enable adhesion to each other and to the inner tube and to the outer cover to the minimum specified in table I.

TABLE I. Physical requirements for hose and hose assemblies.

Sizes, inside diameter (inches)	1/4	5/16	3/8	7/16	1/2	5/8	3/4	1	1-1/4	1-1/2	2
Tolerance, plus or minus, inside diameter (inch)	0.031	0.031	0.031	0.031	0.031	0.031	0.031	0.062	0.062	0.062	0.062
Thickness (minimum) inch:											
Tube	0.040	0.040	0.040	0.047	0.047	0.047	0.047	0.047	0.063	0.063	0.063
Cover	0.047	0.047	0.047	0.047	0.047	0.047	0.047	0.047	0.047	0.047	0.047
Hydrostatic test pressure (min) psi											
Proof test (Hose with coupling) 1/ 2/	300	300	300	300	300	250	250	250	250	250	250
Burst test (Hoses only)	1000	1000	1000	900	900	700	700	700	600	600	600
Adhesion (min) pounds per inch:											
Cover and plies	8	8	8	8	8	8	8	8	8	8	8
Tube and plies	8	8	8	8	8	8	8	8	8	8	8
Between plies, when applicable	8	8	8	8	8	8	8	8	8	8	8
Tensile strength (min) psi											
Cover	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000
Tube	750	750	750	750	750	750	750	750	750	750	750
Ultimate elongation (min) percent:											
Cover	200	200	200	200	200	200	200	200	200	200	200
Tube	150	150	150	150	150	150	150	150	150	150	150

1/ For maximum working pressures, (see 6.3).

2/ Hose fitted with universal quick-acting couplings conforming to WW-C-633 shall withstand a 110 pound-force per square inch (psi) hydrostatic proof test pressure.

3.4 Couplings. Coupling, when required, shall be in accordance with WW-C-633, MIL-C-3486, MIL-C-4109, or standard brass air hose stems and ferrules (on hose up to and including 1/2-inch inside diameter) as specified (see 6.2). Synthetic rubber washers shall be supplied with female couplings. Couplings shall be able to withstand the hydrostatic proof test pressure specified in table I.

- 3.5 Clamps. Unless otherwise specified (see 6.2), hose assemblies shall be furnished with type A, C, D, or F hose clamps conforming to WW-C-440, or furnished with an interlocking type clamp.
- 3.6 Length. The length of hose up to and including 1-inch diameter shall be 25 feet or multiples thereof up to 500 feet; hose 1-1/4 and 1-1/2 inches in diameter shall be 25 feet or multiples thereof up to 250 feet as specified. The length of 2-inch diameter hose shall be 25 or 50 feet (see 6.2).
- 3.6.1 Tolerance. A tolerance of + 2 percent shall be permitted when tested as specified in 4.5.8.
- 3.7 Physical requirements. The hose shall conform to the requirements specified in table I.
- 3.8 Accelerated aging. After accelerated aging in accordance with 4.5.3, the tensile strength shall be not less than 80 percent of the values specified in table I, and ultimate elongation shall be not less than 50 percent of the values specified in table I.
- 3.9 Low temperature requirement. When a low temperature test is specified (see 6.2), the hose shall not fracture or crack when tested as specified in 4.5.4).
- 3.10 Resistance to oil. When tested in accordance with 4.5.5, the increase in volume of the tube and cover shall not exceed 100 percent.
- 3.11 Ozone resistance. The rubber cover shall show no visible cracking under 2X magnification after testing in accordance with 4.5.6.
- 3.12 Marking. Each length of hose shall be marked in a color that contrasts with the color of the hose cover. The marking shall be accomplished either by inlaying 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, the word PNEUMATIC, the maximum working pressure, and the symbol ZZ-H-500. Hose 50 feet in length or cover shall be marked at least every 25 foot intervals, with letters at least 3/16-inch high. Hose less than 50 feet in length or coupled assemblies shall have at least one marking.
- 3.12.1 Marking, alternate method. An alternate method of marking may be the application of a continuous embossed strip along the entire length, vulcanizing the hose with subsequent removal of the strip, leaving a continuous relief identification area. Identification shall be as specified in 3.12 and repeated at maximum intervals of 36 inches. When the marking is accomplished by this alternate method, no color contrast is required.
- 3.13 Workmanship. The quality of workmanship shall be such as to produce hose and hose assemblies that are in accordance with the requirements of this specification.

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 Component and material inspection. Components and materials shall be inspected in accordance with all the requirements specified herein and in applicable referenced documents.
- 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 sample hose length when a first article is required (see 3.1, 6.2, and 6.5). This inspection shall include the examination of 4.4 and the tests of 4.5. 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.
- 4.2.2 Quality conformance inspection. The quality conformance inspection shall include the examination of 4.4, the tests of 4.5, and the preparation for delivery 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. All hose and hose assemblies of the same type and size 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. 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. Tests of the hose shall be based on inspection level S-3 with an AQL of 4.0 percent defective. A representative sample 3 feet in length shall be cut from lengths selected from each lot. If the low temperature test has been specified (see 3.9, 4.5.4, and 6.2), the test specified in 4.5.4 shall be conducted prior to performance of the burst test and the other tests listed in table II. One-half (18 inches) of the 3-foot sample shall be used for the burst test; the remainder shall be used for the other tests listed in table II. If hose is ordered with couplings (see 3.4), the supplier shall reattach couplings to the remaining length from which the 3-foot length was cut. After the couplings have been reattached, the remaining length of the hose shall be used to conduct the hydrostatic proof pressure test specified in 4.5.1. When the remaining length has passed the hydrostatic proof test, it shall be accepted as a full length of hose.
- 4.4 Examination. Each of the sample hose lengths selected in accordance with 4.3.1 shall be visually and dimensionally examined to determine conformance with all 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 selected in accordance with 4.3.2 shall be subjected to the applicable tests specified in table II and 4.5.1 through 4.5.8.

TABLE II. Tests.

Test	Test Method No.	Reference Paragraph
Hose size inside diameter	ASTM D380	Table I
Thickness of tube and cover	ASTM D380	Table I
Tensile strength and elongation	ASTM D380 ASTM D412	Table I
Oil resistance	ASTM D380	4.5.5
Adhesion	ASTM D413	Table I, 4.5.7
Ozone resistance	ASTM D1149	4.5.6
Hydrostatic pressure		
Proof pressure test	ASTM D380	4.5.1
Burst pressure test	ASTM D380	4.5.2
Accelerated aging	ASTM D573	4.5.3
Low temperature		
brittleness (-40F)		4.5.4
Hose length	ASTM D380	4.5.8

- 4.5.1 Hydrostatic proof test, coupled assemblies. When hose is ordered with couplings, samples selected in accordance with 4.3.2 after couplings have been reattached, shall be subjected to the hydrostatic proof test pressure specified in table I 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.
- 4.5.2 Burst test. Hose samples selected in accordance with 4.3.2 shall be subjected to the hydrostatic straight bursting test of ASTM D380. Water shall be used as the test media. Failure of the hose at a pressure below the minimum burst pressure specified in table I shall be the cause for rejection of the lot.
- 4.5.3 Accelerated aging test. Hose samples selected in accordance with 4.3.2 shall be subjected to accelerated aging in accordance with ASTM D573, except that the time for aging shall be 70 hours at a temperature of 212 Fahrenheit (F).
- 4.5.4 Low temperature test. When specified (see 6.2), hose samples selected in accordance with 4.3.2 shall be bent 180F over a mandrel (10 times outside diameter of the hose) and conditioned for 5 hours at -40 + 3.6F. After conditioning, while at the same temperature, the hose shall be straightened and then bent 180F in the opposite direction over the same mandrel. Time consumed in bending shall be held to a maximum of 30 seconds. The hose shall show no cracks at the completion of this test. After completion of this examination, the sample shall be used for the burst test (see 4.5.2) and other tests specified in table II.

- 4.5.5 Oil resistance test. Hose samples selected in accordance with 4.3.2 shall be tested in accordance with the immersion test of ASTM D380. The samples shall be immersed in ASTM oil No. 3 of ASTM D471 for 70 hours at 212F + 3.6F.
- 4.5.6 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 104F + 3.6F to an atmosphere containing 50 parts per hundred million of ozone.
- 4.5.7 Adhesion. From hose or hose assemblies selected under 4.3.2, prepare ring or strip specimens as described in ASTM D380. The adhesion shall be determined in accordance with the machine method of ASTM D413.
- 4.5.8 Hose length measurement. Each hose selected in accordance with 4.3.2 shall be measured for length in accordance with ASTM D380.
- 4.6 Preparation for delivery inspection. An examination shall be made to determine compliance with the requirements of section 5. The sample unit shall be one unit prepared for shipment; i.e., one shipping container, one reel, or one hose length as applicable. Sampling shall be in accordance with MIL-STD-105. The inspection level shall be S-2 with an AQL of 4.0 percent defective.

5. PREPARATION FOR DELIVERY

- 5.1 Preservation packaging, packing, and marking. Preservation, packaging, packing, and marking shall be in accordance with the requirements of MIL-P-775 with the level of preservation and packaging and the level packing as specified (see 6.2).

6. NOTES

- 6.1 Intended use. The hose covered by this specification is intended for general shop service and light pneumatic-tool operations.
- 6.2 Ordering data. Purchasers should select the preferred options offered herein and include the following data in procurement documents:
- Title, number, and date of this specification.
 - Size of hose required (see 1.2.1).
 - When first article is required for inspection and approval (see 3.1, 4.2.1, and 6.5).
 - If couplings are required and type of coupling required (see 3.4).
 - If special type of clamp is required (see 3.5).
 - Length of hose required (see 3.6).
 - If low-temperature test is required (see 3.9, 4.3.2 and 4.5.4)
 - Level of preservation-packaging and level of packing required (see 5.1).

- 6.3 Maximum working pressure. Maximum working pressures of the hose are shown in table III.

TABLE III. Maximum working pressure.

Sizes	Maximum working pressure
(inches)	(psi)
1/4	200
3/8	200
5/16	200
7/16	150
1/2	150
5/8	125
3/4	125
1	125
1-1/4	100
1-1/2	100
2	100

- 6.4 Data requirements. When this specification is used in an acquisition and data are required to be delivered, the data requirements shall be developed as specified by an approved Data Item Description (DD Form 1664) and delivered in accordance with the approved Contract Data Requirements List (CDRL), incorporated into the contract. When the provisions of DOD FAR Supplement, Part 27, Sub-Part 27.410-6 (DD Form 1423) are invoked and the DD Form 1423 is not used, the data shall be delivered by the contractor in accordance with the contract or purchase order requirements.
- 6.5 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 complete hose assembly. The contracting officer should include specific instructions in acquisition documents regarding arrangements for examination, test, and approval of the first article.
- 6.6 Specification part number. The specification part number 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:

Federal Specification part number ZZ-H-500 XX XXX

Federal Specification number

Hose size code number (see 6.6.1)

Length in feet

6.6.1 Hose size. Hose size is designated by a two-digit code number (see table IV).

TABLE IV. Hose size code number.

Hose size code no.	04	05	06	07	08	10	12	16	20	28	32
Hose ID (inches)	1/4	5/16	3/8	7/16	1/2	5/8	3/4	1	1-1/4	1-1/2	2

MILITARY INTERESTS:

Custodians

Navy - YD
Air Force - 99

CIVIL AGENCY COORDINATING ACTIVITIES:

DOT - ACO

HHS - FEC
GSA - FSS

PREPARING ACTIVITY:

Review activities

Navy - YD

Army - ME
Navy - SH
Air Force - 82
DLA - CS

Project 4720-0748

User Activity

Navy - MC

Orders for this publication are to be placed with General Services Administration, acting as an agent for the Superintendent of Documents. See section 2 of this specification to obtain extra copies and other documents referenced herein

4720-0748

SUMMARY OF CHANGES
TO

PROPOSED FEDERAL SPECIFICATION ZZ-H-500C
HOSE, RUBBER, AND HOSE ASSEMBLIES, RUBBER:
PNEUMATIC (YARN OR FABRIC REINFORCED)

The attached draft includes the following major changes:

- Section 2: Deleted some references.
- Section 4: Revised inspection and sampling.
- Section 6: Changed to reflect latest policy.

* INCH-POUND *

ZZ-H-500C
AMENDMENT 1
20 March 1992

FEDERAL SPECIFICATION

HOSE, RUBBER, AND HOSE ASSEMBLIES, RUBBER:
PNEUMATIC (YARN OR FABRIC REINFORCED)

This amendment, which forms a part of ZZ-H-500C, dated September 10, 1987, is approved by the Commissioner, Federal Supply Service, General Services Administration, for the use of all Federal agencies.

PAGE 1

Under Federal Specifications: Add the following document:

"A-A-50431 - Couplings - Quick Disconnect, Bowes Type (Air Hose & Piping)."

PAGE 2

Under Military Specifications: Delete

"MIL-P-775 - Hose, Hose Assemblies, Rubber, Plastic, Fabric, or Metal (Including Tubing), and Fittings, Nozzles, and Strainers, Packaging of
MIL-C-3486 - Coupling and Coupling Halves - Quick Disconnect, Air Hose, Bowes Type"

and substitute:

"MIL-H-775 - Hose, Hose Assemblies; Rubber, Plastic, Fabric, or Metal (Including Tubing) and Associated Hardware: Packaging of"

PAGE 5

3.4, line 2: Delete "MIL-C-3486" and substitute "A-A-50431."

PAGE 6

3.12.1: After first sentence add:

"A second alternate method of marking is the indentation of a continuous printed legend along the entire length of the hose, applied immediately following extrusion of the hose, prior to vulcanization."

ZZ-H-500C
AMENDMENT 1

PAGE 10

5.1, line 3: Delete "MIL-P-775" and substitute "MIL-H-775."

MILITARY INTERESTS:

Custodians

Navy - YD
Air Force - 99

Review Activities

Army - ME
Navy - SH
Air Force - 82
DLA - CS

User Activity

Navy - MC

CIVIL AGENCY COORDINATING ACTIVITIES:

COMMERCE - NBS
USDA - AFS
GSA - FSS

PREPARING ACTIVITY:

Navy - YD
(Project 4720-0024)