

INCH-POUND

ZZ-H-617C
10 April 2002
SUPERSEDING
ZZ-H-617B
11 August 1970

FEDERAL SPECIFICATION

HOSE, RUBBER; WINDSHIELD WIPER

INACTIVE FOR NEW DESIGN AFTER 15 DECEMBER 2000

The General Services Administration has authorized the use of this federal specification by all federal agencies.

1. SCOPE

1.1 Scope. This specification covers one type of hose for use as flexible air or vacuum lines on automotive windshield wiper systems.

2. APPLICABLE DOCUMENTS

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

FEDERAL REGULATIONS

Title 48 – Federal Acquisition Regulations System: Volume 1, Chapter 1 – Federal Acquisition Regulation (FAR); Part 23 – Environment, Conservation, Occupational Safety, and Drug-Free Workplace; Subpart 23.4 – Use of Recovered Materials.

(The code of Federal Regulations (CFR) and the Federal Register (FR) are for sale on a subscription basis from the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402-0001. When indicated, reprints of certain regulations may be obtained from the federal agency responsible for issuing them.)

Beneficial comments, recommendations, additions, deletions, clarifications, etc. and any data, which may improve this document, should be sent to: Commander, Defense Supply Center, Columbus, DSCC-VAI, 3990 East Broad Street, Columbus, OH 43216-5000.

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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 the date of invitation for bids or request for proposal shall apply.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D380	-	Rubber Hose, Standard Test Methods for (DoD adopted)
ASTM D412	-	Vulcanized Rubber and Thermoplastic Elastomers – Tension, Standard Test Methods for (DoD adopted)
ASTM D573	-	Rubber – Deterioration in an Air Oven, Standard Test Method for (DoD adopted)
ASTM D1149	-	Rubber Deterioration – Surface Ozone Cracking in a Chamber, Standard Test Method for (DoD adopted)

(Private sector and civil agencies may purchase copies of this voluntary standard from the American Society for Testing and Materials, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.)

NATIONAL CONFERENCE OF STANDARDS LABORATORIES (NCSL)

ANSI/NCSL Z540-1	-	Calibration Laboratories and Measuring and Test Equipment, General Requirements (DoD adopted)
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(Private sector and civil agencies may purchase copies of this voluntary standard from the National Conference of Standards Laboratories, 1800 30th Street, Suite 305B, Boulder, CO 80301.)

SAE INTERNATIONAL

AS1933	-	Age Controls for Hose Containing Age-Sensitive Elastomeric Material (DoD adopted)
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(Private sector and civil agencies may purchase copies of this voluntary standard from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001.)

(DoD activities may obtain copies of those adopted voluntary standards listed in the DoD Index of Specifications and Standards free of charge from the Standardization Document Order Desk, 700 Robbins Avenue, Building 4D, Philadelphia, PA 19111-5094.)

3. REQUIREMENTS

3.1 Materials. Materials shall be as specified herein and shall conform to all applicable specifications, standards, and drawings. Materials not specified herein shall be of the best quality, suited for the intended purpose, free from defects that may affect serviceability or appearance, and be capable of meeting all of the requirements of this specification.

3.1.1 Rubber. Rubber shall be a nonblooming synthetic compound as specified.

3.1.2 Recovered materials. The offeror/contractor is encouraged to use recovered materials to the maximum extent practicable, in accordance with paragraph 23.403 of the Federal Acquisition Regulation (FAR).

3.1.3 Hazardous substances. The use of hazardous substances, toxic chemicals, or ozone depleting compounds (ODCs) shall be avoided whenever feasible.

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3.2 Construction. The hose shall consist of an inner rubber tube, an intermediate textile-fabric reinforcement, and an outer rubber cover. The tube and cover shall be of seamless construction, uniform in thickness, and free from pitting.

3.2.1 Inner tube. The inner tube shall consist of a smooth, seamless compound of synthetic rubber that meets the requirements of this specification.

3.2.2 Reinforcement. The reinforcement shall consist of one or more plies of cotton or synthetic fabric, or braided cotton or synthetic cord, or a combination of both. The layers of fabric or braided cord shall be well impregnated with rubber compound so that the plies will adhere firmly to one another and to the inner tube and outer cover. When more than one ply of reinforcement is used, there shall be a distinct layer of rubber compound between the plies. When woven fabric is used, it shall be wrapped around the tube on a bias of 45° with the edges lapped or sewed.

3.2.3 Outer cover. The outer cover shall consist of a synthetic rubber that meets the requirements of this specification. It may be of one or a combination of two or more synthetic rubbers.

3.3 Dimensions.

3.3.1 Diameters. The inside and outside diameters of the hose shall be as specified in table I.

TABLE I. Hose diameters.

Inside Diameter, inch	Outside Diameter, inch	
	Braided Type	Wrapped Fabric Type
.156 ± .016	.344 + .047 – .016	.375 + .047 – .016
.219 ± .016	.406 + .047 – .016	.438 + .047 – .016

3.3.2 Lengths.

3.3.2.1 Uncut lengths. Unless otherwise specified (see 6.2), hose shall be furnished in lengths of 50 or 500 feet. Lengths of 50 feet shall be in one piece with a length tolerance of ±1 percent. Lengths of 500 feet may be in four pieces, the shortest piece being no less than 100 feet in length. A tolerance of ±6 inches shall be allowed for uncut hose of 100 feet and above.

3.3.2.2 Cut lengths. When hose is furnished in cut lengths, length tolerances shall be as specified in table II.

TABLE II. Cut length tolerances.

Nominal Cut Length, inches	Tolerance
Up to and including 3	± .062 inch
Over 3 through 18	± .125 inch
Over 18 through 100	± .250 inch
Over 100	± 1 percent

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3.4 Performance characteristics.

3.4.1 Burst pressure. The hose shall withstand a hydrostatic pressure of 250 pounds per square inch (psi) without leaking, bursting, or showing any other signs of failure when tested as specified in 4.4.2.

3.4.2 Vacuum resistance. The outside diameter of the hose shall not decrease by more than 30 percent and the inner tube shall not collapse or separate from the reinforcement when tested as specified in 4.4.3.

3.4.3 Flexibility. The outer cover and reinforcement shall not break, split, or loosen when tested as specified in 4.4.4.

3.4.4 Low temperature flexibility. The hose shall not break or crack when tested as specified in 4.4.5.

3.4.5 Tensile strength. The tensile strength of the hose shall be not less than the values specified in table III when tested as specified in 4.4.6. No part of the hose shall break at less than these specified values.

TABLE III. Tensile strength.

Hose Inside Diameter, inch	Load, pounds
.156	60
.219	80

3.4.6 Accelerated aging. The hose shall retain not less than 75 percent of its original breaking strength when tested as specified in 4.4.7. After aging, the hose shall meet the requirements specified in 3.4.2, 3.4.3, 3.4.4, and 3.4.5.

3.4.7 Ozone resistance. The hose surfaces shall show no signs of cracking when tested as specified in 4.4.8.

3.5 Marking. Unless otherwise specified (see 6.2), the hose shall be legibly marked on the outer cover at intervals of not more than 36 inches with the following information:

- a. Specification number.
- b. Manufacturer's name or trademark.
- c. Nominal hose size (inside diameter).
- d. Capital letters "OZ".
- e. Date of manufacture (quarter of year and year).

For hose less than 36 inches in length, the marking shall be approximately centered. If the marking cannot be made legible on short lengths, the trademark and the nominal hose size may be placed diametrically opposite the remainder of the marking.

3.6 Age. The age of bulk hose that is covered by this specification and furnished for use by the Government shall not exceed the limits specified in AS1933.

3.7 Workmanship. The hose shall be manufactured to be uniform in quality and free from imperfections such as cuts, breaks, blisters, pitting, and exposed reinforcement. The surface of the hose shall be smooth and clean of loose foreign matter.

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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 that supplies and services conform to prescribed requirements.

4.1.1 Test equipment and inspection facilities. Test and measuring equipment and inspection facilities of sufficient accuracy, quality, and quantity to permit performance of the required inspection shall be used. The establishment and maintenance of a calibration system to control the accuracy of the measuring and test equipment shall be in accordance with ANSI/NCSL Z540-1 or equivalent.

4.2 Quality conformance inspection.

4.2.1 Individual tests. Inspection of the product for delivery shall consist of subjecting each hose length to the individual tests specified in table IV. Any item failing to meet the requirements of the individual tests shall be immediately removed from the lot.

Table IV. Inspection requirements.

Requirement	Requirement Paragraph	Test Paragraph	Individual Tests	Sampling Tests
Examination of product	3.2, 3.3, 3.5, 3.7	4.4.1	X	
Burst pressure	3.4.1	4.4.2		X
Vacuum resistance	3.4.2	4.4.3		X
Flexibility	3.4.3	4.4.4		X
Low temperature flexibility	3.4.4	4.4.5		X
Tensile strength	3.4.5	4.4.6		X
Accelerated aging	3.4.6	4.4.7		X
Ozone resistance	3.4.7	4.4.8		X

4.2.2 Sampling tests. Hose lengths, randomly selected from a production lot (see 4.2.2.1) to form an inspection sample (see 4.2.2.2), shall be subjected to the sampling tests specified in table IV.

4.2.2.1 Production lot. A production lot shall consist of all hose of one size manufactured on the same production line(s) by means of the same production techniques, materials, controls, and design during the same continuous production run.

4.2.2.2 Inspection sample. An inspection sample shall consist of hose lengths randomly selected from the production lot without regard to quality. For each full or partial increment of 750 feet of bulk hose produced in the continuous run, one sample shall be subjected to the sampling tests.

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4.2.2.3 Nonconformance of sampling tests. If one or more defects are found in the inspection sample, both the qualifying and inspection activities shall be immediately notified and the production lot shall be rejected and not be supplied to this specification. Acceptance and shipment of the product shall be discontinued until corrective action, acceptable to the qualifying activity, has been taken. The corrective measures shall be performed on the materials or processes, or both, as warranted, and on all products considered subjected to the same failure. Once the corrective action has been completed, either the specific sampling test in which the original sample failed or all sampling tests may be required to be repeated on additional samples, at the option of the qualifying activity. However, final acceptance shall be withheld until testing has shown that the corrective action was successful. In the event of a failure after re-inspection, information concerning the failure and the corrective action taken shall be furnished to both the qualifying and inspection activities.

4.2.3 Disposition of test samples. Samples that have been subjected to any sampling tests are considered damaged and shall not be delivered as part of a contract or purchase order.

4.2.4 Discontinuation and resumption of production. If there has been no production of a specific size for a period of three years or more, eight samples shall be randomly selected from the first lot produced when production of that size has resumed and be subjected to the sampling tests (see table IV).

4.3 Inspection conditions. Unless otherwise specified, all required inspections shall be performed in accordance with the test conditions specified in 4.4.

4.4 Test methods. Unless otherwise specified, tests shall be conducted at an ambient air temperature of 80 ± 9 °F and test specimens shall be conditioned to this temperature prior to testing.

4.4.1 Examination of product. Each length of hose shall be visually and physically examined for conformance to the following requirements:

- a. Construction (see 3.2).
- b. Dimensions (see 3.3).
- c. Marking (see 3.5).
- d. Workmanship (see 3.7).

4.4.2 Burst pressure. An 18-inch length of hose shall be tested in accordance with ASTM D380 (straight or curved bursting test). The hose shall meet the requirements specified in 3.4.1.

4.4.3 Vacuum resistance. The ends of a 12-inch length of hose shall be fitted with couplings. One end shall be closed or sealed to prevent leakage of air and the other end shall be connected to a vacuum pump. The outside diameter of the hose shall be measured and recorded. The hose shall be curved to a radius equal to five times its maximum outside diameter and shall be subjected to a vacuum of 24 inches of mercury. After a period of 5 minutes and with the vacuum maintained, the outside diameter shall again be measured and the hose inspected. (Separation of the inner tube from the reinforcement may be determined by sectioning the hose lengthwise.) Requirements shall be as specified in 3.4.2.

4.4.4 Flexibility. A rod shall be inserted into each end of a 4-inch length of hose of full circumference. The rod ends shall be perpendicular to the axial length within 3° and the depth of insertion shall be as specified in table V. The hose shall then be bent until the rods form a 90° angle. Requirements shall be as specified in 3.4.3.

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TABLE V. Rod size and depth of insertion.

Hose Inside Diameter, inch	Rod Diameter, inch	Depth of Insertion, inches
.156	.188	1.375
.219	.250	1.250

4.4.5 Low temperature flexibility. A 12-inch length of hose of full circumference shall be placed in a cold chamber and conditioned at a temperature of -65 ± 5 °F for 12 hours. At the end of this period and while maintained at the specified temperature, the hose shall be bent 180° around a mandrel having a diameter of 10 times the maximum outside diameter of the hose. The hose shall then be bent in the opposite direction and the bending repeated for a total of six bends in each direction within a period of 20 seconds. The hose shall meet the requirements specified in 3.4.4.

4.4.6 Tensile strength. The tensile strength of the hose shall be determined in accordance with ASTM D412 using a straight specimen of hose of full circumference that is 12 inches in length. The speed of the power-actuated grip shall be 1 inch per minute and the load at break shall be recorded. Requirements shall be as specified in 3.4.5.

4.4.7 Accelerated aging. One 4-inch length of hose of full circumference and three 12-inch lengths of hose of full circumference shall be tested in accordance with ASTM D573 at a temperature of 212 ± 2 °F for 70 hours. At the end of the aging interval, the test specimens shall be removed from the aging chamber, cooled to room temperature, and subjected to the applicable test specified in table VI. Requirements shall be as specified in 3.4.6.

TABLE VI. Test after aging.

Test Specimen	Test, after aging
One 12-inch length	Vacuum resistance (4.4.3)
One 4-inch length	Flexibility (4.4.4)
One 12-inch length	Low temperature flexibility (4.4.5)
One 12-inch length	Tensile strength (4.4.6)

4.4.8 Ozone resistance. An 18-inch length of hose of full circumference shall be bent around a mandrel, having a diameter of seven times the outside diameter of the hose, and bound with twine or tape where the ends of the hose cross one another. If the hose collapses when bent around the mandrel, provisions shall be made to support the hose internally. While on the mandrel, the hose shall be conditioned for 45 minutes in air at room temperature then tested in accordance with ASTM D1149. The ozone concentration shall be 50 ± 5 parts per hundred million (pphm) by volume and the temperature shall be 100 ± 5 °F. The test specimen shall be exposed to these conditions for 168 hours. The outer cover of the hose shall be examined under 9X magnification, ignoring areas immediately adjacent to or within the area covered by the tape or twine. Requirements shall be as specified in 3.4.7.

5. PACKAGING

5.1 Packaging requirements. The preservation, packaging, packing, and marking shall be as specified in the contract or purchase order.

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6. NOTES

INFORMATION FOR GUIDANCE ONLY. (This section contains information of a general or explanatory nature that is helpful but is not mandatory.)

6.1 Intended use. The hose covered by this specification is intended for use as flexible air or vacuum lines in the operation of automotive vehicle windshield wipers. The hose is capable of operating satisfactorily at temperatures ranging from -65 °F to +212 °F and has military application on medium wheel tactical vehicles.

6.2 Acquisition requirements. Acquisition documents must specify the following:

- a. Title, number, and date of this specification.
- b. Diameter and length of hose required (see 3.3).
- c. Marking, if other than as specified (see 3.5).
- d. Packaging requirements (see 5.1).

6.3 Subject term (key word) listing.

Accelerated aging
Air line
Low temperature
Ozone resistant
Vacuum line

6.4 Changes from previous issue. Asterisks (or vertical lines) are not used in this revision to identify changes with respect to the previous issue due to the extensive changes.

MILITARY INTERESTS:

Custodians

Army - AT
Navy - SH
Air Force - 99
DLA - CC

Review Activities

Navy – MC, SA
Air Force - 71

CIVIL AGENCY COORDINATING ACTIVITY:

GSA-FSS

Preparing Activity

DLA - CC

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