

Specification 5100-240d
October 2000
Superseding
Specification 5100-240c
September 1996

UNITED STATES DEPARTMENT OF AGRICULTURE
FOREST SERVICE
SPECIFICATION FOR
NOZZLE, TWIN TIP, SHUTOFF, 1 INCH BASE

1. SCOPE.

1.1. Scope. The twin tip shutoff nozzle described in this specification is used with fire hose in the application of water in wildland firefighting activities. The nozzle has a 1 inch 11-1/2 NPSH inlet and two 3/4 inch 11-1/2 NH outlets. A ball type valve in the nozzle closes or opens the flow into straight stream or spray outlets. One straight stream tip and one spray tip are included. The working pressure is up to 600 psig (4137 kPag).

2. APPLICABLE DOCUMENTS.

2.1. Government Documents. The following specifications, standards, and handbooks form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those in effect on the date of the invitation for bids or request for proposals (see 6.2).

USDA Forest Service Standard

5100-190 - Threads, Gaskets, Rocker Lugs, Connections and Fittings, Fire Hose

USDA Forest Service Specification

5100-244 - Nozzle Tips, Straight Stream and Spray

Federal Specifications

QQ-A-225 - Aluminum and Aluminum Alloy Bar, Rod, Wire, or Special Shapes; Rolled, Drawn, or Cold Finished; General Specification for

QQ-A-225/10 - Aluminum Alloy Bar, Rod, and Wire; Rolled, Drawn, or Cold Finished, 6262

Copies of federal specifications are available from General Services Administration, Federal Supply Service Bureau, Specification Section, Suite 200, 470 East L'Enfant Plaza SW, Washington DC 20407.

Beneficial comments, recommendations, additions, deletions and any pertinent data that may be used in improving this document should be addressed to: USDA Forest Service, San Dimas Technology and Development Center, 444 East Bonita Avenue, San Dimas, CA 91773-3198 by using the Specification Comment Sheet at the end of this document or by letter.

Copies of Forest Service Specifications and Standards are available from USDA Forest Service, San Dimas Technology and Development Center, 444 East Bonita Ave., San Dimas, CA 91773-3198.

2.2. Non-Government Publications. The following documents form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those in effect on the date of the invitation for bids or request for proposals.

American National Standards Institute (ANSI)/American Society for Quality Control (ASQC)

Z 1.4 - Sampling Procedures and Tables for Inspection by Attributes

Address requests for copies to the American National Standards Institute Inc., 11 West 42nd Street, New York, NY 10036.

American Society for Testing and Materials (ASTM)

B 26 - Aluminum-Alloy Sand Castings

Address requests for copies to American Society for Testing and Materials, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.

Institute of Electrical and Electronics Engineers (IEEE)/American Society of Testing and Materials (ASTM)

SI 10 - Standard for Use of the International System of Units (SI): The Modern Metric System

Address requests for copies to American Society for Testing and Materials, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.

Non-Government standards and other publications normally are available from the organizations that prepared or distribute the documents. These documents may also be available in or through libraries or other informational services.

2.3. Order of Precedence. In the event of conflict between the text of this document and the references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

3. REQUIREMENTS.

3.1. First Article. Unless otherwise specified, first article inspection shall be performed on a product sample(s), in accordance with 4.4.3.

3.2. Construction. The nozzle construction shall include a single inlet, a valve with a knob and two outlets, one for a straight stream tip and the other for a spray tip. See Figure 1 for configuration. Figure 1 is provided for information only and is not intended to designate a particular design or manufacturer.

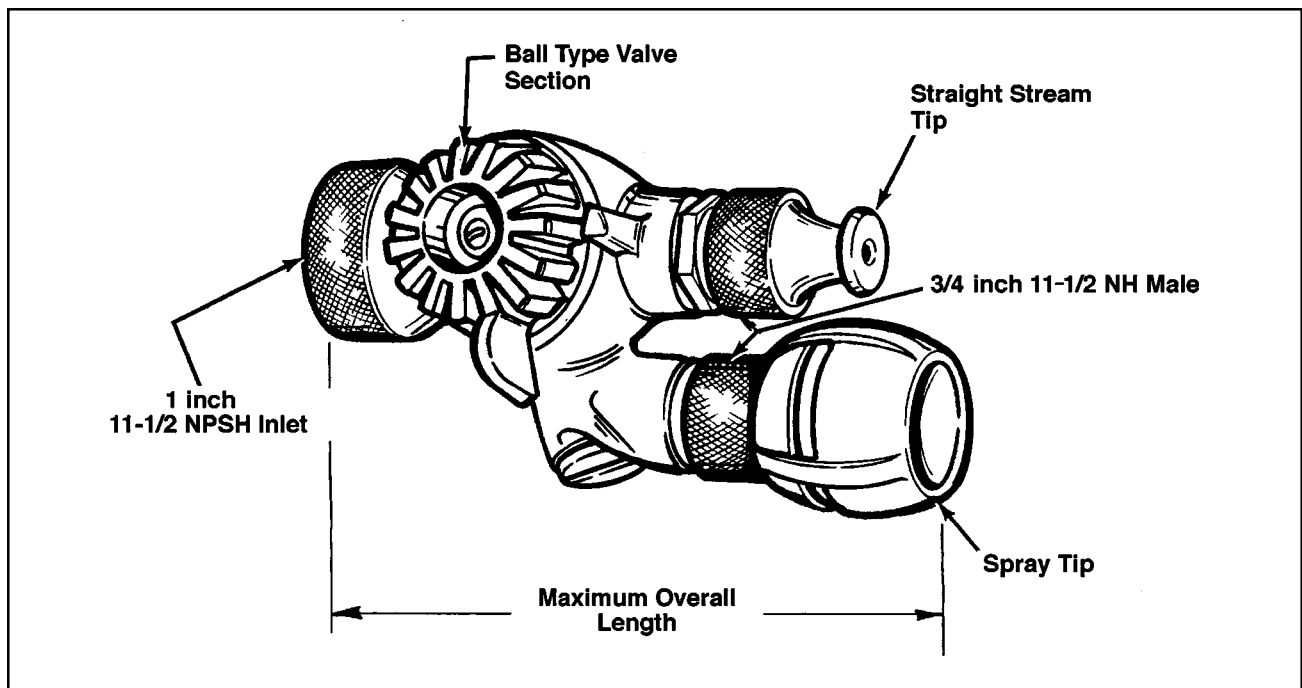


Figure 1. Twin tip shutoff nozzle configuration.

3.2.1. Nozzle Body Inlet. The body inlet shall be 1 inch 11-1/2 NPSH female threads, with a gasket recess and gasket installed. A filter shall be included at the body inlet which will filter water through the spray tip and allow blowout of debris while passing water through the straight stream tip. Filter openings shall not be so constrictive as to reduce flow through the nozzle.

3.2.2. Valve Section. The valve section shall include a replaceable ball valve mounted on replaceable bearings. Valve outlet seals shall be adjustable and replaceable. Ball valve, bearings, and seals shall be made from suitable corrosion resistant and compatible materials. The valve knob shall be compact, with a serrated or a knurled non-slip grip, as shown in Figure 1, and shall be attached to the ball in a manner to ensure secure continuous operation. The sequence of valve operation shall be from shutoff to spray, to straight stream, with an indicator at each position and a mechanical stop at the shutoff and straight stream positions.

3.2.3. Straight Stream Outlet. The straight stream outlet shall be concentric with the body inlet axis. The waterway shall be smooth bored to 0.50 inch (12.7 mm) + 0.030 inch (0.76 mm) / - 0.010 inch (0.25 mm). The straight stream outlet thread series designation shall be 3/4 inch 11-1/2 NH.

3.2.4. Spray Outlet. The spray outlet shall be offset and parallel to the straight stream outlet. The waterway shall be smooth bored to 0.50 inch (12.7 mm) + 0.030 inch (0.76 mm) / - 0.010 inch (0.25 mm). The spray outlet thread series designation shall be 3/4 inch 11-1/2 NH.

3.2.5. Straight Stream Tip. Unless otherwise specified, the nozzle shall be supplied with a straight stream tip of bore diameter size 3/16 inch (4.76 mm), meeting the minimum requirements of USDA Forest Service Specification 5100-244. The straight stream tip shall be installed on the straight stream nozzle outlet as indicated in Figure 1.

3.2.6. Spray Tip. Unless otherwise specified, The nozzle shall be supplied with a spray tip of flow rate designation number 3, meeting the minimum requirements of USDA Forest Service Specification 5100-244. The spray tip shall be supplied installed on the spray nozzle outlet as indicated in Figure 1.

3.2.7. Knurling. The inlet shall be knurled as shown in Figure 1. The outside surface of the inlet shall be knurled for a non-slip grip for a length of 0.75 +/- 0.062 inch (19.05 +/- 1.57 mm).

3.3. Material. Where more than one type of material is used in various components, there shall be no incompatibility between materials which may cause corrosion.

3.3.1. Nozzle and Component Material. The body, knob and other aluminum components material shall be a cast aluminum alloy, 356-T6, in accordance with ASTM B 26 or an aluminum alloy, 6262-T9, in accordance with Federal Specification QQ-A-225 and QQ-A-225/10. The filter material shall be corrosion resistant or stainless steel. The ball valve material shall be stainless steel or aluminum alloy.

3.3.2. Gasket Material. Gasket material physical properties shall meet the requirements of Forest Service Standard 5100-190.

3.3.3. Recoverable Materials. The contractor is encouraged to use recovered materials to the maximum extent practicable, in accordance with paragraph 23.403 of the Federal Acquisition Regulation (FAR), provided all performance requirements of this specification are met.

3.4. Dimensions and Weight. The overall width at maximum extremities without tips shall be a maximum of 3.63 inches (92.2 mm). See Figure 1. The overall length including body and tips shall be a maximum of 7.0 inches (177.8 mm). Maximum weight including body and tips shall be 2 pounds, 2 ounces (0.964 kg).

3.4.1. Dimensional Tolerance. Unless otherwise noted, the following tolerances apply: one place (x.x) +/- 0.1 inch (2.5 mm); two places (x.xx) +/- 0.01 inch (0.25 mm) and three places (x.xxx) +/- 0.010 inch (0.254 mm).

3.5. Workmanship. Workmanship shall be equal to the best commercial practices consistent with the highest engineering standards in the industry and shall be free from any defect which may impair serviceability or detract from the product's appearance.

3.5.1. Symmetry. All metal part sections shall be symmetrical and concentric to 0.030 inch (0.762 mm).

3.5.2. Cast Components. Cast parts shall be fine-grained, free from blowholes, pinholes, pits, porosity, hard spots, shrinkage, cracks or other defects.

3.5.3. Forged or Extruded Components. Forged and extruded sections shall be free from laps, sharp die marks, cracks or other defects.

3.6. Threads, Waterways, Gaskets, and Gasket Recesses. All threads, waterways, gaskets and gasket recesses shall be in accordance with USDA Forest Service Standard 5100-190.

3.7. Marking. Markings shall be in accordance with USDA Forest Service Standard 5100-190. In addition, straight stream tips shall be marked with the bore diameter (in fractions) and spray tips shall be marked with flow rate (gpm/Lm) as specified in USDA Forest Service Specification 5100-244.

3.8. Surface Treatment. Aluminum alloy surfaces, to include threaded surfaces, shall be hardcoated in accordance with USDA Forest Service Standard 5100-190.

3.9. Surface Finish. The finish for all surfaces, to include threaded surfaces, shall be in accordance with USDA Forest Service Standard 5100-190.

3.10. Performance.

3.10.1. Torque. When tested in accordance with 4.6.2, a calibrated torque wrench shall be attached to the nozzle ball valve shaft and the torque required to open and close the valve shall be measured.

3.10.1.1. Dry Valve Torque. When tested in accordance with 4.6.2.1, the torque to open or close the ball valve shall not exceed 20 inch-pounds (2.26 N•m) for a nozzle in a dry condition. A dry condition is defined as before any water or water pressure has been applied to the nozzle.

3.10.1.2. Wet Valve Torque. When tested in accordance with 4.6.2.2, the torque to open or close the ball valve shall not exceed 40 inch-pounds (4.52 N•m) for a nozzle in a wet condition. A wet condition defined as after a hydrostatic water pressure of 600 psig (4137 kPag) has been applied.

3.10.2. Flow Rate. When tested in accordance with 4.6.3, the nozzle shall flow a minimum of 25 gallons per minute (95 liters per minute) in the spray position, and a minimum of 70 gallons per minute (265 liters per minute) in the straight stream position.

3.10.3. Proof Pressure. When tested in accordance with 4.6.4, the nozzle shall withstand a working pressure of 600 psig (4137 kPag) with no leaks, permanent distortion, mechanical damage or structural failure; and shall withstand a proof pressure of 1,200 psig (8274 kPag) with no permanent distortion, mechanical damage or structural failure and no leaks more than twelve drops per minute from both nozzle tips combined.

3.11. Metric Products. Metric dimensions are provided for information only, inch-pound units shall be the required units of measure for this specification. Thread series designations are indicated as 3/4 inch 11-1/2 NH or 1 inch 11-1/2 NPSH. Since these are thread series designations, not an indication of a specific dimension, the metric equivalent is not given. Products manufactured to metric dimensions will be considered on an equal basis with those manufactured using inch-pound units, provided they fall within the tolerances specified using conversion tables contained in the latest revision of IEEE/ASTM SI 10, and all other requirements of this specification are met.

4. SAMPLING, INSPECTION, AND TEST PROCEDURES.

4.1. General Inspection and Tests. Unless otherwise specified in the contract or purchase order, the contractor is responsible for performance of all inspection requirements prior to submission for Government acceptance inspection and tests. The contractor may utilize their own facilities or any commercial laboratory acceptable to the Government. Inspection records of the examination and tests shall be kept complete and available to the Government.

4.1.1. Inspection and Test Site. The Government shall conduct lot acceptance inspection and tests to determine compliance with the specification. If lot acceptance and tests are conducted at locations other than the manufacturing facilities, the contracting officer will specify location and arrangements. In the case of on-site inspections at the contractor's facility, the contractor shall furnish the inspector all reasonable facilities for their work. During any inspection, the inspector may take from the lot one or more samples and submit them to an independent test laboratory approved by the Government or to a Government test facility for inspection and tests.

4.1.2. Testing With Referenced Documents. The contractor is responsible for insuring that components and materials used were manufactured, examined and tested in accordance with referenced specifications and standards. The Government reserves the right to perform any of the inspections or tests set forth in this section where such action is deemed necessary to assure supplies and services conform to prescribed requirements.

4.2. Responsibility for Compliance. All items shall meet all requirements of sections 3 and 4. 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 this specification shall not relieve the contractor of the responsibility of ensuring that all products or supplies submitted to the Government for acceptance comply with all requirements of the contract. Sampling inspection, as part of manufacturing operations, is an acceptable practice to ascertain conformance to requirements, however, this does not authorize submission of known defective material, either indicated or actual, nor does it commit the Government to accept defective material.

4.3. Sampling for Inspection. When inspection is performed, sampling shall be in accordance with ANSI/ASQC Z 1.4.

4.3.1. Lot. All twin tip shutoff nozzles presented together in one delivery will be considered a lot for the purpose of inspection. A sample unit shall be one twin tip shutoff nozzle.

4.3.2. Sampling for Visual and Dimensional Examination. Sampling for visual and dimensional examination shall be S-3, with an Acceptable Quality Level (AQL) of 2.5 percent defective.

4.3.3. Sampling for Lot Acceptance Tests. Sampling for lot acceptance testing shall be S-3 with an AQL of 2.5 percent defective.

4.4. Inspection and Tests.

4.4.1 Visual and Dimensional Examination. When selected in accordance with 4.3.2, each sample nozzle shall be visually and dimensionally examined to determine conformance with this specification. Visual or dimensional defects shall be classified as a major or minor. A defect not listed in Table 1 shall be classified as a minor defect. If the number of defects in any sample exceeds the indicated AQL, the lot shall be rejected.

Table 1. Major and Minor Defects

Defect	Classification	
	Major	Minor
1. Nozzle and tips not complete .	X	
2. Dimensions and weight not as required.	X	
3. Material not as required.	X	
4. Hardcoating not as required .	X	
5. Workmanship and finish not as required.	X	
6. Thread dimensions not within specified tolerances and failure to pass gage tests .	X	
7. Threads not smooth, not free of imperfections.		X
8. Illegible or improper marking .		X

4.4.2. Lot Acceptance Tests. Each of the samples selected in accordance with 4.3.3, shall be tested in accordance with 4.6, to determine conformance with requirements of this specification.

4.4.3. First Article Inspection. Unless otherwise specified in 6.2, the first article sample(s) indicated in 3.1, shall be inspected as specified in 4.4.1 and 4.6. All inspection and testing of a first article sample(s) shall stop upon a single failure and the sample(s) rejected. The contractor shall be informed as to the nature of the failure, but the Government shall not be obligated to continue testing a defective item, once it is known to be defective or when it is considered in the best interest of the Government.

4.4.4. Quality Conformance Inspection. Unless otherwise specified, sampling for inspection shall be performed in accordance with ANSI/ASQC Z 1.4. The inspection level and AQL shall be as specified in 4.3.3.

4.5. Certificate of Conformance. A Certificate of Conformance shall meet the requirements of USDA Forest Service Standard 5100-190. Where certificates of conformance are required, the Government reserves the right to verify test any such items to determine the validity of certification. These certificates shall be based on the testing of component materials and may be performed by the component material supplier. The contractor shall provide certificates of conformance for all materials used in 3.3.1, 3.3.2 and 3.8 (see 4.5.2, 4.5.3, and 4.5.4).

4.5.1. Certificates of Conformance in Lieu of Testing. Unless otherwise specified, certificates of conformance may be acceptable in lieu of testing of end items.

4.5.2. Nozzle and Ball Valve Material. As required by 3.3.1, nozzle material shall meet the indicated material physical property requirement listed, when tested to defined test method. The ball valve material and the filter material shall be identified.

4.5.3. Gasket Material Test. As required by 3.3.2, gasket material physical properties shall meet the requirements of USDA Forest Service Standard 5100-190.

4.5.4. Surface Treatment. As required by 3.8, aluminum alloy surfaces, to include threaded surfaces, shall be hardcoated in accordance with USDA Forest Service Standard 5100-190.

4.6. Performance Testing. Samples shall be subjected to the following tests to determine if the samples meet the requirements of this specification.

4.6.1. Fluid Medium. All testing requiring the use of a fluid medium shall be performed using municipally supplied potable water; this shall include, but is not limited to torque, flow rate and proof pressure testing. If the contractor does not have access to a municipal water supply, the testing shall be performed using any clear fresh water normally available for firefighting. First article testing performed by the Government will be conducted using municipal supplied potable water.

4.6.2. Torque Test. As required by 3.10.1, a suitable calibrated torque wrench shall be attached to the nozzle ball valve shaft and the torque required to open and close the valve shall be measured.

4.6.2.1. Dry Valve Torque Test. As required by 3.10.1.1, with the nozzle in a dry condition, the nozzle ball valve shaft shall be turned from one extreme position to the other with the torque wrench. The torque to open or close the valve shall not exceed 20 inch-pounds (2.26 N•m). Three cycles of straight stream/fully closed, shall be performed with no failures.

4.6.2.2. Wet Valve Torque Test. As required by 3.10.1.2, the nozzle shall be attached to a water source and the discharge ends shall be capped shut. A hydrostatic pressure of 600 psig (4137 kPag) shall be applied. The rate for applying hydrostatic pressure shall not be less than 300 psig (2068 kPag) per minute and not more than 600 psig (4137 kPag) per minute, i.e. at a uniform rate over a one to two minute time interval. The ball valve shaft shall be turned from one extreme position to the other with the torque wrench. The torque required to open or close the valve shall not exceed 40 inch-pounds (4.52 N•m). Three cycles of straight stream/fully closed, shall be performed with no failures.

4.6.3. Flow Rate Test. As required by 3.10.2, with the spray tip and straight stream tip removed, the nozzle will be tested for flow rate by attaching it to a water pressure source. At an inlet pressure of 100 psig (689 kPag), the flow rate shall be measured with the shutoff valve in the spray position and in the straight stream position, using a suitable calibrated flow meter or weigh tank.

4.6.4. Pressure Testing. As required by 3.10.3, the nozzle shall be tested for proof pressure by attaching it to a water pressure source. The rate for applying hydrostatic pressure shall not be less than 300 psig (2068 kPag) per minute and not more than 600 psig (4137 kPag) per minute.

4.6.4.1. Working Pressure. With the valve in the closed position, a hydrostatic pressure of 600 psig (4137 kPag) shall be applied and held for three minutes. There shall be no leaks, permanent deformation, mechanical damage or structural failure.

4.6.4.2. Proof Pressure in Spray Position. The nozzle spray and straight stream discharges/outlets shall be capped shut. With the shutoff valve in the spray position, apply a hydrostatic pressure of 1,200 psig (8274 kPag) and hold for three minutes. Leakage from the nozzle tips combined shall not exceed twelve drops per minute. There shall be no permanent deformation, mechanical damage or structural failure.

4.6.4.3. Proof Pressure in Straight Stream Position. Reduce the hydrostatic pressure to 600 psig (4137 kPag). Place the shutoff valve in the straight stream position. Increase the hydrostatic pressure to 1,200 psig (8274 kPag) and hold for three minutes. Leakage from the nozzle tips combined shall not exceed 12 drops per minute. There shall be no permanent deformation, mechanical damage or structural failure.

5. PACKAGING, PACKING AND MARKING.

5.1. Packaging, Packing and Marking. Packaging, packing and marking shall be as specified in the contract or order.

6. NOTES.

6.1. Intended Use. The twin tip shutoff nozzle described in this specification is used with fire hose in the application of water in wildland firefighting activities.

6.2. Acquisition Requirements. Acquisition documents should specify the following:

- a. Title, number, and date of this specification.
- b. If a first article sample(s) is not required (see 3.1, 4.4.3, and 6.3).
- c. If certificates of conformance (see 4.3.1) are acceptable in lieu of lot by lot testing.
- d. Packaging, packing and marking instructions. (5.1.)

6.3. First Article. When a first article sample(s) is required, it shall be inspected and approved in accordance with the First Article Clauses set forth in the solicitation. Specific instructions shall be included regarding arrangements for selection, inspection, and approval of the first article sample(s).

6.54.4 Notice. When Government drawings, specifications, or other data are used for any purpose other than in connection with a definitely related Government procurement operation, the United States Government thereby incurs no responsibility nor any obligation whatsoever.

6.65. Preparing Activity. USDA Forest Service, San Dimas Technology and Development Center, 444 East Bonita Avenue, San Dimas CA 91773-3198.

United States Department of Agriculture, Forest Service
Standardization Document Improvement Proposal

Instructions: This form is provided to solicit beneficial comments which may improve this document and enhance its use. Contractors, government activities, manufacturers, vendors, or other prospective users of this document are invited to submit comments to the USDA Forest Service, San Dimas Technology and Development Center, 444 East Bonita Avenue, San Dimas, California 91773-3198. Attach any pertinent data which may be of use in improving this document. If there is additional documentation, attach it to the form and place both in an envelope addressed to the preparing activity. A response will be provided when a name and address are included.

Note: This form shall not be used to submit request for waivers, deviation, or for clarification of requirements on current contracts. Comments submitted on this form do not constitute or imply authorization to waive any portion of the referenced document(s) or to amend contractual requirements.

Standard Number and Title: **Specification 5100-240d, Nozzle, Twin Tip, Shutoff, 1 Inch Base.**

Name of Organization and Address:

_____ Vendor _____ User _____ Manufacturer

1. _____ Has any part of this document created problems or required interpretation in procurement use?

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_____ Please explain below.

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