

Standard 5100-190c
December 2005
Superseding 5100-190b
September 1996

UNITED STATES DEPARTMENT OF AGRICULTURE
FOREST SERVICE
STANDARD FOR
THREADS, GASKETS, ROCKER LUGS,
CONNECTIONS AND FITTINGS, FIRE HOSE

1. SCOPE.

1.1. Scope. This document establishes a standard for threads, gaskets, and rocker lugs for fire hose couplings, connections, and fittings used by the USDA Forest Service in wildland firefighting. Thread series designations described in this standard are 3/4 inch 11-1/2 NH, 1 inch 11-1/2 NPSH, 1-1/2 inch 9 NH, 1-1/2 inch 11-1/2 NPSH, 2 inch 11-1/2 NPSH, 2-1/2 inch 7-1/2 NH, 2-1/2 inch 8 NPSH, and 4 inch 4 NH.

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.

Military Specification

MIL-A-8625 -Anodic Coatings for Aluminum and Aluminum-Alloys

Copies of military specifications are available from the Department of Defense Single Stock Point (DODSSP), Building 4/Section D, 700 Robbins Avenue, Philadelphia, PA 19111-5094

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.

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.

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American Society for Quality (ASQ)

Z 1.4 -Sampling Procedures and Tables for Inspection by Attributes

Address requests for copies to the American Society for Quality, P.O. Box 3005, Milwaukee, WI 53201-3005

ASTM International

D 412 -Test Method for Rubber Properties in Tension

D 2240 -Test Method of Test for Rubber Property - Durometer Hardness

Address requests for copies to ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.

Aluminum Companies of America (ALCOA) Specifications

226 -Aluminite Hard Coating

726 -Aluminite Hard Coating

Address requests for copies to ALCOA Technical Department, P.O. Box 132, Sidney, OH 45365.

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. Construction.

3.1.1. Threads. Thread configuration shall be as shown in figure 1. Thread form dimensions shall be as indicated in table 1. Internal and external thread dimensions shall be as indicated in table 2. Dimensions of aluminum couplings, connections and fittings shall be measured after anodic hardcoating has been applied and finished.

3.1.1.1. Go-Not Go Gauges. "Go" and "Not Go" gauges shall be in conformance with the tolerances shown in Tables 3 and 4 and shall be used to verify conformity of fire hose connection and fitting threads to this standard. "Speed handles" or any device which provides mechanical advantage shall not be used on the thread gauges. Gauges shall not be forced once resistance is encountered.

3.1.1.1.1. Go Gauges. For "Go" gauges, the gauge shall rotate completely through the full thread length without any resistance being felt.

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3.1.1.1.2. Not Go Gauges. For “Not Go” gauges, thread engagement shall not exceed 1.75 turns.

3.1.1.2. Blunt Start or Higbee. The outer ends of internal and external threads shall be terminated with the blunt or “Higbee Cut” on the full thread to avoid cross-threading and mutilation of threads. The minimum length of the blunt start shall not be less than the radius formed by a cutter with a radius not less than the height of the thread. The maximum length of the blunt start shall not be greater than 10 degrees of arc.

3.1.2. Gasket Recess. All internally threaded sections shall be provided with a gasket recess as shown in figure 1 and the dimensions shall be as indicated in table 1.

3.1.3. Gasket. All internally threaded couplings, connections and fittings shall be supplied with properly fitted gaskets meeting the dimensional requirements of table 5 and material requirements of 3.2.1. All leakage requirements of referencing documents shall be met without repositioning or replacing the gasket.

3.1.4. Rocker Lug. Rocker lug construction shall be as shown in Figure 3 and shall have dimensions as indicated in table 6. The rocker lug shall be an integral part of the internally threaded section and optional on the externally threaded section of a connection or fitting. No rocker lug is required on 3/4 inch 11-1/2 NH coupling, connection or fitting.

3.1.4.1. Higbee Indicator. The blunt start or Higbee cut on the rocker lug of an internally threaded connection or fitting shall be indicated by an indentation, Higbee indicator obvious to sight and touch, on the top of the rocker lug. A Higbee indicator of an externally threaded connection or fitting is optional.

3.1.5 Fasteners. All threaded fasteners shall have a minimum of four threads fully engaged.

3.1.6 Thread relief. External threads shall have a thread relief. The thread relief diameter shall be the thread minor diameter and the width shall be as specified in table 1.

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

3.2.1. Gasket Material. Gasket material shall be rubber or other type elastomer intended for use in fire hose couplings, connections, and fittings and shall meet the following physical property requirements.

- a. Gasket material shall meet the requirements of ASTM D 2000 AA 720 Z, Z = 1,250 psi modulus at 300 percent elongation minimum.
- b. The change in tensile strength shall not be more than +/- 30 percent, change in elongation shall not be more than -50 percent, and change in hardness shall not be more than +/- 15 points after heat aging for 70 hours at 70° C in accordance with ASTM D 573.
- c. Shore A durometer hardness shall be 70 +/-5 when tested per ASTM D 2240.

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d. Minimum tensile strength shall be 1,250 psi at 300 percent elongation when tested per ASTM D 412.

e. Gasket material age on delivery shall be a maximum of 6 months.

3.2.2. Tailpiece Gasket Material. Tailpiece gasket material shall be rubber or other type elastomer intended for use in fire hose couplings, connections and fittings and shall meet the hardness requirement of 60 ± 5 durometer, using a Shore Type A durometer.

3.2.3. Recovered 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.

3.3. Certificate of Conformance. Where certificates of conformance are required, the Government reserves the right to determine the validity of certification.

3.3.1. Certification. The contractor shall provide the following information on certificates of conformance:

- a. Material description, i.e., Aluminum 6061 T6; rubber gasket ASTM D 2000 AA 720 Z.
- b. Specification, standard, or test method (include type, class, and form where applicable).
- c. Test company name, address, and telephone number.
- d. All characteristic test values.
- e. Authorized responsible technician/manager name and title.
- f. Lot or batch number.
- g. Test date.

3.3.2. Test Results. The contractor shall maintain complete records, including test results. At the request of the Government, the contractor shall provide test results and other records, as described in the certificates of conformance, for all materials used in the manufacture of an item.

3.3.3. Gasket Material Conformance. For all first article testing, quality products list (QPL) testing, and on the first shipment of all lot-by-lot tested and QPL items, the contractor shall supply certificates of conformance for the gasket material based on testing from the sheet material from which the gasket was formed.

3.4. Markings. The fire hose connection or fitting shall be permanently and legibly marked, on the outside surface of the product, with the manufacturer's name or trademark, and the letters "FSS." The minimum letter height shall be 0.12 inch. In addition, each threaded opening shall be similarly marked with the opening size and thread (for example: "1-1/2 NH"). Each threaded opening designation shall plainly indicate which opening is being

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referred to by its proximity or by other clearly understood means. Numerals such as 1/2 are to be considered three letters, "1," "/", and "2."

3.4.1. Marking Order. Markings on multiple threaded couplings shall be indicated with the internal thread first, then the external thread. Markings for a double internal or a double external threaded single piece shall be indicated with the smaller thread first, then the larger thread.

3.5. Thread Surface Treatment. Aluminum-alloy thread surfaces, except still threads, shall be hard-coated to 0.002 inch thick and not vary more than ± 10 percent in accordance with MIL-A-8625, Type III, Class 1, unless otherwise specified. ALCOA Aluminite Hard-Coating No. 226 or equal for forged or extruded (rod) alloy or ALCOA Aluminite Hard-Coating No. 726 or equal for cast aluminum-alloy shall be applied.

3.5.1. Expanded Sections. If in the process of producing aluminum-alloy connections and fittings, it is necessary to expand an attaching body section onto a swivel, the bowl section need not be hardcoated; however, the entire swivel section, including still and screw threads, shall be hardcoated. After hardcoating, the threads may be coated with a permanent type lubricant to prevent galling of the threads.

3.6. Surface Finish. The finish shall be equal to the best commercial practices consistent with the highest engineering standards in the industry and shall be free from any finish defect which may impair serviceability or detract from the items appearance.

3.6.1. Cast Surface Finish. Exterior surfaces shall be smooth and cleaned by sandblasting, tumbling, or other accepted standard commercial process.

3.6.2. Forged and Extruded Surface Finish. Die-formed and machined surfaces, except threads, shall be smooth and have a roughness of not more than 125 μin .

3.6.3. Plastic Surface Finish. Excessive material on edges shall not be allowed. All surfaces shall be free from laps, sharp die marks, cracks, flash, burrs, and sharp edges. The surface of the finished product shall be smooth and tack free.

3.7. Dimensional Tolerance. Unless otherwise noted, the following tolerances apply: one place (x.x) ± 0.1 inch; two places (x.xx) ± 0.03 inch, and three places (x.xxx) ± 0.010 inch.

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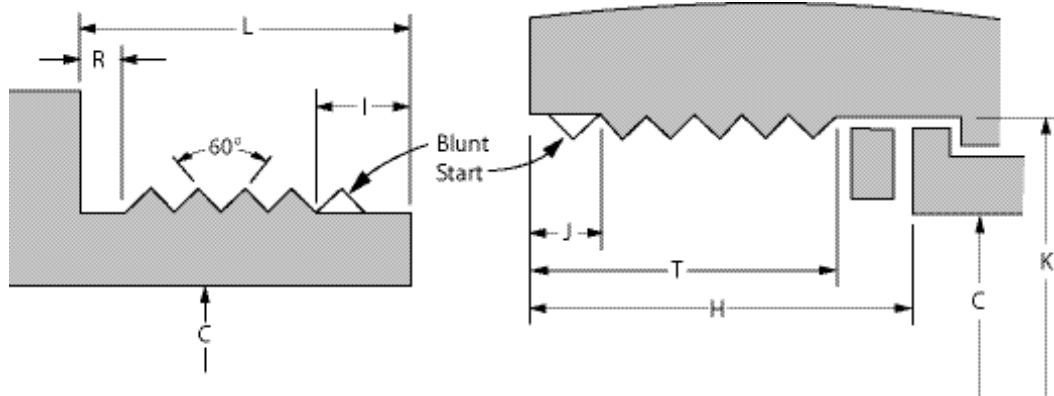


Figure 1—Thread and gasket recess configuration.

C = Diameter of the waterway

H = Depth of the coupling

I = Length of the pilot to the start of the second thread

J = Blunt start from the face to the start of the second thread

K = Diameter of the gasket seat

L = Length of the nipple

R = Length of the thread relief

T = Length of the internal thread

Note for figure 1. See table 1 for associated dimensions.

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Table 1. Thread Form and Gasket Recess Dimensions

Thread Series Designation	Diameter of Waterway +.030, -.010 C	Length of Nipple Minimum L	Length of Pilot to the Start of Second Thread I	Depth of Coupling H	Diameter of Gasket Seat +.016, -.000 K	Length of Internal Thread T	Blunt Start from Face to Start of Second Thread J	Length of Thread Relief, Maximum R
¾ inch 11-1/2 NH	0.75	0.56	0.13 +/- 0.016	0.53	1.04	0.38 +/- 0.016	0.13 +/- 0.016	0.20
1 inch 11-1/2 NPSH	1.00	0.56	0.16 +/- 0.016	0.53	1.44	0.38 +/- 0.016	0.16 +/- 0.016	0.20
1-1/2 inch 11-1/2 NPSH 1-1/2 inch 9 NH	1.50	0.63	0.16 +/- 0.016	0.59	2.06	0.44 +/- 0.031	0.16 +/- 0.016	0.20
2 inch 11-1/2 NPSH	2.00	0.75	0.19 +/- 0.016	0.72	2.38	0.57 +/- 0.031	0.16 +/- 0.016	0.20
2-1/2 inch 7-1/2 NH 2-1/2 inch 8 NPSH	2.50	1.00	0.25 +/- 0.031	0.94	3.19	0.69 +/- 0.031	0.25 +/- 0.031	0.20
4 inch 4 NH	4.00	1.25	0.44 +/- 0.031	1.19	5.13	0.88 +/- 0.031	0.38 +/- 0.031	0.30

Notes:

NH: American Fire Hose Coupling Threads

NPSH: American Nation Hose Coupling Thread

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Table 2. Limiting Thread Dimensions and Tolerances

Thread Series Designation	Threads Per inch tpi	Pitch p	Height of Thread H	Major Diameter			Pitch Diameter			Minor Diameter Maximum
				Maximum	Minimum	Tolerance	Maximum	Minimum	Tolerance	
3/4 inch 11-1/2 NH	11-1/2	0.08696	0.05648	1.0625	1.0455	0.0170	1.0060	0.9975	0.0085	0.9495
1 inch 11-1/2 NPSH	11-1/2	0.08696	0.05648	1.2951	1.2781	0.0170	1.2386	1.2301	0.0085	1.1821
1-1/2 inch 9 NH	9	0.11111	0.07217	1.9900	1.9678	0.0222	1.9178	1.9067	0.0111	1.8457
1-1/2 inch 11-1/2 NPSH	11-1/2	0.08696	0.05648	1.8788	1.8618	0.0170	1.8223	1.8138	0.0085	1.7658
2 inch 11-1/2 NPSH	11-1/2	0.08696	0.05648	2.3528	2.3358	0.0170	2.2963	2.2878	0.0085	2.2398
2-1/2 inch 7-1/2 NH	7-1/2	0.13333	0.08660	3.0686	3.0366	0.0320	2.9820	2.9660	0.0160	2.8954
2-1/2 inch 8 NPSH	8	0.12500	0.08119	2.8434	2.8212	0.0222	2.7622	2.7511	0.0111	2.6810
4 inch 4 NH	4	0.25000	0.16238	5.0109	4.9609	.0500	4.8485	4.8235	0.0250	4.6861

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Internal Threads (Swivel)

Thread Series Designation	Threads Per inch tpi	Pitch p	Height of Thread H	Minor Diameter			Pitch Diameter			Major Diameter Minimum
				Minimum	Maximum	Tolerance	Minimum	Maximum	Tolerance	
3/4 inch 11-1/2 NH	11-1/2	0.08696	0.05648	0.9595	0.9765	0.0170	1.0160	1.0245	0.0085	1.0725
1 inch 11-1/2 NPSH	11-1/2	0.08696	0.05648	1.1921	1.2091	0.0170	1.2486	1.2571	0.0085	1.3051
1-1/2 inch 9 NH	9	0.11111	0.07217	1.8577	1.8799	0.0222	1.9298	1.9409	0.0111	2.0020
1-1/2 inch 11-1/2 NPSH	11-1/2	0.08696	0.05648	1.7758	1.7928	0.0170	1.8323	1.8408	0.0085	1.8888
2 inch 11-1/2 NPSH	11-1/2	0.08696	0.05648	2.2498	2.2668	0.0170	2.3063	2.3148	0.0085	2.3628
2-1/2 inch 7-1/2 NH	7-1/2	0.13333	0.08660	2.9104	2.9424	0.0320	2.9970	3.013	0.0160	3.0836
2-1/2 inch 8 NPSH	8	0.12500	0.08119	2.6930	2.7152	0.0222	2.7742	2.7853	0.0111	2.8554
4 inch 4 NH	4	0.25000	0.16238	4.7111	4.7611	0.0500	4.8735	4.8985	0.0250	5.0359

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a. Dimensions given for the maximum minor diameter of the nipple are figured to the intersection of the worn tool arc with a centerline through crest and root. The minimum minor diameter of the nipple shall be that corresponding to a flat at the minor diameter of the minimum nipple equal to $p/24$, and may be determined by subtracting $11H/9$ (or $0.7939p$) from the minimum pitch diameter of the nipple.

b. Dimensions for the minimum major diameter of the swivel correspond to the basic flat ($p/8$), and the profile at the major diameter produced by a worn tool must not fall below the basic outline. The maximum major diameter of the swivel shall be that corresponding to a flat at the major diameter of the maximum swivel equal to $p/24$, and may be determined by adding $11H/9$ (or $0.7939p$) to the maximum pitch diameter of the swivel.

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Table 3. "GO" and "NOT GO" Gauge Limits of Size for Ring Gauges

Thread Series Designation	"GO" or Maximum Gauge				"NOT GO" or Minimum Gauge			
	Pitch Diameter		Minor Diameter		Pitch Diameter		Minor Diameter	
	Maximum	Minimum	Maximum	Minimum	Maximum	Minimum	Maximum	Minimum
¾ inch 11-1/2 NH	1.0060	1.0057	0.9595	0.9589	0.9978	0.9975	0.9793	0.9787
1 inch 11-1/2 NPSH	1.2386	1.2383	1.1921	1.1915	1.2304	1.2301	1.2119	1.2113
1-1/2 inch 9 NH	1.9178	1.9175	1.8577	1.8570	1.9070	1.9067	1.8833	1.8826
1-1/2 inch 11-1/2 NPSH	1.8223	1.8219	1.7758	1.7752	1.8142	1.8138	1.7956	1.7950
2 inch 11-1/2 NPSH	2.2963	2.2959	2.2498	2.2492	2.2882	2.2878	2.2696	2.2690
2-1/2 inch 7-1/2 NH	2.9820	2.9810	2.9104	2.9094	2.9670	2.9660	2.9114	2.9104
2-1/2 inch 8 NPSH	2.7622	2.7617	2.6930	2.6923	2.7516	2.7511	2.7247	2.7240
4 inch 4 NH	4.8485	4.8479	4.7111	4.7096	4.8241	4.8235	4.7709	4.7694

Table 4. "GO" and "NOT GO" Gauge Limits of Size for Plug Gauges

Thread Series Designation	"GO" or Maximum Gauge				"NOT GO" or Minimum Gauge			
	Major Diameter		Pitch Diameter		Major Diameter		Pitch Diameter	
	Maximum	Minimum	Maximum	Minimum	Maximum	Minimum	Maximum	Minimum
¾ inch 11-1/2 NH	1.0731	1.0725	1.0163	1.0160	1.0622	1.0616	1.0245	1.0242
1 inch 11-1/2 NPSH	1.3057	1.3051	1.2489	1.2486	1.2948	1.2942	1.2571	1.2568
1-1/2 inch 9 NH	2.0027	2.0020	1.9301	1.9298	1.9890	1.9883	1.9409	1.9406
1-1/2 inch 11-1/2 NPSH	1.8894	1.8888	1.8327	1.8323	1.8785	1.8779	1.8408	1.8404
2 inch 11-1/2 NPSH	2.3634	2.3628	2.3067	2.3063	2.3525	2.3519	2.3148	2.3144
2-1/2 inch 7-1/2 NH	3.0846	3.0836	2.9980	2.9970	3.0836	3.0826	3.0130	3.0120
2-1/2 inch 8 NPSH	2.8561	2.8554	2.7747	2.7742	2.8394	2.8387	2.7853	2.7848
4 inch 4 NH	5.0374	5.0359	4.8741	4.8735	5.0068	5.0053	4.8985	4.8979

Notes for Tables 3 and 4 – The minor diameters of plug gauges and the major diameters of ring gauges are undercut beyond the nominal diameters to give a clearance for grinding or lapping. The allowable variation in lead between any two threads not farther apart than the length engagement is +/- .0005 inch. The allowable variations in one-half angle thread is +/- 10 minutes.

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Table 5. Gasket Dimensions

Nominal Waterway Size	Inner Diameter	Outer Diameter + 0/- .03	Thickness
	A	B	C
3/4	0.81	1.04	0.13
1	1.06	1.44	0.13
1-1/2	1.56	2.06	0.13
2	2.06	2.38	0.13
2-1/2	2.56	3.19	0.19
4	4.06	5.13	0.25

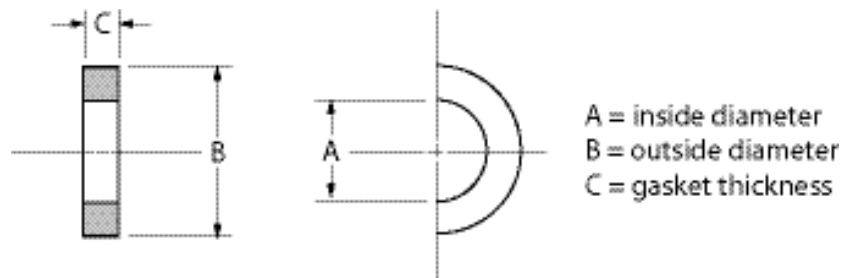


Figure 2—Gasket configuration.

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Table 6. Rocker lug dimensions

Nominal Fitting Size		L	W	T	H	A	B	C	Number of Lugs
1 inch 1-1/2 inch, 2 inch	Maximum	-	0.44	0.31	0.38	0.13	-	-	
	Minimum	0.69	0.25	0.13	0.25	0.06	0.19	0.44	2 or 3
2-1/2 inch, 4 inch	Maximum	-	0.69	0.50	0.44	0.13	-	-	
	Minimum	1.00	0.56	0.25	0.31	0.06	0.50	0.69	2 or 3

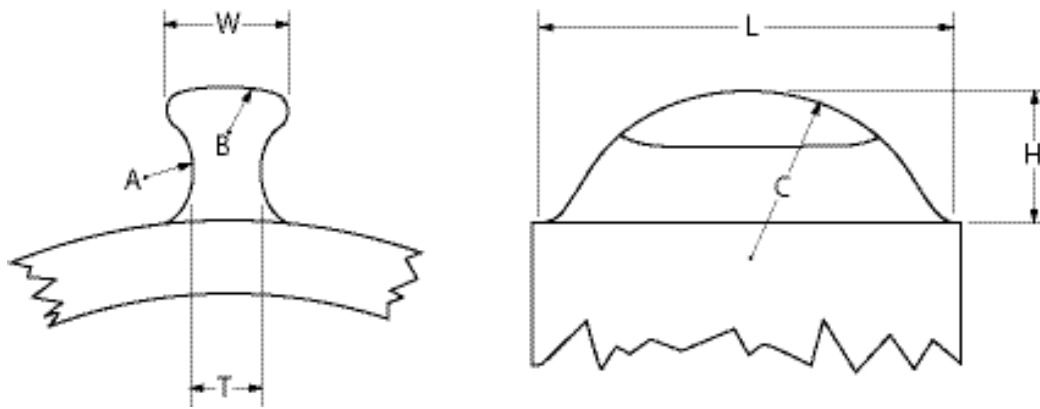


Figure 3—Rocker lug configuration.

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4. NOTES.

4.1. Intended Use. This document establishes a standard for threads, gaskets, and rocker lugs for fire hose couplings, connections, and fittings used by the USDA Forest Service in wildland firefighting.

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

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

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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.

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Standard Number and Title: Standard 5100-190c, Standard For Threads, Gaskets, Rocker Lugs, Connections, and Fittings, Fire Hose.

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