



State of West Virginia
 Department of Administration
 Purchasing Division
 2019 Washington Street East
 Post Office Box 50130
 Charleston, WV 25305-0130

Solicitation

NUMBER
FOR12009

PAGE
1

ADDRESS CORRESPONDENCE TO ATTENTION OF:
PAUL REYNOLDS 304-558-0468

VENDOR

RFQ COPY
 TYPE NAME/ADDRESS HERE

SHIP TO

DIVISION OF FORESTRY
 7 PLAYERS CLUB DRIVE
 CHARLESTON, WV
 25311 304-558-2788

DATE PRINTED
09/05/2012

BID OPENING DATE: 09/13/2012 BID OPENING TIME 1:30PM

LINE	QUANTITY	UOP	CAT. NO.	ITEM NUMBER	UNIT PRICE	AMOUNT
0001		LS		345-08		
ADDENDUM NO. 2 TO CHANGE THE BID OPENING: FROM: SEPTEMBER 06, 2012 @ 1:30 P.M. TO: SEPTEMBER 13, 2012 @ 1:30 P.M. TO ATTACH REVISED PRICING PAGES ATTACH US DEPARTMENT OF AGRICULTURE FOREST SERVICE SPECIFICATIONS ON FLAME RESISTANT CLOTHING. BID CLARIFICATIONS FIRE PROTECTIVE CLOTHING AND EQUIPMENT ***** THIS IS THE END OF RFQ FOR12009 ***** TOTAL:						

SIGNATURE	TELEPHONE	DATE
TITLE	FEIN	ADDRESS CHANGES TO BE NOTED ABOVE

WHEN RESPONDING TO SOLICITATION, INSERT NAME AND ADDRESS IN SPACE ABOVE LABELED 'VENDOR'

SOLICITATION NUMBER: FOR12009
Addendum Number: 2

The purpose of this addendum is to modify the solicitation identified as FOR12009 (“Solicitation”) to reflect the change(s) identified and described below.

Applicable Addendum Category:

- Modify bid opening date and time
- Modify specifications of product or service being sought
- Attachment of vendor questions and responses
- Attachment of pre-bid sign-in sheet
- Correction of error
- Other

Description of Modification to Solicitation: Change bid Opening Date

Additional Documentation: Documentation related to this Addendum (if any) has been included herewith as Attachment A and is specifically incorporated herein by reference.

Terms and Conditions:

1. All provisions of the Solicitation and other addenda not modified herein shall remain in full force and effect.
2. Vendor should acknowledge receipt of all addenda issued for this Solicitation by completing an Addendum Acknowledgment, a copy of which is included herewith. Failure to acknowledge addenda may result in bid disqualification. The addendum acknowledgement should be submitted with the bid to expedite document processing.

ATTACHMENT A

1. Change Bid opening from: September 6, 2012 to September 13, 2012
2. Attach US department of Agriculture Forest Service Specifications on Flame resistant clothing.
3. Bid clarifications
4. Revised Pricing pages (electronic)
5. The addendum acknowledgement is attached. This document should be signed and returned with your bid. Failure to sign and return may result in disqualification.

FOR12009 Addendum 2

To add, clarify and attach the U.S. Department of Agriculture Forest Service specifications (USDA).

From:

3.1.1.1 All Firefighters clothing must be Meta-Aramid MOMEX flame-resistant and Para-Aramid Kevlar flame-resistant.

TO:

3.1.1.1 All Firefighter clothing must meet USDA Forest Services Specifications
Meta-Aramid MOMEX flame-resistant and Para-Aramid Kevlar flame-resistant or equal

From:

3.1.1.2 All items on the attached list must meet US Forestry Services specifications

TO: .

3.1.1.2 All items on the attached pricing page must meet USDA Forest Services specifications

Attached: USDA Forest Services Specifications
Shirt, Flame-Resistant Aramid 5100-91J
Pants, Flame-Resistant Aramid 5100-92M
Tool, Rake and Cutting 5100-284C
Cloths, Laminated, Fire Shelter 5100-607D

**FOR12009
PRICING PAGE**

ITEM	DESCRIPTION	SIZE	UNIT	PRICE	DISCOUNTED PRICE	TOTAL
1	Wildland Firefighters Shirts (NOMEX) Flame-Resistant, 5-1/2 -oz, Aramid Nomex	XS 13-1.2 x 31"	Each			
2	Wildland Firefighters Shirts (NOMEX) Flame-Resistant, 5-1/2 -oz, Aramid Nomex	S 14-1/2 x 32"	Each			
3	Wildland Firefighters Shirts (NOMEX) Flame-Resistant, 5-1/2 -oz, Aramid Nomex	S/Long 14-1/2 x 33"	Each			
4	Wildland Firefighters Shirts (NOMEX) Flame-Resistant, 5-1/2 -oz, Aramid Nomex	M 15-1/2 x 33"	Each			
5	Wildland Firefighters Shirts (NOMEX) Flame-Resistant, 5-1/2 -oz, Aramid Nomex	M/Long 15-1/2 x 34"	Each			
6	Wildland Firefighters Shirts (NOMEX) Flame-Resistant, 5-1/2 -oz, Aramid Nomex	L 16-1/2 x 34"	Each			
7	Wildland Firefighters Shirts (NOMEX) Flame-Resistant, 5-1/2 -oz, Aramid Nomex	L/Long 16 1/2 x 36"	Each			
8	Wildland Firefighters Shirts (NOMEX) Flame-Resistant, 5-1/2 -oz, Aramid Nomex	XL 17-1/2 x 35"	Each			
9	Wildland Firefighters Shirts (NOMEX) Flame-Resistant, 5-1/2 -oz, Aramid Nomex	XL/L 17 1/2 x 36"	Each			
10	Wildland Firefighters Shirts (NOMEX) Flame-Resistant, 5-1/2 -oz, Aramid Nomex	XXL 18-1/2 x 36"	Each			
11	Wildland Firefighters Shirts (NOMEX) Flame-Resistant, 5-1/2 -oz, Aramid Nomex	XXL/Long 18-1/2 x 37"	Each			
12	Wildland Firefighters Shirts (NOMEX) Flame-Resistant, 5-1/2 -oz, Aramid Nomex	XXXL 19-1/2 x 37"	Each			
13	Wildland Firefighters Shirts (NOMEX) Flame-Resistant, 5-1/2 -oz, Aramid Nomex	XXXL/Long 19-1/2 x 38"	Each			
14	Wildland Firefighter's Pants, Type I, 7.5-oz Meta-Aramid NOMEX, BDU-style flame-resistant	Waist 26 to 30" Length 30"	Each			

ITEM	DESCRIPTION	SIZE	UNIT	PRICE	DISCOUNTED PRICE	TOTAL
15	waist-adjustment buckles, cuff hook & loop Spruce Green Color Forest Service	Waist 26 to 30" Length 33"	Each			
16	waist-adjustment buckles, cuff hook & loop Spruce Green Color Forest Service	Waist 26 to 30" Length 36"	Each			
17	waist-adjustment buckles, cuff hook & loop Spruce Green Color Forest Service	Waist 28 to 32" Length 30"	Each			
18	waist-adjustment buckles, cuff hook & loop Spruce Green Color Forest Service	Waist 28 to 32" Length 33"	Each			
18	waist-adjustment buckles, cuff hook & loop Spruce Green Color Forest Service	Waist 28 to 32" Length 36"	Each			
19	waist-adjustment buckles, cuff hook & loop Spruce Green Color Forest Service	Waist 30 to 34" Length 30"	Each			
20	waist-adjustment buckles, cuff hook & loop Spruce Green Color Forest Service	Waist 30 to 34" Length 33"	Each			
21	waist-adjustment buckles, cuff hook & loop Spruce Green Color Forest Service	Waist 30 to 34" Length 36"	Each			
22	waist-adjustment buckles, cuff hook & loop Spruce Green Color Forest Service	Waist 32 to 36" Length 30"	Each			
23	waist-adjustment buckles, cuff hook & loop Spruce Green Color Forest Service	Waist 32 to 36" Length 33"	Each			
24	waist-adjustment buckles, cuff hook & loop Spruce Green Color Forest Service	Waist 32 to 36" Length 36"	Each			
25	waist-adjustment buckles, cuff hook & loop Spruce Green Color Forest Service	Waist 34 to 38" Length 30"	Each			
26	waist-adjustment buckles, cuff hook & loop Spruce Green Color Forest Service	Waist 34 to 38" Length 33"	Each			
27	waist-adjustment buckles, cuff hook & loop Spruce Green Color Forest Service	Waist 34 to 38" Length 36"	Each			
28	waist-adjustment buckles, cuff hook & loop Spruce Green Color Forest Service	Waist 36 to 40" Length 30"	Each			
29	waist-adjustment buckles, cuff hook & loop Spruce Green Color Forest Service	Waist 36 to 40" Length 33"	Each			

ITEM	DESCRIPTION	SIZE	UNIT	PRICE	DISCOUNTED PRICE	TOTAL
30	waist-adjustment buckles, cuff hook & loop Spruce Green Color Forest Service	Waist 36 to 40" Length 36"	Each			
31	Wildland Firefighter's Pants, Type I, 7.5-oz Meta-Aramid NOMEX, BDU-style flame-resistant	Waist 38 to 42" Length 33"	Each			
32	waist-adjustment buckles, cuff hook & loop Spruce Green Color Forest Service	Waist 38 to 42" Length 36"	Each			
33	waist-adjustment buckles, cuff hook & loop Spruce Green Color Forest Service	Waist 40 to 44" Length 33"	Each			
34	waist-adjustment buckles, cuff hook & loop Spruce Green Color Forest Service	Waist 38 to 42" Length 30"	Each			
35	waist-adjustment buckles, cuff hook & loop Spruce Green Color Forest Service	Waist 40 to 44" Length 30"	Each			
36	waist-adjustment buckles, cuff hook & loop Spruce Green Color Forest Service	Waist 40 to 44" Length 36"	Each			
37	waist-adjustment buckles, cuff hook & loop Spruce Green Color Forest Service	Waist 44 to 48" Length 30"	Each			
38	waist-adjustment buckles, cuff hook & loop Spruce Green Color Forest Service	Waist 44 to 48" Length 33"	Each			
39	waist-adjustment buckles, cuff hook & loop Spruce Green Color Forest Service	Waist 44 to 48" Length 36"	Each			
40	Wildland Firefighter's Pants, Type II, 7.0-oz Std. Pack 30 Para-Aramid Kevlar, BDU-style flame-resistant	Waist 30 to 24" Length 33"	Each			
41	waist-adjustment buckles, cuff hook & loop Light Spruce Green Color Forest Service Spec 5100-92	Waist 32 to 36" Length 30"	Each			
42	waist-adjustment buckles, cuff hook & loop Light Spruce Green Color Forest Service Spec 5100-92	Waist 32 to 36" Length 33"	Each			
43	waist-adjustment buckles, cuff hook & loop Light Spruce Green Color Forest Service Spec 5100-92	Waist 34 to 38" Length 30"	Each			
44	waist-adjustment buckles, cuff hook & loop Light Spruce Green Color Forest Service Spec 5100-92	Waist 34 to 38" Length 33"	Each			
45	waist-adjustment buckles, cuff hook & loop Light Spruce Green Color Forest Service Spec 5100-92	Waist 36 to 40" Length 30"	Each			

ITEM	DESCRIPTION	SIZE	UNIT	PRICE	DISCOUNTED PRICE	TOTAL
46	waist-adjustment buckles, cuff hook & loop Light Spruce Green Color Forest Service Spec 5100-92	Waist 36 to 40" Length 33"	Each			
47	waist-adjustment buckles, cuff hook & loop Light Spruce Green Color Forest Service Spec 5100-92	Waist 28 to 32" Length 30"	Each			
48	waist-adjustment buckles, cuff hook & loop Light Spruce Green Color Forest Service Spec 5100-92	Waist 28 to 32" Length 33"	Each			
49	waist-adjustment buckles, cuff hook & loop Light Spruce Green Color Forest Service Spec 5100-92	Waist 30 to 34" Length 30"	Each			
50	Wildland Firefighter's Helmet Cap-style helmet with peak includes three non-metallic headlamp/goggle retainer clips and four retro-reflective strips. Four-point suspension headband with crown straps, sweatband, and nape devise inside of helmet for attaching a face-and-neck shroud. Adjustable chin strap. Color Yellow Conforms to NFPA 1977 Std. pack: 20	Head sizes 6-1/2 to 8.	Each			
51	Wildland Firefighter's Helmet Full Brim with peak includes three non-metallic headlamp/goggle retainer clips and four retro-reflective strips. Four-point suspension headband with crown straps, sweatband, and nape devise inside of helmet for attaching a face-and-neck shroud. Adjustable chin strap. Color RED Conforms to NFPA 1977 Std. pack: 20	Head sizes 6-1/2 to 8.	Each			
52	Personal Gear Pack Heavyweight, urethane-coated nylon duck pack carries up to 40lbs. Of gear. Styled with a main compartment, a sleeping bag compartment and front and back poskets. Adjustable shoulder straps that hide away in back pocket buckles that allow pack to be attached to a firefighter's field pack. Carrying handle on the side. Color: Red Forest Service Spec 5100-215 Std. pack: 10		Each			

ITEM	DESCRIPTION	SIZE	UNIT	PRICE	DISCOUNTED PRICE	TOTAL
53	Complete Field Pack		Each			
	Main pack to carry all wildland firefighters tools, with belt, two canteen cases, and a belt pack. Made of coated duck, includes all necessary hardware and adjustable padded harness for men and women.					
	Color: Bright Yellow Forest Service					
54	Fireline Pack (Complete)		Each			
	Gear carrier includes a main compartment measuring approximately 1,000 cu. in., with top rain skirt allowing expansion, two side pockets which can hold two one-quart water bottles each. Two lid pockets, two fusee pockets, and a belt pocket. All totaling 2,100 cu. in.					
	Bottom mounted fire shelter sleeve can accommodate either a new generation or old design fire shelter.					
	Lumbar style pack hangs low on back for improved line digging ergonomics. Includes two canteen cases and a stuff sack. Color: Blue					
55	Canteens, Water Bags and Accessories	2-1/2 x 3-3/4 x 8-1/4	Each			
	Rigid plastic water bottle with cap is rectangular and disposable. Color: Opaque White Std Pack 100	1 quart Capacity				
56	Canteen Case designed to cover canteen medium weight cotton duckcase with snap fasteners to hold the canteen in place Web loops attach to belt. Silkscreen Reads: FSS	1 quart Capacity	Each			
	Color White					
57	Ignition Devices	72 each per box	Box			
	Backfiring Fusee for starting backfires, positive ignition action similar to highway flares. Ferrule in the base accommodates stick or handle extension. Std pack 1					
	Burns for 10 minutes.					

ITEM	DESCRIPTION	SIZE	UNIT	PRICE	DISCOUNTED PRICE	TOTAL
58	Drip Torch designed for igniting fires in vegetation with a mixture of diesel fuel and gasoline. Aluminum tank and handle assembly Tank capacity is between 1-1/8 and -3/8 gallons. Torch has a 6" diameter. Spout/igniter assembly can be stowed inside of the fuel tank when not in use. Spout with steel fuel trap extend a minimum of 10" from top of the tank to the end of the nozzle with the ignitor extending beyond the nozzle. Fuel trap in the spout and check valve assembly in the tank cover provides flashback protection. Breather valve assembly provides smooth flow of fuel when torch is in use. Meets DOT requirements for transport of flammable liquids. Color Red		Each			
	Hand Tools					
59	Pulaski Tool ax and hoe combination tool designed for the fire line digging and chopping. Cutting edges: 3-3/8" hoe 4-1/2" ax handle 36" long		Each			
60	Forest Fire Shovel Designed especially for fighting wildland fires. Features a solid shank and a straight 34" handle		Each			
61	Pulaski Tool Sheath Molded polyurethane plastic sheath effectively covers the sharp edges of the pulaski tool. Sheath consists of a buckle and strap section and rivet holes for fasteners. Sections are fastened together with oval head rivets and washers.		Each			
62	Shovel Tool Sheath Molded polyurethane plastic sheath accommodates a hand shovel and protects tool and user. Riveted with washer on both sides. Forest Service Spec 5100-316		Each			
63	Backpack Pump Outfit complete pump outfit is a combination of five gallon backpack pump bag. Firefighters hand pump and backpack pump shoulders		Each			

ITEM	DESCRIPTION	SIZE	UNIT	PRICE	DISCOUNTED PRICE	TOTAL
64	Backpack Pump Liner		Each			
	Replacement bladder of Backpack Pump bag. Not safe for drinking water bag. Does not include a quick connect fitting.					
65	Fuel Storage		Each			
	Fuel Bottle made of one piece seamless, lightweight aluminum construction with a synthetic screw on cap. Used for carrying fuel on the fire line. Measure 8.5 cm in diameter and 26 cm long and will fit in a firefighters canteen case. For use in carrying chainsaw mix and other petroleum or alcohol based fuels. Not safe for carry diring fluids.					
66	Fuel Bottle Bag	Deployed size: 86" long: 15-1/2" high; 31" wide	Each			
	Nylon bag with DOT flammable emblem on sides will hold six one-liter aluminum fuel bottles. With Side cinches to prevent rattling. Intended for use in aircraft transport.					
67	Personal Protection Fire Shelter, Complete (M-2002) New generation fire shelter provides incresed protection from radiant and convective heat in wildland firefighter entrapment situations. Includess: Fire Shelter, nylon duck and carrying case, carrying plastic liner.	Depolyed size: 96" long 19-1/2 high; 33" wide	Each			

ITEM	DESCRIPTION	SIZE	UNIT	PRICE	DISCOUNTED PRICE	TOTAL
68	Fire Shelter, Complete (M-2002 Large)	Deployed size: 86" long	Each			
	New generation fire shelter provides increased protection from radiant and convective heat in wildland firefighter entrapment situations. Includes: Fire Shelter, nylon duck and carrying case, carrying plastic liner. Designed for firefighters taller than 6'1" or whose girth exceeds 53". There larger size provides less contact with the shelter material and more air space.	15-1/2 high; 31" wide				
69	Fire Shelter, Single (M-2002)	Deployed size: 86" long	Each			
	New generation fire shelter provides increased protection from radiant and convective heat in wildland firefighter entrapment situations. Each shelter is folded in a quick opening clear polyvinyl bag. (Fire shelter only does not include case or case liner.)	15-1/2 high; 31" wide				
70	Fire Shelter, Single (M-2002 Large)	Deployed size: 96" long	Each			
	New generation fire shelter provides increased protection from radiant and convective heat in wildland firefighter entrapment situations. Each shelter is folded in a quick opening clear polyvinyl bag. Designed for firefighters taller than 6'1" or whose girth exceeds 53". There larger size provides less contact with the shelter material and more air space. (Fire shelter only does not come with case and case liner)	19-1/2 high; 33" wide				
71	Fire Shelter Carrying Case (M-2002)		Each			
	Nylon duck case for carrying M-2002 fire shelter. Opening flap closes with Velcro. Includes vertical and horizontal hangers. Instructions provided in front pocket. For use with M-2002 regular and large) Forest Services Spec 5100-609					
72	Fire Shelter Carrying Case Liner		Each			
	Opened topped hard plastic liner fits inside M-2002 fire shelter carrying case. Liner protects the shelter from being crushed. For use with M-2002 regular and large carrying case.					

ITEM	DESCRIPTION	SIZE	UNIT	PRICE	DISCOUNTED PRICE	TOTAL
73	Training/Practice Fire Shelter, Complete (M-2002)		Each			
	Reusable practice fire shelter system for trainging in use of					
	M-2002fire shelter. Same size and duimensions as M-2002 fire					
	shelter. Includes the carrying case, case liner, polyvinyl bab					
	and practice shelter. Note: This is not fire-resistant and					
	should not be used as a fire shelter.					
74	Training/Practice Fire Shelter, Complete (M-2002 Large)		Each			
	Reusable practice fire shelter system for trainging in use of					
	M-2002fire shelter. Same size and duimensions as M-2002 fire					
	shelter. Includes the carrying case, case liner, polyvinyl bab					
	and practice shelter. Designed for firefighters taller than 6'1"					
	or whose grith exceeds 53" at any point. Note: This is not fire-					
	resistant and shul not be used as a fire shelter.					
GRAND TOTAL						

5100-91J
February 24, 2011
Supercedes
5100-91H
March 5, 2009

U.S. DEPARTMENT OF AGRICULTURE
FOREST SERVICE

SPECIFICATION

SHIRT, FLAME-RESISTANT ARAMID

1. SCOPE AND CLASSIFICATION

1.1 Scope. This specification covers the requirements for flame-resistant aramid shirts.

1.2. Classification. The shirt shall be of one type in the following sizes (see 6.2):

Schedule of sizes

Extra Small (X-SMALL)

Small (SMALL)

Small-Long (SMALL LONG)

Medium (MEDIUM)

Medium-Long (MEDIUM LONG)

Large (LARGE)

Large-Long (LARGE LONG)

Extra Large (X-LARGE)

Extra Large-Long (X-LARGE LONG)

Extra Extra Large (XX-LARGE)

Extra Extra Large-Long (XX-LARGE LONG)

Extra Extra Extra Large (XXX-LARGE)

Extra Extra Extra Large Long (XXX-LARGE LONG)

2. APPLICABLE DOCUMENTS

2.1 Government documents.

2.1.1 Specifications, standards, and handbooks. 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).

Beneficial comments (recommendations, additions, deletions) and any pertinent data that may be used in improving this document should be addressed to: USDA Forest Service, Missoula Technology and Development Center, 5785 Highway 10 West, Missoula, MT 59808, ddavis02@fs.fed.us.

FSC 8415

5100-91J

SPECIFICATIONS

FEDERAL

A-A-50198 - Thread, Gimp, Cotton, Buttonhole
 A-A-55126 - Fastener Tapes, Hook and Loop, Synthetic
 A-A-55217 - Thread, Aramid, Spun Staple
 V-B-871 - Button, Sewing Hole, and Button, Staple, (Plastic)

USDA FOREST SERVICE

5100-87 - Cloth, Shirting, Aramid

STANDARDS

FEDERAL

FED-STD-123 - Marking for Shipment (Civil Agencies)
 FED-STD-376 - Preferred Metric Units for Use By the Federal Government

(Unless otherwise indicated, copies of federal and military specifications and standards are available online at <https://assist.daps.dla.mil/quicksearch/> or in hard copy from the Standardization Documents Order Desk, Building 4D, 700 Robbins Ave., Philadelphia, PA 19111-5094. Copies of USDA Forest Service specifications are available from the preparing activity, 6.6)

2.1.2 Other Government documents, drawings, and publications. The following other Government documents, drawings, and publications form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents shall be those in effect on the date of the invitation for bids or request for proposals (see 6.2).

DRAWINGS

USDA FOREST SERVICE

MTDC-1067 - Patterns, Shirt, Flame-Resistant, Aramid, M-2011

(Copies of Forest Service drawings are available from the preparing activity, 6.6.)

2.2 Non-Government publications. The following documents form a part of this specification 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).

AMERICAN SOCIETY FOR QUALITY (ASQ)

Z1.4 - Sampling Procedures and Tables for Inspection by Attributes

(Copies are available from the American Society for Quality, PO Box 3005, Milwaukee, WI 53201-3005, www.asq.org.)

5100-91J

ASTM

- D 3951 - Standard Practice for Commercial Packaging
- D 5118 - Standard Practice for Fabrication of Fiberboard Shipping Boxes
- D 6193 - Standard Practice for Stitches and Seams

(Copies are available from ASTM International, 100 Barr Harbor Dr., West Conshohocken, PA 19428-2959, www.astm.org.)

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

1977 - Protective Clothing and Equipment for Wildland Fire Fighting

(Address requests for copies to National Fire Protection Association, 1 Batterymarch Park, P.O. Box 9101, Quincy, MA 02269-9101, www.nfpa.org.)

NATIONAL MOTOR FREIGHT TRAFFIC ASSOCIATION, INC., AGENT

National Motor Freight Classification

(Address requests for copies to the American Trucking Association, Inc., Traffic Department, 1616 P St. NW, Washington, DC 20036.)

UNIFORM CLASSIFICATION COMMITTEE, AGENT

Uniform Freight Classification

(Address requests for copies to Uniform Freight Classification Committee, Room 1106, 222 S. Riverside Plaza, Chicago, IL 60606.)

(Non-Government standards and other publications normally are available from the organizations that prepare or 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 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 (see 6.2), First Article Samples of each size in the regular lengths shall be subjected to first article inspection (see 6.3) in accordance with 4.3. During the term of the contract the contractor shall be required to notify the contracting officer in writing when a component, or the component supplier, changes in any way; when a major manufacturing process changes in any way; and when a manufacturing location changes. The contracting officer may at any time require the contractor to submit a new first article sample when substantive changes occur during the term of the contract.

5100-91J

3.1.1 NFPA 1977. The shirts shall be third party certified as being in compliance with National Fire Protection Association (NFPA) Standard 1977, Protective Clothing and Equipment for Wildland Fire Fighting. Proof of this certification shall be presented at the time of First Article submission.

3.2 Materials and components. Materials and components shall be as specified herein and in the applicable drawing, MTDC-1067.

3.2.1 Basic material. The basic material shall in accordance with the requirements specified in Forest Service specification 5100-87, the fabric shall have a soft hand.

3.2.2 Collar interlining. It shall be optional to the contractor to use any of the three materials specified in 3.2.2.1, 3.2.2.2, and 3.2.2.3 for the collar interlining.

3.2.2.1 Basic material. The collar interlining shall be basic material (see 3.2.1).

3.2.2.2 Aramid blend. The collar interlining shall be a blend of 93 percent meta-aramid and 5 percent para-aramid, 2 percent antistatic. The interlining shall be 4.2 to 5.8 ounces per square yard, plain weave. The color shall be natural or yellow. The interlining shall conform to textile fabric requirements specified in NFPA 1977 for protective clothing. The number of fabric nonconformities shall not exceed 200 points per hundred yards when tested in accordance with yard-by-yard inspection for basic material (see 3.2.1).

3.2.2.3 Nonwoven aramid. The collar interlining shall be meta-aramid weighing 1.0 to 1.6 ounces per square yard.

3.2.3 Thread. The aramid thread shall conform to Type I, Tex size 35-40 and Tex size 50-60, or Type II, Tex size 27 and Tex size 45, A-A-55217. Thread color shall be a good approximation of the basic material (see 3.2.1).

3.2.4 Gimp. The cotton gimp for reinforcing buttonholes shall conform to Soft Finish Tex 210, or Glazed Finish Tex 180 of A-A-50198. The color shall be a good approximation of the basic material (see 3.2.1).

3.2.5 Buttons. The buttons shall conform to type II, class D, style 26, size 30-line of V-B-871. The color shall be a good approximation of the color of the basic material (see 3.2.1) and shall have a glossy finish.

3.2.6 Fastener tape, hook and pile. The hook and pile fastener tape shall conform to 1 inch width, type II, class 1 of A-A-55126. The color of the tape shall be a good approximation of the color of the basic material (see 3.2.1).

3.2.7 Labels. Each shirt shall have two labels, one being the combination identification/instruction/care label and the other being a size label. The labels may be woven or non-woven, and shall meet the requirements of NFPA 1977.

5100-91J

3.2.7.1 Combination label. The combination identification/care label shall be written as follows:

[The following information shall be printed in letters at least 3/32 inch in height]
 THIS WILDLAND FIRE FIGHTING PROTECTIVE GARMENT MEETS THE REQUIREMENTS OF NFPA
 1977, STANDARD ON PROTECTIVE CLOTHING AND EQUIPMENT FOR WILDLAND FIRE FIGHTING,
 2011 EDITION.(1/)

[The following information shall be printed with letters at least 1/16 inch in height.]

[Authorized mark of certifying organization] (2/)
 DATE OF CERTIFICATION [mm/yy (as a minimum)] (2/)

SHIRT, FLAME-RESISTANT, ARAMID
 NSN: [- - -] (2/)
 US FOREST SERVICE SPECIFICATION 5100-91J
 MATERIALS CONTENT: 93 % META-ARAMID, 5% PARA-ARAMID, 2% ANTISTATIC
 SIZE: [] (2/)

[Manufacturer's name] (2/)
 [Manufacturer's address] (2/)
 [Country of origin] (2/)
 Contract Number: [] (2/)
 [Manufacturer's garment identification number, lot number, or serial number] (2/)

DATE OF MANUFACTURE: [mm/yy] (2/)

CARE INSTRUCTIONS

- a. Machine wash hot. NO BLEACH.
- b. Wash separately from flammable, lint-producing fabrics.
- c. Rinse thoroughly. Soap or detergent residues will burn.
- d. DO NOT STARCH. Starch will burn.
- e. Tumble dry medium. Remove garment promptly.

DO NOT REMOVE THIS LABEL (3/)

1/ Or more current revision as applicable.

2/ The manufacturer shall insert the applicable information.

3/ When a split label is used, this legend shall appear as the bottom line on both labels.

3.2.7.1.1 Split combination label. It shall be optional to split the combination label information onto two separate labels providing both labels have 'DO NOT REMOVE THIS LABEL' as the bottom line. When the label is split, the second label shall be sewn to the inside of the front right facing in a location and construction corresponding to the front left facing label.

5100-91J

3.2.7.2 Size label. The size label shall be sewn on the inside center back approximately 1/4 inch below the neckline. Sew label on all four sides with a single row of stitching 1/16 to 1/8 inch from edges. The printing shall be clearly visible. The size label shall finish 7/8 by 1-1/2 inch. The label shall be white, the lettering shall be black. The letters shall be a minimum of 3/16 inch high. The size label shall be written as follows:

X-SMALL	SMALL	SMALL LONG	MEDIUM	MEDIUM LONG
LARGE	LARGE LONG	X-LARGE	X-LARGE LONG	XX-LARGE
XX-LARGE LONG	XXX-LARGE	XXX-LARGE LONG		

3.2.8 User instructions. Figure 4 illustrates the user instructions that shall be inserted into each packaged shirt before closure of the package (5.1.1). User instructions shall be printed on 5-1/2 by 8-1/2 inch minimum size sheets of white, 60 pound offset paper stock. Printing shall be with black ink.

3.3 Design. The shirt shall be a long sleeved single-breasted design, button through front and a straight cut bottom (see figures 1 & 2).

3.3.1 Collar. The stand-up collar design shall have a hook and loop fastener tape closure. The interlining shall be quilted to the under collar with four lines of stitching, 1/2 inch gage.

3.3.2 Chest pockets. There shall be two chest patch pockets with flaps (see MTDC-1067 for placement). The left pocket only shall have a sewn pencil division. One inch fastener tape closures are used on the pocket flaps. For all sizes the chest pockets shall finish 6-1/4 X 6-1/4 inches ($\pm 1/4$) and the openings shall measure 6 inches ($\pm 1/8$) between bartacks. The flaps shall finish 6-1/2 X 2-5/8 inches ($\pm 1/4$).

3.3.3 Back. The back possesses a bi-swing bellows design (see figure 2).

3.3.4 Elbow patch. There shall be an elbow patch on each sleeve (see MTDC-1067 for placement).

3.3.5 Pencil pocket. The left sleeve shall have a two channel pencil pocket. The hem of the pencil pocket shall be 3/4 inch wide, double turned clean finished. The pencil pocket shall finish 5-1/4 X 2-3/4 inches ($\pm 1/4$) for all sizes (see pattern for placement). The flap shall finish 2-5/8 X 3 inches ($\pm 1/4$).

3.3.6 Cuffs. Each sleeve cuff opening shall be adjustable and have a pointed tab with a hook and loop fastener tape closure.

3.4 Patterns. Standard full size patterns (MTDC-1067) will be furnished by the Government. The standard patterns shall not be altered in any way and shall be used only as a guide for cutting the contractor's working patterns. The contractor's working patterns shall be identical to the standard patterns. The standard patterns provide a seam allowance of 1/2 inch for side seams, shoulder seams, collar and sleeve seams; and 3/8 inch allowance for all other seams, except where otherwise specified. Pockets, pocket flaps, pencil pocket, elbow patches, and hook and loop fastener tape shall be located in accordance with marks on patterns. The pattern list in Table I is provided to insure that the pattern set provided is complete. The working patterns will be identical to the Government patterns except that additional notching to facilitate manufacture is permissible. Also minor modifications are permitted where necessary to accommodate manufacturer's processes and using automatic equipment. These modifications shall not alter the serviceability or appearance requirements. **NOTE:** When the 5-thread safety stitch is used for the shoulder and armhole seams, contractor must adjust patterns for 3/8-inch gage in lieu of 1/2-inch double needle seams.

5100-91J

3.4.1 List of pattern parts. The components of the shirt shall be cut from materials as specified in accordance with Table I:

Table I. List of pattern parts.

Material	Pattern nomenclature	Cut parts
Basic material	Front	2
	Back	1
	Side back	2
	Top sleeve	2
	Under sleeve	2
	Top collar	1
	Under collar	1
	Pocket	2
	Pocket flap	2
	Cuff	2
	Cuff tab	2
	Pocket (Lt side)	1
	Pencil pocket flap	1
	Elbow patch	2
Basic material or optional aramids	Collar interlining	1

3.5 Construction.

3.5.1 Stitches, seams and stitching. Stitch, seam, and stitching types, as specified in table II, shall conform to ASTM D 6193. When two or more seam or stitch types are given for the same part of an operation, any one of them may be used. Where stitch type 401 is used, the chain, or underside of the stitch, shall be on the inside of the shirt. Seam allowances shall be maintained with seams sewn so that no raw edges, runoffs, twists, pleats, puckers or open seams will result. All seams shall start and finish evenly. Thread tension shall be maintained so that there is no tight or loose stitching. All material edges shall be clean finished, either turned-in, turned-under, or serged. Overedge or pre-hemming shall be 6-10 stitches per inch. Unless otherwise indicated by patterns, bartacks shall be set 1/8-inch from edge. All pocket flaps shall be serged prior to setting. The openings above Bi-swing bartacks shall be closed by superimposing stitching on topstitching.

3.5.1.1 Safety and overedge stitching. The gage of safety stitching shall be 5/16 to 3/8 inch. The gage of overedge stitching and the overedge portion of safety stitching shall be 3/16 to 1/4 inch. The guides and knives for the safety stitch and overedge machines shall be set to trim only the raveled edges of the fabric.

3.5.1.2 Thread breaks and ends of seams. Ends of all seams and stitching produced with 301 stitch type, when not caught in other seams or stitching, shall be backtacked not less than 1/2 inch. Thread breaks (all stitch types) shall be secured by stitching back of the break not less than 1/2 inch. Skipped stitches and thread breaks for 401 stitch type may be repaired using 301 stitch type. The ends of a continuous line of stitching (except labels and automatic stitching) shall be overlapped not less than 1/2 inch. The ends of labels and automatic stitching shall be overlapped not less than three stitches.

3.5.1.3 Stitches per inch. The minimum and maximum number of stitches per inch shall be as specified in table II.

5100-91J

Table II. Seam and Stitching Types

Seam Placement	Seam type	Gage	Stitch type	Stitches per inch	Thread
Side/front seams, arm seams, set in sleeves, shoulder seams OR Alternate safety stitch for shoulder and armhole	LSc-2	3/16 to 1/4 inch gage (double lap seam)	301 or 401	10-13	50-60
Safety stitch side to back	SSa-2	3/8 to 1/2 inch gage	516, 519	8-10	50-60 chainstitch 35-40 overedge
Top stitch side/back, shoulder & armhole (if safety stitched)	SSa-2	3/16 to 1/4 inch gage	301 or 401	8-10	35-40
Front facings	EFa-1	1/16 to 1/8 inch from edge	301	10-13	35-40
Top stitching of pocket flaps, front edge	OSf-1	1/16 to 1/8 inch from edge	301	10-13	35-40
Attachment of pockets When using automatic pocket setting equipment topstitching shall be 1/6 or 1/8 gage	LSd-1	1/16 to 1/8 inch from edge	301	10-13	50-60
Left chest pocket pencil channel	SSv-1	1-1/2 inch \pm 1/8 from right edge, sewn top to bottom edge of pocket	301	10-13	35-40
Attachment of pocket flaps	LSd-1	1/16 to 1/8 inch from edge	301	10-13	50-60
Attachment of elbow patches	LSd-1	1/16 to 1/8 inch from edge	301	10-13	35-40

5100-91J

Table II. Seam and Stitching Types (continued)

Seam Placement	Seam type	Gage	Stitch type	Stitches per inch	Thread
Bottom hemming	EFb-1	1/16 to 1/8 from edge 1/2 ± 1/8 inch wide hem, double turned clean finished	301	10-13	35-40
Sleeve hemming	EFb-1	1/16 to 1/8 inch from the edge 1/2 ± 1/8 inch wide hem	301	10-13	35-40
Attach cuff tab to cuff	SSe-2	1/16 to 1/8 inch from the edge	301	10-13	35-40
Setting cuffs	LSd-1	1/16 to 1/8 inch from the edge	301	10-13	35-40
Attach collar interlining to under collar	SSv-4	Four rows 1/2 inch apart (top and bottom rows match marks on under collar pattern)	301 or 401	10-13	35-40
Attach under collar to top collar	SSe-2	1/16 to 1/8 inch from the edge	301	10-13	35-40
Setting collar	SSa-1 LSb-1	1/16 to 1/8 inch from the edge	301	10-13	50-60
Hook/Loop	LSbj-1	1/8 inch ± 1/32 from the edge on all 4 sides	301	7-12	50-60
Top stitch pleat of Bi-swing	Efa-2 LSbm-4	Two rows 3/16 to 1/4 inch gage apart	301	10-13	35-40
Attachment of buttons			301	per button	35-40
Attachment of labels	LSbj-1	1/16 to 1/8 inch from the edge on all 4 sides	301	7-12	50-60

5100-91J

3.5.2 Puckering. In the course of the sampling examination, seams suspected of being puckered shall be examined at a distance of 3 feet, any seam that is puckered for 2 or more inches so that it causes visible distortion of the garment, shall be scored as a puckered seam.

3.5.3 Buttonholes. The buttonholes shall be the cut-after eyelet end taper bar type, worked over gimp with the end tacked with not less than four stitches not counting the cross-over stitch. The stitching shall be caught in the fabric with the purling on the outside. The finished cut length of the buttonholes shall be 3/4 to 7/8 inch. There shall be 50-60 stitches per buttonhole using Type I, Tex size 35 thread.

3.5.4 Bartacks. Bartack placement shall be as specified in table III (see figures 1 and 2). Unless otherwise specified, bartacks shall be as follows, bartacking shall be free from thread breaks and loose stitching:

Length	Width	Tolerance		Stitches per Bartack	Thread
		Length	Width		
1/2 inch	1/8 inch	±1/16 inch	±1/32 inch	28	35-40

Table III. Bartack Placement

Bartack Placement	Number of Bartacks
All pocket flaps on ends of topstitching	2
Each lower sleeve tab	2
Each lower sleeve seam	1
Each front chest pocket opening	2
Top of pencil pocket, superimposed on stitchlines	2
Top of left chest pocket pencil channel, superimposed on stitchline	1
Bi-swing, upper and lower locations as indicated on patterns (place upper bartack for all sizes 2 inches from the top edge of the back pattern piece)	2

3.6 Manufacturing operations. The shirt shall be made in accordance with the manufacturing requirements specified in table II.

3.6.1 Figures. Figures 1, 2, and 3 are furnished for information purposes only. In the event of inconsistencies between the specification and the figures, the specification shall govern.

3.6.2 Shade and size marking. The cut components of the shirt shall be marked or bundled to ensure a uniform shade and size throughout the garment. Any method of marking may be used except:

- a. Corrosive metal fastening devices.
- b. Sew-on type tickets.
- c. Adhesive type tickets that discolor the material or leave traces of paper or adhesive on material after ticket removal.

5100-91J

3.7 Finished measurements. Finished measurements of shirts shall be as specified in table IV.

Table IV. Finished measurements (inches, $\pm 1/2$ inch)

Size	1/2 chest (A) <u>1/</u>	Back length (B) <u>2/</u>	Sleeve length (C) <u>3/</u>
Extra Small	20-1/2	28-5/8	21-7/16
Small	22-1/2	29-5/8	21-3/4
Small-Long	22-1/2	31-1/8	22-3/4
Medium	24-1/2	30-5/8	22-1/16
Medium-Long	24-1/2	32-1/8	23-1/16
Large	26-1/2	31-5/8	22-3/8
Large-Long	26-1/2	33-1/8	23-3/8
Extra Large	28-1/2	32-5/8	22-11/16
Extra Large-Long	28-1/2	34-1/8	23-11/16
Extra Extra Large	30-1/2	33-5/8	23
Extra Extra Large-Long	30-1/2	35-1/8	24
Extra Extra Extra Large	32-1/2	34-5/8	23-5/16
Extra Extra Extra Large-Long	32-1/2	36-1/8	24-5/16

NOTE: A, B, and C refer to figure 3. A, B, and C measurements shall be taken with the shirt buttoned and laid flat and smooth.

1/Chest measurement shall be taken with shirt buttoned, at a point in line with pit of armhole, from folded edge to folded edge.

2/Back length shall be taken along center of back from undercollar seam to bottom edge of shirt.

3/Sleeve length shall be taken with the sleeve folded along the underarm seam; measure from the arm pit to bottom of sleeve (including cuff).

3.8 Deviations and waivers. Deviations and waivers to the materials or construction specified herein shall not be allowed unless authorized in writing by the administrative contracting officer.

3.9 Workmanship. The finished shirts shall conform to the quality of product established by this specification. The occurrence of nonconformities shall not exceed the applicable acceptable point values. The finished shirts shall conform to NFPA 1977 requirements for protective clothing.

3.10 Metric products. 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 FED-STD-376, and all other requirements of this specification are met.

3.11 Recovered materials. The contractor is encouraged to use recovered material in accordance with Federal Acquisition Regulation 23.4 to the maximum extent practical.

5100-91J

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 (examinations and tests) as specified herein. Except as otherwise specified in the contract or purchase order, the contractor may use his/her own or any other facilities suitable for 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 ensure supplies and services conform to prescribed requirements.

4.1.1 Responsibility for certification. An approved Certification Organization shall certify that the shirts meet the requirements of NFPA 1977. The contractor shall provide all required materials, garments, and information to the Certification Organization to permit such certification.

4.1.2 Responsibility for compliance. All items shall 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 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 nonconforming material, either indicated or actual, nor does it commit the Government to acceptance of nonconforming material.

4.1.3 Responsibility for dimensional requirements. Unless otherwise specified in the contract or purchase order, the contractor is responsible for ensuring that all specified dimensions have been met. When dimensions cannot be examined on the end item, inspection shall be made at any point or at all points in the manufacturing process necessary to ensure compliance with all dimensional requirements.

4.1.4 Certification of compliance. Unless otherwise specified, certificates of compliance supplied by the manufacturer of the item, component, or material, listing the specified test method and test results obtained, may be furnished in lieu of actual lot by lot testing performed by the contractor (see 4.3.2). Where certificates of compliance are submitted, the Government reserves the right to check test such items to determine the validity of the certification.

4.2 Sampling for inspections and tests. Sampling for inspections and tests shall be made in accordance with ASQ Z1.4. The inspection level and acceptable quality level (AQL) shall be as specified.

4.3 Quality conformance inspection. Each end item lot shall be sampled and inspected as specified in 4.3.4.1 and 4.3.4.2. As part of quality conformance inspections, test results shall be submitted to determine compliance of the basic cloth with the requirements of Forest Service specification 5100-87. The packaging shall be sampled as specified in 4.4. Packaging is not required when first articles are presented. Unless otherwise specified (see 6.2), the first articles submitted in accordance with 3.1 shall be inspected as specified in 4.3.4.1 and 4.3.4.2. The presence of any nonconformity or failure to pass any test shall be cause for nonacceptance of a first article sample.

4.3.1 Component and material inspection. In accordance with 4.1, components and materials shall be inspected in accordance with all the requirements of referenced documents, drawings, and standards unless otherwise excluded, amended, modified, or qualified in this specification or applicable purchase document.

5100-91J

4.3.2 Certification. As a part of the first article submission the contractor shall provide certificates of compliance (COC) for the materials of the shirts. COCs shall be provided for the following components:

- Basic material (3.2.1)
- Collar interlining (3.2.2)
- Thread (3.2.3)
- Gimp (3.2.4)
- Buttons (3.2.5)
- Hook and Loop fastener tape (3.2.6)
- Labels (3.2.7)

4.3.2.1 COC Contents. The COC shall include the following:

- Specification with type, class, etc.
- Quantity purchased
- Purchase source, address, and telephone number
- Purchase date

4.3.2.2 Test Reports. The COCs shall be supported by test reports for the following components, test reports of tests performed by the contractor or the manufacturer are acceptable.

- Basic material (3.2.1)
- Thread (3.2.2)

4.3.2.3 NFPA 1977. As a part of first article submission, the contractor shall provide copies of the third party certification to NFPA 1977.

4.3.3 In-process inspection. Inspection shall be made at any point or during any phase of the manufacturing process to determine whether cut and finished lengths, cut parts, marking for location of components, and location of assembled component parts are in accordance with specified requirements and the drawings. Whenever non-conformance is noted, corrections shall be made to the parts and lot affected in-process. Parts that cannot be corrected shall be removed from production.

4.3.4 Examination of the end item. Examination of the end items shall be in accordance with 4.3.4.1 and 4.3.4.2.

4.3.4.1 Visual examination. Each sample shirt selected from lots presented for delivery shall be examined for nonconformities in color, design, material, construction, workmanship and marking and the nonconformities classified in accordance with table V as follows:

5100-91J

TABLE V. End item classification of visual nonconformities

<u>Nonconformity</u>	<u>Point value</u>
<u>Material Nonconformities and Workmanship Damages</u>	
a. Any hole, cut, tear, mend, burn, needle chew, exposed drill holes, or open place:	2
1. Up to and including 1/4 inch	3
2. More than 1/4 inch	1
b. Knot larger than 1/32 inch on any part of the shirt.	1
<p><u>NOTE:</u> Material nonconformities and workmanship damages are to be classified as indicated above only when the condition is one which definitely weakens the structure of the garment, or when it is so conspicuously located as to be clearly noticeable. Nonweakening conditions which are inconspicuous shall not be classified as nonconformities.</p>	
<u>Shaded Parts</u>	
a. Shaded parts (excluding sleeve tab, breast pocket flap liner, and collar interlining).	2
b. Any shade bar above the bottom buttonhole on the finished shirt.	1
c. Shade of sleeve tab or breast pocket flap liner not good approximation of the shade of the garment.	1
<u>Cleanness</u>	
a. Any spot or stain on outside.	1
b. Five or more thread ends not trimmed to 1/2 inch or less.	1
c. Two or more shade or size tickets not removed.	1
d. One or more shade or size markings visible on outside.	1
<u>Cutting</u>	
a. Any component part not cut in accordance with specified pattern or directional lines as indicated on patterns or not in accordance with specification requirements.	3
<u>Components and Assembly</u>	
a. Any component part or required operation omitted (unless otherwise classified herein).	3
b. Any operation not performed as specified (unless otherwise classified herein).	1
c. Any component not as specified (type, size, color, etc.).	3
d. The edge of any component part required to be forced out, having folds more than 1/8 inch (unless otherwise classified herein).	1
e. Any component part twisted, distorted, pleated, misshaped, tight, or full (unless otherwise classified herein).	2

5100-91J

TABLE V. End item classification of visual nonconformities (continued)

<u>Nonconformity</u>	<u>Point value</u>
<u>Seams and Stitching</u>	
a. General:	
1. Seam irregular, twisted, or wavy (unless otherwise classified herein).	1
2. Seam puckered (score only on major portion of seam) (see 3.5.2).	1
3. Any part of shirt caught in an unrelated operation or stitching.	2
4. End of stitching when not caught in other seams or stitching not backstitched as specified (except stitching for attaching labels and automatic stitching).	1
5. Thread break (all stitch types) stitched less than 1/2 inch beyond each end of break.	1
6. Ends of a continuous line of stitching not overlapped as specified.	1
7. Thread color not as specified.	1
8. Stitching for attaching labels or automatic stitching not finished as specified.	1
b. Gage of stitching and seam allowance:	
1. Gage irregular or not within range specified.	1
2. Edge or raised stitching sewn too close to edge, resulting in damage of cloth.	2
3. Seam allowance more than 1/16 inch more or less than specified.	1
c. Open seams:	
1. On all seams except bottom hem and label stitching:	
(a) Up to 1/2 inch (inclusive).	1
(b) More than 1/2 inch up to 3/4 inch (inclusive)	2
(c) More than 3/4 inch	3
2. On bottom hem more than 1/2 inch.	1
3. On label stitching.	1
<u>NOTE:</u> One or more broken, skipped, or runoff stitches on a joining seam constitutes an open seam.	
d. Runoffs:	
1. On joining seam score as open seam.	
2. Edge or raised stitching (when not resulting in an open seam);	
(a) Up to 1/2 inch (inclusive)	1
(b) More than 1/2 inch	2
e. Raw edges:	
<u>NOTE:</u> Raw edge not caught in stitching shall be classified as an open seam (unless otherwise specified).	
f. Seam and stitch type:	
1. Seam or stitch type not as specified.	2
2. Loper thread on outside.	3
3. Any required line of stitching omitted.	3
4. Any line of stitching not beginning or ending where specified (unless otherwise classified herein).	1
5. Any seam not lapped or finished as specified.	1

5100-91J

TABLE V. End item classification of visual nonconformities (continued)

Nonconformity	Point value
g. Broken, missing, or skipped stitches on edge or raised stitching (when seam is seamed, turned, and stitched) more than 1/4 inch.	1
h. Stitch tension:	
1. Loose tension, resulting in a loose seam.	3
2. Loose tension on edge or raised stitching, resulting in exposed loose thread.	1
3. Tight tension (stitches break when strain is applied in direction of seam or stitching).	3
<u>NOTE:</u> Puckering is evidence of tight tension. When puckering is evident, seam shall be tested by exerting pull in lengthwise direction of seam or stitching. If broken stitching results from the pull, score as specified above.	
i. Stitches per inch:	
1. Stitches per inch to be scored only when the condition exists on more than half the length of seam or stitching:	
(a) Less than the minimum specified.	2
(b) More than maximum specified.	1
<u>Buttonholes</u>	
a. Omitted, misplaced, added, not specified type, or not finished as specified.	3
b. Gimp omitted, uncut buttonhole.	1
c. Ragged edge, incomplete stitching, stitching not securely caught in fabric.	2
d. One or more broken stitches or two or more skipped stitches in one or more buttonholes.	1
e. Buttonhole stitching extending beyond bartack; stitches per buttonhole less than minimum specified. (1/)	1
f. Finished cut length not as specified.	1
g. Gimp color not a good approximation of the color of the basic material.	1
h. End of button hole tacked with less than four stitches.	1
<u>Buttons (applying to all buttons)</u>	
a. Missing, broken, defective (2/), misplaced, not positioned, or attached as specified, or insecurely sewn.	2
b. Wrong type, size, or color.	3
c. Badly shaded.	1
d. Stitching on one or more not locked at end of cycle (tug at the loose end of the thread when accessible to determine if it will ravel).	1

1/ Stitches per buttonhole shall be determined by counting the number of needle perforations containing stitch floats to the outside of the buttonhole gimp.

2/ A button shall be considered nonconforming when it has sharp, rough, cracked, or split edge; has scratch, dent, blemish, or imbedded air bubble(s) or foreign matter; or is badly shaded.

5100-91J

TABLE V. End item classification of visual nonconformities (continued)

<u>Nonconformity</u>	<u>Point value</u>
<u>Fastener Tapes</u>	
a. Hook and loop tapes not positioned as specified, exceeding 1/8 inch tolerance.	1
b. Length and width not as specified.	1
c. Incorrect color.	1
<u>Bartacks</u>	
a. One missing, loose, or misplaced; not specified size or not serving intended purpose.	1
b. Two missing, loose, or misplaced; not specified size or not serving intended purpose.	2
c. Three or more missing, loose, or misplaced; not specified size or not serving intended purpose.	3
d. Loose stitch tension.	1
<u>Labels</u>	
a. Size label:	
1. Label missing, incorrect, or illegible.	3
2. Label not located below collar seam as specified.	1
3. Label off center by more than 1/2 inch.	1
4. Stitching through the printing of label.	1
5. Label not sewn on all 4 sides	1
b. Combination label:	
1. Missing, incorrect, or illegible.	3
2. Stitching exposed on outside of shirt.	1
3. Not positioned as specified.	1
4. Stitching through the printing.	1
<u>Collar</u>	
a. Not uniform in size or shape--any point varying more than 3/8 inch with corresponding point or matching part.	3
b. Collar points uneven in length by 3/8 inch or more.	2
c. Twisted, not smooth, too full, short, or tight, causing collar to turn out.	2
d. Collar points not properly forced out.	2
e. Off center by 1/2 inch or more. (3/)	1
f. Tight at joining to neck, causing puckers or pleats at neckline (see 3.5.2).	1
g. Edge of collar not properly forced out, i.e., having a fold of more than 1/8 inch.	1
h. Stitching of topcollar joining seam more than 1/8 inch above or below stitching of undercollar joining seam for a distance of more than 2 inches.	1
i. Parallel rows of stitching on undercollar omitted.	3
j. Stitch gage of parallel rows of stitching varying from the gage specified by more than 1/8 inch.	1

3/ Center of collar is determined by aligning the two shoulder seams at junction of collar.

5100-91J

TABLE V. End item classification of visual nonconformities (continued)

<u>Nonconformity</u>	<u>Point value</u>
<u>Fronts</u>	
a. Spacing between two or more buttonholes unequal by 1/4 inch or more.	1
b. Buttonhole position:	
1. Buttonhole less than 5/8 inch or more than 7/8 inch from edge.	1
2. Two or more buttonholes out of horizontal alignment by more than 1/4 inch.	1
3. Lapel buttonhole not parallel with top edge of lapel.	1
c. Front tight or short, or front facing tight or twisted causing noticeable bulge or twist when shirt is buttoned.	1
d. Front edge not folded straight with warp line (i.e., forming curve).	1
e. Length of fronts:	
1. Uneven by 1/2 inch or more at bottom, when buttoned.	1
2. Uneven by 1/2 inch or more at neck, when buttoned.	1
<u>Front Facing</u>	
a. Facing not caught as specified.	1
b. Back edge of facing not finished as specified.	1
c. Width of facing not as specified.	1
d. Facing not smooth and flat, shows evidence of puckering.	1
<u>Pocket or Flap</u>	
a. Not uniform in size or shape - any measurement varying from pocket to pocket or flap to flap by:	
1. More than 3/8 inch.	3
2. 1/4 inch up to and including 3/8 inch.	2
b. Out of alignment at any point from pocket to pocket or flap to flap by: (Determination may be made by a straight edge)	
1. More than 1/2 inch.	3
2. More than 3/8 inch up to and including 1/2 inch.	1
<u>Pocket</u>	
a. Pocket edge(s) not parallel to front edge of shirt by:	
1. More than 3/8 inch.	3
2. More than 1/4 inch up to and including 3/8 inch.	2
3. 3/16 inch up to and including 1/4 inch.	1
b. Edge of pocket pleated or twisted.	1
c. Pocket corner not secured as specified.	1
d. Width of pocket hem not as specified.	1
e. Pocket hem not overedged.	1
f. Pocket opening gapped.	1

5100-91J

TABLE V. End item classification of visual nonconformities (continued)

<u>Nonconformity</u>	<u>Point value</u>
<u>Flap</u>	
a. Attached crookedly:	
1. Distance between sides of pocket and underside of opened flap vary by more than 1/8 inch.	2
b. Pocket exposed beyond end of flap by 1/8 inch or more.	1
c. Not properly forced out.	1
d. Underside of flap not finished as specified.	1
e. Edge of under flap exposed beyond edge of top flap 1/16 inch or more for a distance of 1 inch or more.	1
f. Side edge(s) of flap extending beyond side edge(s) of pocket by more than 1/4 inch.	1
<u>Sleeves</u>	
a. Sleeves reversed.	3
b. Sleeves pleated or excessive fullness at armhole, affecting appearance (see 3.5.2).	2
c. Sleeve tight at armhole seam causing puckers on front or back, affecting appearance (see 3.5.2).	2
d. Sleeve hem (bottom of sleeve) finishing less than 1-3/8 inch or more than 1-5/8 inch wide.	1
e. Sleeve hem irregular in width by 1/4 inch or more.	1
f. Sleeve tab not finished flat and smooth.	1
g. Tab not positioned as specified or attached crookedly.	1
h. Tab width less than 1-3/8 inch or more than 1-5/8 inch.	1
<u>Bottom Hem</u>	
a. Less than 3/8 inch or more than 5/8 inch wide.	1
b. Irregular in width by 1/4 inch or more.	1
c. Hem end extending more than 1/8 inch beyond front edge of shirt.	1
d. Hem twisted, pleated, or puckered (see 3.5.2).	1

4.3.4.1.1 Acceptable point values. The sample size based on lot size and the acceptance values for 3 and 2 point nonconformities and total (3, 2, and 1 point) nonconformities listed in 4.3.4.1 shall be as specified in table VI. The sample unit shall be one shirt and the lot shall be unacceptable if either or both of the following occur:

- a. The point value for 3 and 2 point nonconformities exceeds the applicable maximum acceptable point value.
- b. The point value for total (3, 2, and 1 point) nonconformities exceeds the applicable maximum acceptable point value.

5100-91J

Table VI. Sampling provisions for visual examination

	Lot size	Sample size	Maximum acceptable point values	
			3 & 2 point nonconformities (1/)	3, 2, & 1 point nonconformities
Normal Inspection	Up to 500	50	18 points	25 points
	501 to 1,200	80	25 points	36 points
	1,201 to 3,200	125	32 points	50 points
	3,201 to 10,000	200	45 points	73 points
	10,001 and over	315	68 points	110 points
Tightened Inspection	Up to 500	50	13 points	20 points
	501 to 1,200	80	20 points	30 points
	1,201 to 3,200	125	32 points	40 points
	3,201 to 10,000	200	45 points	58 points
	10,001 and over	315	68 points	88 points
Reduced Inspection	Up to 1,200	32	13-20 points	25 points
	1,201 to 3,200	50	16-25 points	32 points
	3,201 to 10,000	80	23-32 points	43 points
	10,001 and over	125	32-41 points	54 points

1/ For reduced inspection, when the first value is exceeded but not the second value, the lot shall be accepted, but normal inspection shall be reinstated (see 4.3.4.1.4.4). The second value is the maximum acceptable point value.

4.3.4.1.2 Initiation of inspection. Normal inspection shall be used at the start of inspection unless otherwise directed by the responsible procurement quality assurance element administering the contract.

4.3.4.1.3 Continuation of inspection. Normal, tightened, or reduced inspection shall continue unchanged on successive lots except where switching procedures in 4.3.4.1.4 require change.

4.3.4.1.4 Switching procedures

4.3.4.1.4.1 Normal to tightened. When normal inspection is in effect, tightened inspection shall be instituted when two out of five consecutive lots have not been accepted on original inspection (i.e., ignoring resubmitted lots for this procedure).

4.3.4.1.4.2 Tightened to normal. When tightened inspection is in effect, normal inspection shall be instituted when five consecutive lots have been considered acceptable on original inspection.

4.3.4.1.4.3 Normal to reduced. When normal inspection is in effect, reduced inspection shall be instituted, providing that all of the following conditions are satisfied:

- a. The preceding 10 lots have been on normal inspection and none have not been accepted on original inspection; and
- b. The total number of points for 3 and 2 point nonconformities in the samples from the preceding 10 lots is equal to or less than 60 percent of the total maximum acceptable point values for 3 and 2 point nonconformities from the preceding 10 lots; and

5100-91J

c. The total number of points for 3, 2 and 1 point nonconformities in the sample from the preceding 10 lots is equal to or less than 75 percent of the total maximum acceptable point values for 3, 2 and 1 point nonconformities from the preceding 10 lots; and

d. Production is at a steady rate; and

e. Reduced inspection is considered desirable by the procurement quality assurance element administering the contract.

4.3.4.1.4.4 Reduced to normal. When reduced inspection is in effect, normal inspection shall be instituted if any of the following occur on original inspection:

- a. A lot is not accepted; or
- b. A lot is considered acceptable but exceeds the applicable first value (see 4.3.4.1.1); or
- c. Production becomes irregular or delayed; or
- d. Other conditions warrant that normal inspection be instituted.

4.3.4.2 Dimensional examination. The appropriate number of shirts, determined from table VII below, shall be examined for conformance to the dimensional requirements cited in table IV. When a measurement deviates from a dimension and tolerance specified, the shirt shall be penalized 1 point. Each shirt shall also be penalized 1 point when the sleeves are uneven in length by 1/2 inch or more. The lot shall be unacceptable if the total point value resulting from this examination exceeds the maximum acceptable point value. Each size of shirt present in the lot should be represented in the sample selected for this examination.

Table VII. Sampling provisions for dimensional examination

Lot size	Sample Size	Maximum acceptable point values
Up through 500	8	0
50 - 3,200	13	1
3,201 - 35,000	20	2
35,001 and up	32	3

4.4 Packaging inspection. An examination shall be made to determine that packing and marking comply with the section 5 requirements. Nonconformities shall be scored in accordance with Table VIII. The sample unit shall be one shipping container fully packaged except that it shall not be palletized and it need not be closed. Shipping containers fully packaged that have not been palletized shall be examined for nonconformities in closure. The lot size shall be the number of shipping containers in the end item inspection lot. The inspection level shall be S-2 and the AQL shall be 2.5 nonconformities per hundred units.

Table VIII Packaging Examination

Examine	Nonconformity
Markings	Omitted; incorrect; illegible; of improper size, location, sequence, or method of application.
Materials	Any component missing or not as specified. Any component damaged, affecting serviceability.
Workmanship	Inadequate application of components, such as: incomplete closure of container flaps, improper taping, loose strapping, inadequate stapling. Bulged or distorted container.
Contents	Number of items per container is more or less than required.

5100-91J

5. PACKAGING

5.1 Preservation. Preservation shall be in accordance with ASTM D 3951 and as specified in the contract or purchase order (see 6.2).

5.1.1 Packaging. Each fully buttoned shirt shall be neatly folded to measure approximately 14-1/2 inches by 10-1/2 inches. The folded shirt shall be secured with stainless steel pins, aluminum clips, or plastic fasteners. Each shirt shall be inserted in a snug-fitting flat style clear polyethylene film bag of 0.00125 inch thickness (± 25 percent tolerance). The polyethylene bag shall be formed with heat-sealed seams that are straight, continuous, and parallel to each other and the formed edges of the bag. Before closure, a copy of the User instructions (3.2.8) shall be inserted into the bag with the shirt. The final closure of the bag shall be heat sealed with the heat seal made as close as possible to the open end. The bag may be fabricated from polyethylene film tubing or sheeting. A 1/4 inch diameter hole shall be made at one corner of each polyethylene bag to allow excess air to escape. As an alternate, the polyethylene bag may be of the tuck-in or reverse flap type in which case a heat seal closure and corner vent hole are not required.

5.2 Packing. Unless otherwise specified (see 6.2), packing shall be in accordance with the requirements specified herein.

5.2.1 Packing. Fifty shirts of one size, packaged in accordance with 5.1.1 and folded widthwise, shall be stacked in two rows of 25 each into a type CF, variety SW, class Domestic, grade 350 of ASTM D 5118; size shall be 20-1/2 x 15 x 17-1/2 inches, the closure shall be in accordance with method IV of the appendix. close-fitting fiberboard box. The box shall comply with the Uniform Freight Classification and the National Motor Freight Classification.

5.2.1.1 Packing of larger sizes. When the 50 of the larger size shirts do not fit in the specified box, the contractor shall coordinate with GSA the packaging of fewer shirts per box.

5.3 Marking. In addition to any special marking required by the contract or purchase order, shipping containers shall be marked in accordance with FED-STD-123.

5.3.1 Polyethylene bag. Each polyethylene bag (see 5.1.1) shall have the stock number, nomenclature, and size legibly printed or stamped in black on the center face of the bag, or a label printed black on white with the required information shall be inserted in the bag so that it can be easily read through the polyethylene.

6. NOTES

6.1 Intended use. The shirts are intended to be worn with flame-resistant jeans for fighting wildland fires and for conducting controlled burning operations.

6.2 Acquisition requirements. Acquisition documents must specify:

- a. Title, number, and date of this specification.
- b. Sizes of shirts and quantities of each (see 1.2).
- c. When required, the specific issue of individual document referenced (see 2.1 and 2.2).
- d. When first article samples are not required (see 3.1, 4.3, and 6.3).
- e. When lot by lot testing is required in lieu of certificates of compliance (see 4.3.2).
- f. Packaging requirements if other than specified (see 5.1 and 5.2).

5100-91J

6.3 First article. When first articles are required, they shall be inspected and approved under the appropriate provisions of FAR 52.209. First articles shall be preproduction samples. The contracting officer should include specific instructions in all acquisition documents regarding arrangements for selection, inspection, and approval of the first articles.

6.4 Bidder information. For bidding purposes, 11" X 17" drawings, or electronic drawings in *.dwf format, will be furnished upon request. They will contain sufficient information regarding size, shape, and quantity of material for bidding purposes. It is the bidder's responsibility to determine yield and waste from the provided 11" X 17" drawings or electronic drawings and no further direction or clarification will be provided by the government. Color shade samples, full-size drawings and full-size patterns will be furnished only to successful bidders upon contract award.

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

6.6 Preparing Activity. USDA Forest Service, Missoula Technology and Development Center (MTDC), 5785 Highway 10 West, Missoula, Montana 59808, ddavis02@fs.fed.us.

5100-91J

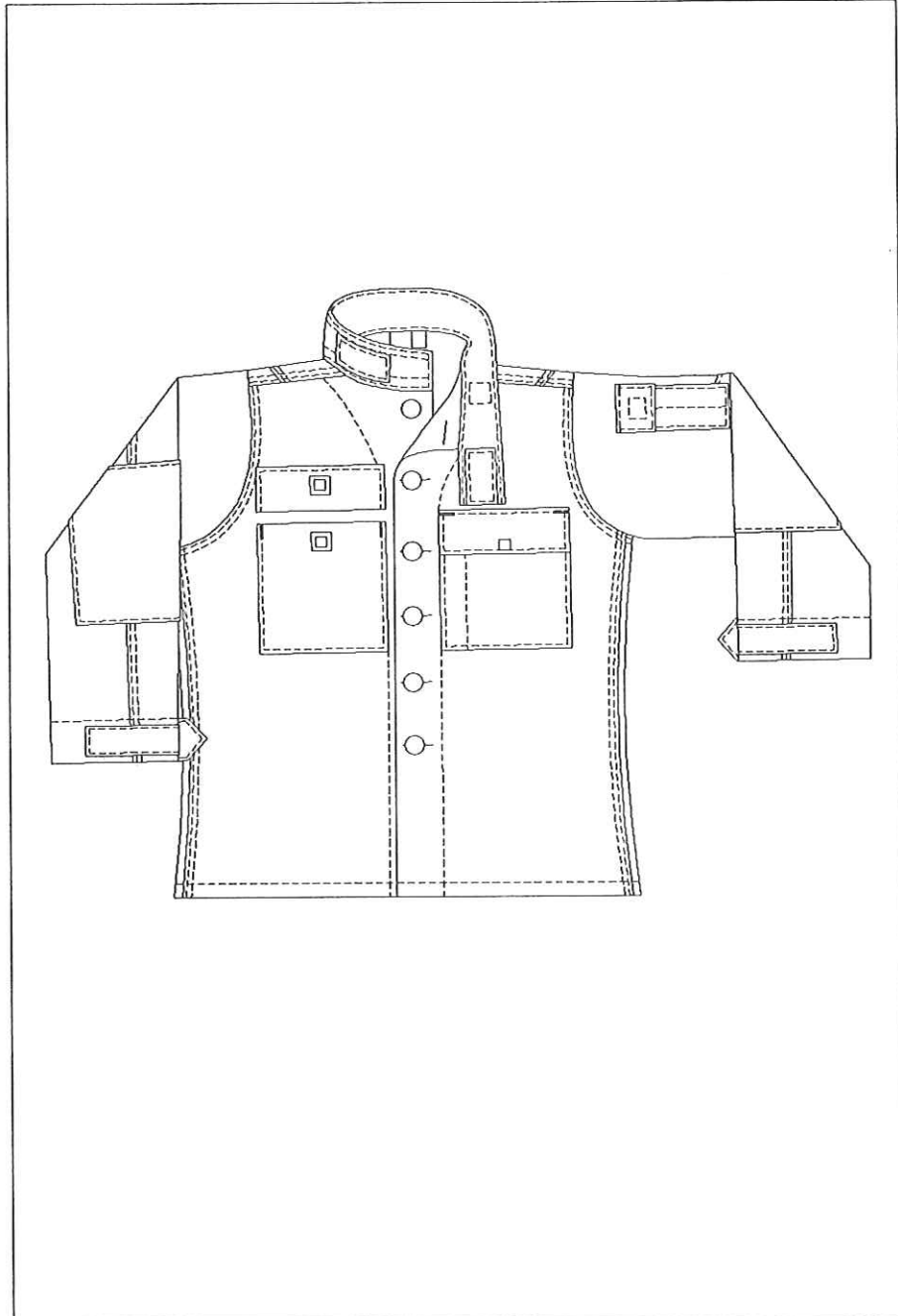


Figure 1

5100-91J

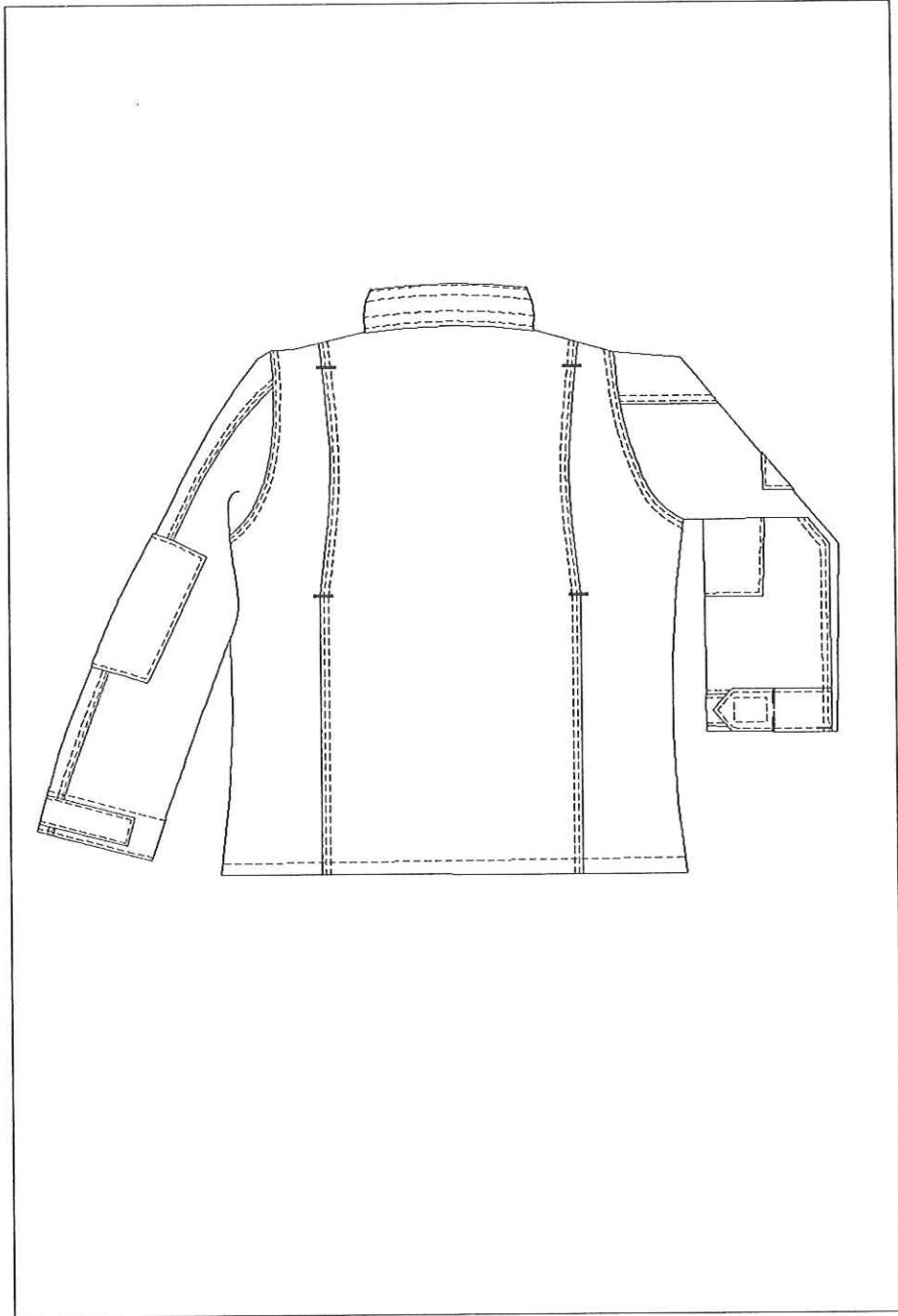


Figure 2

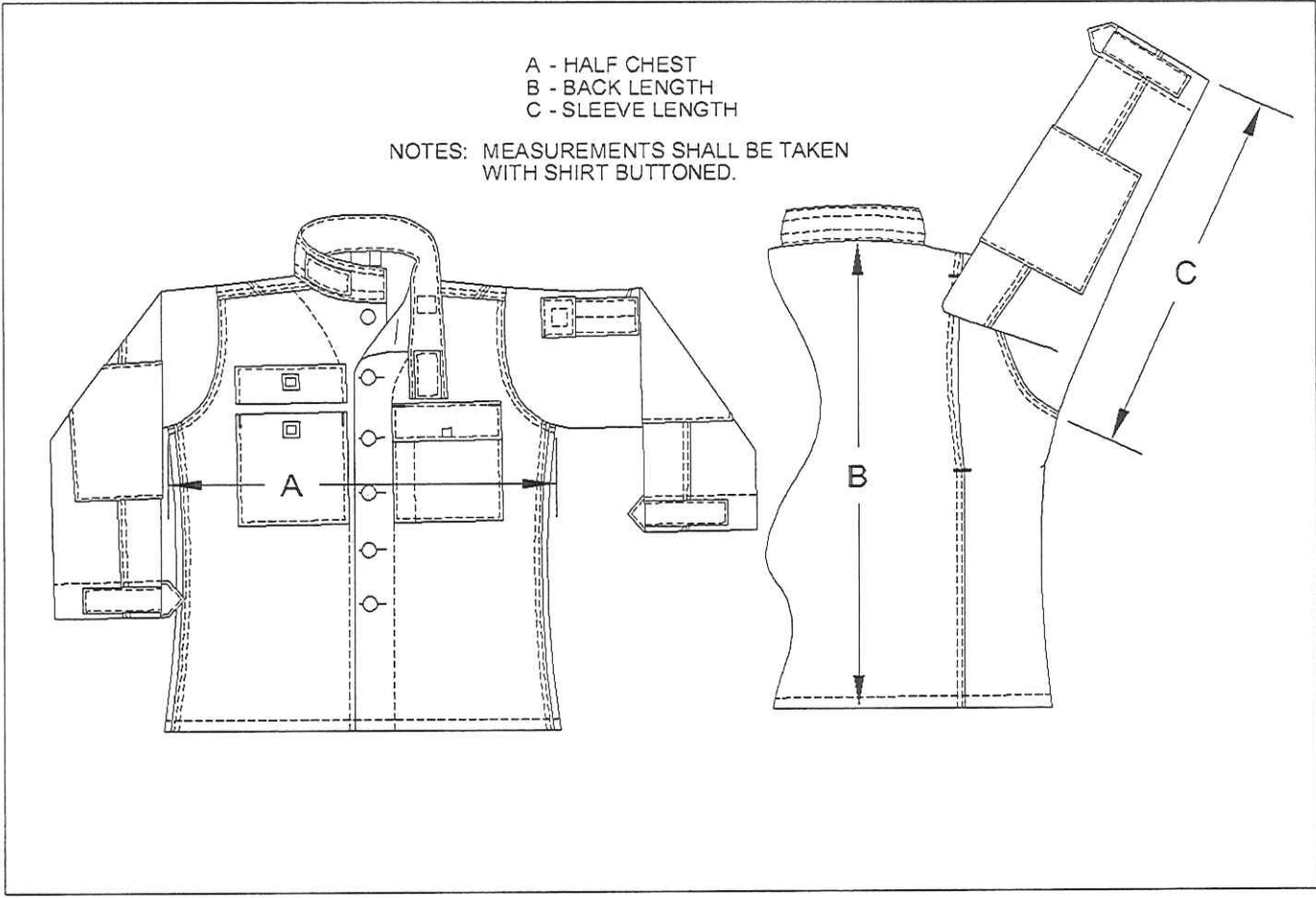


Figure 3

5100-91J

**User Instructions
(Remove only by end user)**

Shirt, Flame-resistant. US Forest Service Specification – 5100-91J

1. Pre-Use Information

- a) Safety Considerations. Use this garment in conjunction with all other required PPE, including hard hat, gloves, fire resistant pants, leather boots and fire shelter. This garment should be used only by personnel who have completed the required formal training courses for wildland fire fighting operations and fully understand the limitations and use of this garment.
- b) This shirt provides limited thermal and physical protection from the hazards associated with wildland fire fighting.
- c) This garment should not be marked.
- d) The protective properties of this garment cannot be tested by users in the field.
- e) The contractor warrants this garment to be free from defects in workmanship and materials for one year after date of purchase. The warranty assumes that the garment is used by trained personnel following accepted wildland fire fighting procedures.

2 Preparation for Use, Donning/Doffing

- a) Sizing/Adjustment: Shirt should be loose fitting. Shirts are available in 13 sizes which include regular or long sleeve and body length options.
- b) Interface Issues: This shirt is an outer garment, undergarments should be made of 100% cotton, wool, silk, aramid or other flame resistant materials. Ensure there is proper coverage at wrist and waist.
- c) Recommended storage: Clean and dry this shirt properly before storage. Store in a dry place - out of direct sunlight and extreme temperatures.

3. Inspection Frequency and Details

Inspect garment upon receipt and after each cleaning. Inspect for holes, tears and proper operation of fasteners.

4. Maintenance and Cleaning

- a) Do not use this garment if it is not thoroughly cleaned and dried.
- b) Machine wash in hot water, NO BLEACH. Wash separately from flammable, lint producing fabrics. Rinse thoroughly, soap and detergent residues will burn. Do not starch. Tumble dry medium and remove promptly.

5. Decontamination Procedures

- a) Decontamination is dependent upon what the protective clothing has been exposed to; however chlorine bleach cannot be used under any circumstances.
- b) For extreme contamination with products of combustion or fire debris, remove the contaminants by flushing with water as soon as possible, followed by appropriate cleaning.

6. Retirement/Disposal Criteria

It is recommended that individual units establish their own criteria for routine inspection and subsequent repair or retirement of this garment.

7. Proper use should be consistent with NFPA 1500, Standard on Fire Department Occupational Safety and Health Program, and 29 CFR 1910.132, "Personal Protective Equipment."

Figure 4
User Instructions

5100-284C
January 1, 2000
 Superseding
 5100-284B
 February, 1994

U.S. DEPARTMENT OF AGRICULTURE
 FOREST SERVICE

SPECIFICATION

TOOL, RAKE AND CUTTING

1. SCOPE

1.1 Scope. This specification covers a special handtool designed for both raking and cutting small brush to construct fire control lines on wildfires and controlled burn operations.

2. APPLICABLE DOCUMENTS

2.1 Government documents. The following government 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:

2.1.1 Government specifications and standards.

SPECIFICATIONS

FEDERAL

TT-C-490 - Cleaning Methods for Ferrous Surfaces and Pretreatments for Organic Coatings

STANDARDS

FEDERAL

FED-STD-123 - Marking for Shipment (Civil Agencies)
 FED-STD-376 - Preferred Metric Units for General Use by the Federal Government
 FED-STD-595 - Colors (Requirements for Individual Color Chips)

(Unless otherwise indicated, copies of federal specifications and standards are available from the Standardization Documents Order Desk, Building 4D, 700 Robbins Ave., Philadelphia, PA 19111-5094.)

Beneficial comments (recommendations, additions, deletions) and any pertinent data that may be used in improving this document should be addressed to: USDA Forest Service, Missoula Technology and Development Center, Building 1, Fort Missoula, Missoula, MT 59804-7294 by using the Specification Comment Sheet at the end of this document or by letter.

FSC 5120

2.1.2 Other Government documents, drawings, and publications. The following other Government documents, drawings, and publications 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.

DRAWINGS

USDA FOREST SERVICE

MEDC-519 - Tool, Rake & Cutting

(Copies are available from the USDA Forest Service, Missoula Technology and Development Center, Building 1, Fort Missoula, Missoula, MT 59804-7294.)

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 SOCIETY FOR QUALITY CONTROL (ASQC)

Z1.4 - Sampling Procedures and Tables for Inspection by Attributes

(Copies are available from the American Society for Quality Control, 611 East Wisconsin Avenue, Milwaukee, WI 53202.)

ANSI (AMERICAN NATIONAL STANDARDS INSTITUTE, INC.)

B18.1.1 - Small, Solid Rivets

B46.1 - Surface Texture (Surface Roughness, Waviness, and Lay)

(Copies are available from the American National Standards Institute, Inc., 1430 Broadway, New York, NY 10018.)

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

D 1974 - Standard Practice for Methods of Closing, Sealing, and Reinforcing Fiberboard Shipping Containers

D 3951 - Standard Practice for Commercial Packaging

D 5118 - Standard Practice for Fabrication of Fiberboard Shipping Boxes

E 18 - Standard Test Methods for Rockwell Hardness and Rockwell Superficial Hardness of Metallic Materials

(Copies are available from ASTM, 100 Barr Harbor Dr., West Conshohocken, PA 19428-2959.)

AMERICAN WELDING SOCIETY

A2.4 - Standards for Welding and Non-Destructive Testing

(Copies are available from the American Welding Society, P.O. Box 351040, Miami, FL 33135.)

IRON AND STEEL SOCIETY

Alloy, Carbon and High Strength Steel, Semifinished for Foraging, Hot Rolled Bars; Cold Finished Steel Bars; Hot Rolled Deformation and Plain Concrete and Reinforced Bar

(Copies are available from the Iron and Steel Society, 410 Commonwealth Dr., Warrendale, PA 15086.)

NATIONAL MOTOR FREIGHT TRAFFIC ASSOCIATION, INC., AGENT

National Motor Freight Classification

(Copies are available from American Trucking Associations, Inc., 2200 Mill Rd., Alexandria, VA 22314.)

(Non-Government standards and other publications normally are available from the organizations that prepare or 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 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 (see 6.2), a sample shall be subjected to first article inspection (see 6.3) in accordance with 4.3.

3.2 Materials and components. The rake and cutting tool shall conform in all respects to the design, details, dimensions, and materials specified herein and in the referenced drawing, MTDC-519. Should there be conflicts between the text of this document and the drawing, this document takes precedence, unless otherwise specified.

3.2.1 Frame and eye. The frame shall be formed from AISI/SAE 1020 hot-rolled steel. The tool eye shall be fabricated from 1/8 inch thick AISI/SAE 1020 hot-rolled steel. Steel composition for frame and eye shall be determined as specified in 4.5.1.1.

3.2.2 Blades. The blades shall be made from AISI/SAE 1080 or 10B38 steel. Steel composition for blades shall be determined as specified in 4.5.1.1. The blades shall be heat treated to a Rockwell C hardness of 52 to 57 at the cutting edge and back from the cutting edge no less than 3/8 inch. Steel hardness shall be determined as specified in 4.5.1.2.

3.2.3 Rivets. The rivets shall be made from solid steel wire equal to or stronger than AISI/SAE 1006 (43,000 psi tensile strength and 24,000 psi yield strength). Rivets shall be 3/16 inch diameter with button, pan, flat, or truss head. Other rivet dimensions shall be in accordance with ANSI B18.1.1.

5100-284C

3.2.4 Handle. The handle shall be ash, which includes wood cut from white ash (*Fraxinus americana*), green ash (*Fraxinus pennsylvanica*), and blue ash (*Fraxinus quadrangulata*). Permitted colors are white, light red and light brown, with dark red and brown permitted within 10 inches of either end. The wood shall show between 5 and 17 annual rings per inch of radius. The maximum permitted cross grain shall be 1/2 diameter in the bottom 2/3, 1/2 diameter in the top 1/3, and 2/3 diameter in the top 7 inches. The blemishes shall not exceed 1 slight dip in grain, or 2 pin twig marks, small streaks, or butterfly marks per handle. Dimensions shall conform in all respects to drawing MTDC-519. The handle shall be free from crooks, bows, cracks, splits, and scores.

3.2.5 Screw or nail. A #10 round head 1 to 1-1/4 inch long wood screw shall be used to affix the handle to the tool head.

3.3 Finish.

3.3.1 Tool head. The head shall be pretreated for painting in accordance with TT-C-490 and painted with an enamel to provide a rust-resistant finish. The enamel shall match color chip 11105 of FED-STD-595. The blade sections shall be coated with a light film of oil after sharpening to prevent rusting

3.3.1.1 Blades. Each blade as shown in MTDC-519 shall be beveled to an included angle of 21 ± 2 degrees to the adjacent back surface. The cutting edges shall be ground to a finish having a roughness of not more than 125 microinches as defined by ANSI B46.1.

3.3.2 Handle. The handle shall be sanded to a smooth finish and coated with a minimum of two coats of clear lacquer. No wax or stain is allowed. The lacquer shall permit visual inspection of the wood, prevent absorption of water, and protect the handle over long periods of storage. The lacquer shall be applied evenly over the surface and shall be free of sags, runs, drips, blisters, wrinkles, frothing, or other defects characteristic of improper application or cure. Flame hardening is optional to the manufacturer.

3.4 Tool assembly.

3.4.1 Welding. The eye shall be welded to the frame using a fillet weld all around as shown in MTDC-519. The weld shall conform to American Welding Society Standard A2.4 in all respects.

3.4.2 Riveting. Each of the four blades shall be affixed to the frame with two rivets. Rivet length shall be such that when assembling the blades to the frame, the formed head shall comply with dimensions shown in MTDC-519. Other rivet dimensions shall be in accordance with ANSI B18.1.1. The rivet heads shall be full, neatly made, concentric with the rivet holes, and shall be in full contact with the surface of the riveted member.

3.4.3 Handle moisture content. Moisture content of the handle at the time of assembly shall not exceed 12 percent when tested as specified in 4.5.2.1.

3.5 Identification marking. The "FSS" mark shall be metal stamped in 1/4 inch high letters on the top of the tool head in the location shown in drawing MTDC-519.

3.6 Workmanship. The head shall be smooth and free of cracks, pits, laps, rust, burrs, cupping, or other defects that may affect serviceability, durability, and appearance. The enamel paint shall be a continuous, uniform, smooth, dry coating having no area without paint except for the cutting edges, which shall be coated as specified. The tool shall conform to the quality of product established by this specification. It shall be manufactured using the best commercial workmanship in all respects. All items shall conform to the quality of product established by this document. The occurrence of defects shall not exceed the applicable acceptable quality levels. There shall be no defects that affect use, appearance, or serviceability.

3.7 Metric products. 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 FED-STD-376, and all other requirements of this specification are met.

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

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 (examinations and tests) as specified herein. Except as otherwise specified in the contract or purchase order, the contractor may use his/her 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 this specification where such inspections are deemed necessary to ensure supplies and services conform to prescribed requirements.

4.1.1 Responsibility for compliance. All items shall 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 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.

4.1.2 Responsibility for dimensional requirements. Unless otherwise specified in the contract or purchase order, the contractor is responsible for ensuring that all specified dimensions have been met. When dimensions cannot be examined on the end item, inspection shall be made at any point or at all points in the manufacturing process necessary to ensure compliance with all dimensional requirements.

4.1.3 Certification of compliance. Unless otherwise specified, certificates of compliance supplied by the manufacturer of the item, component, or material, listing the specified test method and test results obtained, may be furnished in lieu of actual lot by lot testing performed by the contractor (see 4.3.2). When certificates of compliance are submitted, the Government reserves the right to check test such items to determine the validity of the certification.

4.2 Sampling for inspections and tests. Sampling for inspections and tests shall be made in accordance with ASQC/ANSI Z1.4. Inspection levels and acceptable quality levels (AQL) shall be as specified. All tools manufactured at one time shall be considered a lot for purposes of acceptance inspection and test. A sample unit shall be one ax complete with attached handle.

4.3 Quality conformance inspection. Each end item lot shall be sampled and inspected as specified in 4.3.4. Each lot shall be sampled and tested as specified by 4.5.2. Test reports showing compliance with 4.5.2.1 shall be submitted as part of quality conformance inspections. The packaging shall be inspected as specified in 4.4. Packaging is not required when first articles are presented. As part of quality conformance inspections, data analysis shall be submitted to determine compliance of the steel composition as specified in 4.5.1.1 and steel hardness as specified in 4.5.1.2. See also 4.5.1.3. When conducting quality conformance inspections of first articles, the presence of any defect or failure of any test shall be cause for rejection of the first article.

4.3.1 Component and material testing. To meet the requirements of 4.1, components and materials shall be inspected in accordance with all the requirements of referenced documents, drawings, and standards unless otherwise excluded, amended, modified, or qualified in this document or applicable purchase document.

4.3.2 Certification. Unless otherwise specified (see 6.2), as part of first article presentations and lot inspections, it shall be acceptable for the contractor to provide certificates of compliance for all materials and components in lieu of actual lot by lot testing. In addition, when the contractor changes component or material suppliers, a new certification based on actual test results shall be required. All certificates shall include as a minimum:

- Specification, type, class, form, etc. as applicable
- Quantity purchased
- Purchase source, address, and telephone number
- Purchase date
- Lot number traceable to materials used in production
- Contract number

4.3.3 In-process inspection. Inspection shall be made at any point or during any phase of the manufacturing process to determine component parts are in accordance with specified requirements. Whenever nonconformance is noted, corrections shall be made to the parts affected and lot in process. Components that cannot be corrected shall be removed from production.

4.3.4 End item examination. The end items shall be examined for the defects listed in tables I and II. The inspection level shall be S-2, the acceptable quality level (AQL), expressed in terms of defects per hundred units, shall be 2.5 for major and 6.5 for minor defects.

TABLE I. End item visual defects

<u>Examine</u>	<u>Defect</u>	<u>Classification</u>	
		<u>Major</u>	<u>Minor</u>
Tool head	Metal surfaces not finished and painted as specified	X	
	Not free of cracks, laps, burrs, cupping, rust	X	
	Blade cutting edges not sharpened as specified	X	
	Blade beveled edges not protected with suitable rust preventive		X
Handle	Wood not as specified	X	
	Not free from crooks, bows, cracks, splits, and other defects	X	
	Finish not as specified	X	
	Coating not free of defects such as sags, runs, and drips	X	
Markings (FSS)	Omitted, incomplete, incorrect, illegible, misplaced, or size of characters not as specified		X

TABLE II. End item dimensional defects

<u>Examine</u>	<u>Defect</u>	<u>Classification</u>	
		<u>Major</u>	<u>Minor</u>
Tool head	Dimensions and configuration not as specified	X	
	Hardness not as specified	X	
	Cutting edge angles not as specified	X	
	Marking not as specified		X
Handle	Dimensions not as specified	X	

4.4 Packaging inspection. An examination shall be made to determine that packing and marking comply with the section 5 requirements. Defects shall be scored in accordance with the list below. The sample unit shall be one shipping container fully packaged except that it shall not be palletized and it need not be closed. Shipping containers fully packaged that have not been palletized shall be examined for defects in closure. The lot size shall be the number of shipping containers in the end item inspection lot. The inspection level shall be S-2 and the AQL shall be 2.5 defects per hundred units.

<u>Examine</u>	<u>Defect</u>
Markings	Omitted; incorrect; illegible; of improper size, location, sequence, or method of application.
Materials	Any component missing or not as specified. Any component damaged, affecting serviceability.
Workmanship	Inadequate application of components, such as: incomplete closure of container flaps, improper taping, loose strapping, inadequate stapling. Bulged or distorted container.
Contents	Number of items per container is more or less than required.

4.5 Tests.

4.5.1 Component material testing.

4.5.1.1 Steel composition test. A repeatable consensus standard test method shall be used to verify steel composition as required in 3.2.1 and 3.2.2. Any failure shall fail the lot (see 4.5.1.3).

4.5.1.2 Hardness test. Hardness tests to determine compliance with 3.2.2 shall be in accordance with ASTM E 18. Any readings not within specified requirements shall constitute a major defect (see 4.5.1.3).

4.5.1.3 Steel testing documentation. To meet the requirements of 4.5.1.1, a test report/analysis from the steel manufacturer shall be acceptable in lieu of lot by lot testing when validated by the contractor's own tests on the first lot of steel received. The contractor need not retest again unless a new steel supplier is used. Lot by lot hardness testing may be performed any time after tool heads are heat treated. Hardness testing need not be repeated as part of end item testing.

4.5.2 End item testing. Unless otherwise specified, the sample size for testing shall be S-2 with an AQL of 4.0 for all testing.

4.5.2.1 Handle moisture content testing. Moisture content testing to meet the requirements of 3.4.3 shall be part of quality conformance inspection. Moisture testing shall be performed in the following manner: Using a calibrated moisture meter, readings shall be obtained from each end of the handle and its mid point. The handle's moisture content will then be determined by averaging the three readings.

5. PACKAGING, PACKING AND MARKING

5.1 Packaging. The tool head of each tool shall be protected with a fiberboard sleeve securely fastened in place and labeled as shown in figure 1. All other preservation shall be in accordance with ASTM D 3951.

5.2 Packing. Ten tools, packaged as specified in 5.1, shall be packed for shipment as illustrated in figure 1. Packing boxes shall comply with the Uniform Freight Classification and the National Motor Freight Classification and shall be type CF or SF, class Domestic, variety SW or DW, grade 200 minimum, style FOL, and otherwise conforming to ASTM D 5118.

5.3 Marking. In addition to any special marking required by the contract or purchase order, shipping containers shall be marked in accordance with FED-STD-123.

6. NOTES

6.1 Intended use. The rake and cutting tool is used by firefighters for raking and cutting small brush as part of fireline construction on wildfires and controlled burns.

6.2 Ordering data. Documents utilizing this material should specify the following:

- (a) Title, number and date of this specification.
- (b) When first article samples are not required (see 3.1, 4.3, and 6.3).
- (c) When lot by lot testing is required in lieu of certificates of compliance (see 4.3.2).
- (d) Preservation, packing, and marking required in addition to specification requirements (see section 5).

6.3 First article. When a first article is required, it shall be inspected and approved under the appropriate provisions of Federal Acquisition Regulation (FAR) 52.209. The first article should be a preproduction sample. The contracting officer should specify the appropriate type of first article and the number of units to be furnished. The contracting officer should also include specific instructions in acquisition documents regarding arrangements for selection, inspection, and approval of the first article.

6.4 Preparing activity. USDA Forest Service, Missoula Technology and Development Center, Building 1, Fort Missoula, Missoula, MT 59804-7294.

5100-284C

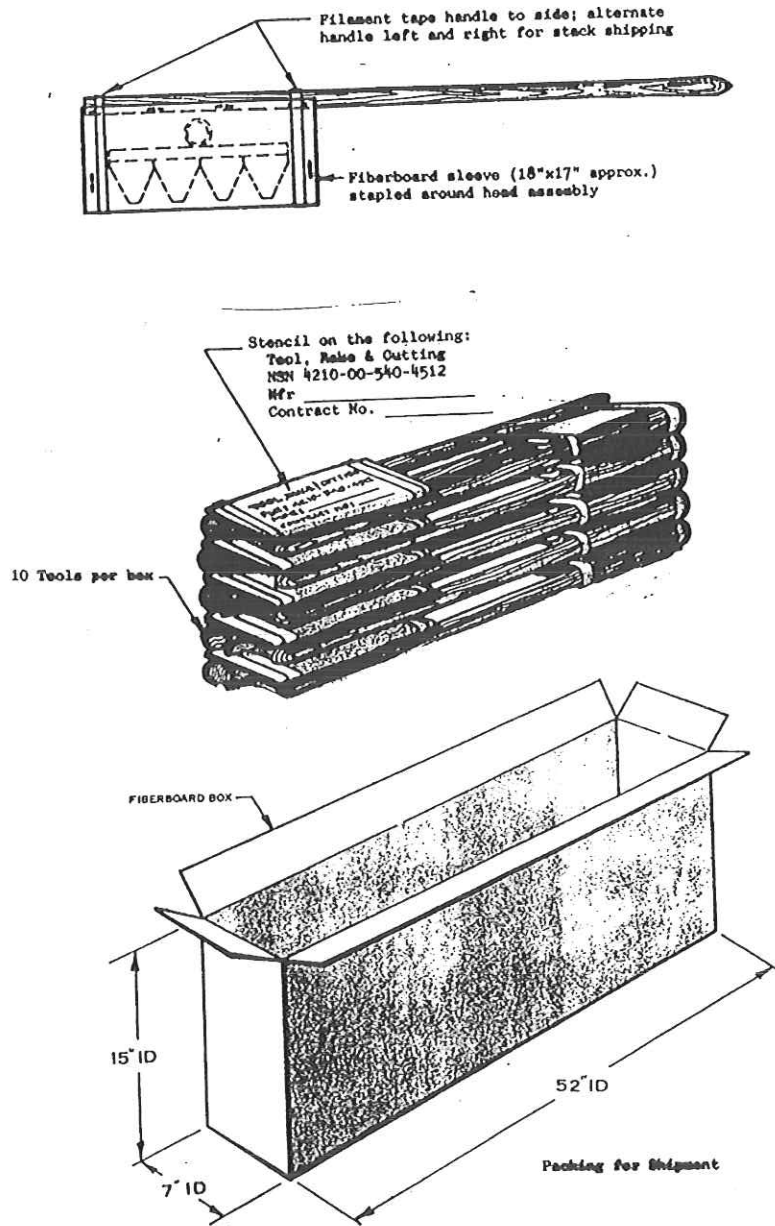


FIGURE 1.--PREPARATION FOR DELIVERY.



Standardization Document Improvement Proposal

This form is provided to solicit beneficial comments that may improve this document and enhance its use. Contractors, government activities, manufacturers, vendors, and users are invited to submit comments to:

USDA Forest Service
Missoula Technology and Development Center
Building 1, Fort Missoula
Missoula, MT 59804-7294

Attach any additional pertinent information that may be of use in improving this document to this form and mail in a envelope. A response will be provided when the submitter includes their name and address.

NOTE: This form shall not be used to submit requests for waivers, deviations, or clarification of specification requirements on current contracts. Comments submitted on this form do not constitute or imply authorization to waive any portion of the document, or to amend contractual requirements.

Document Identification: 5100-284C - TOOL, RAKE AND CUTTING

Submitter's Name (Optional. Please print or type): _____

Submitter's Organization and Address: _____

Vendor User Manufacturer _____

Phone Number: _____

Date: _____

Has any part of the Document created problems or required interpretation in procurement use?

Is any part of the Document too rigid, restrictive, loose, or ambiguous? Please explain below:

Give paragraph number and wording: _____

Recommended change(s): _____

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Missoula Technology and Development Center
Building 1, Fort Missoula
Missoula, MT 59804-7924

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5100-92M
January 15, 2010
 Superceding
 5100-92L
 August 19, 2008

U.S. DEPARTMENT OF AGRICULTURE
 FOREST SERVICE

SPECIFICATION

PANTS, FLAME-RESISTANT ARAMID

1. SCOPE AND CLASSIFICATION

1.1 Scope. This document covers the requirements for flame-resistant pants.

1.2 Classification. The pants shall be of following type and sizes, all dimensions in inches (see 6.2):

Type I - Meta-Aramid Fiber Blend
 Type II - Para-Aramid Fiber Blend

Size - Waist range - length (Short, Reg or Long)

Waist Range	Short	Inseam Regular	Long
24-28	30	33	36
26-30	30	33	36
28-32	30	33	36
30-34	30	33	36
32-36	30	33	36
34-38	30	33	36
36-40	30	33	36
38-42	30	33	36
40-44	30	33	36
42-46	30	33	36
44-48	30	33	36
46-50	30	33	36
48-52	30	33	36

Beneficial comments (recommendations, additions, deletions) and any pertinent data that may be used in improving this document should be addressed to: USDA Forest Service, Missoula Technology and Development Center, 5785 Highway 10 West, Missoula, MT 59808, ddavis02@fs.fed.us.

FSC 8415

5100-92M

2. APPLICABLE DOCUMENTS

2.1 Government documents.

2.1.1 Specifications and standards. The following specifications and standards 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.

SPECIFICATIONS

FEDERAL

A-A-50198 - Thread, Gimp, Cotton, Buttonhole
 A-A-55126 - Fastener Tapes, Hook and Loop, Synthetic
 A-A-55217 - Thread, Aramid, Spun Staple
 A-A-55634 - Zippers (Interlocking Slide Fasteners)

USDA FOREST SERVICE

5100-88 - Cloth, Trouser, Aramid

STANDARDS

FEDERAL

FED-STD-123 - Marking for Shipment (Civil Agencies)
 FED-STD-376 - Preferred Metric Units for Use By the Federal Government

(Unless otherwise indicated, copies of federal and military specifications and standards are available online at <http://assist.daps.dla.mil/quicksearch/> or in hard copy from the Standardization Documents Order Desk, Building 4D, 700 Robbins Ave., Philadelphia, PA 19111-5094. Copies of USDA Forest Service specifications are available from the preparing activity, 6.7)

2.1.2 Other Government documents. The following other Government documents form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents shall be those in effect on the date of the invitation for bids or request for proposals.

DRAWINGS

USDA FOREST SERVICE

MTDC-973 - Patterns, Pants

(Copies are available from USDA Forest Service, Missoula Technology and Development Center, 5785 Highway 10 West, Missoula, MT 59808.)

2.2 Non-Government publications. The following documents form a part of this specification 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.

5100-92M

AMERICAN SOCIETY FOR QUALITY (ASQ)

Z1.4 - Sampling Procedures and Tables for Inspection by Attributes

(Copies are available from the American Society for Quality, PO Box 3005, Milwaukee, WI 53201-3005.)

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

D 1974 - Standard Practice for Methods of Closing, Sealing, and Reinforcing
Fiberboard Boxes

D 3951 - Standard Practice for Commercial Packaging

D 5118 - Standard Practice for Fabrication of Fiberboard Shipping Boxes

D 6193 - Standard Practice for Stitches and Seams

SI-10 - Standard For Use of the International System of Units (SI): The Modern Metric
System (IEEE/ASTM Standard available from ASTM)

(Copies are available from ASTM, 100 Barr Harbor Dr., West Conshohocken, PA 19428-2959,
Website: <http://www.astm.org/>.)

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

1977-2005 - Protective Clothing and Equipment for Wildland Fire Fighting, 2005
Edition

(Copies are available from National Fire Protection Association, 1 Batterymarch Park, P.O. Box
9101, Quincy, MA 02269-9101.)

NATIONAL MOTOR FREIGHT TRAFFIC ASSOCIATION, INC., AGENT

National Motor Freight Classification

(Copies are available from American Trucking Association, Inc., Traffic Department, 1616 P St. NW,
Washington, DC 20036.)

(Non-Government standards and other publications normally are available from the organizations
that prepare or 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 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.

5100-92M

3. REQUIREMENTS

3.1 First article. Unless otherwise specified (see 6.2), only sample pants with regular (33 inch) inseams shall be submitted for first article inspection (see 6.3) in accordance with 4.3. During the term of the contract the contractor shall be required to notify the contracting officer in writing when a component, or the component supplier, changes in any way; when a major manufacturing process changes in any way; or when a manufacturing location changes. The contracting officer may at any time require the contractor to submit a new first article sample when substantive changes occur during the term of the contract.

3.1.1 NFPA 1977. The pants shall be third party certified as being in compliance with National Fire Protection Association (NFPA) Standard 1977, Protective Clothing and Equipment for Wildland Fire Fighting. Proof of this certification shall be presented at the time of First Article submission.

3.2 Materials and components. Materials and components shall be as specified herein and in the applicable drawing, MTDC-973. In addition, the materials and components shall comply with NFPA 1977 (3.1.1).

3.2.1 Basic material. The Type I basic material shall be in accordance with the requirements of Type I of USDA Forest Service specification 5100-88. The Type II basic material shall be in accordance with the requirements of Type II of USDA Forest Service specification 5100-88.

3.2.2 Thread. The aramid thread shall conform to Type I, Tex size 35-40 and Tex size 70-80, or Type II, Tex size 27 and Tex size 60, of A-A-55217. Thread color shall be a good approximation of the basic material (3.2.1).

3.2.3 Gimp. The cotton gimp for reinforcing buttonholes shall conform to Soft Finish Tex 210, or Glazed Finish Tex 180 or 210, of A-A-50198. The color shall be a good approximation of the basic material (3.2.1).

3.2.4 Zipper. The zipper shall be brass with a short tab pull, and shall conform to Type I, Style 1, Size 1-2 or 3-4 of A-A-55634, the tape shall be spun aramid. The color of the tape shall be black.

3.2.5 Button and tack. The button and tack materials shall be of the quality normally used by the manufacturer for tack buttons and button tacks. Material composition and thickness shall withstand the forming operations without wrinkling or cracking.

3.2.5.1 Button. The 27 ligne tack button shall have a flat antique brass front shell with an epoxy finish. YKK Snap Fasteners, Inc. Part No. 0450000346 meets this requirement (see 6.4).

3.2.5.2 Tack. The button tack shall be YKK Snap Fasteners, Inc. Part No. 5040000310C.

3.2.6 Waist take-up tape. The waist take-up tape shall be 5/8 inch wide aramid tape, and shall be C.M. Offray & Son, Inc., style #70-6185-2007-5/8 inch, color black (see 6.4).

3.2.7 Double-bar buckle. The double-bar buckle for the waist take-up shall be Albest Metal Stamping Corp. part no. BB340-10BD, 5/8 inch, black; or ITW Waterbury part number 00482-09-21883(see 6.4).

5100-92M

3.2.8 Leg cuff adjuster metal loop. The metal loop shall be 1-1/16 inch x 3/8 inch, wire thickness 0.105 inch, welded steel, black finish, Albest Metal Stamping Corp. part no. WR17x6-12 BWBD meets this requirement (see 6.4).

3.2.9 Fastener tape, hook and pile. The hook and pile fastener tape shall conform to 1 inch width, type II, class 1 of A-A-55126. The color of the tape shall be green.

3.2.10 Labels. Each pair of pants shall have two labels which shall include a combination identification/instruction/care label and a size label. The labels may be woven or non-woven, and shall meet the requirements of NFPA 1977.

3.2.10.1 Combination label. The combination identification/care label shall meet the product labeling requirements of NFPA 1977. :

(The following information shall be printed in letters at least 3/32 inch in height)
 THIS WILDLAND FIRE FIGHTING PROTECTIVE GARMENT MEETS THE REQUIREMENTS
 OF NFPA 1977, STANDARD ON PROTECTIVE CLOTHING AND EQUIPMENT FOR
 WILDLAND FIRE FIGHTING, 2005 EDITION.

DO NOT REMOVE THIS LABEL (1/)

(The following information shall be printed with letters at least 1/16 inch in height.)
 PANTS, FLAME-RESISTANT ARAMID, Type (I or II) 2/
 [Manufacturer's name] (2/)
 [Manufacturer's address] (2/)
 [Country of origin] (2/)
 [Manufacturer's garment identification number, lot number, or serial number] (2/)
 DATE OF MANUFACTURE: [mm/yy] (2/)
 USDA FOREST SERVICE SPECIFICATION 5100-92M
 SIZE: [] (2/)
 CONTRACT NUMBER: [] (2/)
 NSN: [] (2/)
 MATERIALS CONTENT: (TYPE I: 93 % META-ARAMID, 5% PARA-ARAMID, 2%
 ANTISTATIC. TYPE II: 62% PARA-ARAMID, 37% ARAMID, 1% ANTISTATIC.)2/
 [Authorized mark of certifying organization] (2/)
 DATE OF CERTIFICATION [mm/yy (as a minimum)] (2/)

CARE INSTRUCTIONS

- Machine wash hot. NO BLEACH.
- Wash separately from flammable, lint-producing fabrics.
- Rinse thoroughly. Soap or detergent residues will burn.
- DO NOT STARCH. Starch will burn.
- Tumble dry medium. Remove garment promptly.

1/ When a split label is used, this legend shall appear on both labels."

2/ The manufacturer shall insert the applicable information.

5100-92M

3.2.10.2 Size label. The size label shall finish a minimum of 1 inch wide and shall be long enough to allow a 3/8 inch seam allowance at each end. The numbers and lettering shall be a minimum 3/8 inch high and a minimum 3/16 inch wide. The label shall be white, the numbers and lettering shall be black. The size label shall consist of the waist range in inches and the inseam (SHORT, REG, or LONG), separated by a space (i.e. 26-30 SHORT).

3.2.11 End user instructions. End User Instructions meeting the requirements of NFPA 1977 shall be supplied with each pair of pants, see figure 4.

3.3 Design. The pants have two front quarter top pockets, two cargo pockets with flaps closed with hook and pile tape, two hip patch pockets with flaps closed with hook and pile tape, hemmed bottoms with cuff straps, zipper front closure, and waistband tack button closure.

3.4 Patterns. Standard patterns (MTDC-973) will be furnished by the Government (see 6.4). The standard patterns shall not be altered in any way and shall be used only as a guide for cutting the contractor's working patterns. The contractor's working patterns shall be identical to the standard patterns. The standard patterns provide an allowance of 3/8 inch for all joining seams, unless otherwise specified.

3.4.1 List of pattern parts. The pants shall be cut from the materials specified herein in accordance with the number of pattern parts indicated in table I, except belt loops and leg cuff adjustment straps. See table III, operation 16, for cutting requirements for the belt loops. See table III, operation 17 for the requirements for the leg cuff adjustment straps.

Table I. List of pattern parts

Material	Pattern nomenclature	Cut parts
Basic material (see 3.2.1)	Front	2
	Back	2
	Fly	2 right and 1 left
	Cargo pocket	2
	Cargo pocket flap	2
	Hip pocket	2
	Hip pocket flap	2
	Waistband	1
	Front pocket	2

3.5 Construction.

3.5.1 Stitches, seams, and stitching. Stitch, seam and stitching types, as specified in table III shall conform to ASTM D 6193. When two or more seams or stitch types are given for the same part of an operation, any one of them may be used. Where stitch type 401 is used, the chain, or under side of the stitch, shall be on the inside of the pants. Seam allowances shall be maintained with seams sewn so that no raw edges, run-offs, twists, pleats, puckers, or open seams will result. All seams shall start and finish evenly. Thread tension shall be maintained so that there is no tight or loose stitching. For stitch type 301 the lock shall be imbedded in the materials sewn. Edge stitching and top stitching shall be uniformly gauged throughout the garment. Seams required to be worked out, that have a depth between the fold of 1/16 inch or more shall be considered a nonconformity.

5100-92M

3.5.1.1 Safety and overedge stitching. The gage of safety stitching shall be 5/16 or 3/8 inch. The gage of overedge stitching and the overedge portion of safety stitching shall be 3/16 or 1/4 inch. The guides and knives for the safety stitch and overedge machines shall be set to trim only the raveled edges of the fabric.

3.5.1.2 Thread breaks and ends of seams. Ends of all seams and stitching produced with 301 stitch type, when not caught in other seams or stitching, shall be backtacked not less than 1/2 inch. Thread breaks (all stitch types) shall be secured by stitching back of the break not less than 1/2 inch. Skipped stitches and thread breaks for 401 stitch type may be repaired using 301 stitch type. The ends of a continuous line of stitching (except labels and automatic stitching) shall overlap not less than 1/2 inch. The ends of the label and automatic stitching shall be overlapped not less than three stitches.

3.5.1.3 Stitches per inch. The minimum and maximum number of stitches per inch shall be as specified in table III.

3.5.2 Puckering. In the course of the sampling examination, seams suspected of being puckered shall be examined, at a distance of 3 feet, any seam that is puckered for 2 or more inches so that it causes visible distortion of the garment, shall be scored as a puckered seam.

3.5.3 Buttonhole. The buttonhole shall be eyelet-end tapered bar type worked over gimp with not less than four tacking stitches at bar end catching gimp ends (not counting crossover stitch). The purling shall be on outside of waistband. The cut length shall be 3/4 to 7/8 inch. The buttonhole shall be clean-cut with the stitching securely caught in the fabric.

3.5.4 Bartacks. Unless otherwise specified, bartacks shall be as follows (bartacking shall be free from thread breaks and loose stitching):

<u>Length</u>	<u>Width</u>	<u>Min. Stitches Per Bartack</u>
1/2 ± 1/16 inch	1/8 ± 1/32 inch	28
3/4 ± 1/16 inch	1/8 ± 1/32 inch	42

3.5.5 Button and tack. The complete and assembled buttons and tacks shall sustain a pull of not less than 60 pounds without deforming or separation of the components or assembly. The back and front of the finished buttons and tacks shall be clean and free from any rough or sharp edge, burr or sliver, oil, dents, digs, pits, wrinkle, grease or dirt. Buttons and tacks shall not be cracked, broken, or malformed. The set button and tack parts shall not rotate when twisted. The distance between the top of the button to the bottom of a tack when set shall be 0.335 ± 0.010 inch.

3.6 Manufacturing operations. The pants shall be manufactured in accordance with all operation requirements specified in table III. The contractor is not required to follow the exact sequence of operations provided the finished pants are identical to those produced by following the sequence listed in table III. Any additional basting or holding stitching used to facilitate manufacture is permissible provided that the thread is removed or does not show on the finished pants.

5100-92M

3.6.1 Shade and size marking. The cut parts of the pants shall be marked to insure a uniform shade and size throughout the garment. Any method of marking may be used except:

- a. Corrosive metal fastening devices.
- b. Sew-on type tickets.
- c. Adhesive type tickets that discolor the material or leave traces of paper or adhesive on material after ticket removal.

3.7 Finished measurements. Finished measurements shall be as specified in table II.

Size	1/2 Waist (+/-1/4) (1/)	Inseam (+/-1/2) (2/)
24-28	14	30, 33, 36
26-30	15	30, 33, 36
28-32	16	30, 33, 36
30-34	17	30, 33, 36
32-36	18	30, 33, 36
34-38	19	30, 33, 36
36-40	20	30, 33, 36
38-42	21	30, 33, 36
40-44	22	30, 33, 36
42-46	23	30, 33, 36
44-48	24	30, 33, 36
46-50	25	30, 33, 36
48-52	26	30, 33, 36

1/One-half waist measurement taken along top edge of waistband, with waistband buttoned from folded edge to folded edge.

2/Inseam measurement taken from crotch seam to bottom edge of leg hem.

3.8 Deviations and waivers. Deviations and waivers to the materials or construction specified herein shall not be allowed unless authorized in writing by the contracting officer.

3.9 Workmanship. The finished pants shall conform to the quality of product established by this specification. The occurrence of nonconformities shall not exceed the applicable acceptable point values. The finished pants shall conform to NFPA 1977 requirements for protective clothing.

3.10 Metric products. 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.

3.11 Recovered materials. The contractor is encouraged to use recovered material in accordance with Federal Acquisition Regulation 23.4 to the maximum extent practical.

5100-92M

Table III. Manufacturing Operations Requirements

No.	Manufacturing operations	Stitch type	Seam and stitching type	Stitches per inch	Thread
1.	<p><u>Cutting</u></p> <p>a. Cut pants in strict accordance with patterns furnished, which show directional lines, size, placement of pockets and pocket flaps, and notches for proper assembly of all parts. Unless otherwise specified, directional lines shall be placed in the warp direction. The face of the fabric shall finish on the outside of the pants. The use of drill holes will be acceptable provided they are covered by other parts of the seam allowance; otherwise, exposed drill holes shall be considered as holes in the fabric.</p> <p>NOTE: Except where noted, the patterns provided only address the right side for the major parts. The left side is produced using a mirror image of the provided patterns.</p> <p>b. Directional lines on the fronts and backs may vary from the warp direction by not more than 1-1/2 inches. Measurements shall be taken at top and bottom edges of the pattern from the directional line to the selvage edge (on the even side of the lay) of the fabric and the difference between the two measurements shall not exceed 1-1/2 inches.</p> <p>c. Cut all parts of the pants from the same piece of basic material except fly parts, belt loops, pocket facings, and flap linings (when made of two-piece construction), which may be cut from ends. Parts cut from ends shall approximate the shade of the pants.</p> <p>d. Cut the stripping for the belt loops of sufficient length and width to comply with operation 16.</p>				

5100-92M

Table III. Manufacturing Operations Requirements (continued)

No.	Manufacturing operations	Stitch type	Seam and stitching type	Stitches per inch	Thread
e.	Cut two pieces of pile tape and two pieces of hook tape 1-1/2 ±1/8 inches long for the hip pocket flap closure (see operations 4 and 5).				
f.	Cut two pieces of pile tape and two pieces of hook tape 4-1/2 ±1/8 inches long for the cargo flap closure (see operations 7 and 8).				
g.	Cut 4 pieces of tape for the waist take-up, 2 pieces 3 inches long and 2 pieces 6 inches long.				
h.	Cut 2, 4-1/4 inch long pieces of pile tape and 2, 4-1/4 inch long pieces of hook tape for the leg cuff adjustment straps.				
i.	Cut the stripping for the leg cuff adjustment straps of sufficient length and width to comply with operations 17.				
2.	<p><u>Replacement of nonconforming components</u> During the spreading, cutting, and manufacturing process, components having material nonconformities or damages that are classified in 4.3.4.1 shall be removed from production and replaced with conforming and properly matched components.</p>				
3.	<p><u>Marking</u> a. Mark or ticket all component parts of the pants, except parts cut from ends, to ensure correct size and uniform shade throughout the pants. b. The use of ink pad numbering machine, rubber stamp, or pencil will be acceptable provided the numbers do not show through the outside of the garment or are covered by the seam allowance.</p>				

5100-92M

Table III. Manufacturing Operations Requirements (continued)

No.	Manufacturing operations	Stitch type	Seam and stitching type	Stitches per inch	Thread
NOTE: The Contractor may alter the order of steps in order to accommodate seam construction.					
4.	<u>Make hip pocket flaps (2)</u>				
	a. Fold flap in half, correct side back to back. Close ends.	301	SSe-2(a)	9-13	35-40
	b. Turn, and work out corners.				
	c. Topstitch flaps 1/4 inch from the sides and bottom edge.	301	SSe-2(b)	9-13	35-40
	d. Overedge top edges of both plies of pocket flap together.	503 or 504	SSa-1	9-13	35-40
	e. Position the hook tape (see operation 1f) on the face of the flap as indicated by marks on the pattern and stitch 1/8 ±1/16 inch from the edge on all four sides.	301	LSbj-1	7-12	70-80
5.	<u>Make outside patch hip pockets (2)</u>				
	a. Hem top of patch pockets with the raw edges turned in and stitch 1/16 to 1/8 inch from edge. The pocket hem shall finish 1-1/4 ±1/8 inch wide.	301	EFb-1	9-13	35-40
	b. Position pile tape on outside of pocket to coincide on finished pant with hook tape on pocket flap (operation 4) and stitch 1/16 to 3/32 inch from edges on all four sides through hem and pocket.	301	LSbj-1	7-12	70-80
	c. Turn in bottom and side edges and crease for setting				
6.	<u>Make two (2) front pockets</u>				
	a. Fold pocket in half with the insides out, position at notches and stitch to close bottom and back edge of pocket.	515 or 516	SSe-2(a)	9-13	70-80 (chainstitch) 35-40 (overedge)
	b. Turn pockets right side out and topstitch 1/4 ±1/16 inch from bottom and back edge of pockets.	301	SSe-2(b)	9-13	70-80
7.	<u>Make cargo pocket flaps (2)</u>				
	a. Fold flap in half, correct side back to back. Close ends.	301	SSe-2(a)	9-13	35-40
	b. Turn, and work out corners.				
	c. Topstitch flaps 1/4 inch from the sides and bottom edge.	301	SSe-2(b)	9-13	35-40

5100-92M

Table III. Manufacturing Operations Requirements (continued)

No.	Manufacturing operations	Stitch type	Seam and stitching type	Stitches per inch	Thread
	d. Overedge top edges of both plies of pocket flap together.	503 or 504	SSa-1	9-13	35-40
	e. Position the hook tape (see operation 1f) on the face of the flap as indicated by marks on the pattern and stitch $1/8 \pm 1/16$ inch from the edge on all four sides of each strip.	301	LSbj-1	7-12	70-80
8.	<u>Make cargo pockets</u>				
	a. Fold the front pleat at marks indicated on pattern so folded pleat edge faces towards the rear on the finished pants. Stitch along the folds, $1/16$ to $1/8$ inch from edge.	301	OSf-1	9-13	35-40
	b. Fold the rear bellows at marks indicated on pattern, so that fold is oriented the same as the front pleat. Stitch along both folds, $1/16$ to $1/8$ inch from edge.	301	OSf-1	9-13	35-40
	c. Hem top of cargo pockets with the raw edges turned under and stitched $1/16$ to $1/8$ inch from both the top and bottom folded edges. The pocket hem shall finish $1-1/4 \pm 1/8$ inch wide. Alternatively, stitching along top of hem may be omitted as long as the middle bellow is stitched vertically from the bottom folded edge stitch line to the top folded edge of the pocket.	301	EFt-2	9-13	35-40
	d. Position pile tape on outside of pocket hem to coincide with hook tape on flap (operation 7e) and stitch $1/8 \pm 1/16$ inch from edges on all four sides of each strip through hem.	301	LSbj-1	7-12	70-80
	e. Horizontally bartack pleat at hem stitch line.	1/2 inch Bartack		28 per bartack	35-40
	f. Turn in bottom and side edges and crease for stitching.				

5100-92M

Table III. Manufacturing Operations Requirements (continued)

No.	Manufacturing operations	Stitch type	Seam and stitching type	Stitches per inch	Thread
9.	<u>Make left fly</u>				
	a. Overedge left side of left fly from bottom edge to top.	503 or 504	EFd-1	9-13	35-40
	b. Position left side of zipper on left fly so the edge of chain will be 1/2 to 5/8 inch from front edge of finished fly at both top and bottom, with the bottom end of the chain 1/4 to 1/2 inch above fly notch. Top end of zipper tape shall extend a minimum of 3/8 inch into waistband. An individual or continuous type zipper chain may be used. Attach with a 3/16 or 1/4 inch gage double needle stitch; the first row shall be 1/8 to 3/16 inch back of the chain.	301 or 401	SSau-2	9-13	70-80
10.	<u>Make right fly</u>				
	<u>Option 1 – One piece</u>				
	<u>Fold lengthwise with outside facing out, top stitch front and bottom of fly single stitch 1/16 to 1/8 inch from edge.</u>	301 or 401	OSf-1	9-13	35-40
	<u>Or</u>				
	<u>Option 2 – Two pieces.</u>				
	a. With outsides facing each other, sew the front and bottom edge of the two pieces of the right fly together..	301 or 401	SSe-2(a)	9-13	35-40
	b. Turn fly correct side out, force out edges and topstitch on the front of fly, with a single stitch, 1/16 to 1/8 inch from edge.	301 or 401	SSe-2(b)	9-13	35-40
11.	<u>Attach flies to front and join crotch seam</u>				
	a. Stitch left fly to left front, with bottom of fly matching notch.	301	SSe-2(a)	9-13	70-80
	b. Turn and topstitch fly, 1/16 to 1/8 inch from edge.	301	SSe-2(b)	9-13	70-80
	c. Position back edges of right front, right zipper tape, and right fly together and safety stitch through all layers, 3/16 inch gage to the notch/bottom of fly.	515 or 516	SSa-2	9-13	70-80 (chainstitch) 35-40 (overedge)
	d. Turn right front toward side seam and topstitch through all layers, 1/16 to 1/8 inch from edge. The stitching shall be continued along crotch from notch, with the right front turned to outside, 1/16 to 1/8 inch from edge.	301	LSq-2(b)	9-13	70-80

5100-92M

Table III. Manufacturing Operations Requirements (continued)

No.	Manufacturing operations	Stitch type	Seam and stitching type	Stitches per inch	Thread
	e. Turn left fly and stitch up from bottom forming fly curve and continue stitching to top of waistband. Stitching shall be 1-1/2 ±1/8 inch from front of fly.	301	LSbj-1	9-13	70-80
	f. Turn edge of left front crotch seam to inside and double stitch, catching the right front crotch seam with both rows of stitching through right fly. The double stitching shall be 3/16 to 1/4 inch gage with the outer row of stitching 1/16 inch to 1/8 inch from the folded edge. The top end of stitching shall terminate at the stitching along the back edge of the left fly.	301	LSc-2	9-13	70-80
12.	<u>Set two (2) front pockets</u>				
	a. Position pocket to front at notches and attach with single stitch.	301 or 401	SSe-2(a)	9-13	70-80
	b. Turn front back and roll out welt so stitching finishes to the inside.				
	c. Stitch pocket welt, 3/16 to 1/4 inch gage from edge.	301	SSe-2(b)	9-13	70-80
13.	<u>Attach combination label to jean backs</u>				
	Position label(s) on left back so that on the finished pants it(they) will be under the hip pocket, will face the wearer and the top will be toward the top of the pants. Stitch on all four sides (of each label) 1/16 to 1/4 inch from edge. The stitching shall not be through the printing.	301	LSbj-1	7-11	35-40
14.	<u>Set hip pockets and flaps</u>				
	a. Position hip pocket on each back panel at location marks and attach with a double stitch 1/4 inch gauge with outside row of stitching 1/16 to 1/8 inch from the folded edge.	301	LSd-2	9-13	70-80
	b. Fold under top edge of flap. Position flap so that the top of the flap shall measure approximately 3/4 inch from the top of the pocket, making sure pocket hem and opening are completely covered by the flap and that the flap is aligned with the pocket.				

5100-92M

Table III. Manufacturing Operations Requirements (continued)

No.	Manufacturing operations	Stitch type	Seam and stitching type	Stitches per inch	Thread
	c. Double stitch flap 1/4 inch gage with the top row of stitching 1/16 to 1/8 inch from folded edge.	301	LSd-2	9-13	70-80
15.	<u>Bartack hip pockets and flaps</u> Horizontally bartack the ends of the pocket openings; the bartacks shall capture the ends of both stitch lines of the pocket attachment stitching. Pocket opening shall not finish less than 5-3/8 inches between bartacks for all sizes. For the flaps only, the flap attachment stitch lines shall be backstitched 1/2 inch..	1/4 inch Bartack		21 per bartack	35-40
16.	<u>Make seven belt loops (operation 25)</u> a. All the loops shall measure 5/8 to 3/4 inch in width. The belt loops shall be cut of sufficient length to measure 2-1/8 to 2-1/2 inches between bartacks on finished pants. The end turnunders of all the belt loops shall be 3/8 to 1/2 inch. b. Fold underside raw edges with edges abutted and double stitch length of loop, with stitching 1/4 to 1/2 inch gage, using coverstitch on the underside.	406 or 402	EFh-1	9-13	35-40
17.	<u>Make leg cuff adjustment straps</u> a. Straps shall measure 1 inch in width, and 5-3/4 and 2-1/2 inches in length. b. Fold underside raw edges with edges abutted and double stitch length of strap, with stitching 1/4 to 1/2 inch gage, using coverstitch on the underside.	406 or 402	EFh-1	9-13	35-40

5100-92M

Table III. Manufacturing Operations Requirements (continued)

No.	Manufacturing operations	Stitch type	Seam and stitching type	Stitches per inch	Thread
18.	<u>Join side seams</u>				
	Option 1				
	a. Join side seams with a safety stitch catching the back edge of front pockets, continue stitching to the knee, fold knee pleat so edge faces down on the outside of pants and catch the fold in the seaming, continue stitching to the placement marks for the leg cuff adjustment strap. Insert the 2-1/2 inch strap with metal loop into the seam and continue the safety stitch to the bottom edge of the seam. The coverstitched face of the strap shall be to the inside of the loop.	515 or 516	SSa-2	9-13	70-80 (chainstitch) 35-40 (overedging)
	b. Fold seam edge to rear and top stitch 1/16 to 1/8 gage from top to 1/2 inch below cargo pocket flap location.	301	LSq-2	9-13	70-80
	c. Horizontally bartack bottom of opening of front pocket ¼ inch on the rear panel and ¾ inch on the front panel.	1-inch bartack		48 per bartack	35-40
	d. Fold the 2-1/2 inch leg cuff adjustment strap with metal loop to the outside rear of pants and place a 3/4 inch bartack on the front panel vertically 1/8 inch from side seam, capturing all layers of seam material.	3/4 inch bartack		42 per bartack	35-40
	OR				
	Option 2				
	a. Join side seams with full feld seam the entire length. Fold knee pleat so that edge faces down. Insert the 2-1/2 inch strap with metal loop at placement marks.	301 or 401	LSc-2	9-13	70-80
	NOTE: Contractor must adjust pattern for 3/8 inch full feld seam in lieu of 3/8 inch safety stitch seam.				
	b. Horizontally bartack bottom of opening of front pocket through both front and rear panels.	1-inch bartack		48 per bartack	35-40
	c. Fold the 2-1/2 inch leg cuff adjustment strap with metal loop to the outside rear of pants and place a 3/4 inch bartack along the center line of the seam.	3/4 inch bartack		42 per bartack	35-40

5100-92M

Table III. Manufacturing Operations Requirements (continued)

No.	Manufacturing operations	Stitch type	Seam and stitching type	Stitches per inch	Thread
19.	<u>Set cargo pockets and flaps</u>				
	a. Position cargo pocket at location marks on sideseams and attach with a single row of stitching 1/16 to 1/8 inch from the edge. The pocket opening shall finish 8-1/4 ± 1/8 wide at the top. The upper stitched edge of the pocket bellows shall fall 1/8 inch inside the stitch line on the rear pocket edge. Alternatively, allow the upper stitched edge of the pocket bellows to align with the pocket edge. Contractor may modify cargo pocket pattern to accommodate this alternative.	301	LSd-1	9-13	70-80
	b. Fold under top edge of flap. Position flap so that the top of the flap shall measure approximately 3/4 inch from the top of the pocket, making sure pocket hem and opening are completely covered by the flap and that the flap is aligned with the pocket.				
	c. Double stitch flap 1/4 inch gage with the top row of stitching 1/16 to 1/8 inch from folded edge.	301	LSd-2	9-13	70-80
20.	<u>Bartack cargo pockets and flaps</u>				
	Bartack the bottom of the bellows rear edge of the pocket; alternatively, the bartack may be placed vertically at the bottom of the bellows vertical stitch line. Bartack the ends of the pocket openings vertically on the front panel, for the rear panel bartack horizontally 1/4 inch from top edge; vertically bartack bottom front corner of flap 1/4 inch from front edge. The bartacks shall be superimposed on the pocket stitching and on the raised stitching of the flap. For the flaps only, at the manufacturer's option, the stitch lines may be backstitched 1/2 inch in lieu of bartacking.	1/2 inch Bartack		28 per bartack	35-40
21.	<u>Waistband label</u>				
	Attach size label on left inside surface of the waistband. Sew on all four sides 1/16 to 1/8 inch from edge.	301 or 401	LSbj-1	7-11	35-40

5100-92M

Table III. Manufacturing Operations Requirements (continued)

No.	Manufacturing operations	Stitch type	Seam and stitching type	Stitches per inch	Thread
22.	<u>Seatseam</u> (Option 1)				
	a. Position left and right backs at base of fly and tandem needle stitch bottom to top 1/2 inch from each edge. Rows of tandem needle stitching shall be between 1/64 to 1/32 inch apart. Needles shall be offset to form staggered stitches.	401	SSa-2	9-13 each needle	70-80
	b. Overedge seatseam.	503 or 504	SSa-1	9-13	35-40
	c. Fold seam edge to left rear panel and top stitch 1/8 to 3/16 gage OR	301 or 401	LSq-2	9-13	70-80
	(Option 2) Join rear panels using full feld seam for entire length of seam. NOTE: Contractor must adjust pattern for 3/8 inch full feld seam in lieu of 1/2 inch superimposed (safety stitch) seam.	301 or 401	LSc-2	9-13	70-80
23.	<u>Join inseams</u> The seat and seam crotch seams shall not be staggered more than 3/8 inch (measured from the center of the seams). Fold the knee pleats so the edges face down on outside of pant leg and catch the folds in the seaming				
	a. (Option 1) Safety stitch join the inseams in one continuous operation.	515 or 516	LSq-2(a)	9-13	70-80 (chainstitch) 35-40 (overedging) 70-80
	b. Fold seam edge to rear and top stitch 1/16 to 1/8 inch gage. OR	301 or 401	LSq-2(b)	9-13	70-80
	(Option 2) Join inseams using a full feld seam the entire length. NOTE: Contractor must adjust pattern for 3/8 inch full feld seam in lieu of 3/8 inch safety stitch seam.	301 or 401	LSc-2	9-13	70-80

5100-92M

Table III. Manufacturing Operations Requirements (continued)

No.	Manufacturing operations	Stitch type	Seam and stitching type	Stitches per inch	Thread
24.	<u>Attach fastener slide and stop</u> (when using continuous chain) a. Position and attach fastener slide. b. Attach fastener stop at base and top of right fly.				
25.	<u>Set and topstitch waistbands</u> Finish appearance. The waistband shall be sewn on flat and smooth without fullness, gathers, or pleats. The waistband shall finish 1-1/2 ±1/8 inch. NOTE: When attaching waistband, capture zipper tape in waistband.				
	a. Attach waistband to fronts and backs with 1/8 inch gage stitching for the bottom row and 1/8 inch gage stitching for the top waistband folded edge.	301 or 401	BSc-2	9-13	70-80
	b. Overedge front waistband ends.	503 or 504	EFd-1	9-13	35-40
	c. Turn in end of right waistband 2 ±1/8 inch and stitch along top of waistband 1/8 inch below top for 1-5/8 ±1/16 inch starting at the front edge; turn and stitch down to overlap stitching on right front by a minimum of 5/8 inch. The use of a "U-tack" on both ends of waistband is acceptable.	301	SSa-1	9-13	70-80
	d. Turn in end of left waistband 2 ±1/8 inch and stitch along top of waistband 1/8 inch below top, for 1-5/8 ±1/16 inch starting at the front edge, turn and stitch down to overlap stitching on the left front curve by a minimum of 5/8 inch. The use of a "U-tack" on both ends of waistband is acceptable.	301	SSa-1	9-13	70-80
26.	<u>Attach waist take-up</u> a. Thread one of the pieces of waist take-up tape around one bar of a double bar buckle. On the outside of the pants, attach above the side seam 3/8 inch above bottom edge of waistband with a bartack as shown in Figure 1.	1/2 inch Bartack		28 per bartack	35-40

5100-92M

Table III. Manufacturing Operations Requirements (continued)

No.	Manufacturing operations	Stitch type	Seam and stitching type	Stitches per inch	Thread
	b. On the outside of the pants, position the folded under end of the 6 inch piece of take-up tape 4-1/2 inches to the rear of the loop attachment(26a), 3/8 inch above the bottom edge of the waistband, with the free end pointing to the front, and attach with a bartack. Repeat on other side.	1/2 inch Bartack		28 per bartack	35-40
	c. Thread the loose end of the long pieces through the double bar buckle as shown in figure 1. Double fold the loose end toward the outside of the pants and bartack.	1/2 inch Bartack		28 per bartack	35-40
27.	<u>Attach belt loops</u> Position belt loops as follows:				
	a. One on each outseam, with seam allowance folded to one side.				
	b. One centered between the outseam and center front of the pants.				
	c. One on right back and one left back midway ($\pm 1/2$ inch) between outseam and seatseam.				
	d. One centered on seatseam, with seam allowance folded to one side.				
	e. Fold under belt loop ends and horizontally bartack 1/8 inch from folded ends. Top of belt loops shall finish even with top of waistband.	1/2 inch Bartack	LSd-1	28 per bartack	35-40
28.	<u>Bartack fly and front pockets</u>				
	a. Bartack the fly horizontally at base of fly stitching at the junction of the crotch seam and fly, crossing crotch seam by 1/8 inch.	1/2 inch Bartack		28 per bartack	35-40
	b. Bartack right and left fly together on inside, at bottom outside corner	1/2 inch Bartack		28 per bartack	35-40
	c. Bartack the top of the front pocket openings across the pocket welt.	1/2 inch Bartack		28 per bartack	35-40

5100-92M

Table III. Manufacturing Operations Requirements (continued)

No.	Manufacturing operations	Stitch type	Seam and stitching type	Stitches per inch	Thread
29.	<u>Attach waistband button and buttonhole</u>				
	a. Make horizontal buttonhole $3/4 \pm 1/8$ inch from top of left waistband with end of buttonhole $1/2 \pm 1/8$ inch from front edge.	Buttonhole		50-60 per buttonhole	35-40
	b. Attach a tack button on right waistband to correspond with buttonhole in left fly at waistband, and in line with right fly slide fastener.				
30.	<u>Hem bottoms</u>				
	Turn up bottoms as indicated on patterns with the raw edges turned in and single stitch through the legs of the pants $1/16$ to $1/8$ inch from the edge of the fold, starting and finishing at the inseams. The hem shall finish $1 \pm 1/8$ inches in width.	301	EFb-1	9-13	35-40
31.	<u>Attach leg cuff adjustment strap</u>				
	a. Fold over $1/2$ inch of one end of the $5-3/4$ inch strap. Position the hook tape (see operation 1.h.) even with the end of the strap, covering the $1/2$ inch fold and the coverstitched face of the strap. Stitch $1/8 \pm 1/16$ inch from the edge on all four sides of each strip.	301	LSbj-1	7-12	70-80
	b. Position pile tape on outside of pants as indicated by placement marks on pattern. Position the remaining raw edge of the $5-3/4$ inch strap, $1/2$ inch under the end of the pile tape that is closest to the side seam. Attach the pile tape and strap to pants with stitching $1/8 \pm 1/16$ inch from the edge on all four sides.	301	LSbj-1	7-12	70-80
32.	Clean pants				
	a. Trim all thread ends to less than $1/2$ inch and remove all loose threads, spots, stains and shade or size tickets.				
	b. Close the fly slide fastener and button waistband				

5100-92M

3.12 Figures: Figure 1 is referred to in Table III, figures 2 and 3 are provided for clarity and visual reference of part placement, figure 4 is provided as the template for the User Instructions to be included with each pair of pants. The descriptions contained within this document take precedence if there appears to be any conflict between them and the figures.

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 (examinations and tests) as specified herein. Except as otherwise specified in the contract or purchase order, the contractor may use his/her 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 this document where such inspections are deemed necessary to assure supplies and services conform to prescribed requirements.

4.1.1 Responsibility for certification. An approved Certification Organization shall certify that the pants meet the requirements of NFPA 1977. The contractor shall provide all required materials, garments, and information to the Certification Organization to permit such certification.

4.1.2 Responsibility for compliance. All items shall 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 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 nonconforming material, either indicated or actual, nor does it commit the Government to acceptance of nonconforming material.

4.1.3 Responsibility for dimensional requirements. Unless otherwise specified in the contract or purchase order, the contractor is responsible for ensuring that all specified dimensions have been met. When dimensions cannot be examined on the end item, inspection shall be made at any point or at all points in the manufacturing process necessary to ensure compliance with all dimensional requirements.

4.1.4 Certification of compliance. Unless otherwise specified, certificates of compliance supplied by the manufacturer of the item, component, or material, listing the specified test method and test results obtained, may be furnished in lieu of actual lot by lot testing performed by the contractor (see 4.3.2). Where certificates of compliance are submitted, the Government reserves the right to check test such items to determine the validity of the certification.

4.2 Sampling for inspections and tests. Sampling for inspections and tests shall be made in accordance with ASQ Z1.4. The inspection level and acceptable quality level (AQL) shall be as specified.

5100-92M

4.3 Quality conformance inspection. Each end item lot shall be sampled and inspected as specified in 4.3.4.1 and 4.3.4.2. As part of quality conformance inspections, test results shall be submitted to determine compliance of the basic cloth with the requirements of Forest Service specification 5100-88. The packaging shall be sampled as specified in 4.4. Packaging is not required when first articles are presented. Unless otherwise specified (see 6.2), the first articles submitted in accordance with 3.1 shall be inspected as specified in 4.3.4.1 and 4.3.4.2. The presence of any nonconformity or failure to pass any test shall be cause for nonacceptance of a first article sample.

4.3.1 Component and material inspection. In accordance with 4.1, components and materials shall be inspected in accordance with all the requirements of referenced documents, drawings, and standards unless otherwise excluded, amended, modified, or qualified in this specification or applicable purchase document.

4.3.2 Certification. As a part of the first article submission the contractor shall provide certificates of compliance (COC) for the materials of the pants. COCs shall be provided for the following components:

- Basic material (3.2.1)
- Thread (3.2.2)
- Gimp (3.2.3)
- Zipper (3.2.4)
- Button and Tack (3.2.5.1, 3.2.5.2)
- Waist take-up tape (3.2.6)
- Double-bar buckle (3.2.7)
- Leg cuff adjuster metal loop (3.2.8)
- Hook and Pile fastener tape (3.2.9)
- Labels (3.2.10)

4.3.2.1 COC Contents. For items that are specified by part number or choice of part numbers (and not "or equal"), purchasing documents showing the part number are sufficient as a COC. Otherwise, the COC shall include the following:

- Specification with type, class, etc.
- Quantity purchased
- Purchase source, address, and telephone number
- Purchase date

4.3.2.2 Test Reports. The COCs shall be supported by test reports for the following components:

- Basic material (3.2.1)
- Thread (3.2.2)

These test reports shall also be submitted as a part of the first article submission. Test reports supplied by the manufacturer are acceptable.

4.3.2.3 NFPA 1977. As a part of first article submission, the contractor shall provide copies of the third party certification to NFPA 1977.

5100-92M

4.3.3 In-process inspection. Inspection shall be made at any point or during any phase of the manufacturing process to determine whether cut and finished lengths, cut parts, marking for location of components, and location of assembled component parts are in accordance with specified requirements and the drawings. Whenever non-conformance is noted, corrections shall be made to the parts and lot affected in-process. Parts that cannot be corrected shall be removed from production.

4.3.4 Examination of the end item. Examination of the end items shall be in accordance with 4.3.4.1 and 4.3.4.2.

4.3.4.1 Visual examination. Each sample pair of pants selected from lots presented for delivery (see 4.3.4.1.1) shall be examined for nonconformities in color, design, material, construction, workmanship, and marking and the nonconformities classified in accordance with table IV as follows:

TABLE IV. End item classification of visual nonconformities

<u>Nonconformity</u>	<u>Point value</u>
<u>Material Nonconformities and Workmanship Damages</u>	
a. Any hole, cut, tear, mend, burn, needle chew, exposed drill holes, or open place.	3
b. Knot larger than 1/32 inch (unless otherwise classified herein).	1
c. Woven in waste on outside.	1
d. Misweave, area of poor dye penetration, dyestreak, broken and missing section of yarn, visible mend, or thin place.	1
NOTE: Material nonconformities and workmanship damages are to be classified as indicated above only when the condition is one that definitely weakens the structure of the garment or when it is clearly noticeable.	
<u>Shaded Parts</u>	
a. Shaded parts (excluding hip pocket flap liners, right and left fly pieces, belt loops, and cuff closure pieces).	2
b. Any shade bar appearing on finished pants except on waistband or on any place on leg more than 18 inches below the crotch.	1
c. Part cut from ends is badly shaded.	1
<u>Cleanness</u>	
a. Any spot or stain on outside.	1
b. Five or more thread ends not trimmed to 1/2 inch or less	1
c. Two or more size or shade tickets not removed.	1
d. Size or shade marking or residue visible on outside.	1
e. Use of any corrosive metal fastening device or sew-on ticket	3
<u>(cont)</u>	

5100-92M

TABLE IV. End item classification of visual nonconformities

<u>Nonconformity</u>	<u>Point value</u>
<u>Cutting</u>	
a. Any component part not cut in accordance with specified pattern or directional lines as indicated on patterns or not cut in accordance with specification requirements.	3
b. Directional line on front or back varying from the warp directional by more than 1-1/2 inches.	3
c. Twill line of any outside part not running in specified direction.	3
d. Any component part or required operation omitted (unless otherwise classified herein).	3
e. Any operation not performed as specified (unless otherwise classified herein).	1
f. Any component not as specified.	3
g. The edge of any component part required to be forced out, having folds of more than 1/8 inch (unless otherwise classified).	1
h. Overedge machines trimming more fabric than the raveled edges. NOTE: Examine trim from overedge machines to determine this nonconformity.	3
<u>Seams and Stitching</u>	
a. General:	
1. Seam irregular, twisted, pleated, or wavy (unless otherwise classified herein).	2
2. Seam puckered (score only when on major portion of seam) (see 3.5.2).	1
3. Any part of garment caught in any unrelated operation or stitching.	2
4. End of 301 seam, when not caught in other seam or stitching, backtacked less than 1/2 inch (except stitching for attaching labels and automatic stitching).	1
5. Thread break (all stitch types) stitched less than 1/2 inch beyond each end of break.	1
6. Ends of a continuous line of stitching overlapped less than 1/2 inch on all seams except labels and automatic stitching, or less than three stitches on labels and automatic stitching.	1
7. Thread color not as specified.	1
b. Gage of stitching and seam allowance:	
1. Gage irregular or not within range specified.	2
2. Seam allowance not as specified or varies more than 1/8 inch.	2
3. Edge or raised stitching sewn too close to edge resulting in damage to cloth.	3
c. Open seams: NOTE: One or more broken, skipped, or runoff stitches on a joining seam constitutes an open seam.	
1. On all seams except leg bottoms and label stitching:	
(a) Up to 1/2 inch (inclusive)	1
(b) More than 1/2 inch up to 3/4 inch (inclusive)	2
(c) More than 3/4 inch	3
<u>(cont)</u>	

5100-92M

TABLE IV. End item classification of visual nonconformities

Nonconformity	Point value
2. On leg bottoms more than 3/8 inch.	1
3. On label stitching	1
d. Runoffs:	
1. On joining seam, score as an open seam.	
2. Edge or raised stitching (when not resulting in an open seam):	
(a) 1/4 inch up to 1/2 inch (inclusive)	1
(b) More than 1/2 inch.	2
e. Raw edges:	
1. Raw edge not caught in stitching shall be classified as an open seam (unless otherwise specified).	
f. Seam and stitch type:	
1. Seam or stitch type not as specified.	3
2. Looper thread on outside.	3
3. Any required line of stitching omitted.	3
4. Any line of stitching not beginning or ending where specified (unless otherwise classified herein).	1
g. Stitch tension:	
1. Loose tension, resulting in a loose seam.	3
2. Loose tension on edge or raised stitching, resulting in exposed loose thread.	2
3. Tight tension (stitches break when normal strain is applied to seam or stitching).	3
NOTE: Puckering is evidence of tight tension. When puckering is evident, seam shall be tested by exerting pull in lengthwise direction of seam or stitching. If broken stitching results from the pull, score as specified above.	
4. Lock of 301 stitch not imbedded in materials sewn.	1
h. Stitches per inch:	
1. Stitches per inch to be scored only when the condition exists on more than half the length of seam or stitching:	
(a) Less than the minimum specified	2
(b) More than maximum specified.	1
<u>Buttonholes</u>	
a. Omitted, misplaced, added, not specified type, or not finished as specified.	3
b. Gimp omitted or uncut buttonhole.	1
c. Ragged edge, incomplete stitching, stitching not securely caught in fabric.	2
d. One or more broken stitches or two or more skipped stitches in one or more buttonholes.	1
e. Buttonhole stitching extending beyond bartack; stitches per buttonhole less than minimum specified. (1/)	1
f. Finished cut length not as specified.	1
g. End of buttonhole tacked with less than four stitches per bar.	1
h. Gimp color not a good approximation of the color of the basic material	1
(cont)	
<u>1/ Stitches per buttonhole shall be determined by counting the number of needle perforations containing stitch floats to the outside of the buttonhole gimp.</u>	

5100-92M

TABLE IV. End item classification of visual nonconformities

<u>Nonconformity</u>	<u>Point value</u>
<u>Tack Button and Button Tack</u>	
a. Missing.	3
b. Wrong type, size, color, or finish.	3
c. Misplaced.	1
d. Improperly set; loose, allowing tack to turn or distance from top of button to bottom of tack incorrect distance.	2
e. Button or tack not clean, evidence of oil, grease, or dirt	1
f. Rough or sharp edge, burr or sliver, dent, dig, pits or wrinkle on button or bottom of tack.	2
g. Button or tack cracked, broken, or malformed.	2
h. Lettering detail is marred, missing, or obliterated or is not clear.	2
<u>Fastener Tapes</u>	
a. Missing.	3
b. Misplaced or nonconforming, i.e., not serving intended purpose.	2
c. Length or width not as specified.	1
d. Incorrect color.	1
<u>Bartacks</u>	
a. One missing, loose or misplaced; not specified size or not serving intended purpose. NOTE: Any bartack running off hip or cargo pockets or flaps by more than 1/8 inch shall be classified as a misplaced bartack.	1
b. Two missing, loose, or misplaced; not specified size or not serving intended purpose.	2
c. Three or more missing, loose, or misplaced; not specified size or not serving intended purpose.	3
d. Bartack missing from any belt loop (each occurrence).	3
e. Loose stitch tension.	1
<u>Labels (Combination and Woven Size)</u>	
a. Woven size label missing, incorrect, or illegible.	3
b. Combination label missing, incorrect, or illegible.	3
c. Combination label not stitched on all four sides.	2
d. Any label not positioned as specified.	2
e. Stitching through the printing on any label.	1
<u>Zipper</u>	
NOTE: Operate slider on chain twice opening and closing the complete length of chain and locking slider each time.	
a. Nonconforming, affecting function.	3
b. Not size or style specified.	3
c. Cut, tear, or hole in zipper tape.	3
d. Zipper attached with less than two rows of stitching through length of tape (each side).	3
<u>(cont)</u>	

5100-92M

TABLE IV. End item classification of visual nonconformities

<u>Nonconformity</u>	<u>Point value</u>
e. Stitching too close to metal chain, not permitting slider to pass freely.	3
f. Edge of chain not positioned within specified range at top or bottom from finished edge of left fly.	1
<u>Waistband</u>	
a. Width of finished waistband not as specified.	1
b. Left waistband buttonhole positioned less than 5/8 or more than 7/8 inch from top of waistband.	1
c. End of left waistband buttonhole less than 3/8 or more than 5/8 inch from front edge.	1
d. Right waistband tack button not aligned with buttonhole, causing bulge or twist.	2
<u>Belt Loops</u>	
a. Omitted, covering stitch on outside, or incorrect width.	2
b. Set at an angle (more than 3/16 inch off perpendicular), insecure, not attached as specified, width not as specified, or poorly shaped.	1
c. Space between bartacks on one or more belt loops less than 2-1/8 inches or more than 2-1/2 inches.	2
d. Front belt loop more than 1/2 inch off center.	1
e. Side belt loop more than 1/4 inch from outseam.	1
f. Back belt loop more than 1/2 inch from midway between outseam and seatseam.	1
g. Belt loop on center back more than 1/4 inch from seatseam.	2
h. Belt loop end turn under not as specified.	1
<u>Front Opening</u>	
a. Closed flys uneven in length by more than 1/4 inch.	1
b. Fly twisted or puckered (see 3.5.2).	2
c. Fly facing exposed beyond front edge.	1
d. Bottom ends of fly not caught in stitching of crotch seam.	2
e. Stitching on left fly irregular or not positioned as specified or not terminating where specified.	2
f. Seam joining right fly to front exposed when fly is closed.	2
g. Top end of zipper tape not set into waistband as specified.	3
h. Right edge of zipper tape cut when overedger used.	1
<u>Hip Pockets (and Flaps), Cargo Pockets (and Flaps), and Front Pockets</u>	
a. End of pocket opening exposed beyond end of flap.	1
b. Pocket or flap on right side not in alignment with corresponding pocket or flap on left side by more than 1/4 inch.	1
c. Flap excessively full, twisted or puckered (3.5.2).	1
d. Flap does not lie smooth and flat when closed.	1
e. Bottom of hook tape less than 1/2 inch or more than 5/8 inch from edge of flap.	1
f. Hook tape on hip pocket flap off center by more than 1/4-inch.	1
<u>(cont)</u>	

5100-92M

TABLE IV. End item classification of visual nonconformities

<u>Nonconformity</u>	<u>Point value</u>
g. Hip, cargo or front pocket opening finishing less than specified.	3
h. Hip or cargo pocket hem not finishing 1-3/8 ±1/4 inch.	1
i. Pile tape not positioned correctly on pocket hem	1
j. Outside folded pleat on cargo pocket not facing towards back of pants.	3
<u>Seatseam</u>	
a. Seatseam constructed with less than two needle threads or less than two bobbin or looper threads.	3
b. Needle thread stitching on seatseam forming stitches that are not staggered or specified distance apart.	1
<u>Inseams and outseams</u>	
a. Folds at knees missing on inseam or outseam.	3
b. Folds at knee facing up.	1
<u>Leg Bottom</u>	
a. Not finished as specified.	1
b. Width of hem not as specified or irregular by more than 1/4 inch.	1
<u>Waist take-up</u>	
a. Any of the waist take-up tapes missing from either side, hardware missing, incorrect hardware.	3
c. Loose end of either side not bartacked, buckle incorrectly threaded.	2
<u>Cuff closure</u>	
a. Cuff closure strap missing, incorrectly placed, incorrect hardware.	3

4.3.4.1.1 Acceptable point values. The sample size based on the lot size and the acceptance values for 3 and 2 point nonconformities and total (3, 2, and 1 point) nonconformities listed in 4.3.4.1 shall be as specified in table V. The sample unit shall be one pair of pants and the lot shall be unacceptable if either or both of the following occur:

a. The point value for 3 and 2 point nonconformities exceeds the applicable maximum acceptable point value.

b. The point value for total (3, 2, and 1 point) nonconformities exceeds the applicable maximum acceptable point value.

5100-92M

Table V. Sampling provisions for visual examination

	Lot size	Sample size	Maximum acceptable point values	
			3 & 2 point nonconformities (1/)	3, 2, & 1 point nonconformities
Normal Inspection	Up to 500	50	18 points	25 points
	501 to 1,200	80	25 points	36 points
	1,201 to 3,200	125	32 points	50 points
	3,201 to 10,000	200	45 points	73 points
	10,001 and over	315	68 points	110 points
Tightened Inspection	Up to 500	50	13 points	20 points
	501 to 1,200	80	20 points	30 points
	1,201 to 3,200	125	32 points	40 points
	3,201 to 10,000	200	45 points	58 points
	10,001 and over	315	68 points	88 points
Reduced Inspection	Up to 1,200	32	13-20 points	25 points
	1,201 to 3,200	50	16-25 points	32 points
	3,201 to 10,000	80	23-32 points	43 points
	10,001 and over	125	32-41 points	54 points

1/ For reduced inspection, when the first value is exceeded but not the second value, the lot shall be accepted, but normal inspection shall be reinstated (see 4.3.4.1.4.4). The second value is the maximum acceptable point value.

4.3.4.1.2 Initiation of inspection. Normal inspection shall be used at the start of inspection unless otherwise directed by the responsible procurement quality assurance element administering the contract.

4.3.4.1.3 Continuation of inspection. Normal, tightened, or reduced inspection shall continue unchanged on successive lots except where switching procedures in 4.3.4.1.4 require change.

4.3.4.1.4 Switching procedures.

4.3.4.1.4.1 Normal to tightened. When normal inspection is in effect, tightened inspection shall be instituted when two out of five consecutive lots have not been accepted on original inspection (i.e., ignoring resubmitted lots for this procedure).

4.3.4.1.4.2 Tightened to normal. When tightened inspection is in effect, normal inspection shall be instituted when five consecutive lots have been considered acceptable on original inspection.

4.3.4.1.4.3 Normal to reduced. When normal inspection is in effect, reduced inspection shall be instituted, providing that all of the following conditions are satisfied:

- a. The preceding 10 lots have been on normal inspection and none have not been accepted on original inspection; and
- b. The total number of points for 3 and 2 point nonconformities in the samples from the preceding 10 lots is equal to or less than 60 percent of the total maximum acceptable point values for 3 and 2 point nonconformities from the preceding 10 lots; and

5100-92M

c. The total number of points for 3, 2 and 1 point nonconformities in the sample from the preceding 10 lots is equal to or less than 75 percent of the total maximum acceptable point values for 3, 2 and 1 point nonconformities from the preceding 10 lots; and

d. Production is at a steady rate; and

e. Reduced inspection is considered desirable by the procurement quality assurance element administrating the contract.

4.3.4.1.4.4 Reduced to normal. When reduced inspection is in effect, normal inspection shall be instituted if any of the following occur on original inspection:

a. A lot is not accepted; or

b. A lot is considered acceptable but exceeds the applicable first value (see 4.3.4.1.1); or

c. Production becomes irregular or delayed; or

d. Other conditions warrant that normal inspection be instituted.

4.3.4.2 Dimensional examination. The appropriate number of pants, determined from table VI, shall be examined for conformance to the dimensional requirements cited in table II. When a measurement deviates from a dimension and tolerance specified, the pants shall be penalized 1 point. Each pair of pants shall also be penalized 1 point when the inseams are uneven in length by 1/2 inch or more. The lot shall be unacceptable if the total point value resulting from this examination exceeds the maximum acceptable point value. Each size of pants present in the lot should be represented in the sample selected for this examination.

Table VI. Sampling provisions for dimensional examination

Lot size	Sample Size	Maximum acceptable point values
Up through 500	8	0
50 - 3,200	13	1
3,201 - 35,000	20	2
35,001 and up	32	3

4.4 Packaging inspection. An examination shall be made to determine that preservation, packing, and marking comply with the section 5 requirements. Nonconformities shall be scored in accordance with Table VII. The sample unit shall be one shipping container fully packaged with the exception that it need not be closed. Examination of closure nonconformities listed below shall be made on shipping containers fully packaged. The lot size shall be the number of shipping containers in the end item inspection lot. The inspection level shall be S-2 and the AQL, expressed in terms of nonconformities per hundred units, shall be 2.5.

5100-92M

Table VII. Packaging Examination

<u>Examine</u>	<u>Nonconformity</u>
Markings	Omitted; incorrect; illegible; of improper size, location, sequence, or method of application.
Materials	Any component missing or not as specified. Any component damaged, affecting serviceability.
Workmanship	Inadequate application of components, such as: incomplete closure of container flaps, improper taping, loose strapping, inadequate stapling. Bulged or distorted container.
Contents	Number of items per container is more or less than required.

5. PACKAGING

5.1 Preservation. Preservation shall be in accordance with ASTM D 3951 and as specified in the contract or purchase order (see 6.2).

5.1.1 Packaging. Each pair of pants, with the fly and pocket flaps closed and the inseams meeting, shall be folded from the leg bottom up toward the waistband to an overall length of approximately 23 inches. For larger sizes it may be necessary to adjust the seat area with a tuck to achieve the desired width of approximately 14-1/2 inches.

5.2 Packing. Thirty (30) pairs of pants of one size, packaged in accordance with 5.1.1, shall be packed in a fiberboard box. The box shall comply with the Uniform Freight Classification and the National Motor Freight Classification. Boxes shall be type CF, variety SW, class Domestic, grade 350 (ECT 55) of ASTM D 5118; the closure shall be in accordance with method IV of the appendix. The box size shall be 24" L x 15-1/2" W x 17" D.

5.3 Marking. In addition to any special marking required by the contract or purchase order, shipping containers shall be marked in accordance with FED-STD-123.

6. NOTES

6.1 Intended use. The pants are intended to be worn with flame-resistant shirts for fighting wildland fires and for conducting controlled burning operations.

6.2 Acquisition requirements. Acquisition documents must specify:

- a. Title, number, and date of this specification.
- b. Sizes of pants in listed waist range and inseam length (S, R, or L) and quantities required (see 1.2).
- c. When required, the specific issue of individual document referenced (see 2.1 and 2.2).
- d. When lot by lot testing is required in lieu of certificates of compliance (see 4.3.2).
- e. Packaging requirements if other than specified (see 5.1 and 5.2).

5100-92M

6.3 First article. When first articles are required, they shall be inspected and approved under the appropriate provisions of FAR 52.209. First articles shall be preproduction samples. The contracting officer should include specific instructions in all acquisition documents regarding arrangements for selection, inspection, and approval of the first articles.

6.4 Known sources. The following are know sources for items referenced in this document:

Waist take-up tape

Offray Specialty Narrow Fabrics, Inc.
360 Route 24
P.O. Box 421
Chester, NJ 07930
Ph: 908-879-3636
Fax: 908-879-3630

Double-bar buckle

Albest Metal Stamping Corp.
One Kent Avenue
Brooklyn, NY 11211-1014
718-388-6000

ITW Waterbury
952 South Main Street
Waterbury, CT 06706
203-753-1161

Leg cuff adjuster metal loop

Albest Metal Stamping Corp.
One Kent Avenue
Brooklyn, NY 11211-1014
718-388-6000

Button and tack

YKK Snap Fasteners, Inc.
P.O. Box 240
Lawrenceburg, KY 40342
502-839-6971

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

6.6 Bidder information. For bidding purposes, 11" X 17" drawings will be furnished upon request. They will contain sufficient information regarding size, shape, and quantity of material for bidding purposes. It is the bidder's responsibility to determine yield and waste from the provided 11" X 17" drawings and no further direction or clarification will be provided by the government. Color shade samples, full-size drawings and full-size patterns will be furnished only to successful bidders upon contract award.

5100-92M

6.7 Preparing Activity. USDA Forest Service, Missoula Technology and Development Center (MTDC), 5785 Highway 10 West, Missoula, Missoula, Montana 59808.

5100-92M

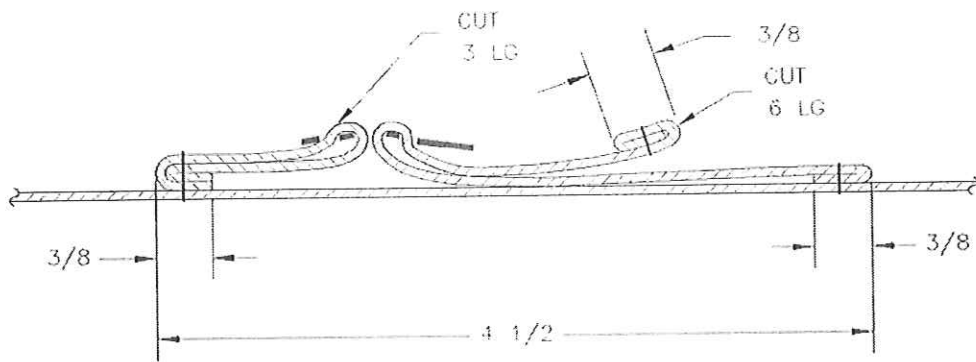
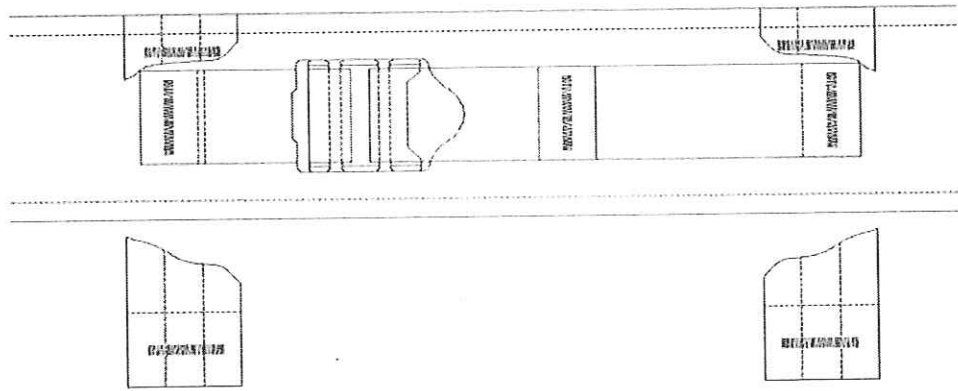


FIGURE 1 - WAIST TAKE-UP TAPE

5100-92M

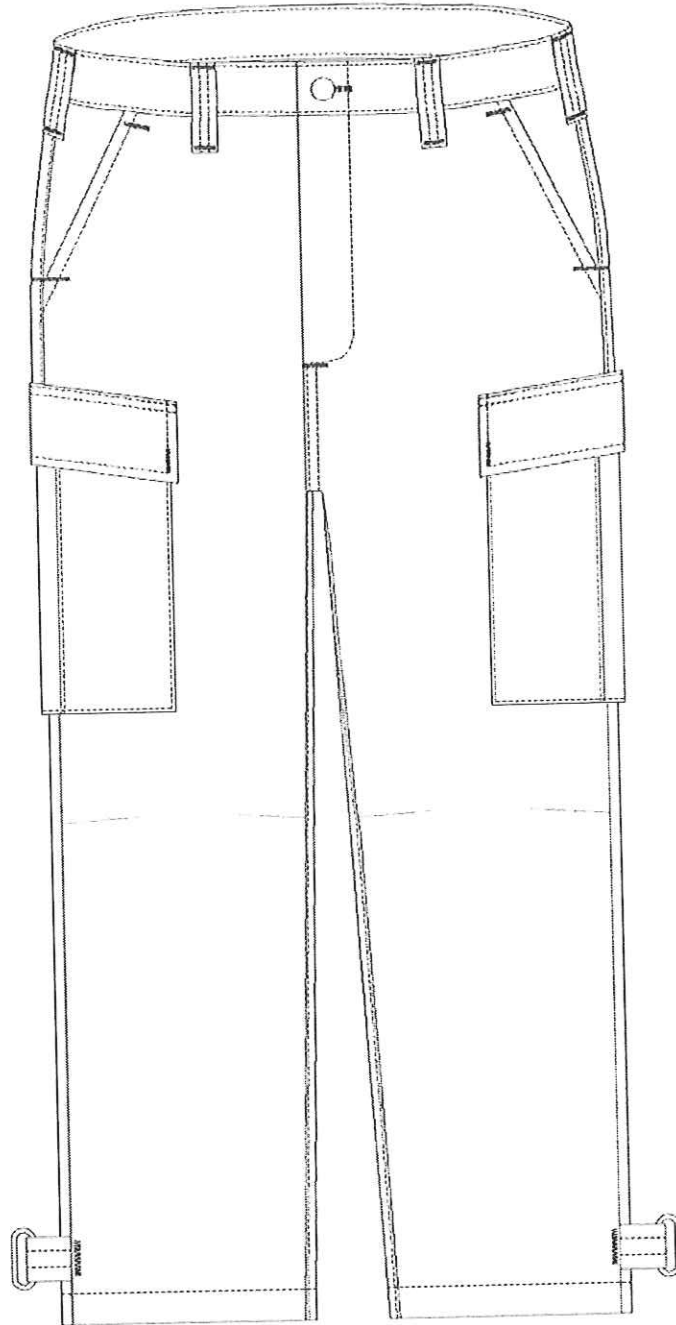


FIGURE 2 - PANTS - FRONT

5100-92M

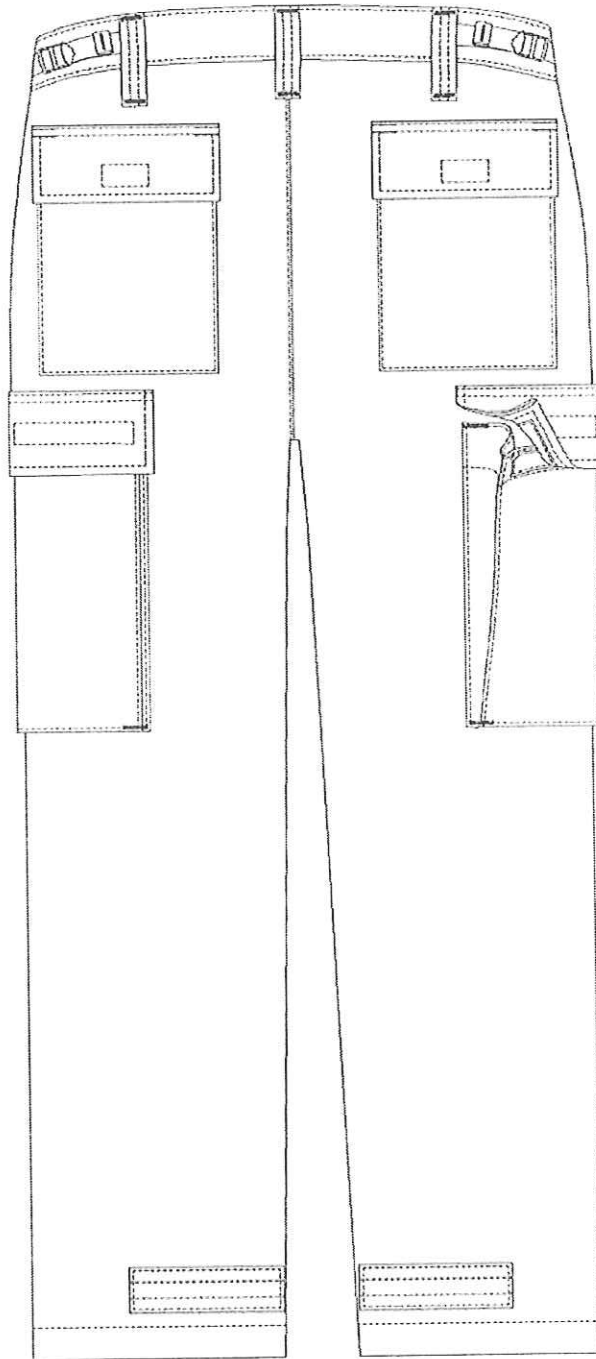


FIGURE 3 - PANTS - BACK

5100-92M

User Instructions
(Remove only by end user)

Pants, Flame-resistant. US Forest Service Specification – 5100-92

1. Pre-Use Information

- a) Safety Considerations. Use this garment in conjunction with all other required PPE, including hard hat, gloves, flame-resistant shirt, leather boots and fire shelter. This garment should be used only by personnel who have completed the required formal training courses for wildland fire fighting operations and fully understand the limitations and use of this garment.
- b) This garment provides limited thermal and physical protection from the hazards associated with wildland fire fighting.
- c) This garment should not be marked.
- d) The protective properties of this garment cannot be tested by users in the field.
- e) The contractor warrants this garment to be free from defects in workmanship and materials for one year after date of purchase. The warranty assumes that the garment is used by trained personnel following accepted wildland fire fighting procedures.

2. Preparation for Use, Donning/Doffing

- a) Sizing/Adjustment: Pants should be loose fitting. Pants are available in 8 waist sizes with short, regular or long inseam length options.
- b) Interface Issues: These pants are an outer garment; undergarments should be made of 100% cotton, wool, silk, aramid or other flame resistant materials.
- c) Recommended storage: Clean and dry these pants properly before storage. Store in a dry place - out of direct sunlight and extreme temperatures.

3. Inspection Frequency and Details

Inspect garment upon receipt and after each cleaning. Inspect for holes, tears and proper operation of fasteners.

4. Maintenance and Cleaning

- a) Do not use this garment if it is not thoroughly cleaned and dried.
- b) Machine wash in hot water, NO BLEACH. Wash separately from flammable, lint producing fabrics. Rinse thoroughly, soap and detergent residues will burn. Do not starch. Tumble dry medium and remove promptly.

5. Decontamination Procedures

- a) Decontamination is dependent upon what the protective clothing has been exposed to; however chlorine bleach cannot be used under any circumstances.
- b) For extreme contamination with products of combustion or fire debris, remove the contaminants by flushing with water as soon as possible, followed by appropriate cleaning.

6. Retirement/Disposal Criteria

It is recommended that individual units establish their own criteria for routine inspection and subsequent repair or retirement of this garment.

7. Proper use should be consistent with NFPA 1500, Standard on Fire Department Occupational Safety and Health Program, and 29 CFR 1910.132, "Personal Protective Equipment."

Figure 4
User Instructions

5100-607D
December 4, 2008
Supercedes
5100-607C
Dated November 29, 2007

U.S. DEPARTMENT OF AGRICULTURE
FOREST SERVICE

SPECIFICATION

CLOTHS, LAMINATED, FIRE SHELTER, M-2002

1. SCOPE

1.1 Scope. This specification covers the requirements for the three laminated cloths used in the manufacture of the Fire Shelter, M-2002, as described by Forest Service Specification 5100-606.

2. APPLICABLE DOCUMENTS

2.1 Government documents, drawings and publications. The following other Government documents and drawings 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.

DOCUMENTS

5100-615 - Protocol for Evaluating Off-gas Toxicity of Fire Shelter Material

DRAWINGS

USDA FOREST SERVICE

MTDC-1000 - Shelter, Fire, M-2002

(Copies are available from the preparing activity, see 6.6.)

Beneficial comments (recommendations, additions, deletions) and any pertinent data that may be used in improving this document should be addressed to: USDA Forest Service, Missoula Technology and Development Center, 5785 Highway 10 West, Missoula, MT 59808, ddavis02@fs.fed.us.

FSC 8305

5100-607D

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 SOCIETY FOR TESTING AND MATERIALS (ASTM)

C 169 – Standard Test Methods for Chemical Analysis of Soda-Lime and Borosilicate Glass
 D 774 - Standard Test Method for Bursting Strength of Paper
 D 1876 - Standard Test Method for Peel Resistance of Adhesives (T-Peel Test)
 D 3951 - Standard Practice for Commercial Packaging
 SI-10 - Standard For Use of the International System of Units(SI): The Modern Metric System (IEEE/ASTM Standard available from ASTM)

(Copies are available from ASTM International, 100 Barr Harbor Dr., West Conshohocken, PA 19428-2959.)

AMERICAN SOCIETY FOR QUALITY (ASQ)

ASQ Z1.4 – Sampling Procedures and Tables for Inspection by Attributes

(Copies are available from ASQ, PO Box 3066, Milwaukee WI 53201-3066.)

ALUMINUM ASSOCIATION

Aluminum Association Standards and Data

(Copies are available from Aluminum Association, Publication Department, 818 Connecticut Ave. NW, Washington, DC 20006.)

(Non-Government standards and other publications normally are available from the organizations that prepare and 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 conflict between the text of this document and 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 Compliance testing. Unless otherwise specified, the laminated cloths shall be subjected to compliance testing in accordance with 4.3. During the term of the contract the contractor shall be required to notify the contracting officer in writing when a component, or the component supplier changes in any way; and when a manufacturing location changes. The contracting officer may at any time require the contractor to submit samples for testing when substantive changes occur during the term of the contract.

5100-607D

3.1.1 ISO registration. The manufacturer shall be registered to ISO 9001, Quality Management Systems - Requirements. The operation of the quality assurance program shall evaluate and test product production against this specification to ensure that production remains in compliance. ISO Registration shall be maintained throughout the term of any government contract.

3.1.2 Third-party certification. The Fire Shelter laminated cloths shall be certified as being in compliance with this specification by Underwriter's Laboratory (UL). Certification testing shall be conducted as specified by 4.1.5 and shall include a follow-up program sufficient to verify continued adherence to the specifications of the contract.

3.2 Materials.

3.2.1 Laminates.

3.2.1.1 Construction of laminates. The M-2002 Fire Shelter uses three separate laminated cloths designated as the shell outer laminate, shell inner laminate, and floor laminate. Each lot of each type of laminate produced shall be traceable by a unique lot number.

3.2.1.2 Shell outer laminate. The shell outer laminate shall be Cleveland Laminating Corp. (6.4) Product number 6077FS, consisting of VSS KA300P-E (3.2.3) and 0.001 inch aluminum foil (3.2.4).

3.2.1.3 Shell inner laminate. The shell inner laminate shall be Cleveland Laminating Corp (6.4) Product number 6078FS, consisting of 0.0007 inch aluminum foil (3.2.5) and glass cloth (3.2.6).

3.2.1.4 Floor laminate. The floor laminate shall be Cleveland Laminating Corp (6.4) Product number 6079FS, consisting of VSS KA180P-E (3.2.2) between two layers of 0.0007 inch aluminum foil (3.2.5).

3.2.2 Silica Cloth KA180P-E. Shall be KA180P-E as manufactured by Valmieras Stikla Skiedra (VSS) (see 6.4), and shall have the physical properties as listed in Table I. The material manufacturer shall certify to the properties of Table I.

3.2.3 Silica Cloth KA300P-E. Shall be KA300P-E as manufactured by Valmieras Stikla Skiedra (VSS) (see 6.4), and shall have the physical properties as listed in Table I. The material manufacturer shall certify to the properties of Table I.

5100-607D

Table I - Material Properties of VSS Fabrics 1/

Properties	Units	VSS KA300P-E	VSS KA180P- E	Test Paragraph
Silica (SiO ₂) and Alumina (Al ₂ O ₃) (combined) Content	%	97.5 min	97.0 min	4.4.2.8
Alumina (Al ₂ O ₃)	%	5.0 max	5.0 max	4.4.2.8
Fluorine (total)	ppm	100 max	100 max	4.4.2.9
		(average of 3 samples)	(average of 3 samples)	
Phosphorus	ppm	100 max	100 max	4.4.2.10
		(average of 3 samples)	(average of 3 samples)	
Weave Style		Plain	Plain	
Fabric Finish		Loom Stage with Silane	Loom Stage with Silane	
Fabric Weight	Oz/sq. yd	9.5 ±0.5	5.6 ±0.5	
Fabric Thickness	Inches	0.016	0.008	
		±0.002	±0.003	
Roll Length	Yards	250 min	250 min	
Yarn Count (Fill x Warp)	Ends/inch	20 x 20, +3, -2	25 x 25, +3, -2	

1/ Unless otherwise specified, every test shall be performed or certified on every lot.

3.2.4 1 mil aluminum foil. The 1 mil thick aluminum foil shall be in accordance with SRM Alloy 1235, 1100 or 1145; 0.001 inch thick -5%, +10%. The aluminum foil shall meet the requirements of Aluminum Association Standards and Data.

3.2.5 0.7 mil aluminum foil. The 0.7 mil aluminum foil shall be in accordance with SRM Alloy 1235, 1100 or 1145; 0.0007 inch thick ±10%. The aluminum foil shall meet the requirements of Aluminum Association Standards and Data.

3.2.6 Glass cloth. The glass cloth shall be woven fiberglass cloth and shall have properties listed in Table II.

3.2.6.1 Glass cloth impurity content. Fluorine shall be tested in accordance with 4.4.2.9. Phosphorus shall be tested in accordance with 4.4.2.10.

5100-607D

Properties	Units	Values	Test Paragraph
Style		1080	
Weave Style		Plain	
Fabric Finish		Loom Stage	
Yarn Count (Fill x Warp)		60 x 47 ±2	
Fabric Weight	Oz/sq. yd	1.38 ±10%	
Fabric Thickness	Inches	0.002 ±0.0005	
ECD (warp and fill)		450 1/0	
Fluorine	ppm	2000 maximum (average of 3 samples)	4.4.2.9
Phosphorus	ppm	75 maximum (average of 3 samples)	4.4.2.10

3.3 Testing.

3.3.1 Off-gas toxicity. The composite of the shell outer and shell inner laminates shall be tested in accordance with 4.4.2.1 to the criteria listed in Table III.

Table III - Criteria for Off-gas Toxicity of Laminates

Species	Designation	Maximum Allowed
Hydrogen cyanide	HCN	17 ppm
Hydrogen chloride	HCl	100 ppm
Hydrogen fluoride	HF	95 ppm
Nitrogen oxides	NOx	20 ppm
Carbon monoxide	CO	420 ppm

3.3.2 Peel strength. The minimum peel or stripping strength of the laminated cloths shall be as shown in Table IV when tested in accordance with 4.4.2.2.

3.3.3 Creep. The adhesive bond of the laminated cloths shall have a maximum creep as specified by Table IV when tested in accordance with 4.4.2.3.

3.3.4 Adhesive identification. The adhesive shall be identified by testing in accordance with 4.4.2.4 and shall match the spectrum of adhesive of the standard samples (6.3).

3.3.5 Organic content of inner shell laminated cloth. The organic content of the shell inner laminate (3.2.1.3) shall not exceed 10.7% when tested as specified by 4.4.2.5.

3.3.6 Adhesive weight. The adhesive weight shall be a maximum of 0.9 gm/ft² for the shell outer laminate (3.2.1.2), a maximum of 0.9 gm/ft² for the shell inner laminate (3.2.1.3) and a maximum of 1.8 gm/ft² for the floor laminate (3.2.1.4) when tested as specified by 4.4.2.6.

3.3.7 Burst Strength. The Burst Strength of the laminated cloths shall be as shown in Table IV when tested in accordance with 4.4.2.7.

5100-607D

Table IV - Physical Properties of Laminates

Laminate	Peel strength (lbs/in width, min.)	Creep (max)	Burst Strength (psi)	
			Average (min.)	Individual (min.)
Shell outer laminate	1.75	2 inches	240	225
Shell inner laminate	1.75	2 inches	70	65
Floor laminate	1.75 (each bond)	2 inches (each bond)	210	190

3.4 Width. The laminated cloths widths shall be as required by the sewing contractor to meet the drawings and specifications for the finished product (drawing MTDC-1000, see Section 2).

3.5 Length and put-up. Unless otherwise specified, the finished laminated cloth shall be furnished on continuous rolls and each roll shall contain not less than 250 linear yards and with not more than six splices.

3.6 Deviations and waivers. There shall be no deviations or waivers to the materials or construction specified herein unless authorized in writing by the contracting officer.

3.7 Workmanship. The finished laminated cloths shall conform to the quality and grade established by this specification. The occurrence of nonconformities shall not exceed the applicable point value or nonconformity limit.

3.8 Metric products. 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. 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 and test requirements (examinations and tests) as specified herein. Except as otherwise specified in the contract or purchase order, the contractor may use his/her 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 this specification where such inspections are deemed necessary to ensure supplies and services conform to prescribed requirements.

4.1.1 Responsibility for compliance. All items shall 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 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 nonconforming material, either indicated or actual, nor does it commit the Government to accept nonconforming material.

5100-607D

4.1.2 Certificate of compliance. Where certificates of compliance are submitted, the Government reserves the right to check test such items to determine the validity of the certification (see 4.1.2.1). All certificates of compliance from the contractor shall be based on full test reports of the characteristics being certified. These test reports shall be in the possession of the contractor and available for inspection by the contracting officer or contracting officer's representative.

4.1.2.1 Certificates of compliance. The contractor shall provide certificates of compliance for materials as shown in Table V.

Table V - Certificates of Compliance

	KA 180	KA 300	Glass Cloth	1 mil Foil	0.7 mil Foil	6077 FS	6078 FS	6079 FS
Table I - Material Properties of VSS Fabrics								
4.4.2.8 Silica Content	X	X						
4.4.2.8 Alumina Content	X	X						
4.4.2.9 Fluorine Content	X	X						
4.4.2.10 Phosphorus Content	X	X						
Other Properties in Table I	X	X						
Table II - Material Properties of Glass Cloth								
4.4.2.9 Fluorine			X					
4.4.2.10 Phosphorus			X					
Other properties in Table II			X					
3.2.4 Foil				X				
3.2.5 Foil					X			
Table III - Off-gas Toxicity of Laminates						X (Combined)	X (Combined)	
Table IV - Physical Properties								
4.4.2.2 Peel						X	X	X
4.4.2.3 Creep						X	X	X
4.4.2.7 Burst						X	X	X
3.3.4 Adhesive ID 4.4.2.4						X	X	X
3.3.5 Organic Content 4.4.2.5							X	
3.3.6 Adhesive Weight 4.4.2.6						X	X	X

5100-607D

4.1.2.2 Certificates of compliance information. The contractor shall provide the following information on or with certificates of compliance:

- Product description
- Fabric identification or style number
- Specification or standard (when applicable)
- Manufacturer's lot number
- Quantity purchased
- Purchase source, address and telephone number
- Purchase date

4.1.3 Test reports. The contractor shall provide copies of the all required test reports. The test reports shall include the following information:

- Manufacturer's name, address, and telephone number
- Lot number
- Date of manufacture
- Testing company name, address, and telephone number
- Testing date
- Tester's name and title
- Full test result of all samples tested

4.1.4 Material samples. The contractor shall retain certified raw materials and laminated samples for each production run in the following amounts and time periods:

<u>Certified raw Materials</u>	<u>Sample size</u>	<u>Time period</u>
VSS KA300P-E	1 linear yard	7 years
VSS KA180P-E	1 linear yard	7 years
1 mil Aluminum foil	1 linear yard	7 years
0.7 mil Aluminum foil	1 linear yard	7 years
Glass cloth	1 linear yard	7 years
<u>Laminated Materials</u>	<u>Sample size</u>	<u>Time period</u>
Shell outer	1 linear yard	7 years
Shell inner	1 linear yard	7 years
Floor	1 linear yard	7 years

4.1.4.1 Material Inventory. Previously approved and certified laminated materials not utilized from a prior contract period may be utilized at the initiation of a new contract period, with certifications.

4.1.5 Third-Party certification. The manufacturer of the laminated materials shall initiate an agreement with Underwriter's Laboratories (UL) (see 6.4) to certify compliance of the laminate material to this document and to monitor the continued quality of the laminated material production. The agreement shall specifically include a follow-up program sufficient to verify continued adherence to the specifications of the contract. The manufacturer of the laminated material shall be responsible for this certification.

5100-607D

4.1.5.1 Testing for third-party certification. UL shall test to confirm the following requirements and tests:

- 3.2.2 Silica Cloth KA180P-E. (visible properties and weight only)
- 3.2.3 Silica Cloth KA300P-E. (visible properties and weight only)
- 3.2.4 1 mil aluminum foil. (thickness only)
- 3.2.5 0.7 mil aluminum. (thickness only)
- 3.2.6 Glass cloth. (All properties of table II)
- 4.4.2.2 Peel strength. (All laminates)
- 4.4.2.3 Creep test. (All laminates)

4.1.5.2 Test witnessing for third-party certification. UL shall witness the following test:

- 4.4.2.1 Off-gas toxicity.

4.1.5.3 Test results review for third-party certification. UL shall review the test results of the following tests and may accept them as proof of conformance:

- 4.4.2.4 Adhesive identification - Infrared test.
- 4.4.2.5 Organic content of inner laminate cloth - Thermogravimetric analysis (TGA).
- 4.4.2.6 Adhesive weight.
- 4.4.2.7 Burst Strength Test.
- 4.4.2.8 Silica and Alumina Content of the silica cloth.
- 4.4.2.9 Fluorine Content.
- 4.4.2.10 Phosphorus Content.

4.1.6 ISO Registration. Evidence of current ISO registration (3.1.1) shall be presented with the First Article Sample of the Fire Shelter in accordance with 5100-606.

4.1.7 Third-party certification. Evidence of third-party certification (3.1.2) shall be submitted with the First Article Sample of the Fire Shelter in accordance with 5100-606, along with the test results of the tests performed in the certification process.

4.2 Sample lots.

4.2.1 Inspection lot. For purposes of inspection and testing, except for off-gas toxicity testing (4.4.2.1, 4.4.2.9, and 4.4.2.10), all laminates produced as a production lot for each product, shell outer (3.2.1.2), shell inner (3.2.1.3) and floor (3.2.1.4) shall be considered an inspection lot.

4.2.1.1 Acceptance tests. Except where otherwise specified (4.4.2.1, 4.4.2.4, 4.4.2.5, and 4.4.2.6) all sampling shall be in accordance with ASQ Z1.4. The sample size shall be selected in accordance with inspection level S-2 with an AQL of 10. The lot size shall be expressed in units of linear yards.

4.2.2 Off-gas toxicity test lot. At the initiation of each contract the shell composite of laminates 3.2.1.2 and 3.2.1.3 shall be tested in accordance with 4.4.2.1.

4.3 Sampling for lot acceptance, inspection and test. Random samples of laminated cloth units shall be selected from each lot for inspection and testing, the sample sizes shall be obtained as specified in ASQ Z1.4.

5100-607D

4.3.1 Visual inspection. For visual inspection, the sample size shall be selected in accordance with inspection level I of ASQ Z1.4 and sufficient rolls shall be selected at random from the lot so that by inspecting approximately 2 consecutive yards out of each roll, a total of inspected yardage equal to that required shall be obtained. A unit of laminated cloth shall be 1 linear yard of the finished material.

4.3.2 Sample Handling and Labeling. All fabric samples shall be packaged and labeled "FIRE SHELTER FABRIC (fabric designation) DO NOT HANDLE PRIOR TO TESTING." Samples shall not be handled by bare hands prior to or during this packaging.

4.4 Inspection and tests.

4.4.1 Visual inspection. Each sample selected according to 4.3.1 shall be visually examined for nonconformities specified in Table VI. Normal inspection distance shall be 3 feet average and samples shall be examined over a uniform light source of 250-foot candles minimum, and all areas of the laminated cloth shall be examined. Classification of nonconformities shall be in accordance with Table VI and lot acceptance shall be based upon Acceptable Quality Levels (AQL's). The AQL's shall be 2.5 for major nonconformities and 6.5 for minor nonconformities.

Table VI - Classification of nonconformities

Classification Examine	Nonconformity	Major	Minor
Material	Not as specified	X	
	Length of put-up not as specified	X	
Blisters and unlaminated areas	Greater than 1/4 square inch in size	X	
	Less than ¼ square inch in size:		
	One to six		X
Creases or mill wrinkles	More than six	X	
	Greater than 6 linear inches in length (applies to inner shell laminate only)	X	
	Less than 6 linear inches in length (applies to inner shell laminate only)		X
Evidence of break	Note: Wrinkles in floor laminate or shell outer laminate are acceptable as long as there is no evidence of foldovers or breaks in aluminum foil.		
	One to six in aluminum foil		X
	More than six	X	

4.4.1.1 Yarn gaps. After laminating the outer shell laminate, any areas of yarn in either direction with yarns spread more than 3/16 inch apart and greater than 8 inches in length shall be removed.

4.4.2 Tests. Each sample of the finished laminates, selected in accordance with 4.2.1.1, shall be tested for the requirements in Table VII.

5100-607D

Table VII - Test methods

Characteristic	Requirement paragraph	Test method
Off-gas Toxicity	3.3.1	4.4.2.1
Peel strength	3.3.2	4.4.2.2
Creep	3.3.3	4.4.2.3
Adhesive identification	3.3.4	4.4.2.4
Organic content		
Glass/Foil Laminate (3.2.1.3)	3.3.5	4.4.2.5
Adhesive weight	3.3.6	4.4.2.6
Burst Test	3.3.7	4.4.2.7

4.4.2.1 Off-gas toxicity. The toxicity shall be performed by the University of Alberta (6.4). The toxicity test shall be conducted in accordance with 5100-615 at the beginning of each contract. Thereafter, during the duration of the contract the test shall be performed when any component changes.

4.4.2.2 Peel strength. Test for peel strength shall be in accordance with ASTM D 1876 except the applied separation rate shall be 3 inches per minute. Samples shall be selected so that different warp and fill threads are tested with each sample. It was found during initial development of this laminate that due to the thinness of the foil, the foil would often tear before the laminate would separate. Failure of the foil (tearing) prior to failure of the bond is an acceptable result.

4.4.2.3 Creep test. The creep test shall be performed using a 50-gram weight in a dead weight, 180-degree angle peel test at a temperature of $425 \pm 5^\circ\text{F}$ and uncontrolled humidity. The sample shall be hung by the cloth component and the 50-gram weight shall be attached to the aluminum foil. The test chamber shall be configured such that no movement is induced into the sample due to airflow. The test strips shall be 2 inches wide and the same length as required for the peel strength test (see 4.4.2.2). The test strips may be cut with the warp or weave (machine or X-machine) direction. Results shall be reported as "pass" or "fail."

4.4.2.4 Adhesive identification - Infrared test. This test shall be conducted by Marsh Technological Services (6.4). Test two samples of each laminate (3.2.1.2, 3.2.1.3, and 3.2.1.4) in each production run. The laminates may be separated by dipping an edge in acetone and peeling it back. The separated pieces shall then be placed in a beaker of acetone and gently heated until the adhesive is dissolved. Remove and rinse the foil and glass cloth samples with acetone into the beaker. Allow acetone to evaporate. Add several drops of DMF (Dimethyl Formamide) to dissolve the residue. Place several drops of the adhesive solution on a sodium chloride crystal and cast a thin film, which will give approximately 0.8 linear units of absorption. Dry the film at 90 to 100°C for 15 minutes. The resultant film shall be analyzed with an infrared grating spectrophotometer such as a Perkin-Elmer Model 283 or equivalent. As an option the glass cloth may be separated from the aluminum foil and sufficient adhesive collected, by careful scraping, to ensure a valid test. Care shall be taken to avoid the induction of particles of foil or glass cloth into the adhesive test sample. The adhesive sample shall be analyzed by FOURIER transform infrared spectroscopy. The resultant spectrum shall be an exact match of one of the spectrum of the standard samples (see 6.3). Any additional or missing bands shall be cause for rejection. The spectral range shall include wave lengths of 600 to $4,000\text{ cm}^{-1}$. Test results shall be reported as "pass" or "fail".

5100-607D

4.4.2.5 Organic content of inner laminate cloth - Thermogravimetric analysis (TGA). This test shall be conducted by Marsh Technological Services (6.4). The TGA shall be performed using two samples from varied areas of the production run. Each sample size shall be 100 ± 5 mg in weight. The sample shall be placed in a 15 ml coors crucible and heated at 100 to 105°C for 1 hour to evaporate moisture in the sample. The moisture free sample shall be reweighed and then heated in a furnace starting at a temperature of 30°C and continuing to 1000°C with a dynamic heating rate of 25 ± 5 °C per minute and an air flow of 150 ± 25 ml per minute. The average weight loss shall be reported to the nearest 0.1 percent (3.3.5).

4.4.2.6 Adhesive weight. This test shall be performed by Cleveland Laminating Corp. The adhesive weight shall be measured and documented during the manufacturing process by sampling and weighing the dried adhesive on the foil prior to bonding. Three (3) tests shall be run at the end of every master roll. A master roll is defined as a number of raw material rolls spliced together and run from start to finish without interruption.

4.4.2.7 Burst Strength Test. The Burst Test shall be in accordance with ASTM D 774. A motor drive Model A Mullen Burst Tester shall be used. The Burst Tester shall be driven by a motor speed of 1750 rpm and use a Model 305-B Mullen® Tester Diaphragm supplied by Mullen® Testers. The material shall be tested with the foil against the diaphragm (on floor laminate either side is acceptable). An average of 3 tests across the material width shall be reported. The lowest value of the 3 tests across the material width shall also be reported.

4.4.2.8 Silica and Alumina Content of the silica cloth. This test shall be performed by West Analytical Services (6.4). Silica content of the silica cloth (3.2.2 and 3.2.3) shall be tested in accordance to ASTM C169. Alumina content of the silica cloth (3.2.2 and 3.2.3) shall be determined by fusing approximately 0.1 grams of sample in lithium tetraborate in a graphite crucible. The hot melt is poured out into a plastic beaker containing dilute hydrochloric acid and transferred to a volumetric flask when dissolution is complete. The alumina determination is made by inductively coupled plasma spectrometry (ICP) using matrix matched standards.

4.4.2.9 Fluorine Content. The trace determination of total Fluorine content of the silica and glass cloths (3.2.2, 3.2.3 and 3.2.6) shall be conducted by Galbraith Laboratories (6.4) using Galbraith test method G54/E9.3 with 50 ppm detection limit. At the initiation of each contract, three samples of material shall be tested to obtain an average.

4.4.2.10 Phosphorus Content. The trace determination of leachable Phosphorus content of the silica and glass cloth (3.2.2, 3.2.3 and 3.2.6) shall be conducted by Galbraith Laboratories (6.4). Galbraith test method G30B/ICP with 50 ppm detection limit. At the initiation of each contract, three samples of material shall be tested to obtain an average.

4.4.3 Classification of nonconformities and lot acceptance. Any sample that fails to comply with test requirements specified in 4.4.2.2, 4.4.2.3, shall be classified as a major nonconformity and lot acceptance shall be in accordance with 4.2.1.1. Any sample that fails to comply with test requirements specified in 4.4.2.1, 4.4.2.4, 4.4.2.5, 4.4.2.6, 4.4.2.7, 4.4.2.8, 4.4.2.9, or 4.4.2.10 shall constitute rejection of the lot.

5100-607D

5. PACKAGING

5.1 Preservation. Preservation shall be in accordance with ASTM D 3951 and as specified herein and in the contract or purchase order.

5.2 Marking. In addition to any special marking required by this specification, marking shall be in accordance with the contract or purchase order.

6. NOTES

6.1 Intended use. The laminate cloth specified herein is the basic material used in the fabrication of fire shelters for wildland firefighters. The shelters provide protection from high radiant heat fluxes in the event firefighters become entrapped by wildfire. The national stock numbers (NSNs) utilized for the Fire Shelters are 4240-01-498-3184 (regular shelter only), 4240-01-498-3194 (regular complete shelter), 4240-01-529-8804 (large shelter only), and 4240-01-527-5248 (large complete shelter).

6.2 Acquisition requirements. Acquisition documents should specify the following:

- (a) Title, number, and date of the specification.
- (b) Length required if other than specified.
- (c) Arrangements for inspection and testing.
- (d) Preservation, packing, and marking required in addition to specification requirements (see section 5).

6.3 Standard samples. Copies of the spectra of standard samples referred to in this specification may be obtained from US Forest Service, Missoula Technology and Development Center, Attn: Specifications Project Leader, 5785 Highway 10 West, Missoula, MT 59808.

6.4 Required sources.

Cleveland Laminating Corp.
2909 East 79th Street
Cleveland, OH 44104
216-883-8484
www.clevelandlam.com

Valmieras Stikla Skiedra (aka VSS)
Cempu 13 Valmiera LV 4201, Latvia
371-420-2212
www.vss.lv

Underwriter's Laboratory
12 Laboratory Drive
Research Triangle Park, NC 27709-3995
919-549-1433
www.ul.com

5100-607D

Marsh Technological Services
8910 Cambridge Ave N
Brooklyn Park, MN 55443
763-315-5444
www.marshitech.com

Galbraith Laboratories, Inc.
2323 Sycamore Dr.
Knoxville, TN 37921-1700
877-449-8797
www.galbraith.com

University of Alberta
4-9 Mechanical Engineering Bldg.
Edmonton, Alberta, Canada T6G 2G8
780-492-2822
www.ualberta.ca

West Analytical Services
349 Tomahawk Drive
Maumee, OH 43537
419-897-9000
www.westpharma.com

6.5 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.

6.6 Preparing activity. US Forest Service, Missoula Technology and Development Center, 5785 Highway 10 West, Missoula, MT 59808.

6.7 Patent. This item has patent No.: US 7,084,083 B2. Contact the preparing activity for further details.

ADDENDUM ACKNOWLEDGEMENT FORM
SOLICITATION NO.: WWV12876

Instructions: Please acknowledge receipt of all addenda issued with this solicitation by completing this addendum acknowledgment form. Check the box next to each addendum received and sign below. Failure to acknowledge addenda may result in bid disqualification.

Acknowledgment: I hereby acknowledge receipt of the following addenda and have made the necessary revisions to my proposal, plans and/or specification, etc.

Addendum Numbers Received:

(Check the box next to each addendum received)

- | | |
|---|--|
| <input type="checkbox"/> Addendum No. 1 | <input type="checkbox"/> Addendum No. 6 |
| <input type="checkbox"/> Addendum No. 2 | <input type="checkbox"/> Addendum No. 7 |
| <input type="checkbox"/> Addendum No. 3 | <input type="checkbox"/> Addendum No. 8 |
| <input type="checkbox"/> Addendum No. 4 | <input type="checkbox"/> Addendum No. 9 |
| <input type="checkbox"/> Addendum No. 5 | <input type="checkbox"/> Addendum No. 10 |

I understand that failure to confirm the receipt of addenda may be cause for rejection of this bid. I further understand that that any verbal representation made or assumed to be made during any oral discussion held between Vendor’s representatives and any state personnel is not binding. Only the information issued in writing and added to the specifications by an official addendum is binding.

Company

Authorized Signature

Date

NOTE: This addendum acknowledgment should be submitted with the bid to expedite document processing.