SPECIFICATION 5100-360E
June 1997
Superseding 5100-360D
February 1996

U.S. DEPARTMENT OF AGRICULTURE
FOREST SERVICE

SPECIFICATION

FUSEE, BACKFIRING

1. SCOPE

1.1 Scope. This specification covers the requirements for one size and type of hand-held waterproof fusee.

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).

STANDARDS

FEDERAL

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

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

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 solicitation.

DOCUMENTS

U.S. DEPARTMENT OF TRANSPORTATION

49 CFR 172.420 - FLAMMABLE SOLIDS label
49 CFR 178.516 - Standards for fiberboard boxes

(The Code of Federal Regulations is for sale from the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402-9325. Reprints of certain regulations may be obtained from the Federal agency responsible for issuing them.)

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 solicitation.

AMERICAN SOCIETY FOR QUALITY CONTROL (ASQC)

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

(Address requests for copies to American Society for Quality Control, 611 East Wisconsin Avenue, Milwaukee, WI 53202.)

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

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

AMERICAN TRUCKING ASSOCIATIONS, INC.

National Motor Freight Classification

(Address requests for copies to American Trucking Associations, Inc., 2200 Mill Rd., Alexandria, VA 22314.)

(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 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), fusees shall be subjected to first article inspection (see 6.3) in accordance with 4.3.1.

3.2 Materials and construction. Materials and construction shall be as specified herein and shall provide finished fusees of sufficient strength and quality to comply with all inspection and test requirements defined in section 4.

3.2.1 Fusee body. Each fusee shall be manufactured in such a manner that it passes the strength test specified in 4.5.1 and the heat exposure test specified in 4.5.8. Each finished fusee shall have a diameter, exclusive of the protective cap and ferrule, of 1 inch +0 inches/-1/4 inch. The length of the fusee, including protective cap and ferrule shall be 13 inches +1 inch/-0 inches. The base shall be closed with a plug made of wood, paper, or other appropriate material.

3.2.2 Ferrule. Each fusee shall have a paper, metal, or composition ferrule of appropriate diameter to provide a snug fit over the fusee body. When constructed of paper, the ferrule shall be similar to the fusee body and shall be equal or greater in strength. The ferrule shall project not less than 3 inches beyond the fusee base, and the interior shall be unobstructed to permit insertion of another fusee from which the cap has been removed. The ferrule shall be tested in accordance with 4.5.2 and 4.5.4.

3.2.3 Fusee head. The fusee head shall be the ignition end and shall have affixed to it a bead of friction type striker compound (3.2.3.1) protected by a removable cap (3.2.3.2).

3.2.3.1 Striker compound. The bead of striker compound shall be securely attached to the head of the fusee. The rim of the fusee shall be free of any such compound. The bead shall not break or become detached when the fusee samples are undergoing testing required in 4.5.4 and 4.5.5. The compound shall have an ignition temperature greater than 350^{O}F when tested in accordance with 4.5.7.

3.2.3.2 Protective cap. The head of the fusee shall be protected by a removable cap not less than 1-3/4 inches in length. The protective cap shall be of an appropriate diameter to provide a snug fit over the body of the fusee, and shall protect the striker compound bead from accidental ignition or exposure. A plug of wood, metal, or metal with a plastic cushion inside shall be inserted into the top of the cap. A scratch strip (3.2.3.2.1) shall be affixed to the top of the plug. The cap shall be attached to the fusee body in such a manner as to facilitate cap removal but prevent accidental detachment. A plastic cap assembly may be substituted for the cap assembly described above.

3.2.3.2.1 Scratch strip. The scratch strip on the plug shall be protected from exposure and shall ignite the fusee samples after they have been tested for waterproofness in accordance with 4.5.4.

3.2.4 Fuel composition. Fusees containing sulphur shall contain no more than 2.6% potassium chlorate or an equivalent amount of any other chlorate. Devices containing a chlorate shall not contain ammonium salts. Compactness of the fuel shall be sufficient to pass the test specified in 4.5.5. The fuel shall not spontaneously ignite when tested in accordance with 4.5.6.

3.2.5 Flame. Each fusee shall produce a flame having a minimum temperature of 1400°F when tested as specified in 4.5.3 and shall not "chimney" in any manner to significantly obscure the flame. Flame length shall be a minimum of 5 inches and flame width a minimum of 3/4 inch at its widest part when tested in accordance with 4.5.3.2. Burning time of the flame shall be a maximum of 13 minutes and a minimum of 10 minutes. Color of the flame shall be either yellow or red.

3.2.6 Waterproofing. Each finished fusee shall be sufficiently coated with a water-resistant material to ensure reliable ignition and burning after long periods of storage under humid conditions and otherwise comply with the test requirements specified in 4.5.4.

3.2.7 Marking. Each fusee shall be marked with the following information in black fade-proof ink and in a size to be clearly legible at up to 3 feet.

> DIRECTIONS -- Pull tape over head of cap. Twist off cap. Scratch end of cap against black lighter on head of fusee. ALWAYS POINT FUSEE AWAY FROM FACE AND BODY WHILE IGNITING AND AFTERWARDS. AFTER IGNITING, HOLD 5 SECONDS BUT NOT MORE THAN 10 SECONDS BEFORE DROPPING.
>
> (NOMINAL BURNING TIME IN MINUTES)
>
> (MONTH/YEAR OF MANUFACTURE)
>
> (MANUFACTURER'S NAME)
>
> NSN 1370-00-294-1279

3.3 Workmanship. 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.

3.4 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.

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

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 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 defective material, either indicated or actual, nor does it commit the Government to accept defective material.

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

4.3 Quality conformance inspection. Each end item lot shall be sampled and inspected as specified in 4.3.2. Each lot shall be sampled and tested as specified by 4.5. Test reports showing compliance with 4.5.1 through 4.5.8 shall be submitted as part of quality conformance inspections. The packaging shall be inspected as specified in 4.4.

4.3.1 First article inspection and testing. Unless otherwise specified (see 6.2), first articles submitted in accordance with 3.1 shall be inspected as specified in 4.3.2 and tested as specified in 4.5. The presence of any defect or failure to pass any test shall be cause for rejection of the first article. Packaging is not required when first articles are presented. The contractor shall supply the number of fusees specified by the contract for first article inspection and testing along with laboratory test reports documenting findings of the tests specified in 4.5. Such testing shall have been done by a laboratory acceptable to the Government. The contractor shall supply two copies of the test reports to the contracting officer or contracting officer's representative, and include two more copies of the test reports with the first article samples themselves. The test reports shall identify the name of the testing laboratory and shall be signed by the test engineer, chemist, or other appropriate laboratory official.

4.3.2 End item examination. The end items shall be examined for the defects listed in table I. The inspection level shall be I, the acceptable quality level (AQL), expressed in terms of defects per hundred units, shall be 4.0.

TABLE I. End item visual and dimensional defects

Examine	Defect	Classification Major	Minor
Fusee	Overall length of tube not as specified	X	
	Overall diameter of tube not as specified	X	
	Any part broken, bent, or otherwise damaged	X	
	Color not as specified		X
Ferrule	Depth not as specified	X	
Markings	Omitted, incomplete, incorrect, illegible, or misplaced		X

4.4 Packaging examination. An examination shall be made to determine that preservation, 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 it need not be closed. Examination of closure defects 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 defects per hundred units, shall be 2.5.

Examine	Defects
Markings (external and unit pack)	Omitted; incorrect; illegible; of improper size. location, sequence, or method of application
Materials	Any component missing, damaged, or not as specified
Workmanship	Inadequate application or components, such as: cushioning; inadequate, bulged, or distorted interior container
Contents	Number of fusees per interior box and shipping container is more or less than required

4.5 End item testing. Unless otherwise specified, the sample size for testing shall be S-3 and the AQL expressed in terms of defects per hundred units shall be 2.5 for all testing. The samples selected as specified shall be evenly divided into two groups. One group shall be subjected to the tests specified in 4.5.1, 4.5.2, and 4.5.3. The other group shall be subjected to the tests specified in 4.5.4 and 4.5.5. Any sample that fails to comply with its specified tests shall be classified as defective and rejected. In addition, should the bead of striker compound come loose from its fusee head when attempting to ignite the fusee during testing specified in 4.5.4 and 4.5.5, that sample shall be classified as defective and rejected.

For the tests required in 4.5.6, 4.5.7, and 4.5.8 a separate random sample of 15 fusees, 5 for each test, shall be selected from the lot and tested as specified. If any sample in any test fails, the lot shall be rejected.

4.5.1 Fusee body strength. The strength test to determine compliance with 3.2.1 shall be conducted as described and illustrated in figure 1. Any visible evidence of the fusee breaking within 5 minutes shall constitute a failure of the sample.

4.5.2 Ferrule strength. Ferrule testing to determine compliance with 3.2.2 shall be conducted as illustrated in figure 2. Complete separation of the fusees at the slip joint within 1 minute shall constitute failure of the ferrule and of the sample fusee.

4.5.3 Flame test. The flame as specified in 3.2.5 shall be tested as follows:

4.5.3.1 Flame temperature. The sample torch shall be ignited then inclined, ignition end down, at an angle of approximately 20 degrees from the horizontal. The flame temperature shall be determined within the flame, approximately 2 inches from the base of the flame. Any non-conformance to specified requirements shall constitute a failure for that sample.

4.5.3.2 Flame dimension. The flame shall be measured while the torch is held at the same angle as specified for the flame temperature test (4.5.3.1). Flame length shall be measured from the burning end of the torch to the tip of the flame. Flame width shall be measured near its middle or apparent maximum width.

4.5.3.3. Burning time. To determine burning time, the fusee shall be held in the same position as for the flame temperature test (see 4.5.3.1).

4.5.4 Waterproofness. The torch shall be submerged horizontally to a depth of 1 inch in water maintained at room temperature (70° ±5°F) for 20 minutes. Immediately after the soak period, the torch shall be ignited by use of the ignition cap provided and shall burn for a minimum of 1 minute before proceeding to the test in 4.5.5. Any non-conformance to specified requirements shall constitute a failure of the sample. Also any noticeable decrease in ferrule strength of the sample, after soaking, shall constitute failure of the sample.

4.5.5 Fuel compactness. This test shall be performed immediately after the test specified in 4.5.4 and with the same sample. After the fusee has been allowed to burn for a minimum of 1 minute from the previous test, the tester shall grasp the fusee by the ferrule, holding the sample 45 degrees from the horizontal, with the arm fully extended horizontally in front of the body. In this position, the tester shall swing the fusee through a 90° arc starting straight out (horizontally) from the body to straight down (vertically) and backup up to complete one cycle. Each cycle shall be completed in 1 second and five consecutive cycles shall be made to complete the test. If the sample does not remain ignited throughout the test, the sample shall be considered defective and rejected. Note: Re-ignition of the fuel by the flame from the burning paper tube shall not be considered as maintaining ignition of the fuel.

4.5.6 Spontaneous ignition. A 20-gram sample of the fuel shall be taken from each of the 5 sample fusees. Each 20-gram sample shall be moistened with 5 grams of water then placed in separate, loosely covered vessels (beakers). The vessels shall then be placed in an oven for 72 consecutive hours maintained at a temperature of 212°F ±5°F. If spontaneous combustion occurs to 1 or more samples during the 72-hour exposure period, the lot shall be rejected.

4.5.7 Ignition temperature. The ignition head and 20 grams of fuel shall be taken from each of 5 sample fusees. Each ignition head and each 20-gram fuel sample shall be placed in separate vessels. The 10 vessels shall then be placed in an oven maintained at a temperature of 350°F ±5°F for 1 hour. Ignition or explosion of any ignition head or fuel sample shall cause rejection of the lot.

4.5.8 Heat exposure. Five sample fusees shall be placed in an oven maintained at a temperature of 160°F ±5°F for 48 hours. If any sample ignites or shows visible decomposition or failure of components, except for the exterior waterproofing, the lot shall be rejected.

5. PACKAGING

5.1 Preservation. Preservation shall be as specified in the contract or purchase order.

5.2 Packing. Seventy-two fusees together with their material safety data sheet shall be packed into a fiberboard box meeting the requirements of 49 CFR 178.516. The box shall conform to the latest version of ASTM D 5118 and comply with the National Motor Freight Classification. The size of the box shall be approximately 14-1/2 inches by 12-1/2 inches by 5-3/4 inches. Closure shall be with a nonmetallic banding.

5.3 Marking. Each shipping container shall be marked in accordance with FED-STD-123, including flammable solid labeling (see 46 CFR 172.420) and special marking as follows: The National Fire Equipment System (NFES) number for the backfiring fusee, NFES 0105, shall appear on a separate line below the national stock number.

6. NOTES

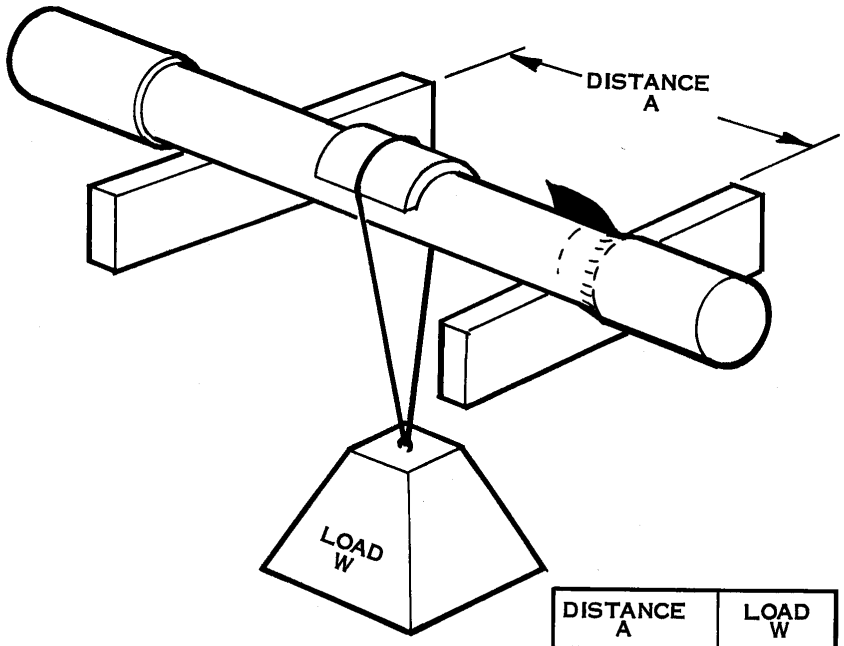
6.1 Intended use. This fusee is designed to be used by wildland firefighters for backfiring and by individuals conducting controlled burning operations.

6.2 Acquisition requirements. Acquisition documents should specify the following:

a. Title, number, and date of the specification.
b. When first article samples are not required (see 3.1, 4.3.1, and 6.3).
c. When certificates of compliance are acceptable in lieu of lot by lot testing (see 4.3.1).
d. Preservation, packing, and marking required in addition to specification requirements (see section 5).

6.3 First article. When first articles are required, they shall be inspected and approved under the appropriate provisions of Federal Acquisition Regulation 52.209. The first articles shall be preproduction samples in the quantities sufficient to conduct the inspections and tests required in this specification. The contracting officer should specify the appropriate type of first article and the number of units to be furnished. The contracting officer should include specific instructions regarding arrangements for selection, inspection, and approval of the first articles.

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



DISTANCE A	LOAD W
6 INCHES	80 LB
4 INCHES	I20 LB

PLACE THE FUSEE ON PARALLEL SUPPORTS HAVING FLAT BEARING SURFACES 1/4 INCH WIDE. APPLY THE LOAD SPECIFIED FOR THE WIDTH BETWEEN PARALLELS IN THE ABOVE TABLE, TO THE FUSEE AT A POINT EQUIDISTANT FROM THE SUPPORTS BY MEANS OF A WIRE LOOPED OVER A 1-INCH-WIDE, HALF RING SECTION OF RIDGED METAL TUBING NOT MORE THAN 1-1/4 IN DIAMETER.

Figure 1.–Strength Test.

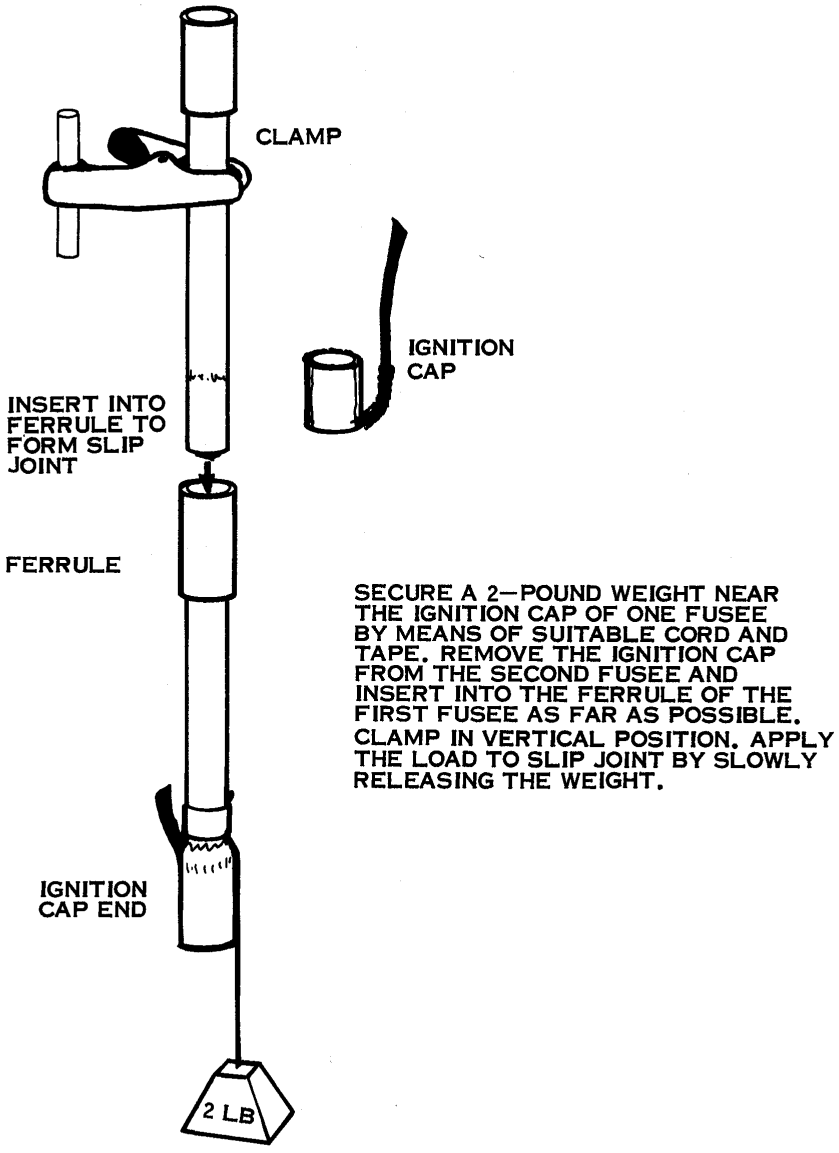


Figure 2.–Ferrule Test.

USDA
Forest Service

Standardization Document Improvement Proposal

This form is provided to solicit beneficial comments that may improve this document and enhance it's 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: **5100-360E - FUSEE, BACKFIRING**

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