



# Standard Guide for Inspection of Nylon, Polyester, or Nylon/Polyester Blend, or Both Kernmantle Rope<sup>1</sup>

This standard is issued under the fixed designation F1740; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon ( $\epsilon$ ) indicates an editorial change since the last revision or reapproval.

## 1. Scope

1.1 This guide covers procedures to assist in the management and care of kernmantle nylon, polyester, or nylon/polyester, or both kernmantle ropes by rescue personnel.

1.2 This guide provides information intended to assist qualified, experienced personnel in establishing procedures for determining whether a rope should be placed into or returned to service. Such procedures may be used to assist in determining serviceability of used rescue ropes. Other factors which may not be included in this guide may also need to be considered when evaluating ropes.

NOTE 1—Interpretation of the terms “qualified” and “experienced” when referring to individuals inspecting ropes may be debatable. Because rope evaluation is a subjective practice, it is in the best interest of the user to clearly define the needs of the user, and then to train personnel according to those needs. Needs and priorities may vary greatly between users.

1.2.1 A rope which has been used in any manner should not be returned to service without first undergoing a thorough inspection to include rope log review, visual inspection, and tactile inspection.

1.2.2 It is the responsibility of the user to understand that evaluation of a used rope is a subjective process. Due to the strength and longevity of kernmantle ropes presently used in rescue operations, it is perfectly reasonable, and even advisable, for these ropes to be reused on future operations unless the rope is physically compromised in some way. If the user chooses to reuse ropes, then the user should also establish specific guidelines, including and possibly in addition to those set forth in this guide, and provide training for personnel who will be responsible for examination of ropes.

1.3 *This standard does not imply approval of any specific type of rescue rope, nor does it purport to ensure the ability of any rope to function as desired. The information included here is not to be considered the only criteria for evaluating the serviceability of rescue rope.*

<sup>1</sup> This guide is under the jurisdiction of ASTM Committee F32 on Search and Rescue and is the direct responsibility of Subcommittee F32.03 on Personnel, Training and Education.

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1.4 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

## 2. Terminology

2.1 *core*—interior (kern) of a kernmantle rope. The core supports the major portion of the load on a kernmantle rope.

2.2 *in-service*—a rescue rope is considered to be “in service” if it is available for use in life safety applications.

2.3 *kernmantle*—a rope design consisting of two elements: an interior core (kern) and an outer sheath (mantle).

2.4 *rescue rope*—rope which is used for rescue purposes.

2.5 *retire*—permanent removal of a rope from service such that it is no longer used for life safety purposes.

NOTE 2—When a rope is retired it should be cut into short lengths which will discourage future use. It should not be stored, kept, or maintained in such a way that it could inadvertently be used as a lifeline. In some cases, when only a single point or a small area of a rope has been damaged and the rest of the rope is still in good condition, the user may elect to cut that section out of the rope and continue to use the shorter rope(s) in lifeline applications. This decision is left to the users’ discretion.

2.6 *rope log*—a written reference kept separately for each rope. A rope log should contain pertinent information about the rope and conditions under which it was used.

2.7 *sheath*—outer cover (mantle) of a kernmantle rope. The sheath serves to protect the core of a kernmantle rope and may also support a portion of the load.

2.8 *use*—one or more individual applications during the course of an operation.

2.9 *user*—may be an individual, a department, a team, or any other entity using the products discussed herein.

## 3. Significance and Use

3.1 The purpose of this guide is to assist the user in developing procedures to determine the serviceability of rope based upon visual and tactile inspection of the rope and the rope history as documented in the rope log.

3.2 This guide is intended for use by experienced personnel deemed qualified by the user to assess the viability of rope, according to the specific needs of that user.

#### 4. Procedure for Recording Rope History

4.1 Rope logs should be designed by the user according to the needs of the user and practices established by the user to ensure maintenance and monitoring of these records.

4.2 Rope logs should include, but not be limited to, the information outlined herein:

4.2.1 Rope Identification,

4.2.2 Date of rope purchase,

4.2.3 Date rope was put into service. (See 5.5.2 for information regarding use of dates.),

4.2.4 Dates and conditions under which rope is used, including weather, approximate load, unusual circumstances and any unusual shock loads, abrasion, or other abuse the rope sustains, and

4.2.5 Dates and actions taken, including inspection, cleaning, drying, storage, and return to service.

#### 5. Procedure for Examining Ropes

5.1 Inspect all ropes for wear and damage prior to use. A rope which has not been inspected shall not be used again or placed into service until an inspection has been performed.

5.1.1 Inspect the entire length of the rope, whether or not the entire length was used.

5.1.2 Clean ropes which are dirty or wet and dried in accordance with manufacturer's recommendations before inspection.

5.2 Perform the complete inspection (visual, tactile, and rope log) by the same person for a given rope.

5.3 Visual inspection of a rope should be done by an experienced individual who is deemed qualified by his user to assess the serviceability of rope, according to the needs of the user. This inspection should take into consideration the current status of normal wear and tear as well as specific damages which may have occurred during use of the rope.

5.3.1 Any section of rope whose sheath appears to be glazed should receive additional scrutiny during the course of the tactile inspection to evaluate for further indication of damage. Significant damage may lead to retirement.

5.3.2 Discoloration may be an indication of rope damage. Retire the rope, if a part of a rope appears discolored and the cause of the discoloration is unknown or is suspected to be from a source harmful to the rope's fiber.

5.3.3 Retire a rope which shows any sign or smell to indicate that it may have been contaminated by an acid, alkaline, oxidizing agent, bleach, or other potentially hazardous chemical or substance.

5.3.4 Abrasion, cuts, or nicks in the outer sheath should indicate an area which should receive special consideration during the course of the tactile inspection to evaluate for indication of further damage.

5.3.5 Retire a rope whose sheath has been cut through or abraded to the extent that the core is visible.

5.3.6 If the diameter of a rope is smaller (or larger) in one area than throughout the rest of the rope, its condition shall be suspect.

NOTE 3—This refers to enough of a variation in the rope's diameter to suggest that the core of the rope has been damaged and closer inspection is needed. Holding the section of rope in question under constant tension aids in visualizing the extent of the change in diameter. A significant decrease in diameter, hour-glass appearance, is usually caused by separation of core fibers and the rope should be retired. A significant increase in the diameter may be caused by a bunching of the core or sheath, or some internal contamination of the core, and may require the rope to be retired.

5.3.7 When sections of rope are formed into approximate 30-cm (circumference) loops, the consistency of the loop should be uniform throughout. If it is not, retire the rope.

5.3.8 Establish additional criteria for visual rope inspection by the user in accordance with the specific needs of the user.

5.4 Tactile inspection of a rope shall be done by an experienced individual deemed qualified by the user to assess the viability of rope, according to the needs of the user. This inspection should take into consideration the current status of normal wear and tear as well as specific damages which may have occurred during use of the rope.

5.4.1 Inspect the entire length of the rope whether or not the entire length was used.

5.4.2 Tactile inspection should be performed in such a way that allows the inspector to feel for changes while maintaining a pressure on the rope.

5.4.3 Retire the rope if any inconsistencies in rope diameter are detected or suspected (if the rope seems to feel larger or smaller at any given point). (See Note 3.)

5.4.4 If a part of the rope feels "mushy" or soft in any area relative to the rest of the rope, the core of the rope may be damaged in that area and the rope shall be considered for retirement.

5.4.5 Retire the rope if the rope is extraordinarily stiff in any area, it has likely been overstressed in that area. If any area of the rope is more stiff or "brittle" feeling than the rest of the rope.

5.5 Rope examination shall include any analysis of the rope log.

5.5.1 Any rope which is noted to have experienced uncontrolled or excessive loading should be considered for retirement.

5.5.2 Retire any rope which is greater than ten years old, regardless of history and usage.

NOTE 4—There is at this writing no universally agreed upon "shelf life" for nylon, polyester, or nylon/polyester rope products. Shelf life will vary according to local atmosphere, storage conditions, heat, light, temperature, and other variables. The ten-year estimate cited in this guide should be considered carefully by any person(s) using this guide, with the understanding that depending on circumstances specific to each situation, rope strength may actually be reduced to unacceptable levels in a shorter period of time. While there is no conclusive data to show the precise effects of rope aging, users' experience as well as research such as that done by Smith, et al, 1984 and Mammut Ropes, 1979, may provide some subjective criteria for decision making about ropes based upon rope age and usage.

5.5.3 Retire any rope which is noted or suspected to have come into contact with harmful chemicals or other substance.

5.5.4 Any rope whose history is unknown shall not be used in lifeline or rescue applications.

5.6 Any doubt about the condition of the rope shall lead to its retirement.

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