Designation: F 1897 – 98

Standard Specification for Leg Protection for Chain Saw Users[1]

This standard is issued under the fixed designation F 1897; 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 (ε) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This specification specifies minimum requirements for the design, performance, testing, and certification of protective garments and protective devices designed to provide cut resistance protection to the legs of operators of power chain saws.

1.2 The objective of this specification is to prescribe fit, function, and performance criteria for protective garments and protective devices that, when worn by chain saw operators, that are intended to reduce leg injuries caused by contact with a running power saw chain.

1.3 This standard is not intended to serve as a detailed manufacturing or purchasing specification, but can be referenced in purchase contracts to ensure that minimum performance requirements are met.

1.4 Controlled laboratory tests used to determine compliance with the performance requirements of this standard shall not be deemed as establishing performance levels for all situations to which chain saw operators may be exposed.

1.5 Mandatory requirements are indicated by the use of shall; recommendations and advisory information is indicated by use of should.

2. Referenced Documents

2.1 *ASTM Standards:*

D 1776 Practice for Conditioning Textiles for Testing[2]

F 1414 Test Method for Measurement of Cut Resistance to Chain Saw in Lower Body (Legs) Protective Clothing[3]

2.2 *AATCC Standards:* [4]

Test Method 96 - (1988) Dimensional Changes in Laundering of Woven and Knitted Fabrics, except Wool

Test Method 158 - (1985) Dimensional Changes on Dry Cleaning in Perchloroethylene: Machine Method

3. Terminology

3.1 *Definitions:*

3.1.1 *approve*, *v*—to be acceptable to the authority having jurisdiction.

3.1.2 *authority having jurisdiction*, *n*—the organization, office, or individual responsible for approving any equipment, installation, or procedure.

3.1.2.1 *Discussion*—The term *authority having jurisdiction* is used in this document in a broad manner since jurisdictions and the responsibilities of approval agencies vary.

3.1.3 *certification*, *n*—a system whereby an organization determines that a manufacturer has demonstrated the ability to make a product that complies with the requirements of the specification, authorizes the manufacturer to use a label on products that comply with the requirements of the specification, and conducts a follow-up to verify the methods the manufacturer uses to determine compliance with the requirements of this specification.

3.1.4 *certification organization*, *n*—an independent, third-party organization that determines product compliance with the requirements of the specification with a labeling and listing follow-up program.

3.1.5 *chain saw*, *n*—a portable power-operated tool used for cutting wood that has cutters linked in a chain.

3.1.6 *chain speed*, *n*—the velocity of synchronized movement of linked cutters around a guide bar and sprocket.

3.1.7 *chain stop*, *n—for chain saw cut resistance*, the resulting action when a material clogs (jams) the drive sprocket or slows the speed sufficiently to prevent advancement of the saw chain.

3.1.8 *cut resistance*, *n—in textile testing for chain saws*, the ability of a material, while in contact with the linked cutters, to resist penetration of the cutters of a moving saw chain, independent of either jamming or chain stop.

3.1.9 *cut-through time*, *n—for chain saw cut resistance*, the time required for a running saw chain to affect complete breakthrough of a protective garment or protective device.

3.1.9.1 *Discussion*—When a cutthrough is effected, speed of the saw chain and time required must be measured.

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[1] This specification is under the jurisdiction of ASTM Committee F-23 on Protective Clothing and is under the direct responsibility of Subcommittee F23.20 on Physical Properties.

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[2] *Annual Book of ASTM Standards*, Vol 07.01.

[3] *Annual Book of ASTM Standards*, Vol 11.03.

[4] Available from American Association of Textile Chemists and Colorists, P. O. Box 12215, Research Triangle Park, NC 27709.

3.1.10 *follow-up program, n*—the sampling, inspection, tests, or other measures conducted by the certification organization on a periodic basis to determine the continued compliance of products that are being made by the manufacturer to the requirements of the standard specification.

3.1.11 *jamming, n—for chain saw cut resistance*, the clogging action manifested by a protective garment that can produce a chain stop.

3.1.12 *label, v—for protective clothing*, to attach a symbol or other identifying mark, the use of which has been authorized by a certification organization.

3.1.13 *list, v—for protective clothing*, to publish a register of equipment or materials that has been verified by a certification organization as being acceptable and meeting the requirements of standard specifications.

3.1.13.1 *Discussion*—The means for identifying listed equipment may vary for each organization concerned with product evaluation, some of which do not recognize equipment as listed unless it is also labeled. The authority having jurisdiction should utilize the system employed by the certification organization to identify a listed product.

3.1.14 *protective apron, n—for chain saw cut protection*, an oversized protective device worn outside the trousers that is secured around the waist and may be secured around the legs (see **protective chaps**).

3.1.15 *protective chaps, n—for chain saw cut protection*, a protective device normally worn outside the trousers that is secured around the legs and waist (see **protective apron**).

3.1.16 *protective clothing, n*—any material or combination of materials used in an item of clothing for the purpose of isolating parts of the body from a potential hazard.

3.1.16.1 *Discussion*—For this specification, the potential hazard is contact with a running chain saw.

3.1.17 *protective device, n—for chain saw cut resistance*, an article of personal protective equipment that augments other equipment and is worn for the purpose of providing limited protection from injury due to contact with a moving power saw chain (see **protective garment**).

3.1.17.1 *Discussion*—Examples of protective devices for leg protection include protective aprons and protective chaps.

3.1.18 *protective garment, n—for chain saw cut protection*, an article of personal protective equipment that is worn for the purpose of providing limited protection from injury due to contact with a moving power saw chain. (See **protective device**.)

3.1.18.1 *Discussion*—Examples of protective garments for leg protection include protective leggings and protective pants.

3.1.19 *protective legging, n—for chain saw cut resistance*, a protective garment with independent legs normally worn outside the trousers.

3.1.20 *protective pad, n—for chain saw cut protection*, a protective material permanently attached into or onto the protective garment or protective device, designed to reduce leg injuries in the event of contact with a moving power saw chain.

3.1.21 *protective pant, n—for chain saw cut resistance*, a trouser-style protective garment in which the protective material is permanently attached to the garment.

3.1.22 *saw chain, n*— closed loop of cutters linked together for use in a portable power-operated tool.

4. Materials and Manufacture

4.1 Protective garments and protective devices shall be constructed of materials that are sufficiently flexible to adapt to the shape of the leg. Protective garments or protective devices should remain functional and effective throughout seasonal climatic variations.

4.2 Protective garments and protective devices shall be constructed to be lightweight and flexible enough so as not to severely restrict movement of the leg.

4.3 Protective garments or protective devices shall be constructed of materials that offer protection as stipulated in Section 5 and that do not impede normal maneuverability or capability to perform the intended task. Protective garments or protective devices should retain their shape and function when wet.

4.4 The workmanship in the production and assembly of the protective garment or protective device, and any associated clothing or restraining material, shall be such that the protective pad is permanently attached to the protective clothing.

4.5 Protective garments or protective devices shall be free of defects or imperfections that could detract from their function or performance. All hardware on protective garments or protective devices should be free of rough spots, burrs, or sharp edges.

5. Areas of Protection

5.1 The means of maintaining the protective garment or protective device in the intended position is considered part of the protective clothing. Protective garments or protective devices shall have an adequate means to keep them securely fastened around the waist and legs.

5.2 After pretreating in accordance with Section 6, protective garments and protective devices shall protect a minimum area as described below:

5.2.1 *Pants/Trousers*:

5.2.1.1 The protective pad shall have a minimum length of 700 mm (28 in.) and extend from the crotch to a point no more than 75 mm (3 in.) above the bottom of the pant leg.

NOTE 1—Should the inseam length be less than 700 mm (28 in.), then the pad may extend above the crotch.

5.2.1.2 The protective pad shall cover at least 3.142 rad (180°) across the frontal arc of each leg plus an additional 0.524 rad (30°) or 100 mm (4 in.) on the left side of both legs. The top of the extended coverage area, adjacent to the crotch, may be trimmed to an angle, not to exceed 0.785 rad (45°) downwards in the back of the left leg, and at an angle not to exceed 1.134 rad (65°) in the back of the right leg. The protective pad should overlap the boot top by at least 50 mm (2 in.) as worn on the user (see Fig. 1a, 1b, and 1c).

5.2.2 *Chaps, Aprons, or Leggings*:

5.2.2.1 The protective pad shall have a minimum length of 700 mm (28 in.) and extend from the crotch to a point 25 mm (1 in.) above the bottom of the carrier garment.

5.2.2.2 The protective pad shall have a minimum width of 350 mm (14 in.) at the midpoint of the pad and a minimum

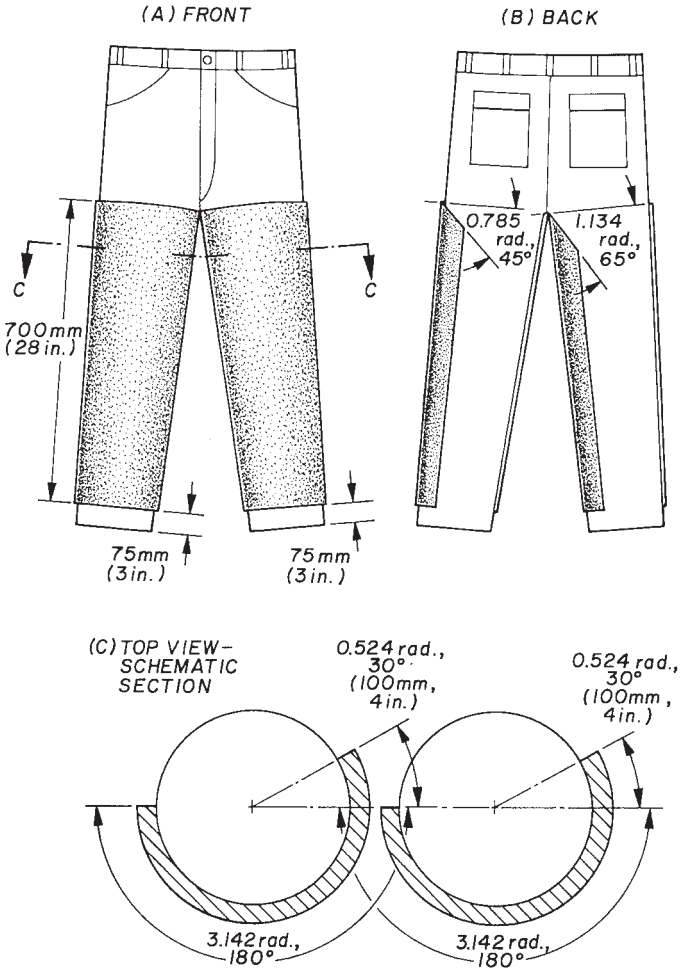

FIG. 1 Protective Pants / Trousers

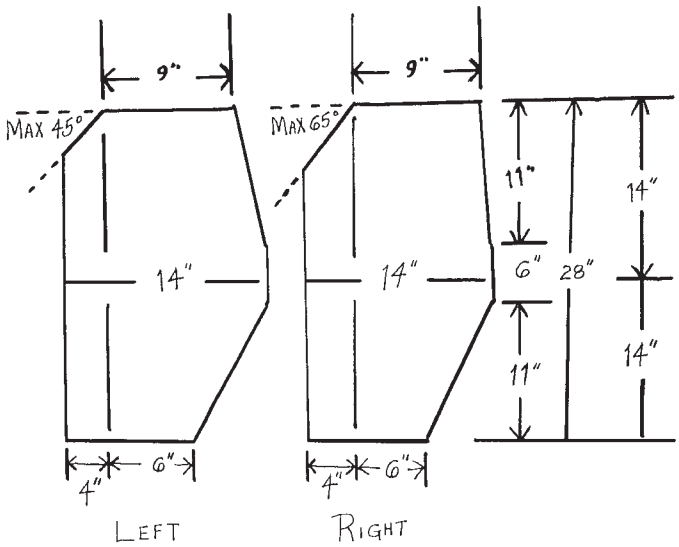

FIG. 2 Chaps, Aprons, or Leggings

width of 250 mm (10 in.) at the bottom of the pad. The top of the extended coverage area, adjacent to the crotch, may be trimmed to an angle of 0.785 rad (45°) downward in the rear of the left leg and up to 1.134 rad (65°) downward on the rear of the right leg (see Fig. 2).

6. Pretreatment

6.1 The manufacturer's care and maintenance guidelines, as required in Section 9, are used to determine the pretreatment method.

6.2 *Protective Garments or Protective Devices Intended for Machine Wash Only*:

6.2.1 The test specimen shall be subjected to five complete laundering cycles in accordance with AATCC Test Method 96-1988 Washing IIC and Drying A.

6.2.2 The test specimens shall then be brought from the dry side to approximate moisture equilibrium in accordance with Practice D 1776.

NOTE 2—Equilibrium is considered to have been reached when the increase in mass of the specimen in successive weighings, made at intervals of not less than 2 h, does not exceed 0.1 % of the mass of the specimen.

6.3 *Protective Garments or Protective Devices Intended for Dry Cleaning Only*:

6.3.1 The test specimen shall be subjected to three dry cleaning cycles in accordance with AATCC Test Method 158-1985.

6.3.2 The test specimens shall then be brought from the dry side to approximate moisture equilibrium in accordance with Practice D 1776 (see Note 2).

6.4 *Protective Garments or Protective Devices Intended for Both Machine Wash and Dry Cleaning*:

6.4.1 The test specimen shall be subjected to five complete laundering cycles in accordance with AATCC Test Method 96–1988 Washing IIC and Drying A, with the following modifications: without the use of soap or detergent, washing temperature 20°C (68°F), rinse temperature 20°C (68°F), and dry temperature 40°C (105°F) for 30 min. or until dry.

6.4.2 The test specimen shall then be subjected to three dry cleaning cycles in accordance with AATCC Test Method 158-1985.

6.4.3 The test specimen shall then be brought from the dry side to approximate moisture equilibrium in accordance with Practice D 1776.

6.5 *Protective Garments or Protective Devices Not Intended to be Laundered or Dry Cleaned*:

6.5.1 The test specimen shall not be pretreated by any of the aforementioned methods.

6.5.2 These protective garments or protective devices shall be brought to moisture equilibrium in accordance with Practice D 1776 (see Note 2).

7. Inspection and Performance Testing

7.1 *Inspection*:

7.1.1 Sampling levels for testing and inspection shall be established by the certification organization and the manufacturer to assure to a reasonable and acceptable confidence level that products certified to standard are compliant.

7.1.2 Inspection for determining compliance with any design requirements specified in the standard shall be performed on a completed garment.

7.1.3 Testing for determining material and component compliance with the requirements specified in this standard shall be

performed on samples that are no better than components used in the actual construction of the protective clothing. The certification organization shall also be permitted to use sample materials cut from representative protective clothing as defined by this standard.

7.2 *Performance Testing*:

7.2.1 *Performance Requirement* —After pretreating the samples as described in Section 6, the test specimens shall be tested in accordance with Test Method F 1414. With the running saw chain moving at a minimum initial speed of 13 m/s (2500f/m), the cut-through time of the test specimen shall not be less than 1.5 s at both 0.785 rad (45°) and 1.570 rad (90°) to the longitudinal axis of the test specimen.

8. Certification

8.1 *General*:

8.1.1 Protective garments or protective devices that are labeled as complying with this standard shall meet or exceed all applicable requirements specified in the standard and shall be certified.

8.1.2 All certifications shall be performed by an approved certification organization.

8.1.3 Compliance protective garments or protective devices shall be labeled and listed. Such protective garments or protective devices shall also have a label and identification that meets the requirements specified in Section 10.

8.2 *Certification Program*:

8.2.1 The certification organization shall not be owned or controlled by manufacturers or vendors of the product being certified. The certification organization shall be primarily engaged in certification work and shall not have a monetary interest in the product's ultimate profitability.

8.2.1.1 The certification organization should have sufficient breadth of interest and activity so that the loss or award of a specific business contract would not be a determining factor in the financial well-being of the organization.

8.2.2 The certification organization shall refuse to certify products to this specification that do not comply with all applicable requirements of this specification.

8.2.3 The contractual provisions between the certification organization and the manufacturer shall specify that certification is contingent upon compliance with all applicable requirements of this specification. There shall be no conditional, temporary, or partial certifications. Manufacturers shall not be authorized to use any label or reference to the certification organization on products that are not manufactured in compliance with all applicable requirements of this specification.

8.2.3.1 The contractual provisions covering certification programs should contain clauses advising the manufacturer that if requirements change, the product should be brought into compliance with the new requirements by a stated effective date through a compliance review program involving all currently listed products. Without these clauses, certifiers would not be able to move quickly to protect their names, marks, or reputations. A product safety certification program would be deficient without these contractual provisions and the administrative means to back them up.

8.2.4 A certification organization shall have, or contract with, laboratory facilities and equipment for conducting proper tests, a program for calibration of all instruments, and procedures to ensure proper control of all testing. These procedures shall include the use of laboratory manuals, data sheets, documented calibration and calibration routines, performance verification, proficiency testing, and staff qualification and training programs.

8.2.4.1 Investigative procedures are important elements of an effective and meaningful product safety certification program. A preliminary review should be carried out on product submitted to the agency before any major testing is undertaken.

8.2.5 Manufacturers shall be required to establish and maintain a program of production, inspection, and testing.

8.2.6 The manufacturer and the certification organization shall evaluate any changes affecting the form, fit, or function of the certified product to determine its continual certification to this specification.

8.2.7 Product certifications shall include a follow-up inspection program, with at least two random and unannounced visits in each 12-month period.

8.2.7.1 Such factory inspections should include, in most instances, witnessing of production tests. With certain products, the certification organization inspectors should select samples from the production line and submit them to the main laboratory for countercheck testing. With other products, it may be necessary to purchase samples on the open market for test purposes.

8.2.8 The certification organization shall have a program for investigating field reports alleging malperformance or failure of listed products.

8.2.9 The operating procedures of the certification organization shall provide a mechanism for the manufacturer to appeal decisions. The procedures shall include the presentation of information from both sides of a controversy to a designated appeals panel.

8.2.10 The certification organization shall be in a position to use legal means to protect the integrity of its name and label. The name and label shall be registered and legally defended.

9. Care and Maintenance

9.1 Protective garments and protective devices shall be maintained according to the manufacturer's instructions.

9.2 If the protective garment or protective device is damaged, check with the manufacturer's instructions for replacement criteria. It may no longer provide the minimum protection required by this specification.

9.3 The protective pad that covers the area outlined in Section 5 shall not be modified.

9.4 Failure to follow manufacturer's instructions may result in the protective garment or protective device no longer meeting the minimum protection required by this specification.

9.5 Manufacturer should also provide some guidance relative to retirement of protective garment or protective device.

10. Identification

10.1 Each protective garment or protective device meeting this specification shall be provided with:

10.1.1 The certification organization's label and means to identify the manufacturer.

10.1.2 A label that states:

10.1.2.1 This product has been certified to comply with Specification F 1897.

10.1.3 Instructions for use, care, repair, replacement, cleaning, and drying.

10.1.4 Any necessary informational and advisory material that includes at least the following or similar statement:

10.1.4.1 **WARNING:** No one can guarantee that an injury will not occur or will be less severe because an operator wears this protective garment or protective device. This protective garment or protective device is intended, under limited conditions, to assist the wearer in reducing the severity of injury from a running power saw chain that accidentally contacts the saw operator's leg. Failure to follow the manufacturer's instructions may result in the protective garment or protective device no longer providing the minimum protection required by this specification.

10.1.5 Visible tracing information related to manufacturer's production lots.

10.1.5.1 Purchasers might wish to include a requirement in purchase specification for an additional label containing certain information such as date of manufacture, manufacturer's name, lot identification number, and so forth, to be located in a protected location on the protective garment or protective device to reduce the chance of label degradation and as a backup source of information to aid in garment tracking.

10.2 Each protective garment or protective device meeting this specification shall meet the following labeling requirements:

10.2.1 The information required by 10.1.1 and 10.1.2.1 shall be permanently marked with characters at least 3 mm (0.125 in.) high on a *white* label placed permanently in a clearly visible location on the outside of the protective garment or protective device.

10.2.2 The information required by 10.1.3 and 10.1.4 shall be printed on a durable material and attached to each protective garment or protective device, such that it can be removed by the purchaser, read, and then stored for future reference. The size of the print shall be clearly visible and legible in characters not less than 3 mm (0.125 in.) in height.

10.2.3 The required labels shall be printed at least in English.

11. Keywords

11.1 chain saw; protection, leg; specification