



# Standard Guide for Care and Maintenance of Flame, Thermal and Arc Resistant Clothing<sup>1</sup>

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## 1. Scope

1.1 This guide provides recommendations for the care and maintenance of clothing that is flame, thermal, and arc resistant.

NOTE 1—The focus of this standard is the laundering process. More detailed information on decontamination, inspection, storage and repair is available in NFPA 2113.

1.2 These recommendations address the Industrial laundering process.

1.2.1 This guide does not provide detailed suggestions for dry cleaning. For more information contact your processor; his/her dry cleaning equipment supplier and solvent supplier; and the fiber, fabric, and garment manufacturers.

1.2.2 This guide does not apply to home laundering of flame, thermal, and arc resistant clothing. Follow label directions or contact garment supplier. For best cleaning results and proper maintenance of the protective characteristics of flame, thermal, and arc resistant clothing the services of a professional processor is recommended. (See X1.1.)

1.2.3 This guide does not apply to specialized protective garments such as specialized firefighter turnout gear and proximity firefighter ensembles.

1.3 This guide also identifies inspection criteria that are significant to the performance of flame, thermal, and arc resistant clothing.

## 2. Referenced Documents

2.1 *ASTM Standards:*

D 123 Terminology Relating to Textiles<sup>2</sup>

F 1494 Terminology Relating to Protective Clothing<sup>3</sup>

2.2 *Other Standard:*

<sup>1</sup> This guide is under the jurisdiction of ASTM Committee F23 on Protective Clothing and is the direct responsibility of Subcommittee F23.80 on Flame and Thermal.

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<sup>2</sup> *Annual Book of ASTM Standards*, Vol 01.06.

<sup>3</sup> *Annual Book of ASTM Standards*, Vol 11.03.

NFPA 2113 Standard for Care of Stationhouse Gear

## 3. Terminology

3.1 *Definitions of Terms Specific to This Standard*—The following terms have been defined specifically as they relate to this guide:

3.1.1 *care, n*—procedures for cleaning, sterilization, decontamination, and storage of flame, thermal, and arc resistant clothing.

3.1.2 *end user, n*—the entity or organization whose employees ultimately wear the flame, thermal, and arc resistant clothing.

3.1.3 *finish, n*—a chemical or mechanical modification, or both, of the fabric for a specific performance result.

3.1.4 *finishing technique, n*—the mechanical means by which the garment is put in its final state (for example, pressing, drying, wrinkle removal, and so forth).

3.1.5 *laundry wash formula, n*—the details related to procedures, cycle times, temperatures, and chemicals used in the laundering process.

3.1.6 *maintenance, n*—the procedures for inspection, repair, and removal from service of flame, thermal, and arc resistant clothing.

3.1.7 *processing launderer (processor), n*—the party performing the operation of cleaning or repairing, or both of the flame, thermal, and arc resistant clothing.

## 4. Summary of Guide

4.1 This guide provides guidelines for use by suppliers of the flame, thermal, and arc resistant clothing including the fabric and fibers used in its construction, processors, and the end user to effectively maintain flame, thermal, and arc resistant clothing and to provide a means of determining when such items should be removed from service. This includes the following:

4.1.1 Classification of flame, thermal, and arc resistant clothing by fiber, fabric, and finish.

4.1.2 Listing of elements to consider when developing wash formulas

4.1.3 Recommendations for removing flame, thermal, and arc resistant clothing from service.

## 5. Significance and Use

5.1 This guide identifies the responsibilities of the fiber, fabric, and clothing manufacturers, as well as the processor, the processor's chemical supplier and the end user.

5.2 This guide has been developed to describe the key components involved in a program for the care and maintenance of flame, thermal, and arc resistant clothing.

5.2.1 New fibers, fabrics and construction techniques are continually being developed to improve flame, thermal, and arc resistant clothing.

5.3 The guidelines in this standard will provide a processor guidance to develop a processing system that maintains the flame, thermal, and arc resistant characteristics of the clothing during their useful service life.

5.3.1 New chemistry and washer controls are continually being developed as well.

5.4 It is this changing environment that makes the development of specific formulas for each fabric and soil type difficult to make absolute at any given point in time.

5.5 The guide also provides guidance as to when flame, thermal, and arc resistant garments should be removed from service.

## 6. Procedure

6.1 The fiber, fabric, and garment manufacturers are responsible to provide information on the performance characteristics and maintenance needs. The end user is responsible to determine the compatibility of the performance characteristics with the intended use.

6.2 The processor and the processor's chemical supplier and the end user should classify flame, thermal, and arc resistant clothing by fiber, fabric, and finish based upon information provided by the garment supplier.

6.3 This guide establishes the following categories for segregating flame, thermal, and arc resistant clothing by fiber and fabric characteristics significant to maintenance:

6.3.1 *Type A*—Flame, thermal, and arc resistant clothing constructed exclusively of fabric made from inherently flame-resistant fibers that are tolerant to high-laundry and finishing temperatures. (See X1.2.)

6.3.2 *Type B*—Flame, thermal, and arc resistant clothing constructed exclusively of fabrics made from inherently flame-resistant fibers that have limitations on the maximum temperature for laundering and finishing. (See X1.3.)

6.3.3 *Type C*—Flame, thermal, and arc resistant clothing constructed exclusively of fabrics that are chemically treated for arc, thermal, and flame resistance.

6.3.4 *Type D*—Flame, thermal, and arc resistant clothing constructed of a combination of fabrics of Type A, and/or B, and/or C.

6.3.5 *Type X*—Flame, thermal, and arc resistant clothing with specific label instructions prohibiting laundering, (for example, "Dry Clean Only", "Do Not Wash").

6.4 The processor, the processor's chemical supplier and end user are responsible to determine if the methods which need to be utilized for proper cleaning of the flame, thermal,

and arc resistant clothing will maintain the flame, thermal, and arc resistant characteristics of the clothing.

6.4.1 Laundry wash formulas should be developed by the processor and wash chemical supplier in collaboration with the clothing and fabric manufacturers based on the following criteria:

- (1) Water Temperature
- (2) Drying Temperature
- (3) Water Hardness
- (4) Mechanical Action
- (5) Machine Load Factor
- (6) Soil Sorting
- (7) Wash Room Chemistry
- (8) Finishing Temperature
- (9) Alkalinity of Detergents
- (10) Souring
- (11) Extraction
- (12) Cycle Times

6.4.2 Based on the preceding criteria the following processes may, but not necessarily be included in a wash formula. When selecting a processor the end user should inquire if the processor is capable of performing the following procedures.

6.4.2.1 *Flush*—A high-level bath for a short period of time prior to the break. Flushes generally are used for conditioning textiles before subsequent baths and for removing debris and loose soil.

6.4.2.2 *Break (break suds)*—The first wash chemical bath. In light and medium-soil formulas, all of the surfactant/detergent and alkali to be used in the entire formula is generally added to the washer in the break bath. The break is the single most important step in the laundering process from the standpoint of soil removal.

6.4.2.3 *Suds*—A bath occurring between the break and ensuing steps. Suds baths are carried out at low water levels, usually with hot or tempered water. If alkali or detergent isn't added on these additional suds baths, they are referred to as carryover.

6.4.2.4 *Carryover (carryover suds)*—A cleaning step in a laundry formula in which no supplies are added, but supplies previously added are retained for use.

6.4.2.5 *Rinse*—High water-level bath or baths following the bleach and preceding the sour or finishing bath. During rinsing the final portions of loosened soil are removed along with the bulk of the washing compounds used in laundering. Except for antichlors, chemicals are usually not added to rinse.

6.4.2.6 *Sour bath*—Normally the final bath in the laundering process. The purpose for the sour (or acid) bath is to neutralize the alkalinity of the water in the textiles before removing them from the machine for finishing.

6.4.3 Since proper loading of the washer is essential to effective processing of flame, thermal, and arc resistant clothing appropriate consideration of load size should be coordinated with the machine manufacturer in cooperation with the processor, processor's chemical supplier and fiber, fabric, and clothing manufacturers.

6.5 Determination of when flame, thermal, and arc resistant clothing should be removed from service shall be the ultimate responsibility of the end user.

6.5.1 The following identifiable items (but not limited to) which may diminish the function of the flame, thermal, and arc resistant clothing can be determined by visual examination:

6.5.1.1 *Worn Out*—Thin spots, holes, excessive wear at edges, stains, or color loss.

6.5.1.2 *Mechanical Damage*—Evidence of cuts, rips, tears, open seams, and nonfunctional closures.

6.5.1.3 *Repairs*—If feasible, flame, thermal, and arc resistant clothing removed from service may be repaired and returned to service. Repairs shall be made using fabrics and components, which are equivalent to those, used in the original manufacturing.

6.5.1.4 *Fit*—The flame, thermal, and arc resistant clothing no longer fits the wearer. Garment may be assigned to another wearer if it meets all appropriate usability requirements.

6.5.1.5 *Modification*—Alteration to garment that differs significantly from original design or function.

6.5.1.6 *Contamination*—Flame, thermal, and arc resistant clothing contaminated by materials that represent a flammability, health, or other safety risk to the wearer should be removed from service by the end user.

## APPENDIX

### (Nonmandatory Information)

#### X1.

X1.1 There may be circumstances under which home laundering of flame, thermal, and arc resistant garments should be avoided by the end user since home laundering cleaning conditions may not be sufficient to remove contaminants that reduce the flame, thermal, and arc resistant characteristics (see Note X1.1). In addition, the end user must ensure the cleaning process used in home laundering follow the manufacturers recommended laundering procedures. The individual(s) providing the home laundering must be adequately informed of the proper cleaning processes needed to insure the flame, thermal, and arc resistant characteristics of protective clothing are maintained, for example, if chlorine bleach is used in home laundering, the flame, thermal, and arc resistant characteristics

of some types of FR clothing can be compromised or eliminated.

NOTE X1.1—Some soils containing potentially flammable materials such as solvents, oil, and other petroleum products may not be removed by home laundering. Home laundering indicates laundering by the employee.

X1.2 An example of Type A fabrics is Aramid.

X1.3 An example of Type B fabrics is FR acrylic.

X1.4 These examples are for illustrative purposes only and are not to be inclusive or exclusive of any other fabrics whose characteristics might place them in these categories.

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