This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.

Designation: F1236 – 23

Standard Guide for Visual Inspection of Electrical Protective Rubber Products[1]

This standard is issued under the fixed designation F1236; 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 The purpose of this guide is to present methods and techniques for the visual inspection of electrical protective rubber products. This guide also includes descriptions and photographs of irregularities found in these products.

NOTE 1—It is not the purpose of this guide to establish the acceptance level of any irregularity described herein. That shall be established by the standard for each product.

1.2 The values stated in inch-pound units are to be regarded as standard. The values given in parentheses are mathematical conversions to SI units that are provided for information only and are not considered standard.

1.3 *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, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.4 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 *ASTM Standards:*[2]

F478 Specification for In-Service Care of Insulating Line Hose and Covers

F479 Specification for In-Service Care of Insulating Blankets

F496 Specification for In-Service Care of Insulating Gloves and Sleeves

F819 Terminology Relating to Electrical Protective Equipment for Workers

3. Terminology

3.1 *Definitions of Terms Specific to This Standard:*

3.1.1 *abrasions and scratches*—surface damage that normally occurs when a product makes contact with an abrasive surface (see Fig. 1 and Fig. 2).

3.1.1.1 *Discussion*—Scuff-like damage can also occur from a brush contact with a hot object such as a soldering iron. This can sometimes look like the graining on leather.

3.1.2 *age cracks*—surface cracks that may look like the crazing of glazed ceramics and become progressively worse with time (see Fig. 3).

3.1.2.1 *Discussion*—It is a slow oxidation process caused by exposure to sunlight (or other environmental conditions) and starts in areas of the rubber that are under stress; see 3.1.14 for ozone cracks damage.

3.1.3 *breakdown*—the electrical discharge or arc occurring between the electrodes and through the equipment being tested (see Figs. 4-6).

3.1.4 *chemical bloom*—a white or yellowish discoloration on the surface of a rubber product caused by the migration to the surface of chemical additives used in the manufacturing process of the finished product (see Fig. 7), caused by the natural aging process.

3.1.4.1 *Discussion*—Not to be confused with 3.1.10 *glove discoloration*.

3.1.5 *color splash*—a spot or blotch on the surface of a rubber product that occurred during the manufacturing process when a contrasting colored particle of unvulcanized rubber became embedded into the finished product (see Fig. 8).

3.1.6 *cuts*—smooth incisions in the surface of the rubber that are usually caused by a sharp-edged object that can increase in size when they are placed under strain (see Fig. 9).

3.1.7 *depressions or indentations*—a shallow recess in the surface of the rubber that exhibits a thinner rubber thickness at the bottom of the depression than in the surrounding areas (see Fig. 10).

3.1.8 *embedded foreign matter*—a particle of non-rubber material that has been molded into the finished product and may appear as a bump when the rubber is stretched (see Fig. 11).

[1] This guide is under the jurisdiction of ASTM Committee F18 on Electrical Protective Equipment for Workers and is the direct responsibility of Subcommittee F18.60 on Terminology.

Current edition approved May 1, 2023. Published May 2023. Originally approved in 1989. Last previous edition approved in 2019 as F1236 – 19. DOI: 10.1520/F1236-23.

[2] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

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FIG. 1 Abrasion

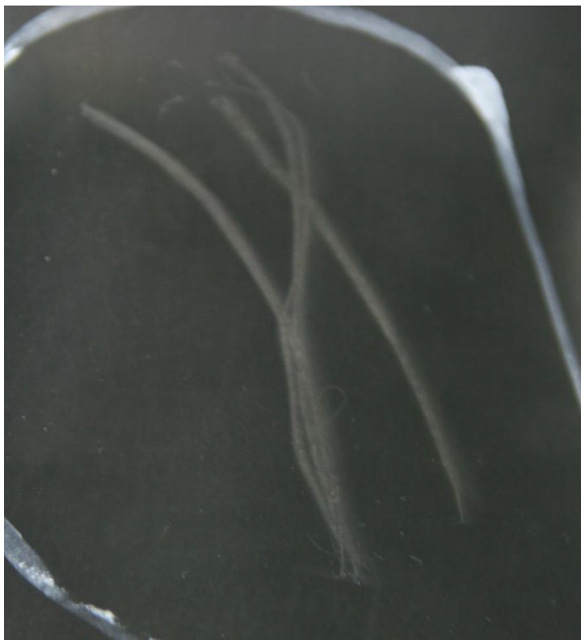

FIG. 2 Scratches

3.1.9 *form marks*—a raised or indented section on the surface of the rubber that was caused by an irregularity in the form.

3.1.10 *glove discoloration*—a non-harmful surface discoloration on a rubber insulating glove caused by the leaching of the tanning chemicals in leather protectors when protectors are left on the rubber insulating glove for an extended time; this is accelerated when the protectors are wet (see Figs. 12-14).

3.1.11 *hard spot*—a hardened area on the rubber surface that is usually caused by exposure to high heat or chemical attack (see Figs. 15-18).

3.1.12 *mold marks*—a raised or indented section on the surface of the rubber that was caused by an irregularity in the mold (see Fig. 19 and Fig. 20).

3.1.13 *nicks, snags, or scratches*—angular tears, notches, or chip-like injuries in the surface of the rubber that have been caused by barbed wire, sharp pointed tools, staples, splinters or similar sharp edged hazards (see Fig. 2, Fig. 21, and Fig. 22).

3.1.14 *ozone cracks*—a series of interlacing cracks that may start at stress points and quickly worsen as a result of rapid oxidation in a highly concentrated ozone atmosphere usually produced by electrical arcing (see Figs. 23-26).

3.1.15 *parting line or flash line*—a ridge of rubber left on finished products occurring at mold joints during the manufacturing process.

3.1.16 *pitting*—a depression in the surface of the rubber that may have been created by the rupturing of an air bubble at or near the surface of the rubber during the manufacturing process (see Fig. 27).

3.1.17 *protuberance*—bulge or swelling that protrudes above the surface of the rubber that may have occurred during the manufacturing process (see Fig. 28).

3.1.18 *puncture*—penetration by a sharp object through the entire thickness of the rubber product (see Fig. 29).

3.1.19 *repair marks*—an area on the surface of the finished product that has a different texture due to the repair or reworking of an irregularity in the mold or form (see Fig. 30).

3.1.20 *runs*—raised flow marks that may occur on the fingers of rubber gloves during the dipping process (see Fig. 31).

3.1.21 *skin breaks*—cavities in the surface of the rubber with filmy ragged edges and smooth interior surfaces that are normally caused by embedded dirt specks during the manufacturing process.

3.1.22 *soft spots*—surface areas of the rubber that have become soft and sometimes tacky as a result of exposure to heat, oils, or chemical solvents (see Fig. 32).

3.1.23 *tears*—a separation of the rubber through its entire thickness, usually at an edge, that has been created by a forceful pulling apart of the rubber (see Fig. 33 and Fig. 34).

3.1.24 *tracking*—the formation of a carbonized path on the surface of a solid insulating medium, resulting from excessive current leakage over the surface (see Figs. 35-37).

4. Significance and Use

4.1 This guide provides inspection methods and techniques that may be used to examine electrical protective rubber products for irregularities. The methods have applications in manufacturing facilities, testing laboratories, and in the field where the products are used.

4.2 This guide also contains photographs that illustrate the descriptions of terms listed in Section 3 and in Definitions F819.

5. Inspection Methods

5.1 *Rolling:*

5.1.1 Inspect glove and sleeve surface areas by gently rolling their entire outside and inside surface areas between the hands. This technique requires gently squeezing together the

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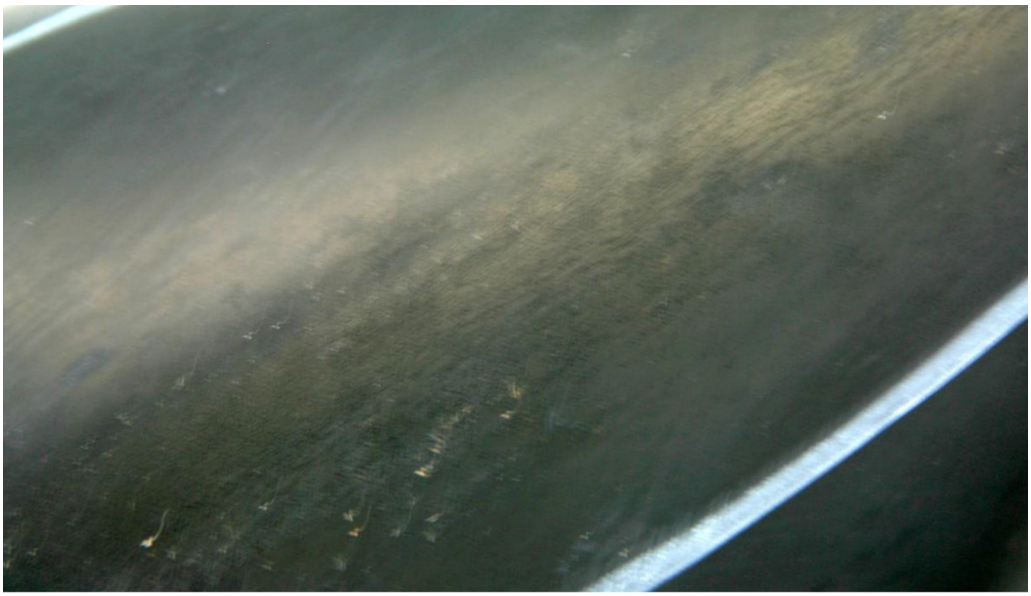

FIG. 3 Age Cracks

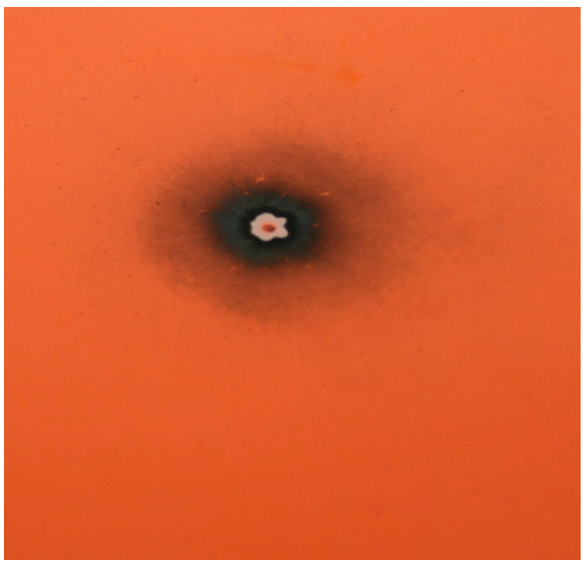

FIG. 4 Breakdown (Dielectric Failure Blanket: Back)

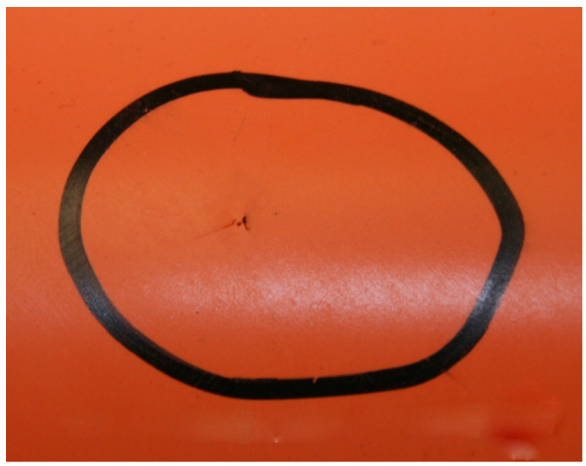

FIG. 5 Breakdown (Dielectric Failure Blanket: Front)

inside surfaces of the glove or sleeve to bend the outside surface area and create sufficient stress to inside surfaces of the glove or sleeve to highlight cracks, cuts, or other irregularities. When the entire outside surface area has been inspected in this manner, turn the glove or sleeve inside-out and repeat the inspection on the inside surface (now on the outside). If necessary, a more careful inspection of suspicious areas can be achieved by gently pinching and rolling the rubber between the fingers (see Fig. 38). Never leave a glove or sleeve in an inside-out condition. Stretch the thumb and finger crotches by pulling apart adjacent thumb and fingers to look for irregularities in those areas (see Figs. 39-42).

5.1.2 Place rubber blankets on a clean, flat surface and roll up tightly starting at one corner and rolling toward the diagonally opposite corner. Inspect the entire surface in accordance with Specification F479 for irregularities as it is rolled up. Unroll the blanket and roll it up again at right angles to the original direction of rolling. Repeat the rolling operations on the reverse side of the blanket (see Fig. 43 and Fig. 44).

5.1.3 Examine all surfaces of the insulating line hose in accordance with Specification F478. Inspect the outside surfaces completely from end-to-end. Inspect the inside surfaces by holding the hose at the far end from the lock and placing both hands side-by-side palms down around the hose. With the slot at the top and the long free end of the hose on the left, slowly bend the two ends of the hose downward while forcing the slot open with the thumbs. The hose should be open at the bend, exposing the inside surface. Slide the left hand about a foot down the hose and then, with both hands firmly gripping the hose, simultaneously move the left hand up and the right hand down to pass this section over the crown of the bend for inspection. Slide the right hand up the hose to the left hand. Hold the hose firmly with the right hand while the left hand again slides another foot down the hose. Repeat the inspection

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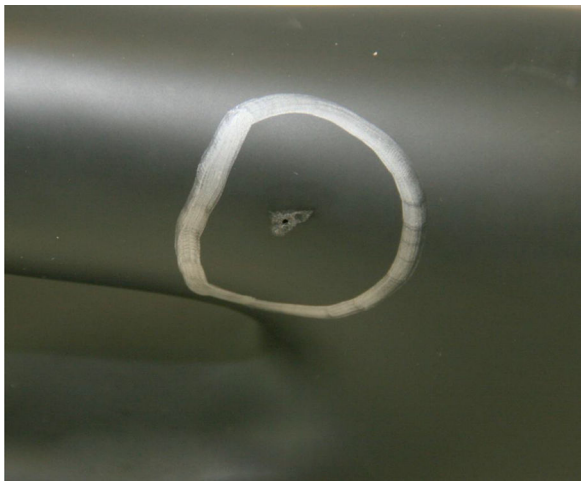

FIG. 6 Breakdown (Dielectric Failure)

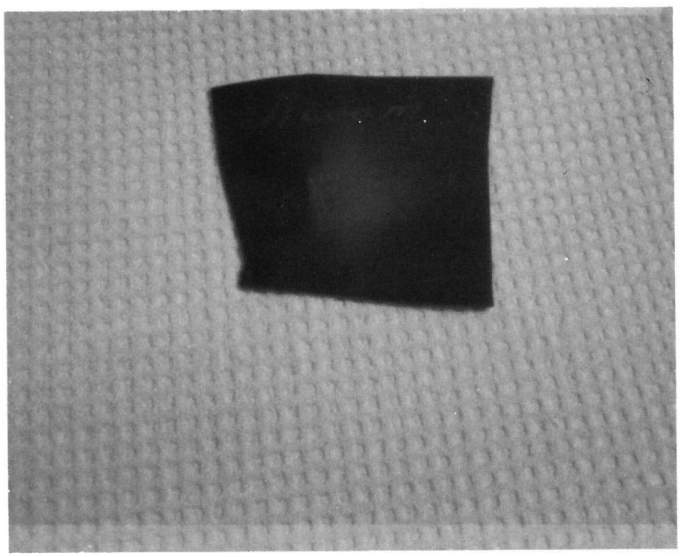

FIG. 7 Chemical Bloom

FIG. 8 Color Splash

FIG. 9 Cuts

and, in this way, the entire length of hose passes through the hands from one end to the other (see Fig. 45).

5.1.3.1 Smaller diameter insulating line hose requires a more pronounced bend during the inspection process (see Figs. 46-48).

5.2 *Inflation:*

5.2.1 Punctures and other small holes in rubber insulating gloves can be found by inflating the gloves with air pressure. Gloves can be inflated manually by grasping the side edges of the glove opening (see Fig. 49) and stretching gently, side-by-side, to close and slightly seal the open end, (see Fig. 50). Roll up the gauntlet end about 1½ in. (38 mm) toward the palm by twirling the glove in a rotating motion using the rolled edges of the glove opening as an axis. Grasp the rolled up end in one hand to contain the entrapped air in the palm and fingers (see Fig. 51). Hold the inflated glove close to one ear and, with the free hand, squeeze the glove palm to increase the air pressure while listening and feeling for pinhole leaks (see Fig. 52). Release the entrapped air.

5.2.2 To entrap air in heavy weight gloves, it may be necessary to lay the glove on a flat surface, palm up, and press the open end closed with the fingers, (see Fig. 53). While holding the end closed, tightly roll up about 1½ in. (38 mm) of the gauntlet (see Fig. 54 and Fig. 55). Grasp the rolled-up end and inspect for small holes in accordance with 5.2.1 (see Fig. 56).

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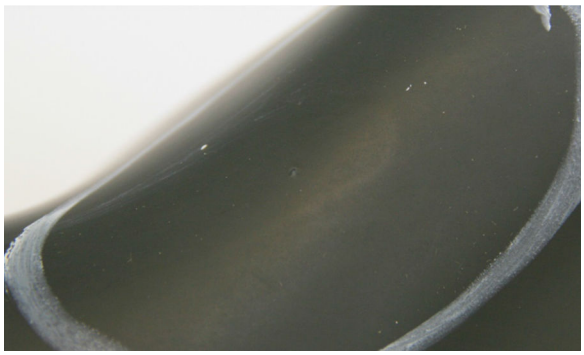

FIG. 10 Depressions

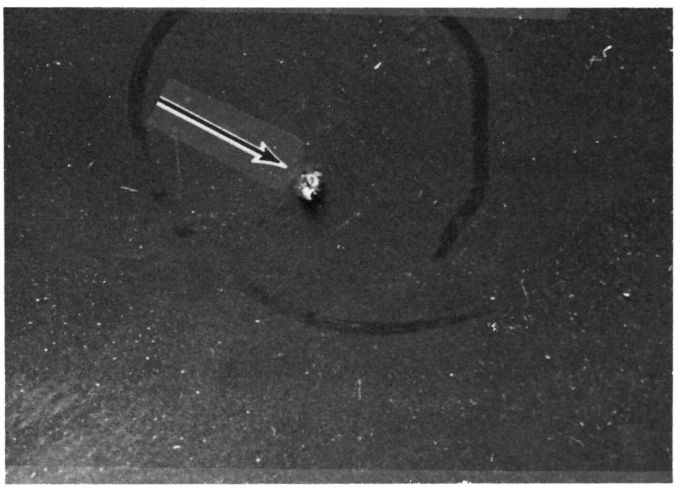

FIG. 11 Foreign Matter

FIG. 12 Glove Discoloration

FIG. 13 Glove Discoloration

FIG. 14 Glove Discoloration

5.2.3 Mechanical glove inflators or sleeve expanders may also be used to inspect the surface areas of the products (see Figs. 57-59).

5.2.4 Take care not to over inflate the gloves or over expand the sleeves as noted in Specification F496, since their physical characteristics may be adversely affected by over inflating or over expanding. Type 1 gloves and sleeves shall not be inflated or stretched to more than twice their normal size. Type 2 gloves and sleeves shall not be inflated or stretched to more than 1.25 times their normal size.

5.3 *Lighting*—The visual inspection of electrical protective rubber products requires good lighting and the products should be thoroughly cleaned before inspection. The light source should be at least 200 fc (2152.8 1x) with a reflector and should be adjustable for different lighting conditions. Some irregularities can be more easily seen with the light shining down on the surface being examined; other irregularities require a low angle of light to allow the defect to cast a shadow in order to be seen.

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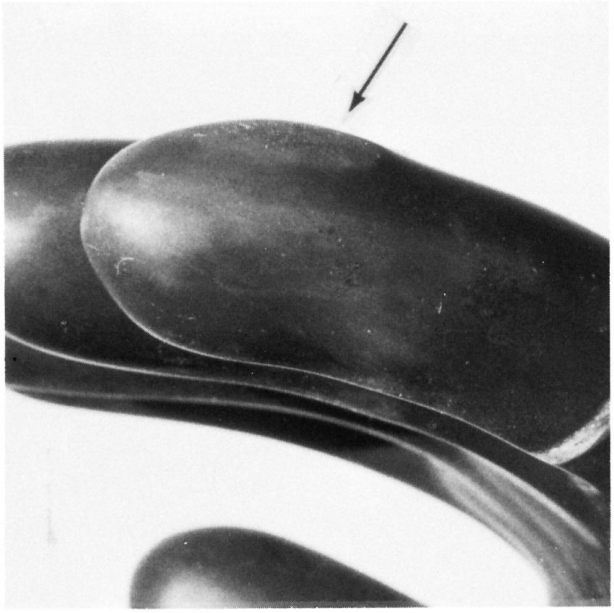

FIG. 15 Hard Spot

FIG. 16 Hard Spot

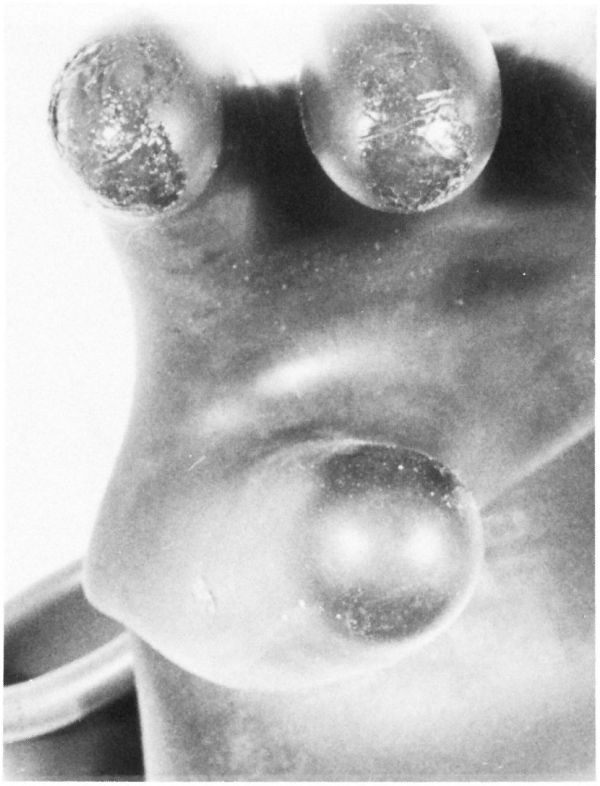

FIG. 17 Hard Spot

FIG. 18 Hard Spot

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