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Standard Terminology Relating to Electrical Protective Equipment for Workers[1]

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1. Referenced Documents

1.1 *ASTM Standards:*[2]

F712 Test Methods and Specifications for Electrically Insulating Plastic Guard Equipment for Protection of Workers

F1116 Test Method for Determining Dielectric Strength of Dielectric Footwear

F1117 Specification for Dielectric Footwear

2. Terminology

afterflame time, *n*—the length of time in seconds for which a material continues to flame after the ignition source has been removed..

DISCUSSION—*In arc testing*, the length of time for which a specimen continues to exhibit a visible flaming as determined by a time display video recording of the specimen during arc testing

arc duration, *n*—time duration of the arc(s).

arc energy (vi dt), *n*—sum of the instantaneous arc voltage values multiplied by the instantaneous arc current values multiplied by the incremental time values during the arc, (J).

arc gap—distance between the arc electrodes (inch).

Arc thermal performance value (ATPV), *n—in arc testing*, the incident energy on a fabric or material that results in a 50 % probability that sufficient heat transfer through the tested specimen is predicted to cause the onset of a second-degree skin burn injury based on the Stoll curve..

arc voltage, *n*—voltage across the gap caused by the current flowing through the resistance created by the arc gap, *V*.

asymmetrical arc current, *n*—the total arc current produced during closure; it includes a direct component and a symmetrical component, *A*.

blanket roll-up—a container made from fabric or similar material and specifically designed to protect the blanket from damage during storage or transportation.

blowout, *n*—the extinguishing of the arc caused by a magnetic field.

breakdown, electrical—the electrical discharge or arc occurring between the electrodes and through the equipment being tested.

bulk storage—the storage of hose or covers together with one or more layers piled neatly, but without the benefit of spacers, supports, or special protective containers.

charring, *n*—the formation of carbonaceous residue as the result of pyrolysis or incomplete combustion.

closure, *n*—point on supply current wave form where arc is initiated.

color splash—a splash, smear, or streak of contrasting color evident on the inside or outside surface of the gloves or sleeves that was deposited during the dipping operation and is vulcanized into the material as part of the homogenous compound.

compatible—not injurious to or changing the physical or electrical characteristics of the blankets or affecting their application, use, or acceptability.

cover—an electrically insulated enclosure designed to be installed temporarily on various types of irregularly shaped electrical equipment to protect personnel and equipment working in close proximity.

designated person—an individual who is qualified by experience or training to perform an assigned task.

distorted—physically changed from the natural and original shape, caused by stress of any type.

electrical testing facility—a location with qualified personnel, testing equipment, and procedures for the inspection and electrical testing of electrical insulating protective equipment.

electrode—the energized or grounded conductor portion of electrical test equipment which is placed near or in contact with the material or equipment being tested.

[1] These definitions are under the jurisdiction of ASTM Committee F18 on Electrical Protective Equipment for Workers and are the direct responsibility of Subcommittee F18.60 on Terminology.

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[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.

electrode clearance—the shortest path from the energized electrode to the ground electrode.

embrittlement, *n*—the formation of a brittle residue as the result of pyrolysis or incomplete combustion.

flashover—the electrical discharge or arc occurring between electrodes and over or around, but not through, the equipment being tested.

foot portion—the portion of the footwear below the wearer's ankle bone.

FRP insulating tubes and rods—fiberglass reinforced plastic (FRP) products manufactured so that the tubes and rods produced will meet the electrical and mechanical requirements in the standard.

gauntlet—the area of a glove between the wrist and the reinforced edge of the opening.

halogenation treatment—exposure of the entire rubber surface area to a halogen for the purpose of reducing surface friction.

heat attenuation factor HAF, *n—in electric arc testing*, the percent of the incident energy which is blocked by a material at an incident energy level equal to ATPV.

heat flux, *n*—the thermal intensity indicated by the amount of energy transmitted divided by area and time kW/m^2 (cal/cm^2s).

hose—an electrical insulating tube with a longitudinal slit designed to be installed temporarily on energized electrical wires.

i^2t, *n*—sum of the instantaneous arc current values squared multiplied by the incremental time values during the arc (A^2s).

ignition, *n*—the initiation of combustion.

incident energy (E_i) , *n*—the amount of energy (total heat, cal/cm^2) received at a surface as a direct result of an electric arc discharge as measured by temperature rise on copper calorimeters.

insulated—separated from other conducting surfaces by a dielectric substance (including air space) offering a high resistance to the passage of current.

DISCUSSION—When any object is said to be insulated, it is understood to be insulated in a suitable manner for the conditions to which it is subjected. Otherwise, it is, within the purpose of this definition, uninsulated. Insulating covering of conductors is one means of making the conductor insulated.

interior foam-filled tube—a tube filled with homogeneous unicellular thermosetting foam having closed cells blown with non-combustible gases, with the filling bonded to the interior wall.

DISCUSSION—The foam filling should be free of voids, separations, holes, cracks, or the like.

isolated—an object that is not readily accessible to persons unless special means of access are used.

ozone—a very active form of oxygen that is produced by corona, arcing, or ultraviolet rays.

ozone cutting and checking—cracks produced by ozone in a material under mechanical stress.

proof-test current—the current measured during ac proof tests.

DISCUSSION—This current is an indication of the validity of the dielectric constant of the type of material used and the thickness of the total contact area under test.

retest—the tests given after the initial acceptance test, usually performed at regular periodic intervals or as required because of physical inspection.

rubber—a generic term that includes elastomers and elastomer compounds, regardless of origin.

sleeve roll-up—a sleeve carrier formed of flat canvas-like material in which a pair of sleeves is rolled lengthwise.

sleeve shoulder roll—the rolled or reinforced edge of an insulating sleeve nearest to the shoulder.

sole, *n*—the underside of the boot or rubber that would be in contact with the ground.

DISCUSSION—See Test Method F1116 and Specification F1117. In this type footwear, it is normally made as one piece and constructed of a molded elastomer.

test, acceptance—one made at the option of the purchaser to verify that a product meets design criteria.

test, design—one made on a sample treated as representative of an industrial product. These tests will not generally be repeated in quantity production.

test, routine—a type of test made regularly on production material.

unassigned blankets—blankets that are in storage prior to being issued for use.

user, *n*—the employer or entity purchasing the equipment to be utilized by workers for their protection; in the absence of such an employer or entity, the individual purchasing and utilizing the protective equipment.

visual inspection—a visual check made to detect constructional defects.

voltage, maximum retest—voltage, either ac rms or dc average, that is equal to the proof test voltage for new protective equipment.

voltage, maximum use—the ac voltage (rms) classification of the protective equipment that designates the maximum nominal design voltage of the energized system that may be safely worked. The nominal design voltage is equal to phase-to-phase voltage on multiphase circuits.

If there is no multiphase exposure in a system area, and the voltage exposure is limited to phase (polarity on dc systems) to ground potential, the phase (polarity on dc systems) to ground potential shall be considered to be the nominal design voltage.

If electrical equipment and devices are insulated, or isolated, or both, such that the multiphase exposure on a grounded wye circuit is removed, then the nominal design voltage may be considered as the phase-to-ground voltage on that circuit.

The formulas for determining the ac maximum use voltage are as follows:

Classes 1, 2, 3 and 4: Maximum ac use voltage = (95 % of ac test voltage) – 2000 ac V

Classes 1, 2, 3 and 4: Maximum ac use voltage = (95 % of dc test voltage) – 30 500 dc V

For Class 00 and Class 0 rubber gloves, and other Class 0 equipment, the maximum use voltage values are not based on the above formulas, but are listed in individual standards.

Class 00: Maximum ac use voltage = 500 V with an ac test voltage of 2500 V

Class 0: Maximum ac use voltage = 1000 V with an ac test voltage of 5000 V

Class 00: Maximum ac use voltage = (95 % of dc test voltage) – 9000 dc V

Class 0: Maximum ac use voltage = (95 % of dc test voltage) – 18 000 dc V

These formulas take into consideration that natural and man-made polymers' ability to withstand voltage is not linear as the thickness and voltage increases.

This definition does not apply to electrically insulating plastic equipment covered by Test Method F712.

DISCUSSION—The work practices and methods associated with removing multiphase exposure at any given work site are not addressed in the ASTM standards. The users of ASTM standards should reference appropriate industry consensus standards for proper work practices.

voltage, nominal design—a nominal value consistent with ANSI C84.1-2001, assigned to the circuit or system for the purpose of conveniently designating its voltage class.

voltage, retest—voltage, either ac rms or dc average, that used protective equipment must be capable of withstanding for a specific test period without breakdown.

X/R ratio, *n*—the ratio of system inductive reactance to resistance.

DISCUSSION—It is proportional to the L/R ratio of time constant, and is, therefore, indicative of the rate of decay of any DC offset. A large X/R ratio corresponds to a large time constant and a slow rate of decay.