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# IEEE Standard Criteria for Independence of Class 1E Equipment and Circuits

NUCLEAR REGULATORY COMMISSION

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**Nuclear Power Engineering Committee  
of the  
IEEE Power Engineering Society**

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**IEEE Standard Board**

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**Abstract:** The independence requirements of the circuits and equipment comprising or associated with Class 1E systems are described. Criteria for the independence that can be achieved by physical separation and electrical isolation of circuits and equipment that are redundant are set forth. The determination of what is to be considered redundant is not addressed.

**Keywords:** associated circuit, barrier, Class 1E, independence, isolation, isolation device, raceway, separation

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- [6] ASTM E119-88, Method for Fire Tests of Building Construction and Materials.
- [7] ASTM E136-92, Test for Behavior of Materials in a Vertical Tube Furnace at 750 °C
- [8] IEEE Std 308-1991, IEEE Standard Criteria for Class 1E Power Systems for Nuclear Power Generating Stations (ANSI).
- [9] IEEE Std 383-1974 (Reaff 1992), IEEE Standard for Type Test of Class 1E Electric Cables, Field Splices, and Connections for Nuclear Power Generating Stations (ANSI)<sup>5</sup>
- [10] IEEE Std 420-1982, IEEE Standard for the Design and Qualification of Class 1E Control Boards, Panels, and Racks Used in Nuclear Power Generating Stations (ANSI)
- [11] IEEE Std 494-1974 (Reaff 1990), IEEE Standard Method for Identification of Documents Related to Class 1E Equipment and Systems for Nuclear Power Generating Stations (ANSI)
- [12] IEEE Std 603-1991, IEEE Standard Criteria for Safety Systems for Nuclear Power Generating Stations.
- [13] IEEE Std 628-1987, IEEE Standard Criteria for the Design, Installation, and Qualification of Raceway Systems for Class 1E Circuits for Nuclear Power Generating Stations (ANSI)
- [14] IEEE Std 690-1984, IEEE Standard for the Design and Installation of Cable Systems for Class 1E Circuits in Nuclear Power Generating Stations.
- [15] NEMA VE 1-1991, Metallic Cable Tray Systems<sup>6</sup>

#### 4. Definitions

**acceptable:** Demonstrated to be adequate by the safety analysis of the station

**associated circuits:** Non-Class 1E circuits that are not physically separated or are not electrically isolated from Class 1E circuits by acceptable separation distance, safety class structures, barriers, or isolation devices.

**NOTE** — Circuits include the interconnecting cabling and the connected loads.

**auxiliary supporting features:** Systems or components that provide services (such as cooling, lubrication, and energy supply) that are required for the safety system to accomplish its safety functions.

**barrier:** A device or structure interposed between redundant Class 1E equipment or circuits, or between Class 1E equipment or circuits and a potential source of damage to limit damage to Class 1E systems to an acceptable level.

**cable in free air:** That portion of a cable not routed in either a raceway or an enclosure.

**Class 1E:** The safety classification of the electric equipment and systems that are essential to emergency reactor shutdown, containment isolation, reactor core cooling, and containment and reactor heat removal, or are otherwise essential in preventing a significant release of radioactive material to the environment.

**design basis events:** Postulated abnormal events used in the design to establish the acceptable performance requirements of the structures, systems, and components.

**division:** The designation applied to a given system or set of components that enables the establishment and maintenance of physical, electrical, and functional independence from other redundant sets of components

<sup>5</sup> IEEE publications are available from the Institute of Electrical and Electronics Engineers Service Center, 445 Hoes Lane, P.O. Box 1331, Piscataway, NJ 08855-1331

<sup>6</sup> NEMA publications are available from the National Electrical Manufacturers Association, 2101 L Street, NW, Washington, DC 20037, USA.