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Standard
for
FUSES ABOVE 600 VOLTS

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Development of the Standards of the American Institute of Electrical Engineers

Recognizing the importance in the development of electrical engineering, of standardization in the electrical field, the AIEE in 1898 appointed a Committee on Standardization, consisting of seven members having qualifications and experience from designing, manufacturing and operating standpoints. The report of this Committee was accepted at a meeting of the Institute in June 1899.

Experience gained in applications of the standards and further developments in electric apparatus and methods showed the necessity of revision, and a committee was appointed which after consultation with manufacturing and operating engineers presented the first revised report on Standardization Rules of the AIEE in June 1902.

The next revision was undertaken by a committee of ten, which presented its report in May 1906.

In September 1906, a Standards Committee of eleven members was appointed for further revision, and its report was presented in June 1907.

The appreciation of the importance and value of standardization resulted in the formation of a Standing Committee, with the title of Standards Committee of the AIEE. This became effective in the Constitution of June 1907. The scope and amount of work necessitated increasing the number of members from time to time until in 1922 there were 37 members divided into a number of subcommittees specializing on various subjects.

AIEE Standards published in a single volume as each revision was adopted were generally accepted as standards of the electrical industry of the United States since the adoption of the first report in 1899. Subsequent reports on standards were made and published, in some cases in several editions. The dates of adoption by the Board of Directors of such reports are as follows: June 20, 1902; June 21, 1907; June 27, 1912; July 10, 1914; June 30, 1915; June 28, 1916; November 8, 1918; October 8, 1920, and June 29, 1922.

On June 29, 1922, in view of the increasing complexity of the work, a reorganization of the Standards Committee was effected, and a working organization established which provided for an increase in standardization work and for the appointment on Working Committees of the Standards Committee of non-Institute members.

The present plan under which the Institute Standards are being issued involves the separation of the complete body of standards into more than forty sections, each published as a separate pamphlet and dealing with a specific subject. Each section of the standards has been formulated either by a subcommittee of the Standards Committee which was made as representative as possible for the work in hand, by an AIEE Technical Committee or subcommittee, or by a Sectional Committee organized according to the procedure of the American Standards Association. The division of the standards into a number of separate publications simplifies the process of keeping the standards revised to conform with the latest development and enables those interested in a particular field to obtain in concise form the material relating to that field. In framing the Institute Standards the chief purpose has been to define terms and conditions which characterize the rating and behavior of electric machinery and apparatus, with special reference to the conditions of acceptance tests.

The AIEE Standards Committee takes this occasion to draw attention to the value of suggestions based upon experience gained in the application of the standards to general practice. Any suggestions looking toward improvements in the standards will be welcomed for the guidance of the Committee in preparation of future editions, and should be communicated to the Secretary of the AIEE Standards Committee, 33 West 39th Street, New York 18, N. Y.

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The work of preparing this standard was carried out by members of the Subcommittee on Switches, Fuses and Insulators of the AIEE Committee on Switchgear. The members of the subcommittee are:

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Standard of the American Institute of Electrical Engineers

FUSES ABOVE 600 VOLTS

SCOPE

This standard applies to the following types of devices designed for operation above 600 volts whether for indoor or outdoor service.

- (a) Fuses (see paragraph 25-50).
- (b) Fuse cutouts (see paragraph 25-63).
- (c) Fuse parts of combined equipment.

SERVICE CONDITIONS

25-1 Usual Temperature and Altitude Service Conditions—Equipment conforming to these standards shall be suitable for operation at its standard rating, provided that:

(a) The temperature of the cooling air (ambient temperature) does not exceed 40C and copper-to-copper contacts, or equivalent are used for fuse terminals and all conducting joints (except those of the conducting element).

(b) The temperature of the cooling air (ambient temperature) does not exceed 55C if the fuse has all contacts silver surfaced or equivalent, and in addition has all conducting joints, except those of the conducting element) including terminal connections, either:

- (1) Separately held mechanically and either soldered or silver surfaced, or
- (2) Brazed, welded or silver soldered and provided that such operation does not result in temperatures in excess of 90C for Class O, 105C for Class A, or 130C for Class B insulations.

(c) The altitude does not exceed 3300 feet (1000 meters).

25-2 Unusual Temperature and Altitude Service Conditions—The application of equipment at higher ambient temperatures or at higher altitudes than specified in *Usual Temperature and Altitude Service Conditions* shall be considered as special.

Standard equipment may be applied at higher ambient temperatures or at higher altitudes than specified, but its performance may be affected and special consideration should be given to these applications. (See paragraph 25-4).

25-3 Other Conditions Which May Affect Design and Application—Where other unusual conditions exist they should be brought to the attention of those responsible for the design and application of the equipment. Examples of such conditions are:

(a) Damaging fumes or vapors, excessive or abrasive dust, explosive mixtures of dust or gases, steam, salt spray, excessive moisture or dripping water, etc.

(b) Abnormal vibration, shocks, or tilting.

(c) Excessively high or low temperatures.

(d) Unusual transportation or storage conditions.

(e) Unusual space limitations.

(f) Unusual operating duty, frequency of operation, difficulty of maintenance, poor wave form, unbalanced voltage, special insulation requirements, etc.

25-4 Applications at Altitudes Greater than 3300 Feet (1000 Meters)—Equipment that depends on air for its insulating and cooling medium will have a higher temperature rise and a lower dielectric value when operated at altitudes higher than 3300 feet.

Dielectric strength and current ratings should be multiplied by factors shown in Tables 1a and 1b.

Equipment designed for standard temperature rise may be used at its normal current rating without exceeding ultimate standard temperature limits provided that the ambient temperature does not exceed the ambient allowed in paragraph 25-1, multiplied by the factor shown in table 1c.

TABLE I
Altitude Correction

		Altitude Correction Factor To Be Applied To		
		a	b	c
Altitude Feet	Meters	Dielectric Strength	Current Rating	Ambient Temperature
3300	1000	1.00	1.00	1.00
4000	1200	.98	.995	.992
5000	1500	.95	.99	.980
6000	1800	.92	.985	.968
7000	2100	.89	.98	.956
8000	2400	.86	.97	.944
9000	2700	.83	.965	.932
10000	3000	.80	.96	.920
12000	3600	.75	.95	.896
14000	4200	.70	.935	.872
16000	4800	.65	.925	.848
18000	5400	.61	.91	.824
20000	6000	.56	.90	.800

The correction factors in Table 1, columns b and c are not to be applied at the same time.

If the derating as determined from the table is serious, equipment of a suitably higher rating should be chosen to meet requirements, after derating factors have been applied.

DEFINITIONS

Definitions as given herein apply specifically to the apparatus treated in this standard. For other definitions applying to fuses, see American Standard Definitions of Electrical Terms, ASA C42.

General

- 25-50 Fuse**—A fuse is an overcurrent protective device with a circuit-opening fusible member directly heated and severed by the passage of overcurrent through it.
- 25-51 Vented Fuse**—A vented fuse is a fuse which during circuit interruption may eject forcibly arc gases, solid particles, liquid or other material into the surrounding atmosphere.
- 25-52 Non-Vented Fuse**—A non-vented fuse is a fuse which during circuit interruption does not eject forcibly arc gases, solid particles, liquid or other material into the surrounding atmosphere.

Construction

- 25-53 Current-Responsive Element** — The current-responsive element of a fuse is the conducting section with predetermined characteristics, the melting

and/or severance of which initiates the interruption function of the fuse. (The current-responsive element may consist of the combination of a fusible element and, when used, a strain element.)

- 25-54 Conducting Element**—The conducting element of a fuse is the conducting means, including the current responsive element, for completing the electric circuit between the terminals of the fuse holder.
- 25-55 Arc Extinguishing Medium**—The arc extinguishing medium of a fuse is the material included in the fuse to facilitate current interruption.
- 25-56 Refill Unit**—A refill unit of a fuse is an assembly comprising a conducting element, the complete arc extinguishing medium and parts normally required to be replaced after each circuit interruption to restore the fuse to its original operating condition.
- 25-57 Fuse Link**—A fuse link is a replaceable part or assembly comprised entirely or principally of the conducting element required to be replaced after each circuit interruption to restore the fuse to operating condition.
- 25-57.5 Fusible Element**—A fusible element is the current-carrying part of a fuse unit designed to sever under stated conditions.
- 25-58 Fuse Tube**—A fuse tube is a tube of insulating material which encloses the conducting element.
- 25-59 Fuse Holder**—A fuse holder is an assembly of a fuse tube or tubes, together with parts necessary to enclose, and provide means of making contact with, the conducting element and the fuse clips. The fuse holder does not include the conducting element.
- 25-60 Fuse Unit**—A fuse unit is an assembly comprising a conducting element mounted in a fuse holder with parts and materials in the fuse holder essential to the operation of the fuse.
- 25-61 Fuse Clips (Fuse Contacts)**—Fuse clips are current-carrying parts of a fuse support which engage the fuse holder.
- 25-62 Fuse Support (Fuse Mounting)**—A fuse support is an assembly of base, insulating means, and fuse clips for mounting a fuse holder and connecting it into the circuit.
- 25-63 Fuse Cutout**—A fuse cutout is an assembly of a fuse support and fuse holder which may or may not include a fuse link or conducting element.
- (a) *Enclosed Fuse Cutout*—An enclosed fuse cutout is a fuse cutout in which the fuse clips and fuse holder are mounted completely within an enclosure.