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APPARATUS BUSHINGS
(Proposed A.I.E.E. Standard for trial use)
and
PROPOSED TEST CODE



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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 A.I.E.E. 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 electrical 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 A.I.E.E. 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 A.I.E.E. 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.

A.I.E.E. 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 Working Committee of the Standards Committee which was made as representative as possible for the work in hand, by an A.I.E.E. 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 electrical machinery and apparatus, with special reference to the conditions of acceptance tests.

The A.I.E.E. 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 practise. Any suggestions looking toward improvement 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 A.I.E.E. Standards Committee, 33 West 39th Street, New York.

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The major work of preparing this proposed standard was carried out by the A.I.E.E. Joint Committee on Bushing Standardization. The personnel of this group was as follows:

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STANDARDS OF THE American Institute of Electrical Engineers

APPARATUS BUSHINGS (Proposed A.I.E.E. Standard for Trial Use)

SCOPE

21-1 These standards specifically cover the following types of bushings:

- (a) Outdoor bushings for large apparatus.
- (b) Cover type bushings for small apparatus.
- (c) Indoor bushings for all types of apparatus except dry type instrument transformers, air-blast transformers, dry type regulators, and circuit breakers rated below 5,000 volts, and non-oiltight oil circuit breakers rated 50,000 kva or less.

These standards are not intended to apply to wall bushings, cable potheads, nor insulators for back-connected disconnecting switches, although many of the principles may be applicable.

The bushing requirements as specified in these standards apply to bushings when mounted for testing in accordance with specified arrangements as given in the Test Code (**Appendix I**). Requirements when installed in apparatus shall be covered by standards for such apparatus.

SERVICE CONDITIONS

21-5 Usual Service Conditions—Apparatus bushings conforming to these standards shall be suitable for operation at their standard ratings:

- (a) When and where the temperature of the external cooling medium does not exceed 40C maximum, or 30C average for any twenty-four hour period.
- (b) Where the altitude does not exceed 3300 feet (1000 meters).

21-6 Unusual Service Conditions—The use of apparatus in external cooling media having temperatures higher than 40C maximum, or 30C average for any twenty-four hour period, or at altitudes greater than 3300 feet (1000 meters) should be considered as special.

Temperature Rise: For apparatus intended for service at altitudes greater than 3300 feet (1000 meters) it is provisionally agreed that the permissible temperature rises (as determined by test at low altitude, 3300 feet or less) shall be less than those specified in these standards by four-tenths of one per cent of the specified rise for each 330 feet (100 meters) of altitude in excess of 3300 feet (1000 meters) at which the actual installation is to be made.

21-7 Conditions Affecting Construction or Protecting Features—Unusual conditions may require special construction or operation, and these should be brought to the attention of those responsible for the application, manufacture, and operation of the equipment. Among such unusual conditions are:

- Exposure to damaging fumes or vapors.
- Exposure to excessive moisture or dripping water.
- Exposure to excessive dust, abrasive dust or magnetic dust.
- Exposure to steam.
- Exposure to salt air.
- Exposure to abnormal vibration, shocks or tilting.
- Exposure to unusual transportation or storage conditions.
- Exposure to oil vapors.
- Unusual space limitations.
- Unusual insulation requirements.

DEFINITIONS

21-25 Bushing—A bushing is an insulating structure including a central conductor, or providing a central passage for a conductor, with provision for mounting on a barrier, conducting or otherwise, for the purpose of insulating the conductor from the barrier and conducting current from one side of the barrier to the other.