

An American National Standard
IEEE Standard Test Code for
High-Voltage Air Switches

(Supplement: Ice Tests)

Approved March 5, 1981
Reaffirmed March 10, 1988
Reaffirmed December 3, 1992

IEEE Standards Board

Approved July 10, 1984
Reaffirmed April 25, 1988

American National Standards Institute

IEEE

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April 22, 1985

SH09951

Foreword

(This Foreword is not a part of ANSI/IEEE C37.34b-1985, Ice Tests, supplement to ANSI/IEEE C37.34-1971 [R1977], Test Code for High-Voltage Air Switches.)

This document for ice tests is coordinated with the IEC Supplement to Publication 129 (1975), Alternating Current Disconnectors (Isolators) and Earthing Switches, entitled Additional Tests for Disconnectors and Earthing Switches, which are intended for severe conditions of ice formation.

The C37.34 ice tests describe a method for natural environment (outdoor) testing that is not described in the IEC document.

Paragraphs are rearranged to establish *criteria for acceptance*, which are necessary to demonstrate compliance with the standard. Specific requirements have been added for manually operated, power-operated, and fault-initiating switches.

7.1 Definition. Ice tests are design tests made to determine the rated ice breaking ability of the switching equipment.

7.2 General. An ice storm can cause major difficulties in the operation of electric power systems. Under certain atmospheric conditions, a deposit of ice can build up to a thickness that can cause overhead lines to fail and can cause difficulty in the operation of outdoor switching equipment.

The purpose of these tests is to demonstrate that the equipment will operate successfully under iced conditions. The test code describes the procedure for producing controlled coatings of ice that compare with those encountered in nature, and defines these procedures so that the tests can be consistently repeated.

7.3 Study of Ice Formation. Nature produces ice coatings that can be divided into two general categories:

(1) Clear ice—generally results from rain falling through air whose temperatures is somewhat below the freezing point of water.

(2) Rime ice—characterized by a white appearance caused by entrapped air during the ice formation; usually forms from rain falling through air whose temperature is below -10°C ($+14^{\circ}\text{F}$), or forms when atmospheric moisture condenses on cold surfaces.

The test shall be performed with clear ice since it is recognized that clear ice coatings represent the most difficult operating conditions. Since such coatings may form during a period of rain when initial temperatures are above freezing, the switch bearings and moving joints may be filled with water, which may freeze.

7.4 Test Methods. Either of the following are acceptable:

(1) Controlled environment test (indoor laboratory test)

(2) Natural environment test (outdoor test)

The type of laboratory used must be stated on the test report. Three-pole, group-operated switches must be tested as complete three-pole assemblies; single-pole operated (EHV) switches may be tested as a complete single-pole assembly.

7.4.1 Switch Surface Condition. External switch surfaces shall be free from all traces of oil or grease: a thin film of oil or grease will prevent ice from adhering to the switch and will greatly affect the test results.

7.4.2 Test Arrangement. A switch shall be tested for ice breaking ability during opening operation and closing operation.

The switch shall be tested with a minimum of one insulator per stack and representative operating mechanism components, such as levers, bell cranks, pin joints, universal joints, bearings, etc, as required for a typical installation in the field.

7.4.2.1 When testing in a controlled environment (indoor laboratory) with space limitations, reductions are permitted for switch mounting height, insulator height, phase spacing, and vertical operating pipe length.

7.4.2.2 When testing in a natural environment (outdoor), reductions are permitted for switch mounting height, phase spacing, and vertical operating pipe length.

7.4.3 Measurement of Ice Thickness. Metal rods or tubes approximately 1 in (2.5 cm) in diameter and 2 ft (60 cm) in length shall be mounted with their longitudinal axes horizontal, at each end of the test specimen, so placed to receive the same general wetting as the switch under test. For switches with main contacts other than at the end, additional metal rods or