ANSI® C37.44-1981
(Revision of ANSI C37.44-1969)

American National Standard Specifications for Distribution Oil Cutouts and Fuse Links

Secretariat

Institute of Electrical and Electronics Engineers
National Electrical Manufacturers Association

Approved May 22, 1980

American National Standards Institute, Inc

American National Standard

An American National Standard implies a consensus of those substantially concerned with its scope and provisions. An American National Standard is intended as a guide to aid the manufacturer, the consumer, and the general public. The existence of an American National Standard does not in any respect preclude anyone, whether he has approved the standard or not, from manufacturing, marketing, purchasing, or using products, processes, or procedures not conforming to the standard. American National Standards are subject to periodic review and users are cautioned to obtain the latest editions.

CAUTION NOTICE: This American National Standard may be revised or withdrawn at any time. The procedures of the American National Standards Institute require that action be taken to reaffirm, revise, or withdraw this standard no later than five years from the date of publication. Purchasers of American National Standards may receive current information on all standards by calling or writing the American National Standards Institute.

Published by

American National Standards Institute

1430 Broadway, New York, New York 10018

Printed in the United States of America

A1M381/425

Foreword

(This Foreword is not a part of American National Standard Specifications for Distribution Oil Cutouts and Fuse Links, ANSI C37.44-1981.)

This standard is a revision of American National Standard Specifications for Distribution Oil Cutouts and Fuse Links, ANSI C37.44-1969, to bring it up to date and in line with present day requirements for high-voltage fuses and switches.

This standard was prepared by the C37 Subcommittee on High-Voltage Fuses with cooperation from the IEEE Subcommittee on High-Voltage Fuses and from NEMA. Liaison was maintained with EEI and IEC during the revision process in order to incorporate the latest thinking up to the time of publication.

This publication is one of a series of complementary American National Standards covering various types of high-voltage fuses and switches, so arranged that certain of the standards apply to all devices, while each of the other standards provides additional specifications for a particular device. For any device, ANSI/IEEE C37.40-1981, ANSI/IEEE C37.41-1981, plus the additional standard covering that device constitute a complete standard for the device. In addition, ANSI C37.48-1969 is an application, operation, and maintenance guide for all the devices.

The following American National Standards make up this series:

American National Standard Service Conditions and Definitions for High-Voltage Fuses, Distribution Enclosed Single-Pole Air Switches, Fuse Disconnecting Switches, and Accessories, ANSI/IEEE C37.40-1981

American National Standard Design Tests for High-Voltage Fuses, Distribution Enclosed Single-Pole Air Switches, Fuse Disconnecting Switches, and Accessories, ANSI/IEEE C37.41-1981

American National Standard Specifications for Distribution Cutouts and Fuse Links, ANSI C37.42-1981 [This revision includes pertinent data formerly contained in ANSI C37.43. The C37.43 standard is dropped as redundant.]

American National Standard Specifications for Distribution Oil Cutouts and Fuse Links, ANSI C37.44-1981

American National Standard Specifications for Distribution Enclosed Single-Pole Air Switches, ANSI C37.45-1981

American National Standard Specifications for Power Fuses and Fuse Disconnecting Switches, ANSI C37.46-1981

American National Standard Specifications for Distribution Fuse Disconnecting Switches, Fuse Supports, and Current Limiting Fuses, ANSI C37.47-1981

American National Standard Guide for Application, Operation, and Maintenance of Distribution Cutouts and Fuse Links, Secondary Fuses, Distribution Enclosed Single-Pole Air Switches, Power Fuses, Fuse Disconnecting Switches, and Accessories, ANSI C37.48-1969

Suggestions for improvement of this standard will be welcome. They should be sent to the American National Standards Institute, 1430 Broadway, New York, N.Y. 10018.

This standard was processed and approved for submittal to ANSI by American National Standards Committee on Power Switchgear, C37. Committee approval of the standard does notnecessarily imply that all the committee members voted for its approval. At the time it approved this standard, the C37 Committee had the following members:

C. L. Wagner, *Chair*
D. J. Polasky *(Co-Secretariat)*

Organization Represented	***Name of Representative***
Association of Iron and Steel Engineers	J. M. Tillman
Electric Light and Power Group	J. E. Beehler D. O. Craghead H. G. Darron H. G. Frus J. D. Hendrix K. G. Adgate (Alt) R. L. Capra (Alt) R. L. Lindsey (Alt) E. E. Ramm (Alt)
Institute of Electrical and Electronics Engineers	H. H. Fahnoe R. E. Friedrich M. J. Maier H. W. Mikulecky G. W. Walsh H. F. White M. J. Beachy (Alt) R. A. McMaster (Alt) C. A. Mathews (Alt) D. C. Musgrave (Alt)
National Electrical Manufacturers Association	A. P. Colaiaco R. W. Dunham D. G. Portman G. A. Wilson W. R. Wilson
Tennessee Valley Authority	R. C. St. Clair
Testing Laboratory Group	L. Frier E. J. Huber R. W. Seelbach (Alt)
U.S. Department of the Army	R. H. Bruck
U.S. Department of the Interior, Bureau of Reclamation	E. M. Tomsic
U.S. Department of the Navy, Navy Construction Batallion Center	J. N. Montagna A. R. Hanks (Alt)

The C37 Subcommittee on High-Voltage Fuses, which developed this standard, had the following members:

R. H. Arndt, *Chair*
D. J. Polasky ***(****Co-Secretariat****)***

M. J. Beachy
R. E. Bennett
F. L. Cameron
L. Cavic
A. M. DiCioccio
R. A. Few
G. P. Gill
C. H. Griffin
S. Lampe
J. R. Marek
H. W. Mikulecky
W. W. Olive
A. M. Salazar
J. G. St. Clair
E. W. Schmunk
G. D. Smith
R. B. Steel
E. E. Steven
H. E. Swanson
K. Behrendt (Alt)

The IEEE High-Voltage Fuse Subcommittee had the following members:

H. W. Mikulecky, *Chair*

R. H. Amundson
J. G. Angelis
E. H. Arjeski
R. H. Arndt
L. R. Beard
R. Bennett
R. F. Burnett
F. L. Cameron
A. DuPont
H. H. Fahnoe
G. P. Gill
R. E. Koch
J. R. Marek
H. G. Reid
W. H. Russell
E. W. Schmunk
H. E. Swanson

The NEMA High-Voltage Fuse Technical Committee had the following members:

F. L. Cameron, *Chair*
D. J. Polasky *(Secretary)*

L. R. Beard
R. E. Bennett
F. L. Cameron
J. Fox
G. P. Gill
J. R. Marek
H. L. Miller
H. A. Norberg
W. W. Olive
R. L. Robertson
R. B. Steel
H. E. Swanson
J. S. Wall
J. G. Angelis (Alt)
R. Ball (Alt)
R. A. Few (Alt)

CLAUSE PAGE

American National Standard Specifications for Distribution Oil Cutouts and Fuse Links

1. Scope

This standard applies to high-voltage fuses (above 600 volts) and accessories for alternating-current distribution systems as follows:

1) Distribution oil cutouts
2) Fuse housings, fuse supports, fuse mountings, and fuse links, all of the type used exclusively with distribution oil cutouts
3) Removable switch blades for distribution oil cutouts.

2. Rating

2.1 Rating Information

2.1.1 Ratings for Distribution Oil Cutouts

The ratings of distribution oil cutouts shall include:

1) Rated continuous current, determined by the temperature-rise design tests at the rated continuous current specified in 4.7. These tests shall be made under the usual service conditions specified in 2.1 of American National Standard Service Conditions and Definitions for High-Voltage Fuses, Distribution Enclosed Single-Pole Air Switches, Fuse Disconnecting Switches, and Accessories, ANSI/IEEE C37.40-1981.
2) Rated maximum voltages, determined by the dielectric and current interrupting design tests specified in 4.1 and 4.2, at altitudes up to 3300 feet (1000 meters), as specified in 2.1 of ANSI/IEEE C37.40-1981.
3) Rated frequency, as specified in 2.1 of ANSI/IEEE C37.40-1981.
4) Rated interrupting current in terms of available rms short-circuit current, determined by the current interrupting design tests specified in 4.2
5) Basic impulse insulation level (BIL), determined by the impulse withstand tests specified in 4.1.

6) Rated load-break current (when provision is made for load-break operation), determined by the design tests specified in 4.3.
7) Rated making current in terms of available rms short-circuit current, determined by the making current tests specified in 4.4.
8) Rated short-time currents, momentary, 15 cycle and 3 second, determined by the design tests specified in 4.6.

2.1.2 Ratings for Fuse Links for Distribution Oil Cutouts

The ratings of fuse links for distribution oil cutouts shall include:

1) Rated continuous current, determined by the temperature-rise design tests specified in 4.7 and the electrical interchangeability requirements specified in 3.1.
2) Rated maximum voltage, determined by the highest rated voltage fuse cutout in which the fuse link is designed to be used.

2.1.3 Performance Characteristics of Distribution Oil Cutouts

The performance characteristics of distribution oil cutouts shall include:

1) Normal-frequency dry- or wet-withstand voltages, as specified in 4.1.
2) Temperature-rise limitations, as specified in 4.7.
3) Radio-influence levels, as specified in 4.5.

2.1.4 Performance Characteristics of Fuse Links for Distribution Oil Cutouts

The performance characteristics of distribution fuse links for use in distribution oil fuse cutouts shall include:

1) Melting-time-current characteristics, specified as the electrical interchangeability requirements in 3.1 and determined as specified in 4.8.
2) Total clearing-time-current characteristics, determined as specified in 4.8.

NOTE — These time-current characteristics shall be presented as curves, as specified in 12.3 of American National Standard Design Tests for High-Voltage Fuses, Distribution Enclosed Single-Pole Air Switches, Fuse Disconnecting Switches, and Accessories, ANSI/IEEE C37.41-1981.

2.2 Rated Continuous Current

2.2.1 Rated Continuous Current of Distribution Oil Cutouts

The continuous current rating of oil fuse and disconnecting cutouts shall be 100, 200, and 300 amperes.

2.2.2 Rated Continuous Current of Distribution Fuse Links

The rated continuous current of fuse links for use in distribution oil fuse cutouts has not been standardized as yet.

Table 1— Rated Symmetrical Interrupting Currents [*]

Maximum Voltage Ratings of Oil Cutouts (kV)	Continuous Current (amperes)	Symmetrical Interrupting Rating at Maximum Voltage (amperes, rms)	Asymmetrical Total Current* (amperes, rms)
2.6	100	4250	6 000
5.2	100	3550	5 000
5.2	200	5300	7 600
5.2	300	7100	10 200
7.8	100	3550	5 000
7.8	200	3550	5 000
15.0	100	2240	3 000
15.0	200	4250	6 750

*Asymmetrical values are provided for information purposes.

2.3 Overload and Thermal Ratings

Overload and thermal ratings are not applicable to distribution oil cutouts.

2.4 Rated Voltages

2.4.1 Rated Voltages of Distribution Oil Cutouts

The maximum rated voltages of distribution oil cutouts shall be 2.6, 5.2, 7.8, and 15.0 kV.

2.4.2 Rated Voltage of Fuse Links

The maximum rated voltage shall be 15 kV for fuse links for use in distribution oil fuse cutouts.

2.5 Rated Frequency

The rated frequency of distribution oil cutouts shall be 60 Hz.

2.6 Rated Interrupting Current for Distribution Oil Fuse Cutouts

The rated interrupting currents of oil fuse cutouts shall be in accordance with Table 1.

2.7 Rated Load-Break Current of Distribution Oil Cutouts

The rated load-break current of distribution oil fuse and disconnecting cutouts shall be the same as the continuous current rating of the cutout. The cutouts shall be capable of at least 100 open-close operations at this current without impairing the operation of the cutout.

2.8 Basic Impulse Insulation Level (BIL) of Distribution Oil Cutouts

The basic impulse information level of distribution oil cutouts shall be:

Maximum Rated Voltage (kV)	*BIL (kV, crest)*
2.6	45
5.2	60
7.8	75
15.0	95

2.9 Rated Making Current (Making Current Rating) of Distribution Oil Cutouts

The rated making current of a distribution oil cutout shall be the same value as the current interrupting rating of the cutout.

NOTE — The oil cutout combines the functions of a current interrupting and a load switching device and thus requires a making current rating.

2.10 Rated Short-Time Currents of Distribution Oil Cutouts

The rated short-time currents of distribution oil disconnecting cutouts shall be as given in Table 2.

3. Interchangeability Requirements

3.1 Electrical Interchangeability

The melting-time-current characteristics of fuse links for use in distribution oil fuse cutouts shall be as follows:

1) The current-responsive element for ratings 100 amperes or below shall melt in 300 seconds at an rms current within the range of (____)%[1] of the continuous current rating of the fuse link.
2) The current-responsive element of ratings above 100 amperes shall melt in 600 seconds at an rms current within the range of (____)%1 of the continuous current rating of the fuse link.
3) The melting-time-current characteristic of a fuse link at any current higher than (____)1 to (____)1 or (____)%1 specified in (1) and (2) shall be shown by each manufacturer's published time-current curves, since the current-responsive element is a distinctive feature of each manufacturer.
4) For any given melting time, the maximum steady-state rms current shall not exceed the minimum by more than 20%.

[1]Standard values have not yet been established.

Table 2— Rated Short-Time Currents

Ratings of Disconnecting Cutouts		Short-Time Current Ratings of Cutout (amperes)		
Continuous Current (amperes)	Maximum Voltage (kV)	Momentary, 1 Cycle	15 Cycles	3 Seconds
100	2.6	6,000	4500	2500
100	5.2	6,000	4500	2500
200	5.2	11,000	9000	4000
300	5.2	11,000	9000	4000
100	7.8	6,000	4500	2500
200	7.8	11,000	9000	4000
100	15.0	6,000	4500	2500
200	15.0	11,000	9000	4000

Table 3— Line-to-Ground Dielectric Test Voltages

Maximum Voltage of Cutout (kV)	Withstand Voltages		
	Normal-Frequency Dry Test, 1 min (kV, rms)	Normal-Frequency Wet Test, 10 s* (kV, rms)	Impulse Test (BIL) 1.2×50 μs Wave (kV, crest)
2.6	15	14	45
5.2	21	20	60
7.8	27	24	75
15.0	35	30	95

*Wet tests are required only for cutouts supplied with bushings exposed to the weather.

3.2 Mechanical Interchangeability

Fuse links for distribution oil cutouts are not interchangeable among different manufacturer's cutouts. Thus mechanical interchangeability requirements are not specified.

4. Design Test Requirements

4.1 Dielectric Tests

Distribution oil cutouts shall be capable of withstanding the test voltages specified in 4.1.1 when tested as specified in Section 4 of ANSI/IEEE C37.41-1981.

4.1.1 Test Voltages

The line-to-ground dielectric test voltages to be applied to distribution oil cutouts shall be as given in Table 3.

4.1.2 Number of Samples

The test shall be made on three cutouts equipped with fuse links and blades.

4.2 Interrupting Tests

4.2.1 Determination of Interrupting Ratings

Distribution oil fuse cutouts, when tested as specified in Section 6. of ANSI/IEEE C37.41-1981 and in 4.2.2, and when fused with any size and type of fuse link recommended by the manufacturer, shall interrupt all currents that cause melting of the fuse link on circuits having available short-circuit currents up to and including the rated interrupting current of the cutout and having all degrees of asymmetry.

4.2.2 Interrupting Performance Tests

Distribution oil fuse cutouts shall withstand the interrupting performance tests specified in Section 6 of ANSI/IEEE C37.41-1981.

4.3 Load-Break Tests

Distribution oil cutouts, when tested as specified in Section 7 of ANSI/IEEE C37.41-1981, shall interrupt all load currents, up to and including the rated continuous current of the cutouts, magnetizing currents of transformers, and line-charging currents normally associated with load currents within the rated continuous currents of the cutouts. Also, they shall perform successfully under a duty cycle of 100 unit open-close operations at the rated continuous current of the cutout.

Table 4— Limits of Radio-Influence Voltage

Maximum Voltage of Cutouts (kV)	Test Voltage (volts)	Limit of Radio-Influence Voltage (μV at 1 MHz)
2.6	2890	250
5.2	5770	250
7.8	8320	250
15.0	9410	250

Oscillograph records shall be made of at least one out of the first ten and two out of last ten tests at each current.

4.4 Making Current Tests

Distribution oil cutouts, when tested in accordance with Section 8 of ANSI/IEEE C37.41-1981, shall be capable of being closed safely on circuits having available short-circuit currents equal to the rated interrupting current of the cutout.

4.5 Radio-Influence Tests

Distribution oil cutouts, when new and clean and when tested at the point of manufacture as specified in Section 9 of ANSI/IEEEC37.41-1981 , shall be capable of meeting the limits of radio-influence voltage at the test voltages specified in Table 4.

4.6 Short-Time Current Tests for Disconnecting Cutouts

Distribution oil disconnecting cutouts equipped with a blade designed for the cutout or a blade recommended by the manufacturer shall carry the rated short-time currents given in 2.10 when tested as specified in Section 10 of ANSI/ IEEE C37.41-1981.

4.7 Temperature-Rise Limitations

Distribution oil cutouts, and fuse links, when tested in the oil fuse cutout of the lowest current rating for which the fuse link is designed, shall be capable of carrying their rated continuous current when tested as specified in Section 11 of ANSI/IEEE C37.41-1981 and in 4.7.1 and 4.7.2.

4.7.1

After carrying the rated continuous current for the duration specified in 11.2.1 of ANSI/IEEE C37.41-1981, the temperature rise of the cutout, when fused with a fuse link of the largest rating for which the cutout is designed of when equipped with a blade, and when tested within an ambient temperature range of 10°C to 40°C as specified in 11.2.2 of ANSI/IEEE C37.41-1981, shall not exceed the values specified in Section 3 of ANSI/IEEE C37.41-1981. There shall be no deterioration of any part of the cutout.

If the distribution oil cutout is employed in an enclosure in which the ambient temperature may be as high as 55°C, the fuse may have to be derated in order to meet the operating temperature limits for both conducting and insulating parts.

4.7.2

Distribution oil cutouts shall be suitable for use in enclosures exposed to solar radiation, provided that the ambient temperature inside the enclosure does not exceed 55°C and the temperature rises are at least 15°C lower than specified in Section 3. of ANSI/IEEE C37.40-1981 under either of the following conditions:

1) The fuse is tested in the enclosure, and the rises are measured over the inside ambient.
2) The fuse is tested outside the enclosure, and the rises are measured over the outside ambient.

Distribution oil cutouts shall be suitable for use in enclosures not exposed to solar radiation, provided that when a cutout is tested in the enclosure, (1) the temperature rise over the outside ambient temperature does not exceed the temperature rises specified under 4.7.1, and (2) the limits of total temperature under 4.7.1 are not exceeded when all internal heat generating devices are operating at maximum rating.

NOTE — It is recommended that proper consideration be given to any cables connected to cutouts that are located in ambient temperatures higher than 40°C or where the current carrying parts of the cutouts will exceed a 30°C rise over a 40°C ambient temperature. The limiting conductor operating temperature of the cables used for these conditions should be checked to ensure that the total cable temperature limits are not exceeded. It is recommended that proper consideration be given to any terminating of splicing materials, such as insulating tapes and filling compounds, for the high-temperature application.

IEEE No. 55-1953, Guide for Temperature Correlation in the Connection of Insulated Wires and Cables to Insulated Electrical Equipment,[2] has been prepared to cover such applications.

[2]Available from the Institute of Electrical and Electronics Engineers, 345 East 47th Street, New York, N.Y. 10017.

4.8 Time-Current Tests for Fuse Links

The time-current curves for fuse links for oil fuse cutouts shall be determined by the tests specified in Section 12 of ANSI/IEEE C37.41-1981. A sufficient number of tests shall be made to ensure that all fuse links meet the accuracy requirement of +20% of the minimum melting current at 0.1 and 300 or 600 seconds, and +50% at 10 seconds (see 3.2.1.3 of American National Standard Specifications for Distribution Cutouts and Fuse Links, ANSI C37.42-1981).

5. Conformance Tests for Distribution Oil Cutouts

Conformance tests, as defined in Section 3 of ANSI/IEEE C37.40-1981, shall consist of a normal-frequency dry-withstand voltage test. The test shall be conducted as specified in 4.1 above and 4.2.1 of ANSI/IEEE C37.41-1981.

6. Nameplate Marking

6.1 Distribution Oil Cutouts

The following minimum information shall be placed on all distribution oil fuse cutouts:

1) Manufacturer’s name or trademark (or monogram)
2) Manufacturer’s type or identification number
3) Rated continuous current
4) Rated maximum voltage
5) Rated interrupting current

6.2 Fuse Links

The rated continuous current shall be marked on each fuse link for use in oil fuse cutouts.

6.3 Shipping Container for Fuse Links

The following minimum information shall be placed on the shipping container for fuse links:

1) Manufacturer’s name or trademark (or monograin)
2) Manufacturer’s type or identification number
3) Rated continuous current

7. Application Requirements

7.1 Basis for Selection of Rated Voltage of Distribution Oil Cutouts

The selection of distribution oil cutout voltage ratings shall be based on considerations in Section 48-3.2 of NEMA Std Pub SG 2-1976, High-Voltage Fuses,[3] and ANSI C37.48-1969.

[3]Available from the National Electrical Manufacturers Association, 2101 L Street, NW, Washington, D.C. 20037.

7.2 Guide for Selection of Rated Voltage of Distribution Oil Cutouts

Table 1 in Section 48-3.3 of NEMA Std Pub SG 2-1976 shall be used as a guide for oil cutout voltage rating selection, except that a 2.6 kV maximum or higher voltage cutout shall be used on 2.4 to 2.6 kV systems.

7.3 Coordination Factor for Operating Variables

In comparing time-current curves for coordination purposes, a value of 75% of the minimum melting time shall be used to make allowance for most operating variables, such as preheating of the fuse link by load and normal variations in ambient temperature, and to prevent partial melting of the current-responsive element (melting of the fusible element but not the strain element).

NOTE — As specified in 48-3.5.2 of NEMA Std Pub SG 2-1976 and 3.3.2 of ANSI C37.48-1969, 75% of the melting time can be obtained in comparing curves as follows: Place the curve sheets so that the current scales line up exactly and the 1-second line on the sheet for the melting-time-current curve coincides with the 0.75-second line on the sheet for the total clearing-time-current curves (or so that the 4 on the melting-time scale coincides with the 3 on the total clearing-time scale). Compare the curves on the two sheets, reading the time values on the total clearing-time scale.

7.4 Coordination Charts

Coordination charts that show the basis for the data, including the coordination factor[4] that is applied to the melting-time-current characteristics for operating variables, shall be provided by each manufacturer.

8. Revision of American National Standards Referred to in This Document

When the following American National Standards referred to in this document are superseded by a revision approved by the American National Standards Institute, the revision shall apply:

American National Standard Design Tests for High-Voltage Fuses, Distribution Enclosed Single-Pole Air Switches, Fuse Disconnecting Switches, and Accessories, ANSI/IEEE C37.41-1981

American National Standard Service Conditions and Definitions for High-Voltage Fuses, Distribution Enclosed Single-Pole Air Switches, Fuse Disconnecting Switches, and Accessories, ANSI/IEEE C37.40-1981

American National Standard Specifications for Distribution Cutouts and Fuse Links, ANSI C37.42-1981

[4]See 48-3.5.1 of NEMA Std Pub SG 2-1976.