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AMERICAN NATIONAL STANDARD

American National Standard

ANSI C29.6

AMERICAN NATIONAL STANDARD FOR WET-PROCESS PORCELAIN INSULATORS— HIGH-VOLTAGE PIN TYPE

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION
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ANSI® C29.6-1996

AMERICAN NATIONAL STANDARD

for Wet-Process Porcelain Insulators—High-Voltage Pin Type

National Electrical Manufacturers Association

Approved July 16, 1996

American National Standards Institute

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Foreword (This Foreword is not part of American National Standard C29.6-1984.)

The first edition of this standard was based essentially on the EEI-NEMA (Edison Electric Institute-National Electrical Manufacturers Association) Standards for Wet-Process Porcelain Insulators (High-Voltage Pin Type), EEI TDJ-56, NEMA 144-1952. Subsequent revisions were developed by the Standards Committee on Insulators for Electric Power Lines, C29.

The principal differences between this edition and the 1977 edition are: movement of the section on packing to an Annex, the inclusion of a table for metric equivalents, and additional dimensions for figures 1-5.

Suggestions for improvement of this standard will be welcome. They should be sent to the National Electrical Manufacturers Association, 1300 North 17th Street, Suite 1847, Rosslyn, VA 22209.

This standard was processed and approved for submittal to ANSI by American National Standards Committee on Insulators for Electric Power Lines, C29. Committee approval of the standard does not necessarily imply that all committee members voted for its approval. At the time it approved this standard, the C29 Committee had the following members:

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C. Merther, Secretary

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AMERICAN NATIONAL STANDARD **C29.6-1996**

American National Standard for Wet-Process Porcelain Insulators—High-Voltage Pin Type

1 Scope

This standard covers high-voltage pin-type insulators made of wet-process porcelain and used in the transmission and distribution of electric energy.

2 Referenced American National Standards

This standard is intended for use in conjunction with the following American National Standards. When these standards are superseded by a revision approved by the American National Standards Institute, Inc., the revision shall apply.

ANSI C29.1-1982, *Test Methods for Electrical Power Insulators*

ANSI Z55.1-1967 (R1973), *Gray Finishes for Industrial Apparatus and Equipment*

3 Definitions

See Section 2 of ANSI C29.1-1982 for definitions of terms.

4 General

4.1 Insulators shall conform in all respects to the requirements of this standard. The text and figures supplement each other and shall be considered part of this standard.

4.2 Manufacturer's drawings, if furnished, shall show the outline of the insulators, together with all pertinent dimensions. Any variations in these dimensions due to manufacturing tolerances shall be indicated.

5 Material

5.1 The insulators shall be made of good commercial-grade wet-process porcelain.

5.2 The entire surface of the insulator, with the exception of a firing surface, shall be glazed. The entire surface shall be relatively free from imperfections. Color is not a part of this standard. If gray is required, it shall be in accordance with ANSI Z55.1-1967 (R1973) and conform to Munsell notation 5BG 7.0/0.4, with the following tolerances:

Hue: ± 12 (3G to 7B)
Value: ± 0.5
Chroma: -0.2 to +0.6

5.3 Metal parts shall be made of a suitable corrosion resistance and temper.

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6 Dimensions and characteristics

6.1 Figures 1 through 5 are drawings of insulator types. Dimensions and characteristics of the insulators shall be in accordance with these figures.

6.2 When specified, neck designations shall be as shown in table 1.

6.3 All dimensions and other numerical values are given in customary English units. Except as otherwise stated, metric equivalents shall be as shown in table 2.

7 Marking

Each insulator shall bear a symbol identifying the manufacturer. The marking shall be legible and durable.

Table 1–Neck designations and dimensions

Designation Letter	Diameter (inches)	Groove-Height Relationship as Applicable (inches)	
		Minimum	Maximum
A	1-3/4 ± 1/8	--	--
C	2-1/4 ± 1/8	9/16	7/8
F	2-7/8 ± 1/8	9/16	7/8
J	3-1/2 ± 1/8	1/4	5/8
K	4 ± 1/8	1/4	5/8
N	6 ± 1/8	9/16	7/8

Table 2–Metric equivalents

Inches	Millimeters	Inches	Millimeters
1/8	3	6	152
1/4	6	6-1/2	165
9/16	14		
5/8	16	7	178
3/4	19	7-1/2	191
7/8	22		
		8	203
1-1/16	27	8-1/4	210
1-3/8	35	8-3/4	222
1-7/16	37		
1-3/4	44	9	229
		9-1/2	241
2	51		
2-1/8	54	10	254
2-1/4	57	10-1/2	267
2-3/8	60		
2-1/2	64	11-1/4	286
2-7/8	73		
		12	305
3	76	12-1/2	318
3-1/2	89		
3-5/8	92	13	330
		13-1/2	343
4	102		
4-1/8	105	14	356
4-1/4	108		
4-3/8	111	17	432

Table continued, next page

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Table 2–continued

Inches	Millimeters	Inches	Millimeters
4-5/8	118		
4-7/8	124	21	533
5-1/8	130	27	686
5-1/4	133		
5-1/2	140	34	864
5-3/4	146		

NOTES:

1 These metric equivalents are for use in converting dimensions given in this standard only.

2 These metric equivalents are not applicable to the dimensions of thread gages shown in figure 6 or the mandrels used to measure the groove radius.

8 Sampling, Inspection, and Tests

8.1 General

Tests described in 8.2 shall be required only on insulators of new designs. Tests described in 8.3 shall be required on each lot of insulators. Tests described in 8.4 shall be made on each insulator.

8.2 Design tests

8.2.1 Low-frequency dry flashover test

Three insulators shall be selected at random and tested in accordance with 4.2 of ANSI C29.1-1982. Failure of the average dry flashover value of the three insulators to equal or exceed 95% of the rated dry flashover value, as given in the applicable figure, shall constitute failure to meet the requirements of this standard.

8.2.2 Low-frequency wet flashover test

Three insulators shall be selected at random and tested in accordance with 4.3 of ANSI C29.1-1982. Failure of the average wet flashover value of the three insulators to equal or exceed 90% of the rated wet flashover value, as given in the applicable figure, shall constitute failure to meet the requirements of this standard.

8.2.3 Critical impulse flashover tests—positive and negative

Three insulators shall be selected at random for the critical impulse flashover test, positive, and three for the critical impulse flashover test, negative, and tested in accordance with 4.7 of ANSI C29.1-1982. Failure of the average critical impulse flashover value of the three insulators to equal or exceed 92% of the rated critical impulse flashover value, as given in the applicable figure, shall constitute failure to meet the requirements of this standard.

8.2.4 Radio-influence voltage test

Five insulators shall be selected at random and tested in accordance with 4.9 of ANSI C29.1-1982. If one or more insulators fail to meet the requirements given in the applicable figure, five additional insulators shall be selected at random and tested. Failure of one or more of these additional insulators shall constitute failure to meet the requirements of this standard.

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8.2.5 Thermal shock test

Five insulators shall be selected at random and tested for ten complete cycles in accordance with 5.5 of ANSI C29.1-1982. The temperature of the hot water bath shall be approximately 150°F (66°C), and the temperature of the cold water bath shall be approximately 39°F (4°C). If one or more insulators fail, five additional insulators shall be selected at random and tested. Failure of one or more of these additional insulators shall constitute failure to meet the requirements of this standard.

8.3 Quality conformance tests[1]

8.3.1 Visual and dimensional tests

Conformity with 5.2 may be determined by visual inspection. All insulators not conforming to 5.2 fail to meet the requirements of this standard.

Three insulators shall be selected at random from the lot and their dimensions checked against the dimensions on the manufacturer's drawing. Failure of more than one of these insulators to conform, within manufacturing tolerances, to the dimensions on this drawing shall constitute failure of the lot to meet the requirements of this standard.

8.3.2 Porosity test

Specimens shall be selected from insulators destroyed in other tests and tested in accordance with 5.4 of ANSI C29.1-1982. Penetration of the dye into the body of the dielectric shall constitute failure of the lot to meet the requirements of this standard.

8.3.3 Cantilever-strength test

Three insulators shall be selected at random and tested in accordance with 5.1.3 of ANSI C29.1-1982. Failure of the average strength of the three insulators to meet the strength requirement given in the applicable figure, or failure of any one insulator to equal 85% of that strength requirement, shall constitute failure of the lot to meet the requirements of this standard.

8.3.4 Pinhole gaging test

Fifteen insulators shall be selected at random and gaged with a gage similar to that shown in Figure 6 (see page 12). The insulators shall be tested in accordance with 5.6.2 of ANSI C29.1-1982. The clearance between the top of the gage and the crown of the pinhole cavity shall be not less than 1/8 inch nor more than 3/4 inch. The number of turns required to disengage the insulator from the gage shall average not less than 3-1/2 for the entire sample nor be less than 3 for any one insulator. If more than one insulator fails to meet this requirement, thirty additional insulators shall be selected at random and gaged. Failure of more than a total of three insulators from both the first and second samples shall constitute failure of the lot to meet the requirements of this standard.

8.3.5 Puncture test

Three assembled insulators shall be selected at random and tested in accordance with 4.11 of ANSI C29.1-1982. If the average puncture voltage of the three insulators fails to meet the requirement given in the applicable figure, or if the percent average variation exceeds 15%, this shall constitute failure of the lot to meet the requirements of this standard.

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[1] Substantial test experience indicates that a total of 1/2% of the number of insulators in the lot is sufficient to establish characteristics demonstrable by destructive tests.

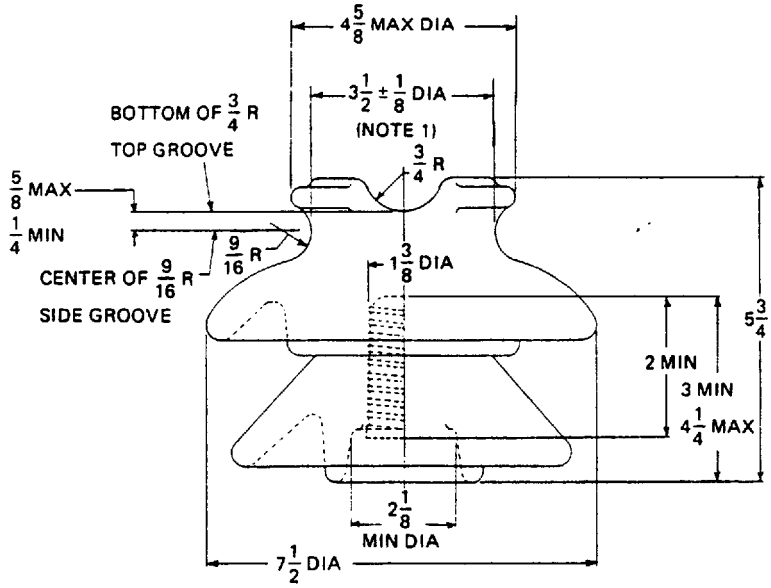
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8.4 Routine test (flashover test)

Each insulator shall be subjected to a routine flashover test in accordance with 7.1 of ANSI C29.1-1982. All insulators that puncture fail to meet the requirements of this standard.

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NOTES

1 "J" neck.

2 All dimensions are in inches.

3 If high-resistance coatings are applied to the insulator, such coatings shall be considered as effective leakage surfaces, and the distance over them shall be included in the leakage distance.

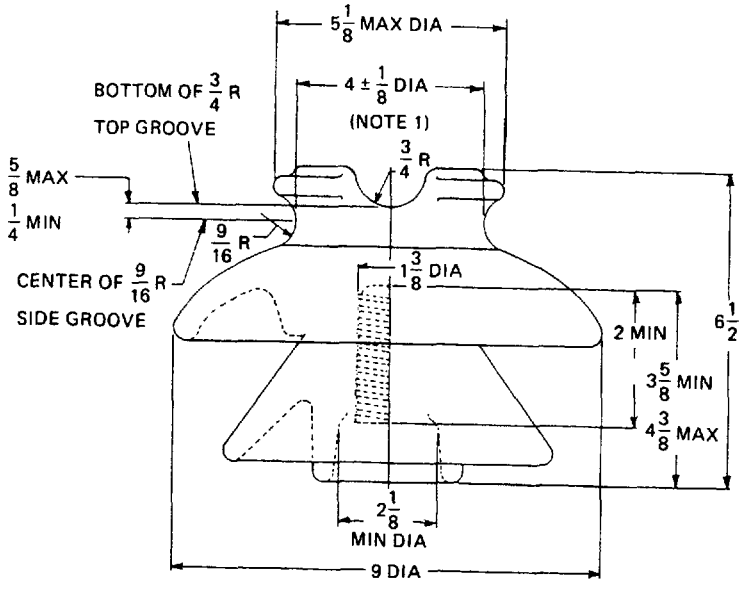
4 Top-wire groove shall seat a mandrel with a diameter of 1-7/16 inches.

5 Side-wire groove shall seat a mandrel with a diameter of 1-1/16 inches.

	Rating	See C29.1-1982, Section
Dimensions		
Leakage distance, inches	13	2.5.2
Dry-arcing distance, inches	7	2.5.3
Minimum pin height, inches	6	—
Mechanical Values		
Cantilever strength, pounds (kilonewtons)	2500 (11)	5.1.3
Electrical Values		
Low-frequency dry flashover, kilovolts	95	4.2
Low-frequency wet flashover, kilovolts	60	4.3
Critical impulse flashover, positive, kilovolts	150	4.7
Critical impulse flashover, negative, kilovolts	190	4.7
Low-frequency puncture voltage, kilovolts	130	4.11
Radio-Influence Voltage Data		
Low-frequency test voltage, rms to ground, kilovolts	15	4.9
Maximum RIV at 1000 kHz		
Radio freed, microvolts	100	4.9
Plain, microvolts	8000	4.9

Figure 1–Pin insulator, class 56-1

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NOTES

1 "K" neck.

2 All dimensions are in inches.

3 If high-resistance coatings are applied to the insulator, such coatings shall be considered as effective leakage surfaces, and the distance over them shall be included in the leakage distance.

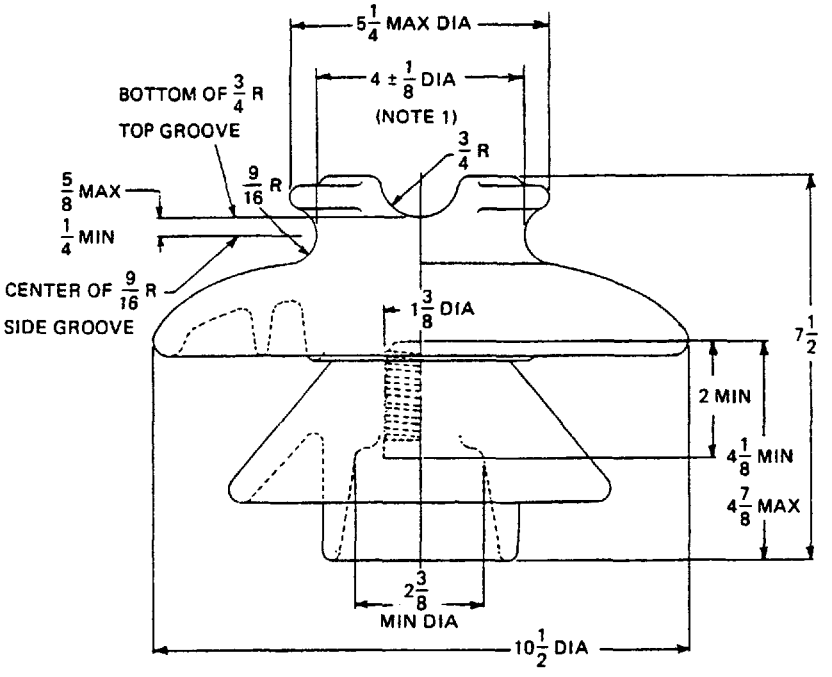
4 Top-wire groove shall seat a mandrel with a diameter of 1-7/16 inches.

5 Side-wire groove shall seat a mandrel with a diameter of 1-1/16 inches.

	Rating	See C29.1-1982, Section
Dimensions		
Leakage distance, inches	17	2.5.2
Dry-arcing distance, inches	8-1/4	2.5.3
Minimum pin height, inches	7	
Mechanical Values		
Cantilever strength, pounds (kilonewtons)	3 000 (13)	5.1.3
Electrical Values		
Low-frequency dry flashover, kilovolts	110	4.2
Low-frequency wet flashover, kilovolts	70	4.3
Critical impulse flashover, positive, kilovolts	175	4.7
Critical impulse flashover, negative, kilovolts	225	4.7
Low-frequency puncture voltage, kilovolts	145	4.11
Radio-Influence Voltage Data		
Low-frequency test voltage, rms to ground, kilovolts	22	4.9
Maximum RIV at 1000 kHz		
Radio freed, microvolts	100	4.9
Plain, microvolts	12 000	4.9

Figure 2–Pin insulator, class 56-2

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NOTES

1 "K" neck.

2 All dimensions are in inches.

3 If high-resistance coatings are applied to the insulator, such coatings shall be considered as effective leakage surfaces, and the distance over them shall be included in the leakage distance.

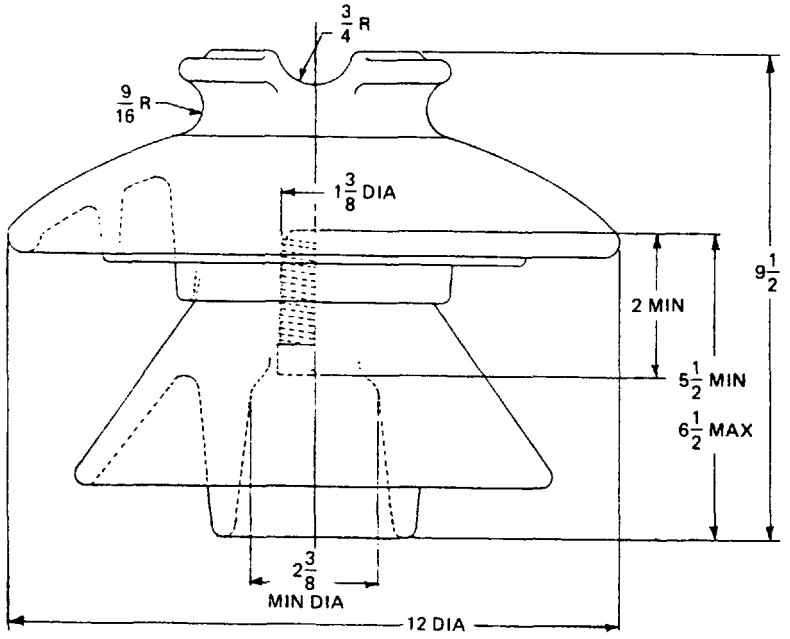
4 Top-wire groove shall seat a mandrel with a diameter of 1-7/16 inches.

5 Side-wire groove shall seat a mandrel with a diameter of 1-1/16 inches.

	Rating	See C29.1-1982, Section
Dimensions		
Leakage distance, inches	21	2.5.2
Dry-arcing distance, inches	9-1/2	2.5.3
Minimum pin height, inches	8	
Mechanical Values		
Cantilever strength, pounds (kilonewtons)	3 000 (13)	5.1.3
Electrical Values		
Low-frequency dry flashover, kilovolts	125	4.2
Low-frequency wet flashover, kilovolts	80	4.3
Critical impulse flashover, positive, kilovolts	200	4.7
Critical impulse flashover, negative, kilovolts	265	4.7
Low-frequency puncture voltage, kilovolts	165	4.11
Radio-Influence Voltage Data		
Low-frequency test voltage, rms to ground, kilovolts	30	4.9
Maximum RIV at 1000 kHz		
Radio freed, microvolts	200	4.9
Plain, microvolts	16 000	4.9

Figure 3–Pin insulator, class 56-3

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NOTES

1 All dimensions are in inches.

2 If high-resistance coatings are applied to the insulator, such coatings shall be considered as effective leakage surfaces, and the distance over them shall be included in the leakage distance.

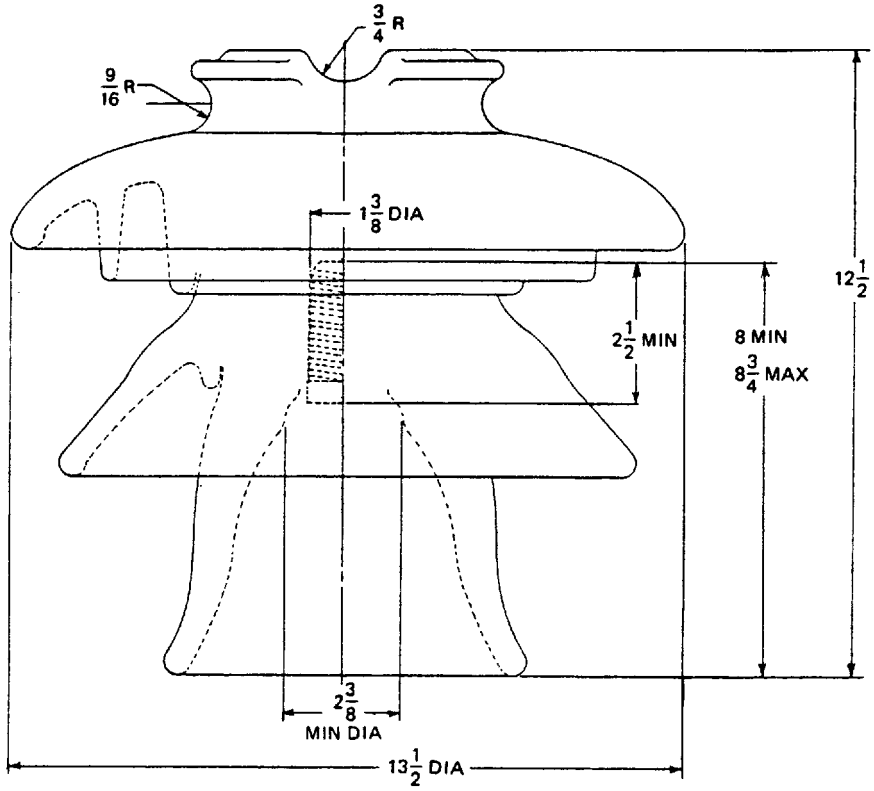
3 Top-wire groove shall seat a mandrel with a diameter of 1-7/16 inches.

4 Side-wire groove shall seat a mandrel with a diameter of 1-1/16 inches.

	Rating	See C29.1-1982, Section
Dimensions		
Leakage distance, inches	27	2.5.2
Dry-arcing distance, inches	11-1/4	2.5.3
Minimum pin height, inches	10	
Mechanical Values		
Cantilever strength, pounds (kilonewtons)	3 000 (13)	5.1.3
Electrical Values		
Low-frequency dry flashover, kilovolts	140	4.2
Low-frequency wet flashover, kilovolts	95	4.3
Critical impulse flashover, positive, kilovolts	225	4.7
Critical impulse flashover, negative, kilovolts	310	4.7
Low-frequency puncture voltage, kilovolts	185	4.11
Radio-Influence Voltage Data		
Low-frequency test voltage, rms to ground, kilovolts	30	4.9
Maximum RIV at 1000 kHz		
Radio freed, microvolts	200	4.9
Plain, microvolts	16 000	4.9

Figure 4–Pin insulator, class 56-4

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NOTES

1 All dimensions are in inches.

2 If high-resistance coatings are applied to the insulator, such coatings shall be considered as effective leakage surfaces, and the distance over them shall be included in the leakage distance.

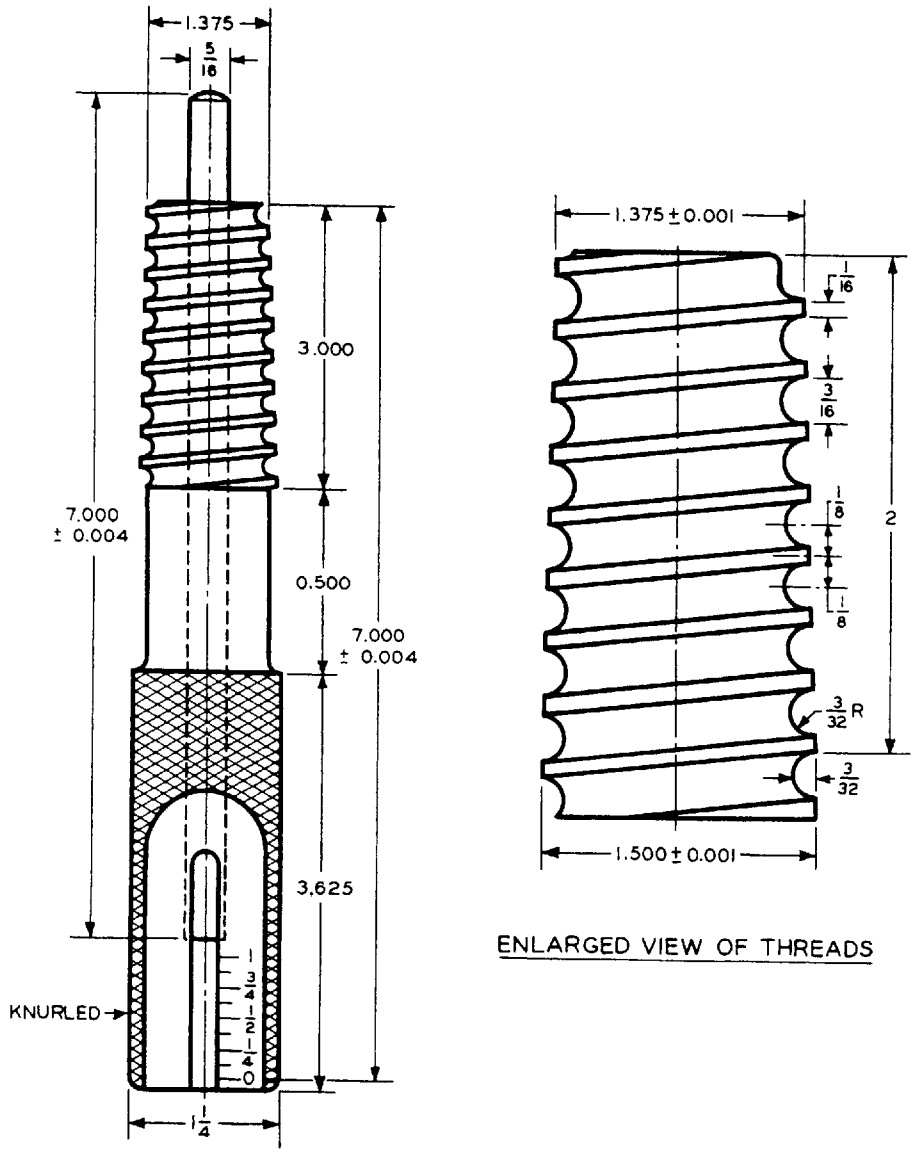
3 Top-wire groove shall seat a mandrel with a diameter of 1-7/16 inches.

4 Side-wire groove shall seat a mandrel with a diameter of 1-1/16 inches.

	Rating	See C29.1-1982, Section
Dimensions		
Leakage distance, inches	34	2.5.2
Dry-arcing distance, inches	14	2.5.3
Minimum pin height, inches	12	—
Mechanical Values		
Cantilever strength, pounds (kilonewtons)	3 000 (13)	5.1.3
Electrical Values		
Low-frequency dry flashover, kilovolts	175	4.2
Low-frequency wet flashover, kilovolts	125	4.3
Critical impulse flashover, positive, kilovolts	270	4.7
Critical impulse flashover, negative, kilovolts	340	4.7
Low-frequency puncture voltage, kilovolts	225	4.11
Radio-Influence Voltage Data		
Low-frequency test voltage, rms to ground, kilovolts	44	4.9
Maximum RIV at 1000 kHz		
Radio freed, microvolts	200	4.9
Plain, microvolts	25 000	4.9

Figure 5–Pin insulator, class 56-5

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NOTES

1 All dimensions are in inches.

2 A tolerance of ± 0.002 inch is allowed on all fractional dimensions.

3 Round all sharp corners to not more than 0.005-inch radius.

Figure 6–Insulator thread gage

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ANNEX A
(Informative)
Packing

(This annex is not part of American National Standard C29.6-1996, but is included for information only.)

Packaging of insulators should be such as to afford reasonable and proper protection to the insulators in shipping and handling.

Each box or container should be marked with: the number of pieces contained therein; the catalog number, or class number, or description of the contents; and the manufacturer's name.

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