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(Revision of
ANSI C135.20-1988)

IEEE Standard for Zinc-Coated Ferrous Insulator Clevises for Overhead Line Construction

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IEEE Power Engineering Society

Approved 19 March 1998

IEEE-SA Standards Board

Abstract: Zinc-coated ferrous clevises for spool-type insulators commonly used for supporting or dead-ending conductors in line construction are covered. The specifications for spool-type insulators used with these clevises are covered in ANSI C29.3-1986.
Keywords: clevis pin, dead-end loading, side loading, spool-type insulators, swinging insulator clevises, zinc-coated ferrous clevises

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Introduction

(This introduction is not part of IEEE Std C135.20-1998, IEEE Standard for Zinc-Coated Ferrous Insulator Clevises for Overhead Line Construction.)

This standard covers zinc-coated ferrous clevises for spool-type insulators commonly used for supporting or dead-ending conductors in line construction. The specifications for spool-type insulators used with these clevises are covered in ANSI C29.3-1986.

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IEEE Standard for Zinc-Coated Ferrous Insulator Clevises for Overhead Line Construction

1. Overview

1.1 Scope

This standard covers zinc-coated ferrous clevises for spool-type insulators commonly used for supporting or dead-ending conductors in line construction.

The standards for spool-type insulators used with these clevises are covered in ANSI C29.3-1986.

1.2 Application

Clevises and clevis pins conforming to this standard shall meet in all respects the dimensional and performance requirements hereinafter stated. The text, specifications, references to other standards, and associated figures supplement each other and shall be considered as part of this standard.

2. References

This standard shall be used in conjunction with the following publications. When the following standards are superseded by an approved revision, the revision shall apply.

ANSI C29.3-1986 (Reaff 1995), Wet-Process Porcelain Insulators (Spool Type).[1]

ASTM A153/A153M-95, Zinc Coating (Hot-Dip) on Iron and Steel Hardware.[2]

[1]ANSI publications are available from the Sales Department, American National Standards Institute, 11 West 42nd Street, 13th Floor, New York, NY 10036, USA.

[2]ASTM publications are available from the American Society for Testing and Materials, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959, USA.

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3. Materials

3.1 Clevises and clevis pins

Clevises and clevis pins for spool-type insulators shall be made from one of the following materials:

a) Hot rolled open-hearth steel;
b) Basic oxygen steel;
c) Electric furnace steel.

Materials shall be of a grade and quality suitable to meet the strength and performance requirements of this standard.

3.2 Cotters

Cotters for clevis pins shall be self-locking and made from corrosion-resistant materials.

4. Strength

4.1 Dead-end loading

Refer to Figures 1 through 5 for specific ultimate strengths.

Dead-end load shall be applied in a direction in line with the mounting bolt and perpendicular to the clevis pin. The clevis shall be capable of withstanding the specified ultimate strength loading without any permanent deformation.

4.2 Side loading

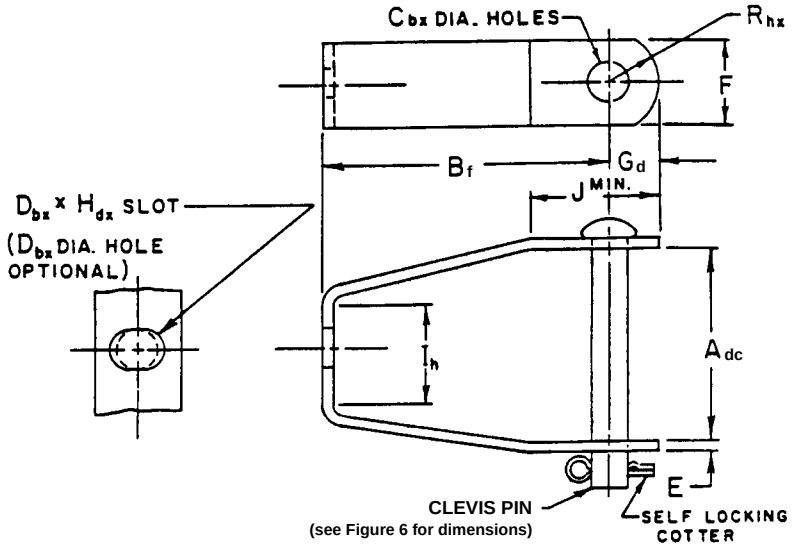
Items 5, 6, and 7 in Figure 3 shall be capable of withstanding a side pull loading of 4.5 kN (1000 lb) applied at 90° to the axis of both the mounting bolt and the clevis pin, without exceeding a test deflection of 10 mm (3/8 in) and a permanent deflection of 6 mm (1/4 in), measured at the center of the clevis pin.

5. Dimensions

Dimensions and tolerances shall be in accordance with Figures 1 through 6.

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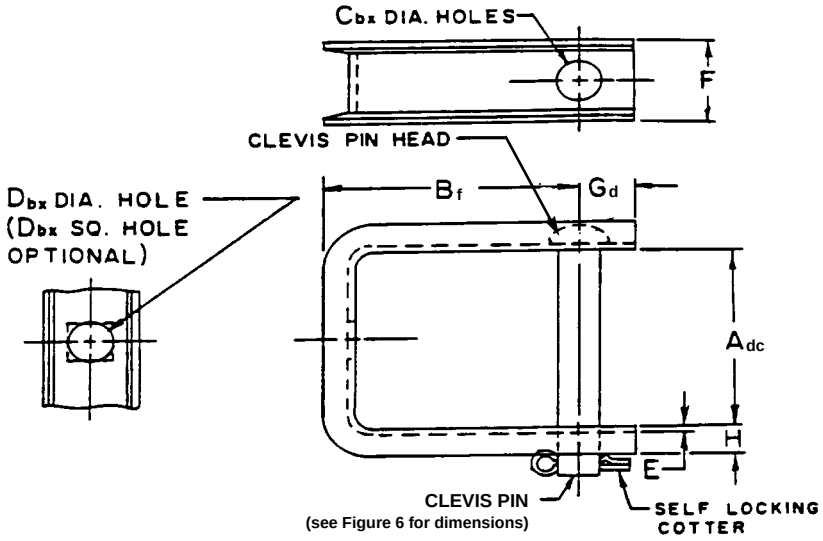
Metric units for dimensions (mm)												
Item	**Ultimate strength (kN)**	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**R**
1	9	60	108	14	17	5	38	22	19	38	52	22
2	18	86	127	17	17	5	38	22	19	38	52	22
Allowable variations: a = 1; b = 1; c = 2; d = 3; e = 5; f = 6; g = 10; h = 13; x = 0 Single letter indicates same + or –, (a = + or – 1) Two letters indicate first + second –, (ax = +1, –0) Dimensions without tolerance are reference.												

English units for dimensions (in)												
Item	**Ultimate strength (lb)**	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**R**
1	2000	2-3/8	4-1/4	9/16	11/16	3/16	1-1/2	7/8	3/4	1-1/2	2-1/16	7/8
2	4000	3-3/8	5	11/16	11/16	3/16	1-1/2	7/8	3/4	1-1/2	2-1/16	7/8
Allowable variations: a = 1/64; b = 1/32; c = 1/16; d = 1/8; e =3/16; f = 1/4; g = 3/8; h = 1/2; x = 0 Single letter indicates same + or –, (a = + or – 1/64) Two letters indicate first + second –, (ax = +1/64, –0) Dimensions without tolerance are reference.												

Figure 1—Clevises for 54 mm (2-1/8 in) and 81 mm (3-3/16 in) spool-type insulators

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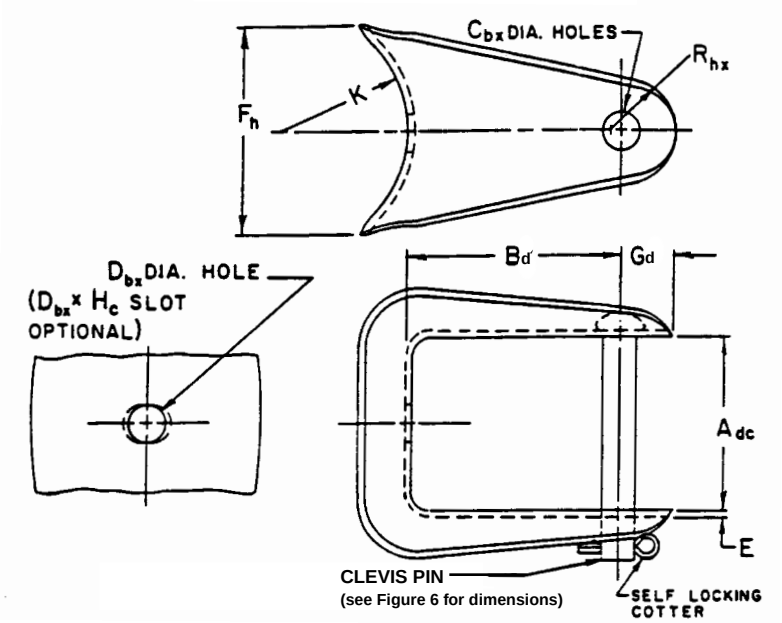


Metric units for dimensions (mm)									
Item	**Ultimate strength (kN)**	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**
3	13.5	86	102	17	17	3	32	22	13
4	18	86	102	17	17	3	38	22	13
Allowable variations: a = 1; b = 1; c = 2; d = 3; e = 5; f = 6; g = 10; h = 13; x = 0 Single letter indicates same + or –, (a = + or – 1) Two letters indicate first + second –, (ax = +1, –0) Dimensions without tolerance are reference.									

English units for dimensions (in)									
Item	**Ultimate strength (lb)**	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**
3	3000	3-3/8	4	11/16	11/16	1/8	1-1/4	7/8	1/2
4	4000	3-3/8	4	11/16	11/16	1/8	1-1/2	7/8	1/2
Allowable variations: a = 1/64; b = 1/32; c = 1/16; d = 1/8; e = 3/16; f = 1/4; g = 3/8; h = 1/2; x = 0 Single letter indicates same + or –, (a = + or – 1/64) Two letters indicate first + second –, (ax = +1/64, –0) Dimensions without tolerance are reference.									

Figure 2—Clevises for 76.2 mm (3 in) and 81 mm (3-3/16 in) spool-type insulators

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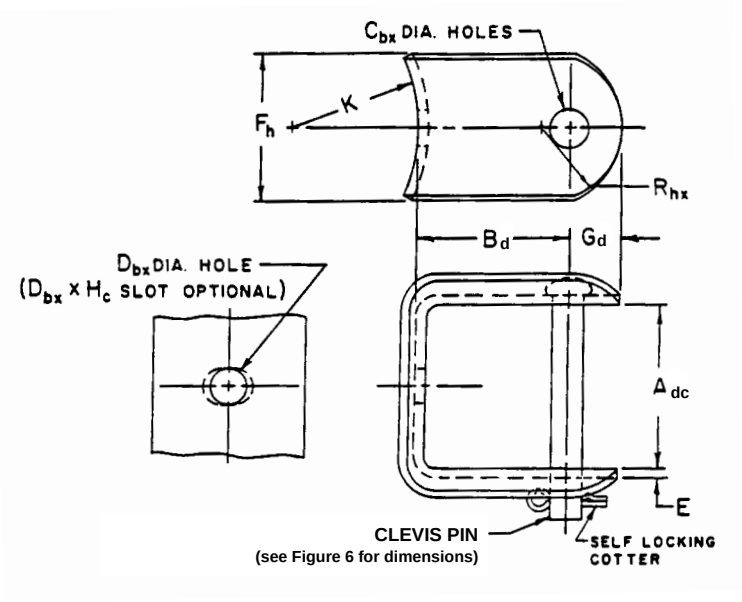
Metric units for dimensions (mm)												
Item	**Ultimate strength (kN)**	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**K**	**R**	**Side pull (kN)**
5	13.5	86	102	17	17	3	89	22	22	70	25	4.5
6	18	86	102	17	17	4	89	22	22	89	25	4.5
7	18	86	102	17	17	3	102	25	—	60	25	4.5
Allowable variations: a = 1; b = 1; c = 2; d = 3; e = 5; f = 6; g = 10; h = 13; x = 0 Single letter indicates same + or –, (a = + or – 1) Two letters indicate first + second –, (ax = +1, –0) Dimensions without tolerance are reference.												

English units for dimensions (in)												
Item	**Ultimate strength (lb)**	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**K**	**R**	**Side pull (lb)**
5	3000	3-3/8	4	11/16	11/16	12 GA (0.109)	3-1/2	7/8	7/8	2-3/4	1	1000
6	4000	3-3/8	4	11/16	11/16	9 GA (0.148)	3-1/2	7/8	7/8	3-1/2	1	1000
7	4000	3-3/8	4	11/16	11/16	1/8	4	1	—	2-3/8	1	1000
Allowable variations: a = 1/64; b = 1/32; c = 1/16; d = 1/8; e = 3/16; f = 1/4; g = 3/8; h = 1/2; x = 0 Single letter indicates same + or –, (a = + or – 1/64) Two letters indicate first + second –, (ax = +1/64, –0) Dimensions without tolerance are reference.												

Figure 3—Clevises for 76.2 mm (3 in) and 81 mm (3-3/16 in) spool-type insulators

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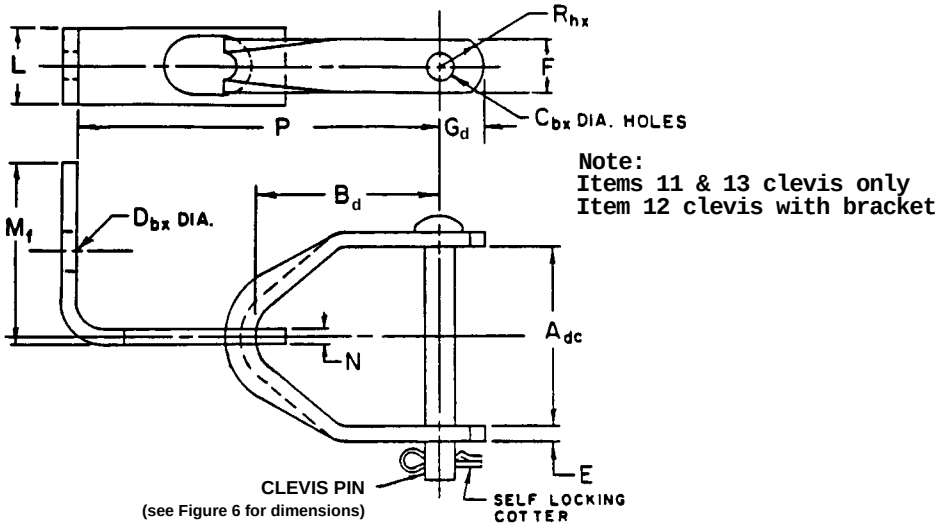


Metric units for dimensions (mm)											
Item	**Ultimate strength (kN)**	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**K**	**R**
8	18	86	76	17	17	5	75	22	22	64	41
9	18	86	89	17	17	5	75	22	22	64	41
10	18	86	102	17	17	5	75	22	22	64	41
Allowable variations: a = 1; b = 1; c = 2; d = 3; e = 5; f = 6; g = 10; h = 13; x = 0 Single letter indicates same + or –, (a = + or – 1) Two letters indicate first + second –, (ax = +1, –0) Dimensions without tolerance are reference.											

English units for dimensions (in)											
Item	**Ultimate strength (lb)**	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**K**	**R**
8	4000	3-3/8	3	11/16	11/16	3/16	2-15/16	7/8	7/8	2-1/2	1-5/8
9	4000	3-3/8	3-1/2	11/16	11/16	3/16	2-15/16	7/8	7/8	2-1/2	1-5/8
10	4000	3-3/8	4	11/16	11/16	3/16	2-15/16	7/8	7/8	2-1/2	1-5/8
Allowable variations: a = 1/64; b = 1/32; c = 1/16; d = 1/8; e = 3/16; f = 1/4; g = 3/8; h = 1/2; x = 0 Single letter indicates same + or –, (a = + or – 1/64) Two letters indicate first + second –, (ax = +1/64, –0) Dimensions without tolerance are reference.											

Figure 4—Clevises for 81 mm (3-3/16 in) spool-type insulators

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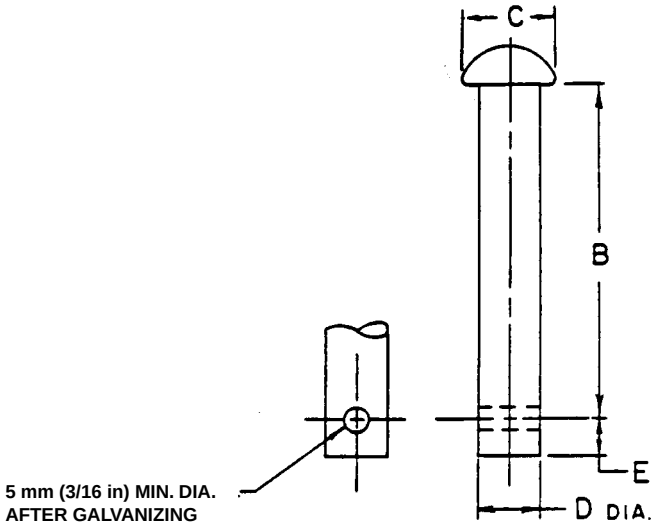
Metric units for dimensions (mm)													
Item	**Ultimate strength (kN)**	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**L**	**M**	**N**	**P**	**R**
11	4.5	86	129	17	—	5	38	22	—	—	—	—	22
12	9	60	59	11	17	5	19	13	44	59	5	121	11
13	9	60	59	11	—	5	19	13	—	—	—	—	11
Allowable variations: a = 1; b = 1; c = 2; d = 3; e = 5; f = 6; g = 10; h = 13; x = 0 Single letter indicates same + or –, (a = + or – 1) Two letters indicate first + second –, (ax = +1, –0) Dimensions without tolerance are reference.													

English units for dimensions (in)													
Item	**Ultimate strength (lb)**	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**L**	**M**	**N**	**P**	**R**
11	4000	3-3/8	5-1/16	11/16	—	3/16	1-1/2	7/8	—	—	—	—	7/8
12	2000	2-3/8	2-5/16	7/16	11/16	3/16	3/4	1/2	1-3/4	2-5/16	3/16	4-3/4	7/16
13	2000	2-3/8	2-5/16	7/16	—	3/16	3/4	1/2	—	—	—	—	7/16
Allowable variations: a = 1/64; b = 1/32; c = 1/16; d = 1/8; e = 3/16; f = 1/4; g = 3/8; h = 1/2; x = 0 Single letter indicates same + or –, (a = + or – 1/64) Two letters indicate first + second –, (ax = +1/64, –0) Dimensions without tolerance are reference.													

Figure 5—Swinging insulator clevises for 54 mm (2-1/8 in) and 81 mm (3-3/16 in) spool-type insulators

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Metric units for dimensions (mm)				
Clevis item number	**B**	**C**	**D**	**E**
1	75_{d}	19_{dc}	13_{b}	6
2, 5, 6, and 7	105_{d}	22_{dc}	16_{b}	6
3, 4, 8, 9, and 10	108_{d}	22_{dc}	16_{b}	6
11	102_{d}	22_{dc}	16_{b}	6
12 and 13	75_{d}	16_{dc}	10_{b}	6
Allowable variations: a = 1; b = 1; c = 2; d = 3; e = 5; f = 6; g = 10; h = 13; x = 0 Single letter indicates same + or –, (a = + or – 1) Two letters indicate first + second –, (ax = +1, –0) Dimensions without tolerance are reference.				

English units for dimensions (in)				
Clevis item number	**B**	**C**	**D**	**E**
1	$2\text{-}15/16_{d}$	$3/4_{dc}$	$1/2_{b}$	1/4
2, 5, 6, and 7	$4\text{-}1/8_{d}$	$7/8_{dc}$	$5/8_{b}$	1/4
3, 4, 8, 9, and 10	$4\text{-}1/4_{d}$	$7/8_{dc}$	$5/8_{b}$	1/4
11	4_{d}	$7/8_{dc}$	$5/8_{b}$	1/4
12 and 13	$2\text{-}15/16_{d}$	$5/8_{dc}$	$3/8_{b}$	1/4
Allowable variations: a = 1/64; b = 1/32; c = 1/16; d = 1/8; e = 3/16; f = 1/4; g = 3/8; h = 1/2; x = 0 Single letter indicates same + or –, (a = + or – 1/64) Two letters indicate first + second –, (ax = +1/64, –0) Dimensions without tolerance are reference.				

Figure 6—Clevis pins for insulator clevises

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6. Testing

6.1 Porcelain spool insulators

Appropriate porcelain spool insulators meeting the requirements of ANSI C29.3-1986 shall be used in testing. The load shall be applied by means of a loop of flexible stranded cable, the diameter of which shall not exceed the radius of the wire grooves of the spool insulators. The failure of the spool insulator, if such failure is related to the deformation of the clevis, shall also constitute a failure of the clevis.

6.2 Clevises

For testing, the clevises shall be attached to a steel block, and where applicable, the steel block shall have a radius conforming to the radius of the clevis.

7. Corrosion protection

All clevises and clevis pins shall be zinc coated after fabrication. The coating shall be applied using one of the following methods:

a) The hot dip process in accordance with ASTM A153/A153M-95. The hole for the cotter may be drilled after zinc coating.
b) Any other method producing a zinc coating that meets the requirements of ASTM A153/A153M-95 for adhesion, purity, and thickness applicable to the class of the material being coated.

8. Finish

All clevises shall be reasonably smooth on all surfaces and free from sharp projections and edges. Cotters shall be cut squarely and be free of sharp projections.

9. Marking

Clevises shall bear the manufacturer’s symbol or identification mark.

10. Sizes

Clevises covered by this standard are intended for use with the spool-type insulators listed in Table 1, which are covered in ANSI C29.3-1986.

Table 1—Spool-type insulators covered in ANSI C29.3-1986

Insulator class	Load rating kN (lb)	Size mm (in)	Clevis item no.
53.1	9.0 (2000)	54 (2-1/8)	1, 12, 13
53.2	13.5 (3000)	76 (3)	3, 5
53.3	18.0 (4000)	81 (3-3/16)	2, 4, 6, 7, 8, 9, 10, 11

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