

Part-2: Supply Requirements

Section 6 – Schedule of Supply

The Schedule of Supply consists of six parts:

1. Lot-3
 - 1-1. List of Goods and Related Services
 - 1-2. Delivery and Completion Schedule
2. Technical Specifications
3. Drawings
4. Inspections and Tests
5. PACKING, MARKING AND DRAWINGS INSTRUCTIONS FOR BOX
DESIGN NO. 1 & 3

Detail Address of Destination as below:

Sl No.	Name of ware house	Address
01	Central ware house, Dhaka.	Polashbari, Nabinagor,Savar, Dhaka-1344
02	Central ware house, Chittagong.	Fojdarhat, Chittagong.
03	Central ware house, Khulna.	Shiromoni, Khulna.

Lot-3

3-1 List of Goods and Related Services

Name of Bidder _____

Item : Insulator

Package Number - URIDS(E)-G-10, Lot No-3. URIDS(E)-G-10-03/01 Page ____ of ____

Line Item No.	Description of Goods	Quantity	Physical unit	Quantity to deliver at Final Destination (BREB Central Warehouse)			Delivery (to the final destination) period from the date of contract signing			
				70% of the quantity against each item at BREB central ware house Khulna	15% of the quantity against each item at BREB central ware house Dhaka	15% of the quantity against each item at BREB central ware house Chittagong	Latest Delivery Date (1 st phase)*	Latest Delivery Date (2 nd phase)*	Bidder's offered Delivery date [to be provided by the bidder]	
									1 st phase	2 nd phase
1	2	3	4	5	6	7	8	9	10	11
C-1	Insulator, Pin Type, 11 Kv 1" Thread	355000	Each	248500	53250	53250	50% of each item within 20 weeks	Remaining 50% of each item within 40 weeks from the date of contract signing		
C-2	Insulator, Spool, 3 Inch Grove Diameter.	30000	Each	21000	4500	4500				
C-3	Insulator, Spool, 1-3/4 Inch Grove Diameter.	375000	Each	262500	56250	56250				
C-4	Insulator, Spool, 1-1/2 Inch Grove Diameter.	30000	Each	21000	4500	4500				
C-5	Insulator, Pin Type, 33 Kv 1-3/8" Thread.	40000	Each	28000	6000	6000				
C-10	Insulator,suspension,6 Inch,11 Kv	374000	Each	261800	56100	56100				
C-11	Insulator,suspension,10 Inch,33 Kv	25000	Each	17500	3750	3750				

Name of Bidder:

Signature of Bidder:

Date:

2. Technical Specifications & Drawings For Insulator

Summary of Technical Specifications:

Bangladesh Rural Electrification Board has followed the Technical Specifications for all the required materials used in the construction of overhead rural electricity distribution system approved by BREB Board. The Specifications have been being used for several years and updated time to time. Under this Package No. URIDS(E)-G-10 Lot No. URIDS(E)-G-10-03/01 includes 7 items of insulator

The performance, design and dimension requirements of BREB based on other internationally recognized standards, are acceptable only if the requirements of such standards are equivalent or exceed the requirements mentioned in this document. The time-current characteristics of this standard shall be strictly adhered to. All accompanying drawings are conceptual. The manufacturer is responsible for preparation of drawings and design which meets the dimensional, strength and performance requirements of this standard. The text, figures and references to other standards supplement each other, and shall be considered parts of this standard.

Insulators are to be used on BREB overhead distribution lines; the standard establishes the performance requirements, application criteria and manufacturing tolerances. All insulators covered by this standard shall be fabricated from good commercial wet-process porcelain and shall meet minimum performance ratings. Each insulator shall have a smooth glazed surface, free from imperfections or blemishes which can impair service life and performance.

The Goods and Related Services shall comply with the following Technical Specifications and Standards:

2.2 Lot No.URIDS(E)-G-10-03/01: Insulator:

**PUBLICATION 200-1988
RURAL ELECTRIFICATION BOARD (REB)
PEOPLES REPUBLIC OF BANGLADESH
STANDARD FOR**

Product Name: OVERHEAD DISTRIBUTION LINE PORCELAIN INSULATORS

1. SCOPE

This standard establishes the performance requirements, application criteria and manufacturing tolerances of porcelain insulators to be used on REB overhead distribution lines.

2. GENERAL

Porcelain insulator types furnished to REB specifications shall each conform in all respects to ANSI specifications as follows:

Item No.	Insulator Type	Class	ANSI Specification
C-10	Clevis Suspension	52-1	C29.2
C-11	Clevis Suspension	52-4	C29.2
C-4	Spool	53-1	C29.3
C-3	Spool	53-2	C29.3
C-2	Spool	53-4	C29.3
C-1	Medium Voltage Pin	55-4	C29.5
C-5	High Voltage Pin	56-3	C29.6

3. MATERIALS

All insulators covered by this standard shall be fabricated from good commercial wet-process porcelain. Ferrous parts of clevis type suspension insulators, other than stainless steel or aluminum, shall be hot-dip galvanized in accordance with ANSI-A153.

4. MARKING

Each REB insulator shall bear the manufacturer's symbol and year of manufacture. Suspension insulators (REB Items C-10 and C-11) shall also bear the tension proof test load in KGs (pounds), identified by the word "Test". Additionally, REB item C-11 shall be marked with the combined mechanical and electrical rating in KGs (pounds). All markings shall be legible and durable.

5. FINISH

Each insulator shall have a smooth glazed surface, free from imperfections or blemishes which can impair service life and performance.

6. TESTS

Each insulator type shall be tested using methods described in ANSI C29.1. Tests required for specific insulator types are described in their associated ANSI specifications listed in Section 2. These tests are:

- 6.1 Electrical tests including:
 - a. Low-frequency dry flashover voltage tests
 - b. Low-frequency wet flashover voltage tests
 - c. Low-frequency dry withstand voltage tests
 - d. Low-frequency wet withstand voltage tests
 - e. Impulse withstand voltage tests
 - f. Radio-influence voltage tests
 - g. Visual corona tests
 - h. Puncture tests
- 6.2 Mechanical tests selected from:
 - a. Tensile strength
 - b. Cantilever strength, if applicable
 - c. Compression strength, if applicable
 - d. Torsional strength, if applicable
 - e. Transverse strength, if applicable
 - f. Mechanical impact strength, if applicable
- 6.3 Combined mechanical and electrical strength test for suspension insulators only.
- 6.4 Time-load-withstand-strength test.
- 6.5 Porosity test.
- 6.6 Thermal test.
- 6.7 Pinhole gauging test.
- 6.8 Galvanizing test in accordance with ANSI/ASTM B499-75.
- 6.9 Routine electrical tests including
 - a. High-frequency tests
 - b. Low-frequency tests
- 6.10 Routine mechanical tests for suspension insulators.

7. PERFORMANCE REQUIREMENTS

REB insulators shall meet the following minimum performance ratings:

7.1 Suspension Insulators (ANSI C29.2)

Item No.	C-10	C-11	Refer to ANSI
ANSI Class	52-1	52-4	C29.2 Section
1. Electrical:			
a. Low-frequency dry flashover (KV)	60	80	4.2
b. Low-frequency wet flashover (KV)	30	50	4.3
c. Critical impulse flashover, positive (KV)	100	125	4.7
d. Critical impulse flashover, negative (KV)	100	130	4.7
e. Low-frequency puncture (KV)	80	110	4.11
2. Radio-influence voltages (RIV):			
a. Low-frequency test voltage (rms-ground, KV)	7.5	10	4.9
b. Maximum RIV @ 1.0 mHz, (μv)	50	50	4.9
3. Mechanical:			
a. Combined mechanical and electrical strength KG (Lb)	4,536 (10,000)	6,804 (15,000)	5.2
b. Mechanical impact strength Cm-Kg (Inch-Lb)	52 (45)	64 (55)	5.1.2.3
c. Tension proof Kg (Lb)	2,268 (5,000)	3,402 (7,500)	7.2.1
d. Time load Kg (Lb)	2,721 (6,000)	4,536 (10,000)	5.3
4. Dimensions:			
a. Leakage distance Cm (inches)	17.78 (7)	29.21 (11.5)	2.5.2

7.2 Spool Insulators (ANSI C29.3)

Item No.	C-4	C-3	C-2	Refer to ANSI
ANSI Class	53-1	53-2	53-4	C29.3 Section
1. Electrical:				
a. Low-frequency dry flashover (KV)	20	25	25	4.2
b. Low-frequency wet flashover (KV)				
1. Vertical	8	12	12	4.3
2. Horizontal	10	15	15	4.3
2. Mechanical:				
a. Transverse strength KG (Lb)	907 (2,000)	1,361 (3,000)	2,041 (4,500)	5.1.6

7.3 Pin Insulators (ANSI C29.5)

Item No.	C-1	Plain	Refer to ANSI C29.5 Section
ANSI Class	55-4		
Rating	Radio Free		
1. Electrical:			
a. Low-frequency dry flashover (KV)	65	70	4.2
b. Low-frequency wet flashover (KV)	35	45	4.3
c. Critical impulse flashover, positive (KV)	105	110	4.7
d. Critical impulse flashover, negative (KV)	130	140	4.7
e. Low-frequency puncture voltage (KV)	95	95	4.11
2. Radio-influence voltages (RIV):			
a. Low-frequency test voltage (rms-ground, KV)	10	10	4.9
b. Maximum RIV @ 1.0 mHz, (μ v)	50	5,500	4.9
3. Mechanical:			
a. Cantilever strength KG (Lb)	1,361 (3,000)	1,361 (3,000)	5.1.3
4. Dimensions:			
a. Leakage distance Cm (inches)	22.86 (9)	22.86 (9)	2.5.2
b. Dry arcing distance Cm (inches)	12.7 (5)	12.7 (5)	2.5.3
c. Minimum pin height Cm (inches)	12.7 (5)	12.7 (5)	

7.4 Pin Insulators (ANSI C29.6)

Item No.	C-5	Refer to ANSI C29.6 Section
ANSI Class	56-3	
1. Electrical:		
a. Low-frequency dry flashover (KV)	125	4.2
b. Low-frequency wet flashover (KV)	80	4.3
c. Critical impulse flashover, positive (KV)	200	4.7
d. Critical impulse flashover, negative (KV)	265	4.7
e. Low-frequency puncture (KV)	165	4.11
2. Radio-influence voltage (RIV):		
a. Low-frequency test voltage (rms-ground, KV)	30	4.9
b. Maximum RIV, μV		
1. Plain	16,000	4.9
2. Radio free	200	4.9
3. Mechanical:		
a. Cantilever strength KG (Lb)	1,361 (3,000)	5.1.3
4. Dimensions:		
a. Leakage distance Cm (inches)	53.34 (21)	2.5.2
b. Dry arcing distance Cm (inches)	24.13 (9½)	2.5.3
c. Minimum pin height Cm (inches)	20.32 (8)	

8. DIMENSIONS AND PERMITTED TOLERANCES

Principal dimensions and permitted tolerances, after galvanizing are presented in Figures 1 to 7, and are measured in Centimeters (inches). These dimensions (and tolerances) are defined as follows:

8.1 Suspension Insulator

a. ANSI type 52-1 - Figure 1.

- D1 = Maximum insulator skirt diameter
- D2 = Diameter of cross section of clevis tongue
- D3 = Diameter of hole in clevis tongue
- D4 = Diameter of clevis hole in metal cap
- D5 = Diameter of clevis pin shank
- H1 = Separation between bottom of clevis pin inserted in cap and bottom of hole in clevis tongue of the same insulator
- H2 = Minimum separation between bottom of clevis pin and throat of clevis
- W = Minimum width of clevis opening
- T = Thickness of clevis tongue

b. ANSI type 52-4 - Figure 2.

- D1 = Maximum insulator skirt diameter
- D2 = Diameter of hole in clevis tongue
- D3 = Diameter of clevis hole in metal cap
- D4 = Diameter of clevis pin shank
- H1 = Separation between bottom of clevis pin inserted in cap and bottom of hole in clevis tongue of the same insulator
- H2 = Minimum separation between bottom of clevis pin and throat of clevis
- C = Separation between bottom of clevis pin and outside surface of clevis tongue
- T = Thickness of clevis tongue
- W = Minimum width of clevis opening

8.2 Spool Insulator

a. ANSI types 53-1, 53-2, 53-3 - Figures 3, 4 & 5.

- D1 = Pin hole diameter
- D2 = Opening diameter
- D3 = Overall diameter
- D4 = Inner diameter of side groove horizontal
- H1 = Half height of insulator
- H2 = Depth of pin hole entrance
- R = Radius of side groove (vertical)

8.3 Pin Insulator

a. ANSI types 55-4, 56-3 - Figures 6 & 7.

- D1 = Maximum diameter of insulator skirt
- D2 = Maximum diameter of insulator top
- D3 = Inner diameter of side groove, horizontal
- D4 = Diameter of thread
- H1 = Overall height of insulator
- H2 = Depth of thread
- H3 = Separation between bottom of top groove and center of side groove
- R1 = Radius of side groove (vertical)
- R2 = Radius of top groove

9. INSPECTION

The manufacturer shall perform the necessary inspection and tests to determine if REB porcelain insulators comply with the requirements of this standard. Non-conforming insulators are unacceptable. REB reserves the right to witness inspection and tests, and shall request test reports for each insulator type.

10. PACKAGING

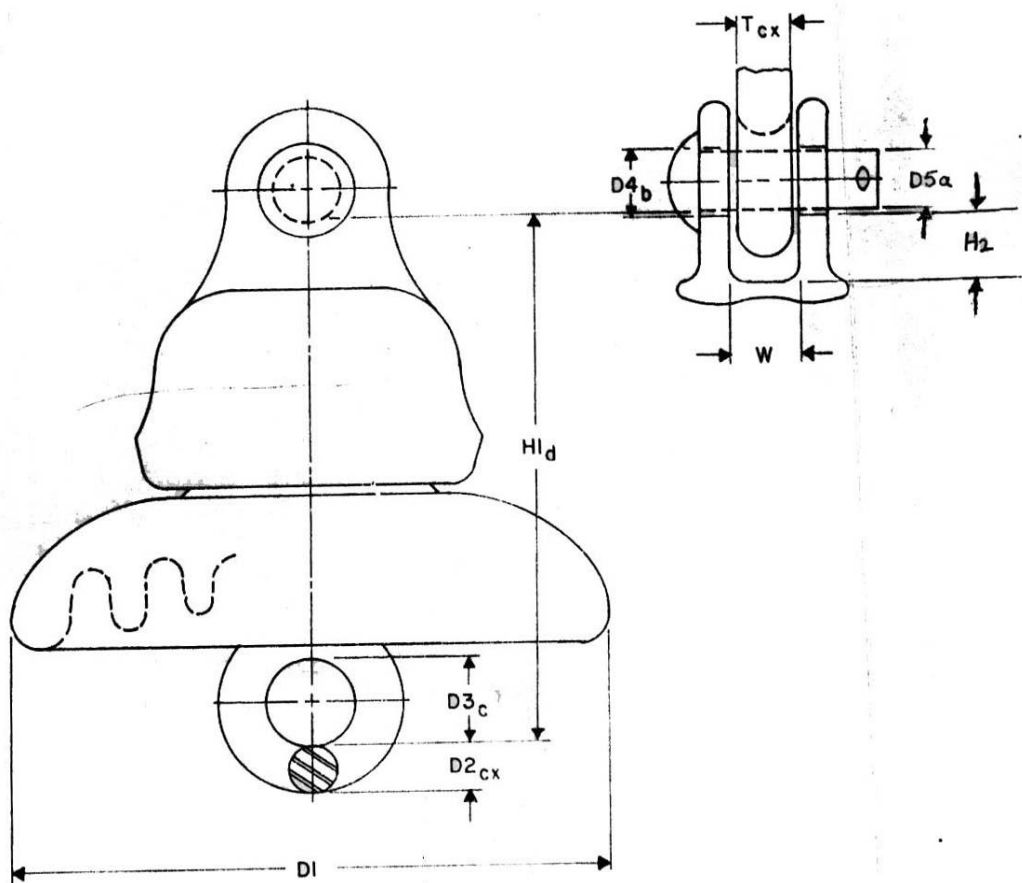
REB overhead distribution line porcelain insulators shall be securely packaged for shipping and handling. Each package shall be marked with the number of insulators enclosed, the manufacturers name, insulator class number and REB item number.

11. OTHER STANDARDS

The performance and dimensional requirements of REB overhead distribution line porcelain insulators based on other internationally recognized standards, are acceptable only if requirements of such standards are equivalent to or exceed the requirements quoted in this document.

12. BIBLIOGRAPHY OF REFERENCE STANDARDS: (Latest Edition)

1. ANSI C29.2: American National Standard for Insulators - Process Porcelain and Toughened Glass Suspension Type.
2. ANSI C29.3: American National Standard for Wet - Process Porcelain Insulators (Spool Type).
3. ANSI C29.5: American National Standard for Wet - Process Porcelain Insulators (Low-and-Medium-Voltage Type).
4. ANSI C29.6: American National Standard for Wet - Process Porcelain Insulators (High Voltage Pin Type).
5. ANSI C29.1: American National Standard Test Methods for Electrical Power Insulators.
6. ANSI/ASTM B499-75: Method for Measurement of Coating Thickness by the Magnetic Method: Non-Magnetic Coatings on Magnetic Basis Metals.
7. ANSI A153: Standard Specifications for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.



DIMENSIONS IN Cm (INCHES)

D1-(MAX)	D2	D3	D4	D5	H1	H2 (MIN)	W (MIN)	T
15.24 (6)	1.27 (1/2)	2.2225 (7/8)	1.74625 (11/16)	1.5875 (5/8)	13.97 (5-1/2)	1.74625 (11/16)	1.74625 (11/16)	1.27 (1/2)

Allowable Variation Cm (Inches)

c=0.15875 (1/16), d=0.3175 (1/8), x=0 (0)

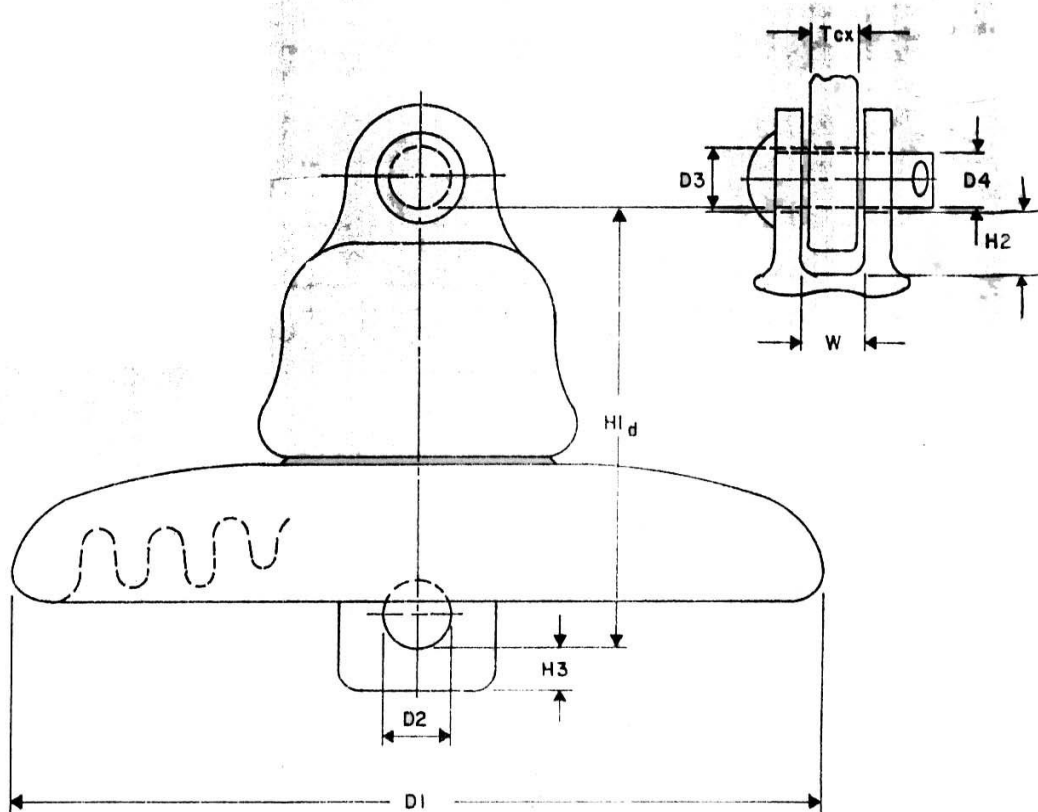
Single letter indicates \pm Variation.

Example: d= ± 0.3175 Cm (1/8 inch)

Two letters indicate + First Variation, - Second Variation.

Example: cx= + 0.15875 Cm (1/16 inch) - 0 = +0.15875 Cm (1/16 inch)

FIGURE-1
SUSPENSION INSULATOR, CLASS 52-1



DIMENSIONS IN Cm (INCHES)

D1- (MAX)	D2	D3	D4	H1	H2 (MIN)	H3	W (MIN)	T
25.4 (10)	1.74625 (11/16)	1.74625 (11/16)	1.5875 (5/8)	14.605 (5-3/4)	1.74625 (11/16)	1.27 (1/2)	1.74625 (11/16)	1.27 (1/2)

Allowable Variation Cm (Inches)

c=0.15875 (1/16), d=0.3175 (1/8), x=0 (0)

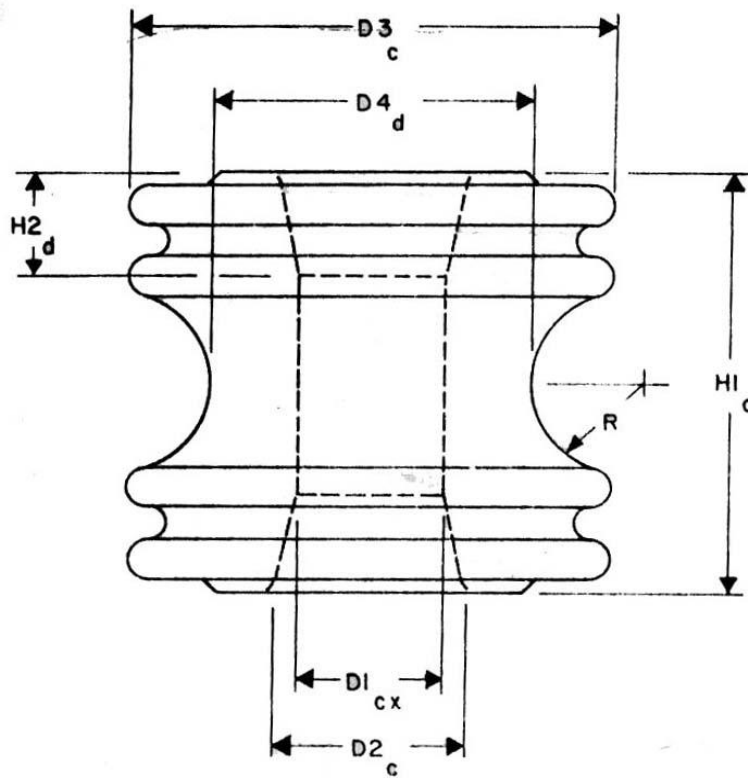
Single letter indicates \pm Variation.

Example: d= ± 0.3175 Cm (1/8 inch)

Two letters indicate + First Variation, - Second Variation.

Example: cx= + 0.15875 Cm (1/16 inch) - 0 = +0.15875 Cm (1/16 inch)

FIGURE-2
SUSPENSION INSULATOR, CLASS 52-4



DIMENSIONS IN Cm (INCHES)

D1	D2	D3	D4	H1	H2	R
1.74625 (11/16)	2.2225 (7/8)	5.715 (2-1/4)	4.445 (1-3/4)	5.3975 (2-1/8)	1.27 (1/2)	1.11125 (7/16)

Allowable Variation Cm (Inches)

c=0.15875 (1/16), d=0.3175 (1/8), x=0 (0)

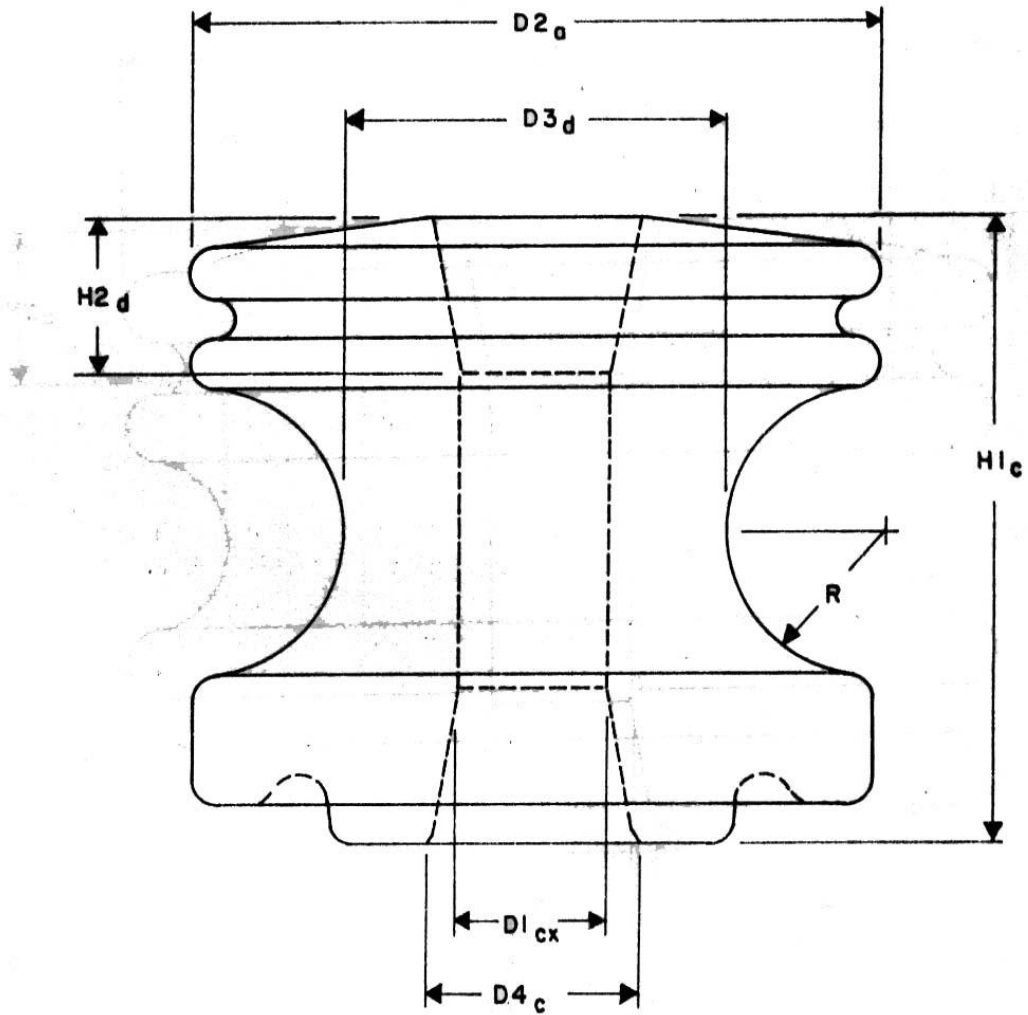
Single letter indicates \pm Variation.

Example: d= ± 0.3175 Cm (1/8 inch)

Two letters indicate + First Variation, - Second Variation.

Example: cx= + 0.15875 Cm (1/16 inch) - 0 = +0.15875 Cm (1/16 inch)

FIGURE-3
SPOOL INSULATOR, CLASS 53-1



DIMENSIONS IN Cm (INCHES)

D1	D2	D3	D4	H1	H2	R
1.74625 (11/16)	7.62 (3)	4.445 (1-3/4)	2.38125 (15/16)	7.62 (3)	1.905 (3/4)	1.74625 (11/16)

Allowable Variation Cm (Inches)

$c=0.15875$ (1/16), $d=0.3175$ (1/8), $x=0$ (0)

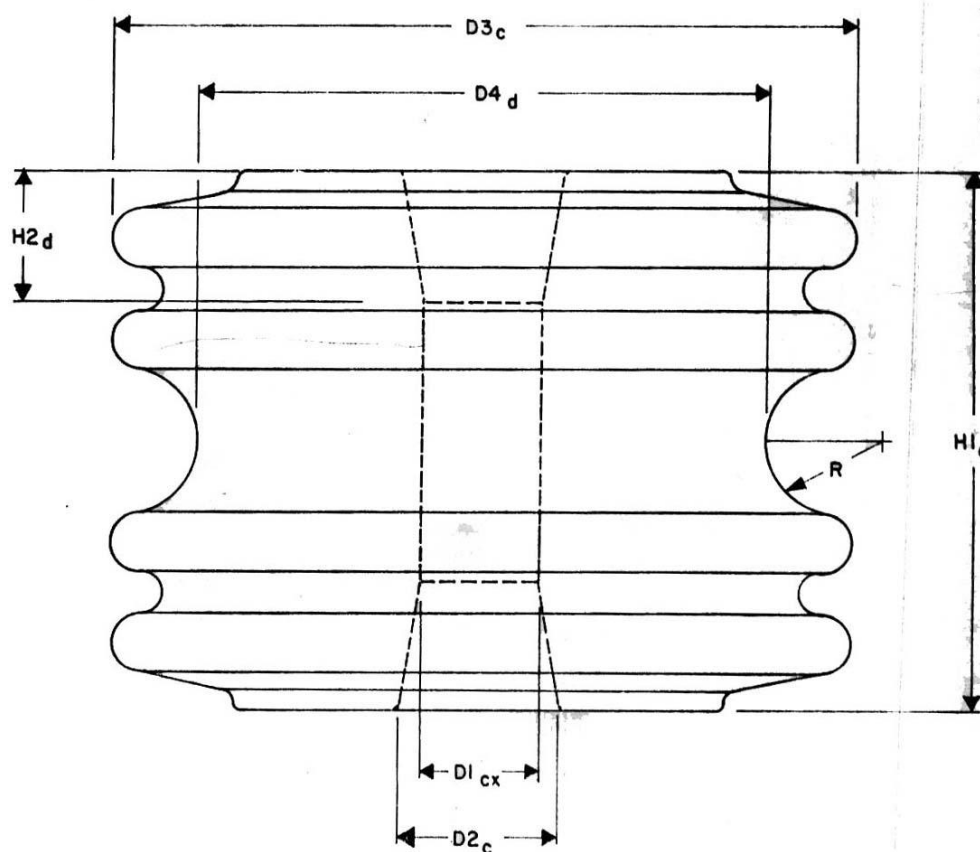
Single letter indicates \pm Variation.

Example: $d= \pm 0.3175$ Cm (1/8 inch)

Two letters indicate + First Variation, - Second Variation.

Example: $cx= + 0.15875$ Cm (1/16 inch) - 0 = $+0.15875$ Cm (1/16 inch)

FIGURE-4
SPOOL INSULATOR, CLASS 53-2



DIMENSIONS IN Cm (INCHES)

D1	D2	D3	D4	H1	H2	R
1.74625 (11/16)	2.38125 (15/16)	10.4775 (4-1/8)	7.62 (3)	7.62 (3)	1.905 (3/4)	1.5875 (5/8)

Allowable Variation Cm (Inches)

c=0.15875 (1/16), d=0.3175 (1/8), x=0 (0)

Single letter indicates \pm Variation.

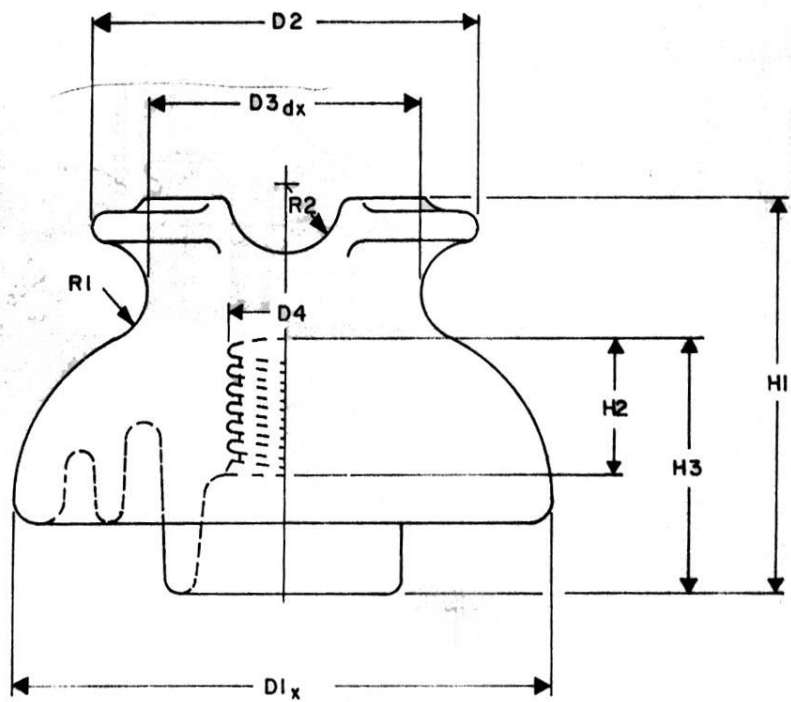
Example: d= ± 0.3175 Cm (1/8 inch)

Two letters indicate + First Variation, - Second Variation.

Example: cx= + 0.15875 Cm (1/16 inch) - 0 = +0.15875 Cm (1/16 inch)

FIGURE-5
SPOOL INSULATOR, CLASS 53-4

- * The internal threads of the insulator shall be of **ceramic**.
- * Insulators with **zinc** (Zn) or **lead** (Pb) threads shall not be acceptable.



DIMENSIONS IN Cm (INCHES)

D1	D2 (MAX)	D3	D4	H1	H2 (MIN)	H3	R1	R2
14.12875 (5-9/16)	10.4775 (4-1/8)	7.1875 (2-7/8)	2.54 (1)	11.1125 (4-3/8)	5.08 (2)	7.3025 (2-7/8)	1.42875 (9/16)	2.54 (1)

Allowable Variation Cm (Inches)

c=0.15875 (1/16), d=0.3175 (1/8), x=0 (0)

Single letter indicates \pm Variation.

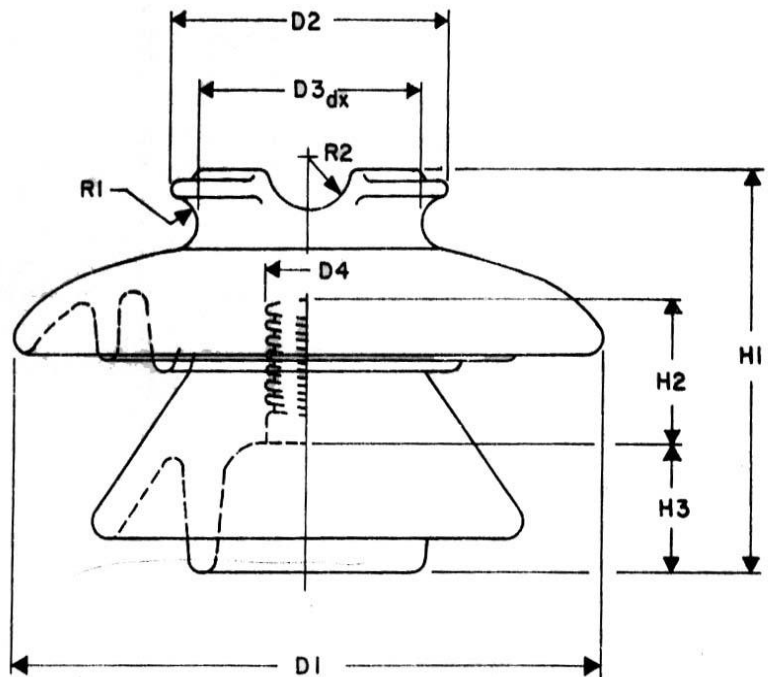
Example: d= ± 0.3175 Cm (1/8 inch)

Two letters indicate + First Variation, - Second Variation.

Example: cx= + 0.15875 Cm (1/16 inch) - 0 = +0.15875 Cm (1/16 inch)

FIGURE-6
11 KV PIN INSULATOR, CLASS 55-4

- * The internal threads of the insulator shall be of **ceramic**.
- * Insulators with **zinc** (Zn) or **lead** (Pb) threads shall not be acceptable.



DIMENSIONS IN Cm (INCHES)

D1	D2	D3	D4	H1	H2 (MIN)	H3	R1	R2
26.67 (10-1/2)	12.3825 (4-7/8)	10.16 (4)	3.4925 (1-3/8)	19.05 (7-1/2)	5.3975 (2-1/8)	6.6675 (2-5/8)	1.42875 (9/16)	1.905 (3/4)

Allowable Variation Cm (Inches)

c=0.15875 (1/16), d=0.3175 (1/8), x=0 (0)

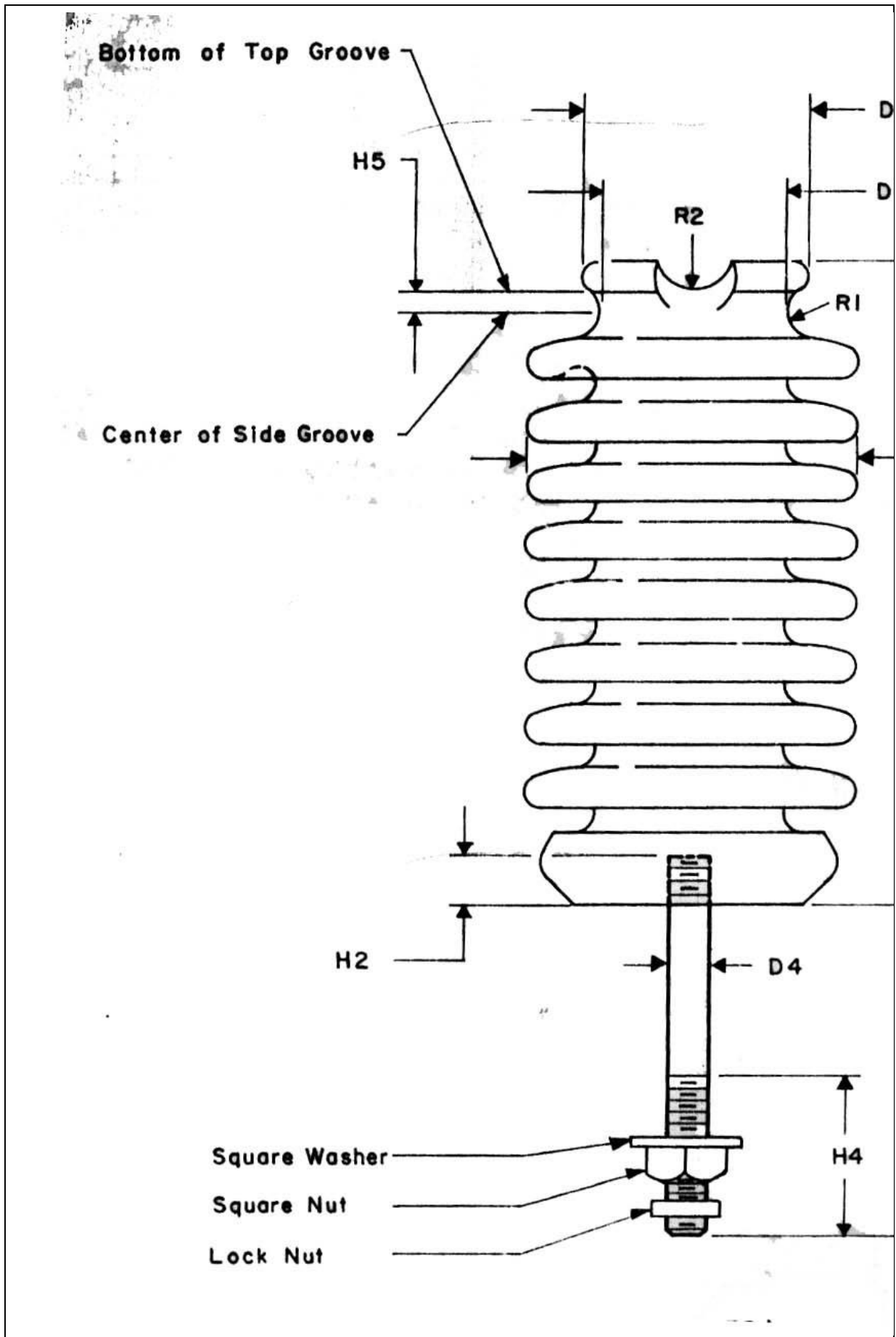
Single letter indicates \pm Variation.

Example: d= ± 0.3175 Cm (1/8 inch)

Two letters indicate + First Variation, - Second Variation.

Example: cx= + 0.15875 Cm (1/16 inch) - 0 = +0.15875 Cm (1/16 inch)

FIGURE-7
33 KV PIN INSULATOR, CLASS 56-3



DIMENSIONS IN Cm (INCHES)

D1	D2	D3	D4	H1	H2	H3	H4	H5 (MIN)	H5 (MAX)	R1 & R2
16.51 (6-1/2)	12.3825 (4-7/8)	7.3025 (2-7/8)	1.905 (3/4)	36.83 (14-1/2)	2.2225 (7/8)	17.78 (7)	8.89 (3-1/2)	1.42875 (9/16)	2.2225 (7/8)	2.54 (1)

Allowable Variation Cm (Inches)

c=0.15875 (1/16), d=0.3175 (1/8), x=0 (0)

Single letter indicates \pm Variation.

Example: d= \pm 0.3175 Cm (1/8 inch)

Two letters indicate + First Variation, - Second Variation.

Example: cx= + 0.15875 Cm (1/16 inch) - 0 = +0.15875 Cm (1/16 inch)

6. TESTS

Each insulator type shall be tested using methods described in ANSI C29.1. Tests required for specific insulator types are described in their associated ANSI specifications listed in Section 2. These tests are:

6.1 Electrical tests including:

- a. Low-frequency dry flashover voltage tests
- b. Low-frequency wet flashover voltage tests
- c. Low-frequency dry withstand voltage tests
- d. Low-frequency wet withstand voltage tests
- e. Impulse withstand voltage tests
- f. Radio-influence voltage tests
- g. Visual corona tests
- h. Puncture tests

6.2 Mechanical tests selected from:

- a. Tensile strength
- b. Cantilever strength, if applicable
- c. Compression strength, if applicable
- d. Torsional strength, if applicable
- e. Transverse strength, if applicable
- f. Mechanical impact strength, if applicable

6.3 Combined mechanical and electrical strength test for suspension insulators only.

6.4 Time-load-withstand-strength test.

6.5 Porosity test.

6.6 Thermal test.

6.7 Pinhole gauging test.

6.8 Galvanizing test in accordance with ANSI/ASTM B499-75.

6.9 Routine electrical tests including

- a. High-frequency tests
- b. Low-frequency tests

6.10 Routine mechanical tests for suspension insulators.

7. PERFORMANCE REQUIREMENTS

REB insulators shall meet the following minimum performance ratings:

7.1 Suspension Insulators (ANSI C29.2)

Item No.	C-10	C-11	Refer to ANSI
ANSI Class	52-1	52-4	C29.2 Section
1. Electrical:			
a. Low-frequency dry flashover (KV)	60	80	4.2
b. Low-frequency wet flashover (KV)	30	50	4.3
c. Critical impulse flashover, positive (KV)	100	125	4.7
d. Critical impulse flashover, negative (KV)	100	130	4.7
e. Low-frequency puncture (KV)	80	110	4.11
2. Radio-influence voltages (RIV):			
a. Low-frequency test voltage (rms-ground, KV)	7.5	10	4.9
b. Maximum RIV @ 1.0 mHz, (μV)	50	50	4.9
3. Mechanical:			
a. Combined mechanical and electrical strength KG (Lb)	4,536 (10,000)	6,804 (15,000)	5.2
b. Mechanical impact strength Cm-Kg (Inch-Lb)	52 (45)	64 (55)	5.1.2.3
c. Tension proof Kg (Lb)	2,268 (5,000)	3,402 (7,500)	7.2.1
d. Time load Kg (Lb)	2,721 (6,000)	4,536 (10,000)	5.3
4. Dimensions:			
a. Leakage distance Cm (inches)	17.78 (7)	29.21 (11.5)	2.5.2

7.2 Spool Insulators (ANSI C29.3)

Item No.	C-4	C-3	C-2	Refer to ANSI
ANSI Class	53-1	53-2	53-4	C29.3 Section
1. Electrical:				
a. Low-frequency dry flashover (KV)	20	25	25	4.2
b. Low-frequency wet flashover (KV)				
1. Vertical	8	12	12	4.3
2. Horizontal	10	15	15	4.3
2. Mechanical:				
a. Transverse strength KG (Lb)	907 (2,000)	1,361 (3,000)	2,041 (4,500)	5.1.6

7.3 Pin Insulators (ANSI C29.5)

Item No.	C-1	Plain	Refer to ANSI C29.5 Section
ANSI Class	55-4		
Rating	Radio Free	Plain	
1. Electrical:			
a. Low-frequency dry flashover (KV)	65	70	4.2
b. Low-frequency wet flashover (KV)	35	45	4.3
c. Critical impulse flashover, positive (KV)	105	110	4.7
d. Critical impulse flashover, negative (KV)	130	140	4.7
e. Low-frequency puncture voltage (KV)	95	95	4.11
2. Radio-influence voltages (RIV):			
a. Low-frequency test voltage (rms-ground, KV)	10	10	4.9
b. Maximum RIV @ 1.0 mHz, (μv)	50	5,500	4.9
3. Mechanical:			
a. Cantilever strength KG (Lb)	1,361 (3,000)	1,361 (3,000)	5.1.3
4. Dimensions:			
a. Leakage distance Cm (inches)	22.86 (9)	22.86 (9)	2.5.2
b. Dry arcing distance Cm (inches)	12.7 (5)	12.7 (5)	2.5.3
c. Minimum pin height Cm (inches)	12.7 (5)	12.7 (5)	

7.4 Pin Insulators (ANSI C29.6)

Item No.	C-5	Refer to ANSI C29.6 Section
ANSI Class	56-3	
1. Electrical:		
a. Low-frequency dry flashover (KV)	125	4.2
b. Low-frequency wet flashover (KV)	80	4.3
c. Critical impulse flashover, positive (KV)	200	4.7
d. Critical impulse flashover, negative (KV)	265	4.7
e. Low-frequency puncture (KV)	165	4.11
2. Radio-influence voltage (RIV):		
a. Low-frequency test voltage (rms-ground, KV)	30	4.9
b. Maximum RIV, μV		
1. Plain	16,000	4.9
2. Radio free	200	4.9
3. Mechanical:		
a. Cantilever strength KG (Lb)	1,361 (3,000)	5.1.3
4. Dimensions:		
a. Leakage distance Cm (inches)	53.34 (21)	2.5.2
b. Dry arcing distance Cm (inches)	24.13 (9½)	2.5.3
c. Minimum pin height Cm (inches)	20.32 (8)	

8. DIMENSIONS AND PERMITTED TOLERANCES

Principal dimensions and permitted tolerances, after galvanizing are presented in Figures 1 to 7, and are measured in Centimeters (inches). These dimensions (and tolerances) are defined as follows:

8.1 Suspension Insulator

- a. ANSI type 52-1 - Figure 1.
 - D1 = Maximum insulator skirt diameter
 - D2 = Diameter of cross section of clevis tongue
 - D3 = Diameter of hole in clevis tongue
 - D4 = Diameter of clevis hole in metal cap
 - D5 = Diameter of clevis pin shank
 - H1 = Separation between bottom of clevis pin inserted in cap and bottom of hole in clevis tongue of the same insulator
 - H2 = Minimum separation between bottom of clevis pin and throat of clevis
 - W = Minimum width of clevis opening
 - T = Thickness of clevis tongue

b. ANSI type 52-4 - Figure 2.

- D1 = Maximum insulator skirt diameter
- D2 = Diameter of hole in clevis tongue
- D3 = Diameter of clevis hole in metal cap
- D4 = Diameter of clevis pin shank
- H1 = Separation between bottom of clevis pin inserted in cap and bottom of hole in clevis tongue of the same insulator
- H2 = Minimum separation between bottom of clevis pin and throat of clevis
- C = Separation between bottom of clevis pin and outside surface of clevis tongue
- T = Thickness of clevis tongue
- W = Minimum width of clevis opening

8.2 Spool Insulator

a. ANSI types 53-1, 53-2, 53-3 - Figures 3, 4 & 5.

- D1 = Pin hole diameter
- D2 = Opening diameter
- D3 = Overall diameter
- D4 = Inner diameter of side groove horizontal
- H1 = Half height of insulator
- H2 = Depth of pin hole entrance
- R = Radius of side groove (vertical)

8.3 Pin Insulator

a. ANSI types 55-4, 56-3 - Figures 6 & 7.

- D1 = Maximum diameter of insulator skirt
- D2 = Maximum diameter of insulator top
- D3 = Inner diameter of side groove, horizontal
- D4 = Diameter of thread
- H1 = Overall height of insulator
- H2 = Depth of thread
- H3 = Separation between bottom of top groove and center of side groove
- R1 = Radius of side groove (vertical)
- R2 = Radius of top groove

9. INSPECTION

The manufacturer shall perform the necessary inspection and tests to determine if REB porcelain insulators comply with the requirements of this standard. Non-conforming insulators are unacceptable. REB reserves the right to witness inspection and tests, and shall request test reports for each insulator type.

10. PACKAGING

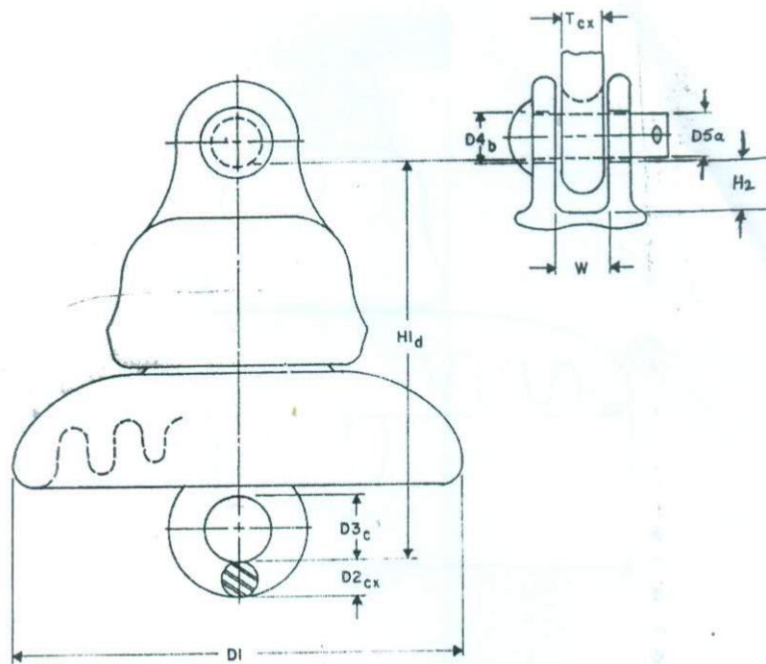
REB overhead distribution line porcelain insulators shall be securely packaged for shipping and handling. Each package shall be marked with the number of insulators enclosed, the manufacturers name, insulator class number and REB item number.

11. OTHER STANDARDS

The performance and dimensional requirements of REB overhead distribution line porcelain insulators based on other internationally recognized standards, are acceptable only if requirements of such standards are equivalent to or exceed the requirements quoted in this document.

12. BIBLIOGRAPHY OF REFERENCE STANDARDS: (Latest Edition)

1. ANSI C29.2: American National Standard for Insulators - Process Porcelain and Toughened Glass Suspension Type.
2. ANSI C29.3: American National Standard for Wet - Process Porcelain Insulators (Spool Type).
3. ANSI C29.5: American National Standard for Wet - Process Porcelain Insulators (Low-and-Medium-Voltage Type).
4. ANSI C29.6: American National Standard for Wet - Process Porcelain Insulators (High Voltage Pin Type).
5. ANSI C29.1: American National Standard Test Methods for Electrical Power Insulators.
6. ANSI/ASTM B499-75: Method for Measurement of Coating Thickness by the Magnetic Method: Non-Magnetic Coatings on Magnetic Basis Metals.
7. ANSI A153: Standard Specifications for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.



DIMENSIONS IN Cm (INCHES)

D1-(MAX)	D2	D3	D4	D5	H1	H2 (MIN)	W (MIN)	T
15.24 (6)	1.27 (1/2)	2.2225 (7/8)	1.74625 (11/16)	1.5875 (5/8)	13.97 (5-1/2)	1.74625 (11/16)	1.74625 (11/16)	1.27 (1/2)

Allowable Variation Cm (Inches)

c=0.15875 (1/16), d=0.3175 (1/8), x=0 (0)

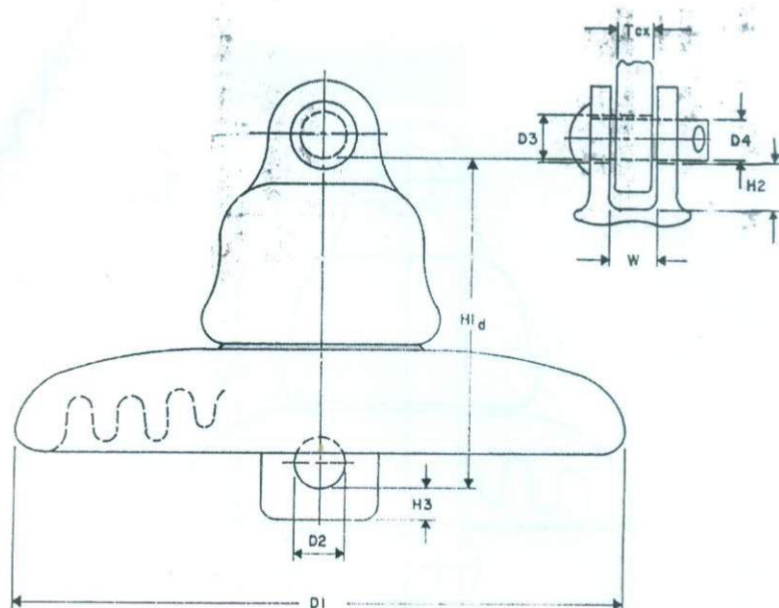
Single letter indicates \pm Variation.

Example: d= ± 0.3175 Cm (1/8 inch)

Two letters indicate + First Variation, - Second Variation.

Example: cx= + 0.15875 Cm (1/16 inch) - 0 = +0.15875 Cm (1/16 inch)

FIGURE-1
SUSPENSION INSULATOR, CLASS 52-1



DIMENSIONS IN Cm (INCHES)

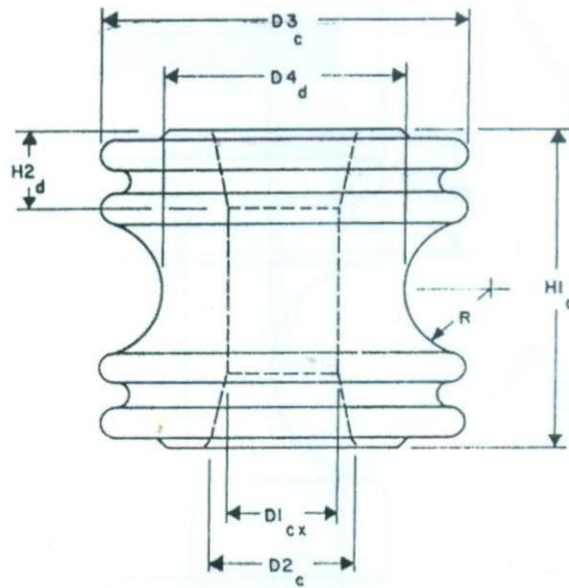
D1- (MAX)	D2	D3	D4	H1	H2 (MIN)	H3	W (MIN)	T
25.4 (10)	1.74625 (11/16)	1.74625 (11/16)	1.5875 (5/8)	14.605 (5-3/4)	1.74625 (11/16)	1.27 (1/2)	1.74625 (11/16)	1.27 (1/2)

Allowable Variation Cm (Inches)
 $c=0.15875$ (1/16), $d=0.3175$ (1/8), $x=0$ (0)

Single letter indicates \pm Variation.
 Example: $d= \pm 0.3175$ Cm (1/8 inch)

Two letters indicate + First Variation, - Second Variation.
 Example: $cx= + 0.15875$ Cm (1/16 inch) - 0 = $+0.15875$ Cm (1/16 inch)

FIGURE-2
SUSPENSION INSULATOR, CLASS 52-4



DIMENSIONS IN Cm (INCHES)

D1	D2	D3	D4	H1	H2	R
1.74625 (11/16)	2.2225 (7/8)	5.715 (2-1/4)	4.445 (1-3/4)	5.3975 (2-1/8)	1.27 (1/2)	1.11125 (7/16)

Allowable Variation Cm (Inches)

c=0.15875 (1/16), d=0.3175 (1/8), x=0 (0)

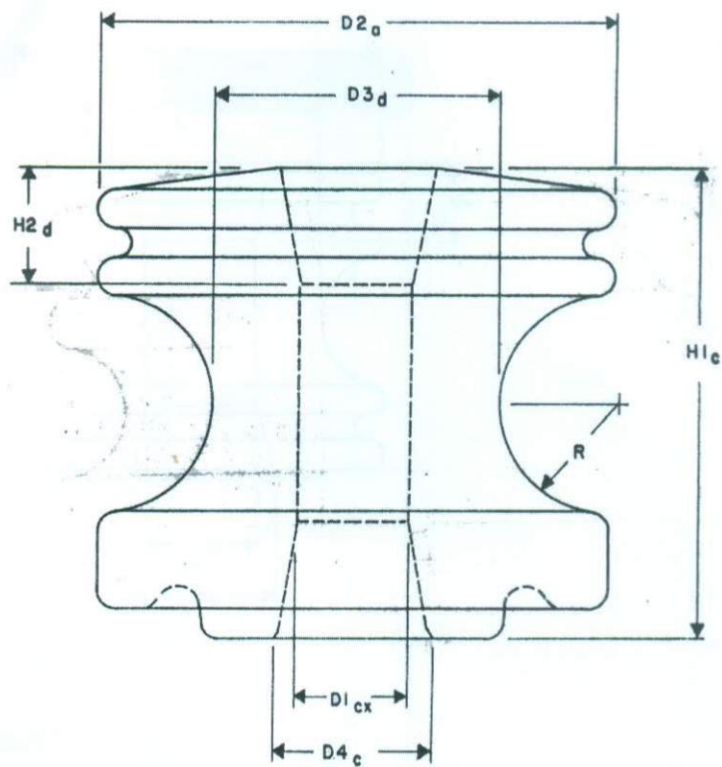
Single letter indicates \pm Variation.

Example: d= ± 0.3175 Cm (1/8 inch)

Two letters indicate + First Variation, - Second Variation.

Example: cx= + 0.15875 Cm (1/16 inch) - 0 = +0.15875 Cm (1/16 inch)

FIGURE-3
SPOOL INSULATOR, CLASS 53-1



DIMENSIONS IN Cm (INCHES)

D1	D2	D3	D4	H1	H2	R
1.74625 (11/16)	7.62 (3)	4.445 (1-3/4)	2.38125 (15/16)	7.62 (3)	1.905 (3/4)	1.74625 (11/16)

Allowable Variation Cm (Inches)

$c=0.15875$ (1/16), $d=0.3175$ (1/8), $x=0$ (0)

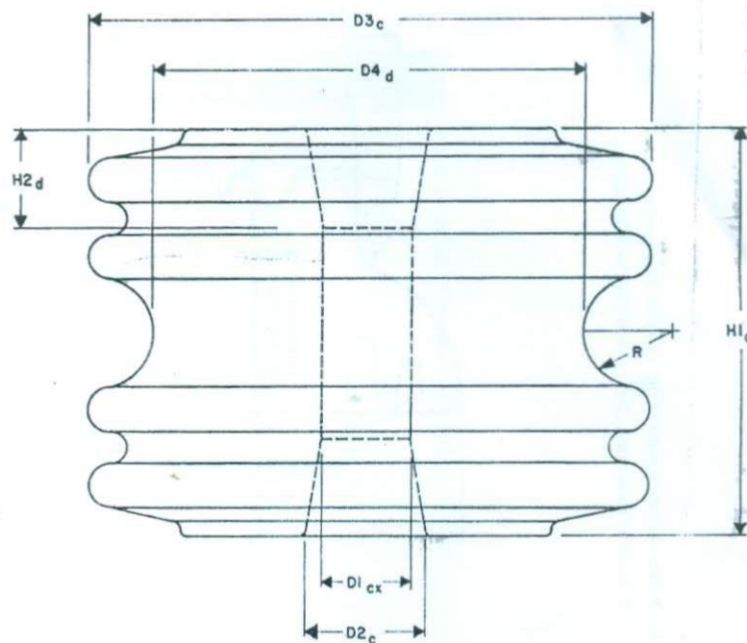
Single letter indicates \pm Variation.

Example: $d= \pm 0.3175$ Cm (1/8 inch)

Two letters indicate + First Variation, - Second Variation.

Example: $cx= + 0.15875$ Cm (1/16 inch) - 0 = $+0.15875$ Cm (1/16 inch)

FIGURE-4
SPOOL INSULATOR, CLASS 53-2



DIMENSIONS IN Cm (INCHES)

D1	D2	D3	D4	H1	H2	R
1.74625 (11/16)	2.38125 (15/16)	10.4775 (4-1/8)	7.62 (3)	7.62 (3)	1.905 (3/4)	1.5875 (5/8)

Allowable Variation Cm (Inches)

c=0.15875 (1/16), d=0.3175 (1/8), x=0 (0)

Single letter indicates \pm Variation.

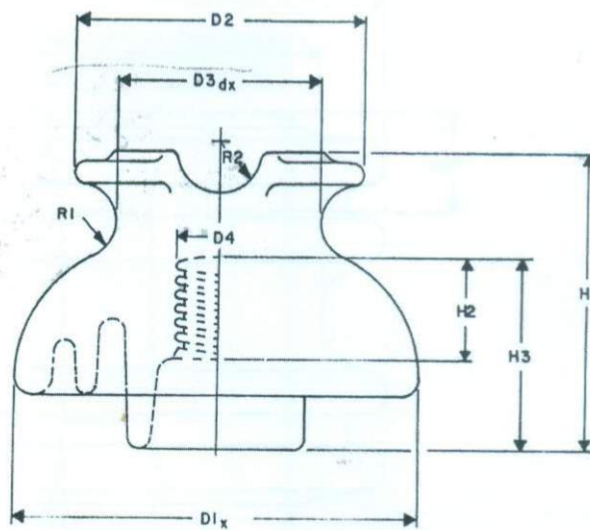
Example: d= ± 0.3175 Cm (1/8 inch)

Two letters indicate + First Variation, - Second Variation.

Example: cx= + 0.15875 Cm (1/16 inch) - 0 = +0.15875 Cm (1/16 inch)

FIGURE-5
SPOOL INSULATOR, CLASS 53-4

- * The internal threads of the insulator shall be of **ceramic**.
- * Insulators with **zinc** (Zn) or **lead** (Pb) threads shall not be acceptable.



DIMENSIONS IN Cm (INCHES)

D1	D2 (MAX)	D3	D4	H1	H2 (MIN)	H3	R1	R2
14.12875 (5-9/16)	10.4775 (4-1/8)	7.1875 (2-7/8)	2.54 (1)	11.1125 (4-3/8)	5.08 (2)	7.3025 (2-7/8)	1.42875 (9/16)	2.54 (1)

Allowable Variation Cm (Inches)

c=0.15875 (1/16), d=0.3175 (1/8), x=0 (0)

Single letter indicates \pm Variation.

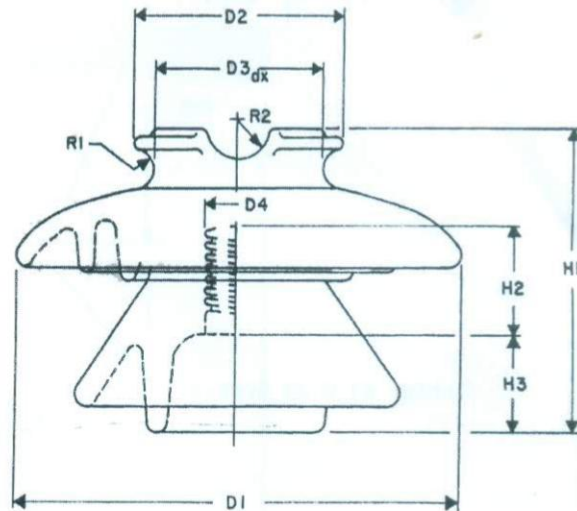
Example: d= ± 0.3175 Cm (1/8 inch)

Two letters indicate + First Variation, - Second Variation.

Example: cx= + 0.15875 Cm (1/16 inch) - 0 = +0.15875 Cm (1/16 inch)

FIGURE-6
11 KV PIN INSULATOR, CLASS 55-4

- * The internal threads of the insulator shall be of **ceramic**.
- * Insulators with **zinc** (Zn) or **lead** (Pb) threads shall not be acceptable.



DIMENSIONS IN Cm (INCHES)

D1	D2	D3	D4	H1	H2 (MIN)	H3	R1	R2
26.67 (10-1/2)	12.3825 (4-7/8)	10.16 (4)	3.4925 (1-3/8)	19.05 (7-1/2)	5.3975 (2-1/8)	6.6675 (2-5/8)	1.42875 (9/16)	1.905 (3/4)

Allowable Variation Cm (Inches)

c=0.15875 (1/16), d=0.3175 (1/8), x=0 (0)

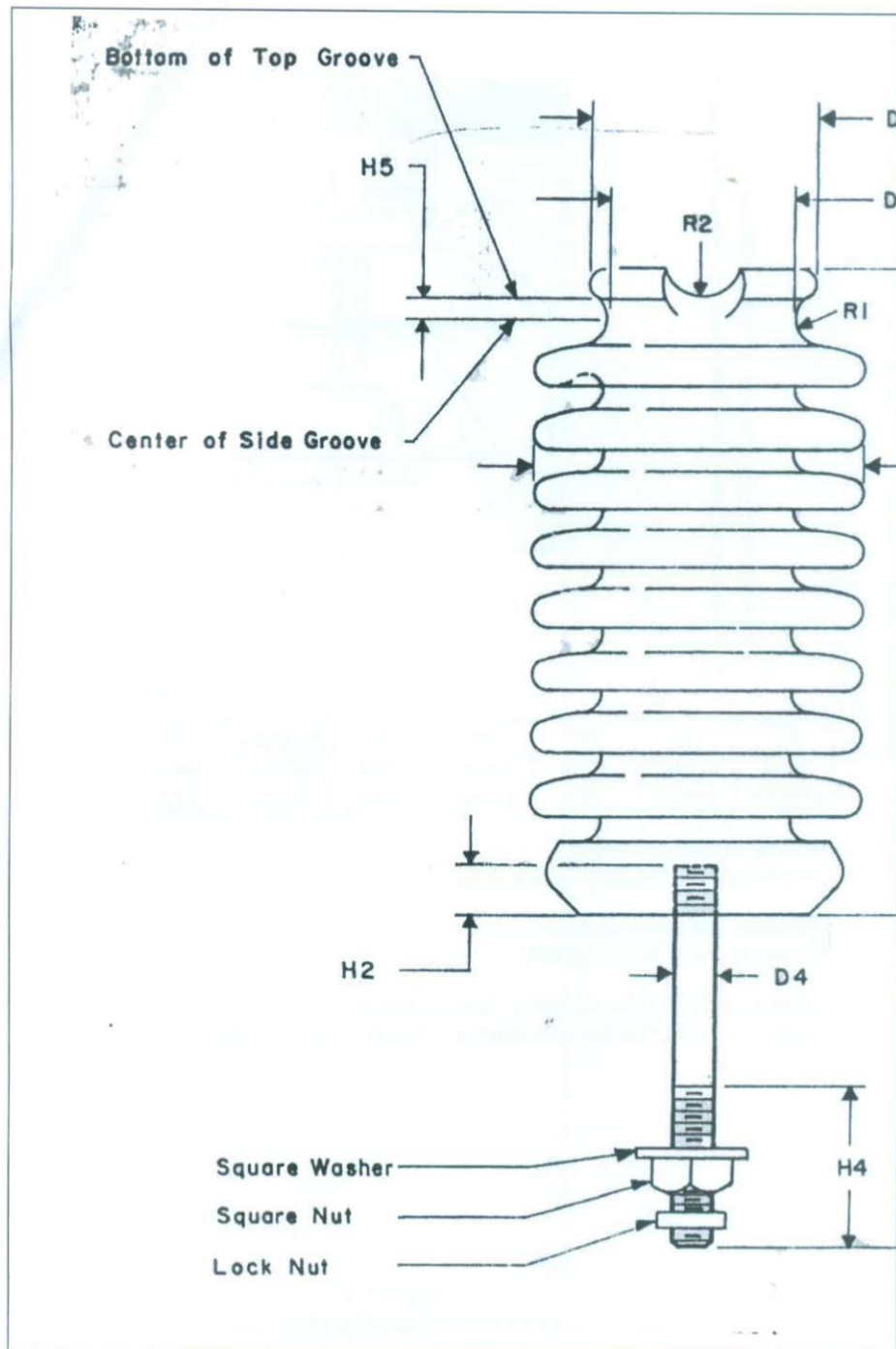
Single letter indicates \pm Variation.

Example: d= ± 0.3175 Cm (1/8 inch)

Two letters indicate + First Variation, - Second Variation.

Example: cx= + 0.15875 Cm (1/16 inch) - 0 = +0.15875 Cm (1/16 inch)

FIGURE-7
33 KV PIN INSULATOR, CLASS 56-3



DIMENSIONS IN Cm (INCHES)

D1	D2	D3	D4	H1	H2	H3	H4	H5 (MIN)	H5 (MAX)	R1 & R2
16.51 (6-1/2)	12.3825 (4-7/8)	7.3025 (2-7/8)	1.905 (3/4)	36.83 (14-1/2)	2.2225 (7/8)	17.78 (7)	8.89 (3-1/2)	1.42875 (9/16)	2.2225 (7/8)	2.54 (1)

Allowable Variation Cm (Inches)

c=0.15875 (1/16), d=0.3175 (1/8), x=0 (0)

Single letter indicates \pm Variation.

Example: d= ± 0.3175 Cm (1/8 inch)

Two letters indicate + First Variation, - Second Variation.

Example: cx= + 0.15875 Cm (1/16 inch) - 0 = +0.15875 Cm (1/16 inch)

SPECIFICATION SUBMISSION AND COMPLIANCE SHEET(Form PG3-5)

(To be filled by the Bidder)

Package No.: URIDS(E)-G-10

Sub-Package No.: URIDS(E)-G-10-03

Item: Insulator

Subject	REB Requirement	Guaranteed Specification
Manufacturer's Name	To be provided	
Item : C-1		
Cat. No.	To be provided	
1) Standard	ANSI C29.5, Class 55-4	
2) Dimensions :-		
i) Leakage distance (Radio free)	9" (22.86cm)	
ii) Dry arcing distance (Radio free)	5" (12.7cm)	
2) Finishing	Smooth glazed surface	
3) Electrical Performance :-		
i) Low frequency dry flashover (Radio free)	65 KV	
ii) Low frequency wet flashover (Radio free)	35 KV	
iii) Critical impulse flashover (+) ve(Radio free)	105 KV	
iv) Critical impulse flashover (-) ve (Radio free)	130 KV	
v) Low frequency puncture voltage (Radio free)	95 KV	
4) RIV Performance requirements :-		
i) Low frequency test voltage	10 KV	
ii) Maxm RIV @ 1.0 MHz (Radio free)	50 micro-volt	
5) Cantilever Strength	3000 lbs	
6) Interior thread	Ceramic thread	
Item : C-2		
Cat No.		
1) Standard	ANSI C29.3, Class 53-4	
2) Finish	Smooth glazed surface	
3) Electrical Performance		
i) Low frequency dry flashover	25 KV	
ii) Low frequency wet fashover (Vertical)	12 KV	
iii) Low frequency wet flashover (Horizontal)	15 KV	
iv) Transverse strength	2041 Kg (4500 lbs)	
v) Dimension	As per bid document	
Item : C-3		
Cat No.		
1) Standard	ANSI C29.3, Class 53-2	
2) Finish	Smooth glazed surface	
3) Electrical Performance		
i) Low frequency dry flashover	25 KV	
ii) Low frequency wet flashover(Vertical)	12 KV	
iii) Low frequency wet fshover (Horizontal)	15 KV	
iv) Transverse strength	1361 Kg (3000 lbs)	
v) Dimension	As per bid document	
Item : C-4		
Cat No.		
1) Standard	ANSI C29.3, Class 53-1	
2) Finish	Smooth glazed surface	
3) Electrical Performance		
i) Low frequency dry flashover	20 KV	
ii) Low frequency wet flashover (Vertical)	8 KV	
iii) Low frequency wet flashover (Horizontal)	10 KV	
iv) Transverse strength	907 Kg (2000 lbs)	
v) Dimension	As per bid document	

R2

250

Subject	REB Requirement	Guaranteed Specification
Item : C-5		
Cat No.		
1) Standard	ANSI C29.6 , Class 56-3	
2) Dimensions		
i) Leakage distance (Radio free)	21" (53.34cm)	
ii) Dry arcing distance (Radio free)	9-1/2" (24.13cm)	
2) Finishing	Smooth glazed surface	
3) Electrical Performance:-		
i) Low frequency dry flashover (Radio free)	125 KV	
ii) Low frequency wet flashover (Radio free)	80 KV	
iii) Critical impulse flashover (+) ve (Radio free)	200 KV	
iv) Critical impulse flashover (-) ve (Radio free)	265 KV	
v) Low frequency puncture voltage (Radio free)	165 KV	
4) RIV Performance Requirements :-		
i) Low frequency test voltage	30 KV	
ii) Maxm RIV @ 1.0 MHz (Radio free)	200 micro-volt	
5) Cantilever strength	3000 lbs	
6) Interior thread	Ceramic thread	
Item : C-10		
Cat No.	To be provided	
1) Standard	ANSI C29.2, Clas 52-1	
2) Leakage distance	7"	
3) Electrical Performance		
i) Low frequency dry flashover	60 KV	
ii) Low frequency wet flashover	30 KV	
iii) Critical impulse flashover (+) ve	100 KV	
iv) Critical impulse flashover (-) ve	100 KV	
v) Low frequency puncture voltage	80 KV	
4) RIV Performance Requirements		
i) Low frequency test voltage	7.5 KV	
ii) Maxm RIV at 1.0 MHz	50 micro-volt	
5) Mechanical Performance :-		
i) Electro-mechanical strength	4536 Kg	
ii) Mechanical impact strength	52 cm-Kg	
iii) Tension proof	2268 Kg	
iv) Time load	2721 Kg	
6) Finishing	Smooth glazed surface	
Item : C-11		
Cat No.		
1) Standard	ANSI C29.2, Class 52-4	
2) Leakage distance	11.5"	
3) Electrical Performance :-		
i) Low frequency dry flashover	80 KV	
ii) Low frequency wet flashover	50 KV	
iii) Critical impulse flashover (+) ve	125 KV	
iv) Critical impulse flashover (-) ve	130 KV	
v) Low frequency puncture voltage	110 KV	
4) RIV Performance Requirements :-		
i) Low frequency test voltage	10 KV	
ii) Maxm RIV at 1.0 MHz	50 micro-volt	
5) Mechanical Performance		
i) Electro-mechanical strength	6804 Kg	
ii) Mechanical impact strength	64 cm-Kg	
iii) Tension proof	3402 Kg	
iv) Time load	4536 Kg	
6) Finishing	Smooth glazed surface	

22

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Subject	REB Requirement	Guaranteed Specification
Test Report :-		To be furnished
1) Electrical Test	a) Low Frequency Dry Flashover Voltage Test	
	b) Low Frequency Wet Flashover Voltage Test	
	c) Low Frequency Dry Withstand Voltage Test	
	d) Low Frequency Wet Withstand Voltage Test	
	e) Impulse Withstand Voltage Test	
	f) Radio Influence Voltage Test	
	g) Visual Corona Test	
	h) Puncture	
2) Mechanical Test	a) Tensile Strength	
	b) Cantilever Strength	
	c) Compression Strength	
	d) Torsional Strength	
	e) Transverse Strength	
	f) Mechanical Impact Strength	
3) Combined Mechanical & Electrical Strength Test for suspension insulators only.		
4) Time Load Withstand Strength Test		
5) Porosity Test		
6) Thermal Test		
7) Pinhol Gauging Test		
8) Galvanizing Test as per ANSI/ASTM B499-75		
9) Routine Electrical Test	a) High Frequency test	
	b) Low Frequency test	
10) Routine Mechanical Test		

Note:-The bidders are required to submit all certified Test Reports as per above description. In the event of non-submission of any Test Report, the bid may be rejected.

Signature of Bidder:

Name:

In the capacity of:


 (মোঃ নাজমুল হাসান)
 সহকারী প্রকৌশলী
 এম্পিএসএল, বাপুবিবো, ঢাকা।


 (Md. Nazmul Haque)
 Project Director
 URIDS (DMCS) Project

3. Drawings

There are drawings for each item (Insulator) of Lot No-3, included with the technical specifications described in serials-2 of Section 6.

4. Inspections and Tests

4.1 Pre-shipment/Pre-delivery Inspection	<ul style="list-style-type: none">(a) PSI Conducted by: Pre-shipment Inspection will be carried out by the purchaser's nominated Inspection Team of 3 members and/or purchaser's appointed PSI agent.(b) Time and Place of Inspection: At least three weeks before the shipment of goods. Tests will be conducted in presence of the Purchaser's nominated inspection team/agent at the manufacturer's laboratory or any other recognized facility as accepted by the Purchaser.(c) Process of Test: Inspection Team and/or PSI agent will randomly collect 5 (five) nos. of samples of each item for inspection from the production line as well as from manufactured quantity. Each sample shall be identified and signed by the Inspection Team or PSI agent. The Inspection Team or PSI agent shall witness the tests as mentioned in Para-4.1.1 of Section-6 in case of Insulator and Para-2.2 (6) of Section-6 in case of Insulator, and will also conduct visual inspection of the physical conditions (identification mark, manufacturer's symbol and year, dimension, pin-hole gauge, damage, deformity, finishing, etc.), quantity and packaging of the goods before shipment and delivery in accordance with GCC clause 26.2(d) Cost: All costs related to inspection & testing during pre-shipment inspection shall be borne by the supplier. However, costing related to travel, accommodation and subsistence of the purchaser's nominated inspectors/agent shall be borne by the purchaser. PSI agent fee (if applicable) will also be borne by the purchaser. If goods are not ready for inspection on due date and time as noticed by the supplier, the additional PSI agent fee (if incurred) will be realized from the supplier.(e) Notice: The supplier shall give a reasonable advance notice, including the place and time thereof to the Purchaser by e-mail/fax at least 45 (forty five) days in advance of the inspection.(f) Shipment Clearance: Purchaser will issue a shipment clearance to the supplier upon receipt of satisfactory PSI report within one week from the date of inspection. The supplier shall not ship the materials before obtaining shipment clearance from the BREB.
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4.2 Post Landing/ Delivery Inspection	<p>(a) The supplier shall inform the Purchaser immediately after arrival of the goods at Final destination. An inspection team nominated by the Purchaser shall perform the post landing inspection in presence of Supplier's representative (if they desire so).</p> <p>(b) The Inspection Team will visually inspect the physical conditions (identification mark, manufacturer's symbol and year, dimension, pin-hole gauge, damage, deformity, finishing, etc.), quantity and packaging of the goods delivered. In case of insulators, delivered materials will be accepted after testing (tests are mentioned below) at BREB facilities and facilities within Bangladesh decided by Purchaser in presence of Supplier's representative (if they desire so).</p> <p><u>For Lot No.URIDS(E)-G-10-03/01</u></p> <ol style="list-style-type: none"> Megger. Dry flashover voltage. Wet flashover voltage. Puncture voltage. Cantilever strength/Electro-mechanical strength.
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5. PACKING, MARKING AND DRAWINGS INSTRUCTIONS FOR BOX DESIGN NO. 1 & 3

AMENDMENT AND ADDENDUM TO:

REB STANDARDS FOR WOODEN CONDUCTOR
REELS, INSULATOR & TRANSFORMER PACKINGS,
ALL RESPECTIVE PUBLICATIONS- 1988
(3 PAGES AFTER AMENDMENT)

ALL RESPECTIVE SECTIONS REGARDING PACKAGING & SHIPING OF CONDUCTOR REELS, INSULATOR & TRANSFORMER WHERE WOODEN PACKINGS ARE APPLICABLE SHALL BE AMMENDE AND ADDED AS FOLLOWS:

ADD IN STANDARDS FOR INSULATORS & TRANSFORMERS: The following table shall be added as a second paragraph under respective sections of packaging and shipping.

REPLACE FROM STANDARDS FOR CONDUCTOR REELS: The existing table in second paragraph regarding preservative treatment shall be replaced by the following new table:

Description	Requirements / Methods		Standards
Lumber/ Timber Species	The following softwoods and hardwoods shall be permitted regardless of countries of origin:		AWPA C1-82, C2-83 & C16-82 & IRG DOC : IRG / WP 96-40071
	Species	Treatment Group	
1	2	3	4

Softwoods (strength group A: green fibre stress 50 N/mm² and above):

- | | | |
|----|---|---|
| 1. | Southern pines (<i>Pinus elliottii</i> , <i>P. taeda</i> , <i>P. echinata</i> , <i>P. Palustris</i>). | A |
| 2. | Douglas fir (incised) (<i>Pseudotsuga menziesii</i>). | A |
| 3. | European red pine (<i>Pinus sylvestris</i>). | A |
| 4. | Caribbean pine (<i>Pinus caribaea</i>). | A |
| 5. | Chir pine (<i>Pinus roxburghii</i>). | A |
| 6. | Larches (<i>Larix</i> spp.) | A |

Softwoods (strength group B: green fibre stress below 50 N/mm² and above 40 N/mm²):

- | | | |
|----|--|---|
| 1. | Pines other than listed under strength group A (<i>Pinus</i> spp.). | A |
| 2. | Firs, Partals (<i>Abies</i> spp). | A |
| 3. | Spruces (<i>Picea</i> spp.). | A |
| 4. | Deodar (<i>Cedrus deodara</i>). | A |
| 5. | Cedars (<i>Thuja</i> spp). | A |
| 6. | Hemlock (<i>Tsuga heterophylla</i>). | A |

Hardwoods (strength group A: green fibre stress 50 N/mm² and above):

- | | | |
|----|--|----------------|
| 1. | Garjan, Keruing (<i>Dipterocarpus</i> spp.). | B |
| 2. | Mango, Amm (<i>Mangifera indica</i>). | B |
| 3. | Uriam (<i>Mangifera sylvatica</i>). | B |
| 4. | Koroi, Sirish (<i>Albizia procera</i> , <i>A. lebbbeck</i> , <i>A. lucida</i> , <i>A. richardiana</i> , <i>A. odoratissima</i>). | A ² |

5.	Batnas, Oaks (<i>Quercus</i> spp.).	A
6.	Birches (<i>Betula</i> spp.).	B
7.	Maples (<i>Acer</i> spp.).	B
8.	Eucalyptus (<i>Eucalyptus</i> spp.).	A
9.	Jams (<i>Syzygium</i> spp.).	B ²
10.	Baens (<i>Avecinnia</i> spp.).	B
11.	Civit (<i>Swintonia floribunda</i>)	A
12.	Minjiri (<i>Cassia siamea</i>).	A
13.	Sissoo (<i>Dalbergia sissoo</i>).	A
14.	Babul, Kikar (<i>Acacia arabica</i>).	A
15.	Devdaru (<i>Polyalthia longifolia</i>).	B

Hardwoods(Strength group B: green fibre stress below 50 N/mm² and above 40 N/mm²):

1.	Rubberwood (<i>Hevea brasiliensis</i>).	B
2.	Bats, Pakurs (<i>Ficus</i> spp.).	B
3.	Raintree (<i>Samania saman</i>).	A
4.	Keoras (<i>Sonneratia</i> spp.).	B
5.	Korois other than listed under strength group A (<i>Albizia</i> spp.).	A
6.	Kadam (<i>Anthocephalus cadamba</i>).	B

Notes: Treatment Group A= Timber Species with durable and impermeable heartwood.
Treatment Group B= Timber Species with permeable/treatable heartwood.
1. Except *A. richardiana* which falls under treatment group B.
2. Only kalojam (*S. gambolana*), others fall under treatment group B.

Manufacturing: A single packing unit including laggings shall either be constructed with timber of strength group A having specified nominal size and thickness of lumber or constructed with lumber of strength group B having thickness of lumber at least 1.5 times higher than specified nominal.

Preservatives: (any one) Either salt or oxide formulated Acid Copper Chromate (ACC)/Chromated Copper Boron (CCB). Bidder shall furnish any of these preservatives, trade names of preservative shall not be acceptable. **AWPA P5-83, C1-82, C2-83, and C16-82. & IRG DOC: IRG\WP 96-40071.**

Preservative Treatment: Full cell pressure treatment after all carpentry works. One treatment charge shall include one species and one commodity, seasoned at same moisture content (not more than 20% MC for all hardwoods and not more than 25% MC for all softwoods at centerline of a piece). Impregnation pressure shall not be less than 10 kg/cm² and initial vacuum shall not be less than 559 mm of Hg. **AWPA C1-82, C16-82. & IRG DOC: IRG\WP 96-40071.**

Results of Treatment:

Penetration of Preservative : For the timber species under treatment group A, only complete (100%) sapwood shall be penetrated with preservative. For the timber species under treatment group B, complete (100%) sapwood and at least 10mm (including sapwood and hardwood) from the surface of any face, shall be penetrated with preservative. The penetration of preservative shall be governed by the presence of Copper component in borings. Only complete (100%) heartwood shall be penetrated with boron where heartwood is non durable. **AWPA C16-82. & IRG DOC: IRG\WP 96-40071.**

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Assay zone : Assay shall include borings, which penetrated up to zones specified for assay. Borings taken from the center of wide surface of a piece shall only be assayed. For all species of timber, the assay zone shall be 0 mm to 15 mm (0 to 0.62 inch). **AWPA C16-82 & IRG DOC: IRG/WP 96-40071.**

Preservative Retention: Copper shall be calculated as CuO and Chromium as CrO₃. The minimum retention shall be w/w 1.56% dry oxides (1.56 kg dry oxides in 98.44 kg of oven dry wood) for CCB and ACC in specified assay zone within the following limits: **AWPA C1-82, C2-83 & C16-82. & IRG DOC: IRG/WP 96-40071.**

Preservative	Specified retention (w/w%).	Minimum retention of individual components (w/w%)			Minimum sum of individual components assayed (w/w%)
		CrO ₃	CuO	H ₃ BO ₃	
CCB/ACC	1.56	0.85	0.40	0.31	1.56

A tolerance of -10% from the specified minimum retention is acceptable during destination inspection.

Tests:	1) Wet ash analysis for oxides.	AWPA A7-75, A2-85 (Section 2.5.6).
	2) X-ray.	AWPA A9-86.
	3) Atomic absorption.	AWPA A7-75 and A11-83.

ADD IN STANDARDS FOR INSULATORS & TRANSFORMERS:

The following paragraph shall be added as a new and first paragraph of sections for packaging and shipping:

"Insulator /transformer shall be shipped in non -returnable boxes manufactured from export quality preservative treated "wood". Wooden boxes shall be constructed from new lumber which shall be square sawn (wood without crossgrain), be of smooth surface, with no splits, warps, crooks, loose fibres decay or insect infestation. The timber used for standard wooden boxes shall be preservative treated in accordance with "American Wood Preservers' Association Standards" and as stipulated below:".





BANGLADESH RURAL ELECTRIFICATION BOARD
Office of the Timber Products Specialist & Environment Monitoring Cell
WOODEN PACKING SPECIFICATION SUBMISSION SHEET
(Attachment to the Tender Submission Sheet)
(To be filled by the Tenderer)

Form No. TPF 073-007
Version - 01
Approved date: 22/07/2013

Sub-package No.

BREB SHIPPING BOX DESIGN NO. 3:
Applicable for all Insulators ("C" Items)

Technical Particulars	BREB Specification	Guaranteed Specification
1) Bidders' Name:	To be mentioned.	
2) Authorized Manufacturers' Name:	To be mentioned.	
3) Standard of manufacturing:	Must be: As per BREB Shipping Box Design No. 3 (Revised July 2000)	
4) BREB Items: C	Must be furnished: The appropriate Design for the Items as per BREB Shipping Box Design No. 3 (Revised July 2000)	
5) Physical Requirements:	Must be as follows: All material and equipment shall be packed for export shipment to a tropical climate in wooden shipping boxes that are <u>sufficiently durable</u> to withstand numerous handling. The shipping boxes shall strong enough to prevent loss from pilferage or damage sustained from stacking, shipping or handling. Workmanship in the manufacture of the wooden shipping boxes shall be of the highest standard and the material used shall be in accordance with the best commercial practices. All lumber used shall be new, <u>well seasoned</u> , sound, and free of splits, decay or an excessive number of knots. Plywood used shall be new, free of splits and decay and shall be exterior grade quality. Note: " <u>Sufficiently durable</u> " means either the lumber shall be completely heartwood or mixture of sapwood and heartwood with preservative treatment of lumber with CCB having penetration of complete sapwood and treatable heartwood (if any) and retention of w/w 1.56% dry oxides of CCB in an assay zone of 0" to 0.62" as per BREB Specification for Wooden Conductor Reels. The sapwood of any timber species is not sufficiently durable. " <u>Well seasoned</u> " means lumber shall be kiln dried; otherwise the lumber shall not be well seasoned.	
6) Dimension of Box:	Must be as follows: The maximum number of pieces of equipment allowable per box will determine the size of the shipping boxes. For dimension of each C item, see Table-1 attached with Shipping Box Design No. 3 (Revised July 2000)	
7) Thickness of Battens and Separators (mm):	Must be as follows: For thickness of battens and separators in mm of each C item, see Table-1 attached with Shipping Box Design No. 3 (Revised July 2000).	
8) Box Preparation:	Must be as follows: (i) All framing shall be located on the outside of the insulator box. (ii) Insulators shall be separated, both horizontally and vertically by wood partitions/separators. (iii) Each insulator box shall be banded with 2 (two) 12.7mm wide steel bands or 15 mm (+/-0.5 mm) wide & 01 (One) mm thickness of PVC bands installed horizontally (lengthways).	
9) Preservative Treatment:	Must be as follows: As per Foot Note No. 8 of Table-1 of Shipping Box Design No. 3 (Revised July 2000), all wooden battens and separators shall be pressure treated with Chromated Copper Boron (CCB) to have preservative penetration of 100% sapwood and dry oxide retention of weight per weight (w/w) 1.56% in all treated zone equivalent to maximum thickness used in lumber.	
10) Penalization formula for packing deviations detected during Post-Landing inspection of BREB Shipping Box Design No. 3	Must be as per BREB Board Decision No. 13848 (Board Session 525, Date: 20-01-2015)	

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SHIPPING BOX DESIGN ON- 3 (Revised July 2000)
For Shipment of Insulator (C-Items)

Exhibit H-3
Page 1 of 2

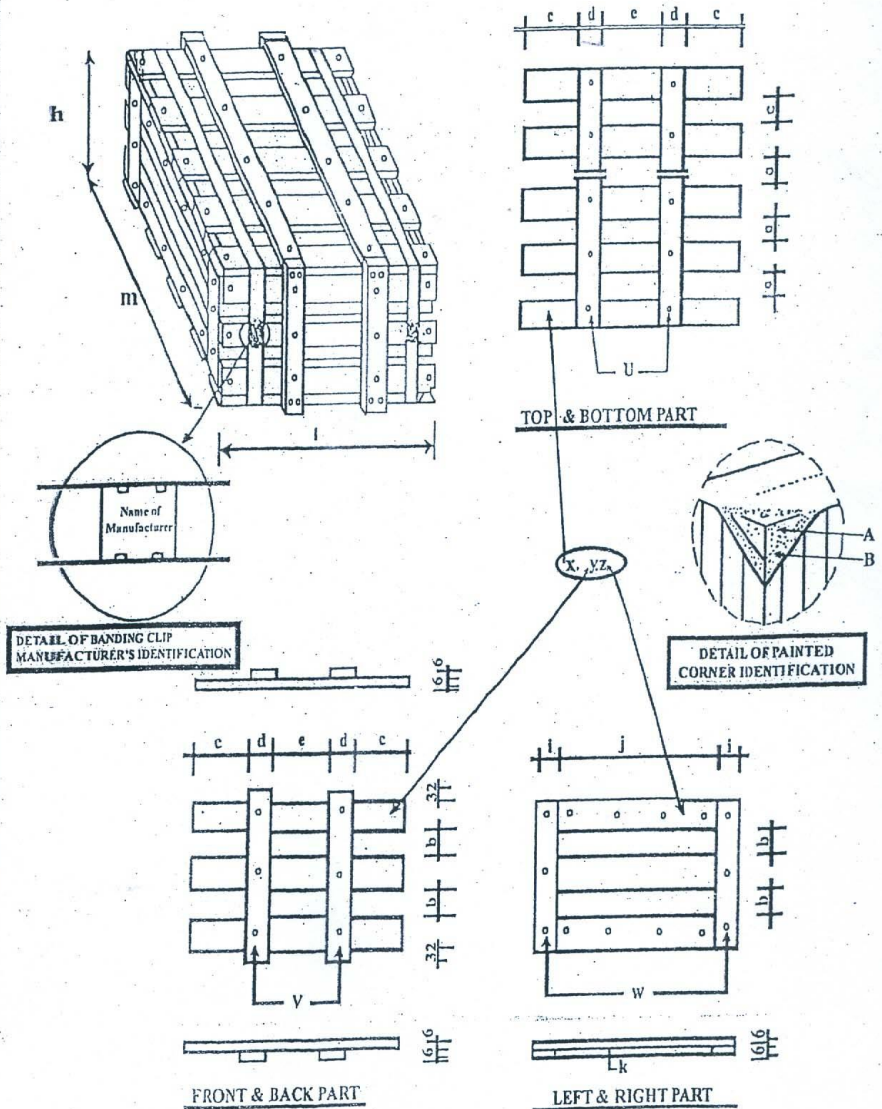


Table-1

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Item	Dimension of Insulator Box, Batten & Separator in mm					No. of Insulator per box
	C-1	C-2/C-3/C-4	C-5	C-10	C-11	
l x m x h	835 x 340 x 270	645 x 400 x 300	645 x 610 x 225	560 x 395 x 360	610 x 580 x 300	
x'	2 x 4 x 835 x 50 x 16	2 x 3 x 645 x 70 x 16	2 x 5 x 645 x 60 x 16	2 x 4 x 560 x 75 x 16	2 x 5 x 610 x 70 x 16	C-1=20 Pcs
y'	2 x 3 x 835 x 50 x 16	2 x 3 x 645 x 70 x 16	2 x 3 x 645 x 60 x 16	2 x 3 x 560 x 75 x 16	2 x 3 x 610 x 70 x 16	C-2=45 Pcs
z'	2 x 3 x 308 x 50 x 16	2 x 3 x 268 x 70 x 16	2 x 3 x 578 x 60 x 16	2 x 3 x 363 x 75 x 16	2 x 3 x 548 x 70 x 16	C-3=72 Pcs
k'	2 x 2 x 208 x 50 x 16	2 x 2 x 268 x 70 x 16	2 x 2 x 458 x 60 x 16	2 x 2 x 263 x 75 x 16	2 x 2 x 428 x 70 x 16	C-4=144 Pcs
u'	2 x 2 x 340 x 50 x 16	2 x 2 x 400 x 50 x 16	2 x 2 x 610 x 60 x 16	2 x 2 x 395 x 75 x 16	2 x 2 x 580 x 60 x 16	C-5=4 Pcs
v'	2 x 2 x 302 x 50 x 16	2 x 2 x 332 x 50 x 16	2 x 2 x 257 x 60 x 16	2 x 2 x 392 x 75 x 16	2 x 2 x 332 x 60 x 16	C-10=12 Pcs
w'	2 x 2 x 238 x 50 x 16	2 x 2 x 268 x 50 x 16	2 x 2 x 193 x 60 x 16	2 x 2 x 328 x 50 x 16	2 x 2 x 268 x 60 x 16	C-11=6 Pcs
a	4667	40	77.5	3167	57.5	
b	44	29	65	51.5	29	
c	250	170	178	152	167	
d	50	50	60	75	60	
e	235	205	169	106	156	
i	50	50	60	50	60	
j	208	268	458	263	428	
Separator	i) 5 x 290 x 145 x 3.5 ii) 8 x 220 x 145 x 3.5 i) 2 x 755 x 100 x 3.5	i) N x 540 x 70 x 3.5 ii) N x 255 x 60 x 3.5	i) 4 x 575 x 60 x 18	i) 3 x 360 x 50 x 18 ii) 2 x 360 x 75 x 18 iii) 2 x 490 x 75 x 18	i) 3 x 548 x 60 x 18	

- 1) Allowable variations of l, m & h is +/- 5mm and accordingly of the length of x, y & z respectively.
- 2) Allowable variations of length of x, y, z, k, u, v, & w is +/- 5mm accordingly to the variations of l, m & h.
- 3) (') Marks means minimum breadth & width (thickness) are given in the above Table-1.
- 4) Minimum sizes of separators are given in the above Table-1 but according to the actual requirement higher sizes are acceptable.
- 5) "N" means "as required number".
- 6) All Framing shall be located on the outside of the box.
- 7) All insulators shall be separated both horizontally and vertically by wood partitions.
- 8) All wooden part shall be treated with chemical preservatives according to the requirement of REB.