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LAPP Insulators: An Industry Leader

Porcelain suspension insulators have a very long useful life. Over the years efficient porcelain designs have evolved to become highly standardized. This standardization permits an exact definition of ratings, as well as precisely defined design and quality control testing. Through the decades, LAPP Insulators has been responsible for many developments in porcelain suspensions, including improvements in design, assembly, materials and testing which have significantly contributed to today's standards.

1. Hardware

Standard, High-Strength and Fog-type porcelain suspensions are available for ball-socket or clevis-eye insulator coupling. Caps are ferrous, hot-dip galvanized.

2. Cement Assembly

Caps are cemented on the porcelain. This loads the porcelain in a large area, low-intensity compression grip. LAPP specifies the use of cement well-suited for porcelain insulator assemblies.

3. Galvanized Hardware

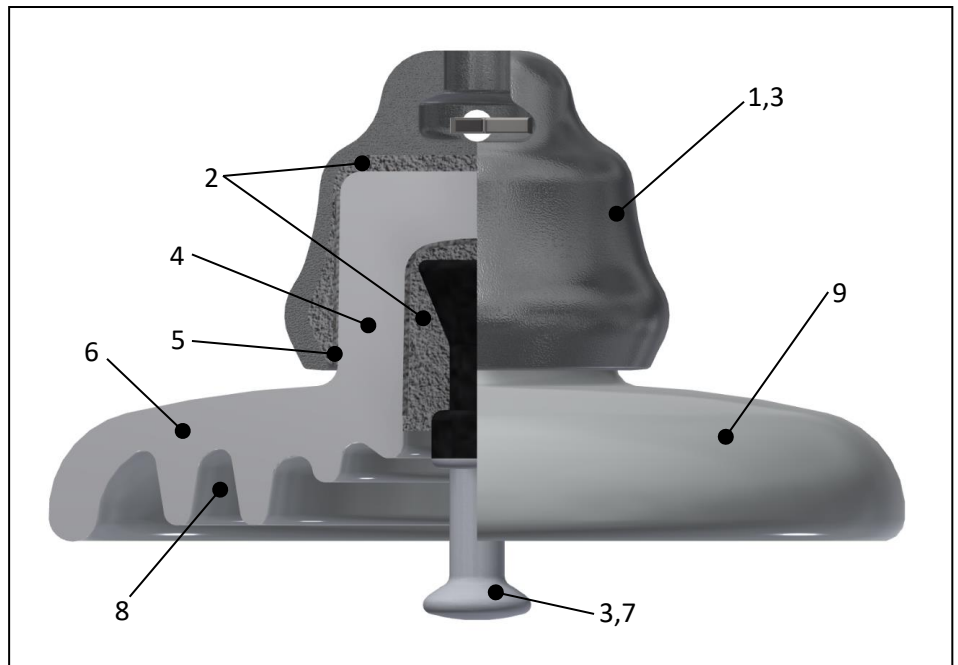
Before cementing, all surfaces of the hardware that will come in contact with the cement are coated. The coating protects the hardware from chemical attack by the cement. It also allows for the relief of mechanical stress due to thermal variations.

4. Straight Head Design

First implemented by LAPP in 1948, the straight headed porcelain shell design provides a uniform distribution of mechanical stresses across the head surface, greatly reducing concentrated mechanical stresses associated with conical or “dove-tailed” porcelain shell designs.

5. Bonded Sand Bands

Sand bands bonded to the porcelain by glaze provide a rough gripping surface for permanently attaching hardware. The sand band helps distribute mechanical stresses evenly though the porcelain.



6. Sound Porcelain and Assembly

Porcelain suspension insulators are made from fully vitrified porcelain designed to meet strength requirements. Assembled units are subjected to rigorous electrical and mechanical tests before shipment.

7. Forged Steel Bolts

All strength ratings of porcelain suspension insulators use a forge-steel ball bolt or eye bolt that has been hot-dip galvanized. Most ball-socket units are available with a choice of straight (regular) or zinc sleeve ball bolt.

8. Protected Leakage

The porcelain shell is designed to provide optimum leakage distance in relation to the shell diameter. The sturdy shell design also protects the leakage corrugations from mechanical damage.

9. Glazes

Porcelain suspension insulators are available in a choice of four glaze colors: light gray-ANSI 70, dark gray, brown and royal blue. Please consult the tables in this catalog to determine which colors are available for specific products.

- **Strength Ratings**

A complete product line allows transmission design engineers to specify exactly what they want in strength ratings.

- Porcelain suspension insulators are available in ball-and-socket and clevis-eye designs for M&E strength ratings of 20,000 lbs., 30,000 lbs., 40,000 lbs. and 50,000 lbs. for conventional disc type suspensions
- Fog-type suspension designs are also available for M&E strength ratings of 20,000 lbs., 30,000 lbs. and 40,000 lbs.
- M&E strength ratings of 66,000 and 90,000 lbs. are available upon request

- **Radio and TV Interference-free**

Porcelain suspension insulators are designed to be free of radio and TV interference. Hardware is smoothly contoured with well-rounded edges to reduce Radio Interference Voltage (RIV).

- **Fog-type Porcelain Suspensions**

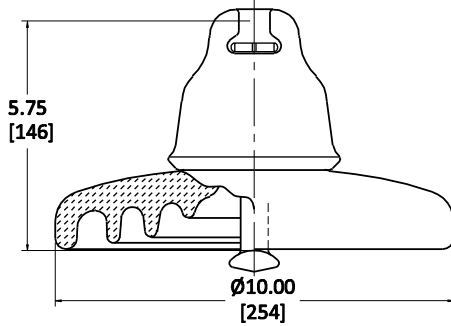
These suspensions provide up to 50% more leakage distance than standard porcelain suspension insulators.

- **Markings on Insulators**

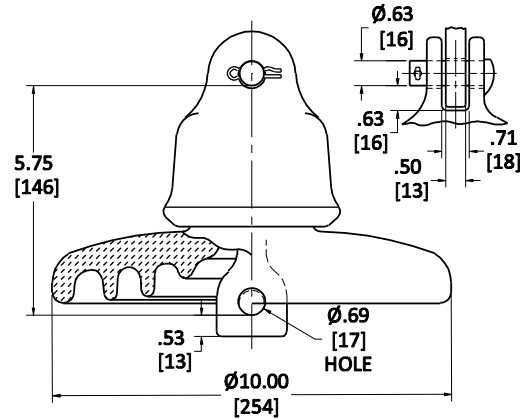
Porcelain suspension insulators are marked with the year of manufacture, country of origin, M&E rating and proof test rating of the insulators.

- **High grade electrical porcelain**

Electrical grade porcelain is free from internal stresses that can cause spontaneous shattering in toughened glass insulators. Electrical grade porcelain has been the preferred insulating material for high voltage transmission for many decades.



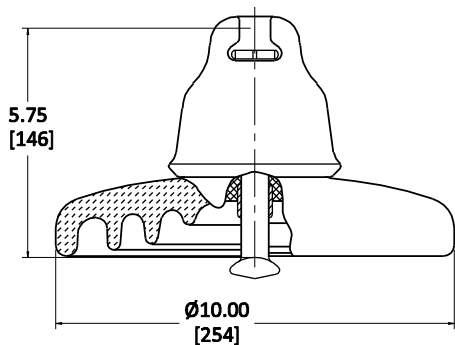
52-3-H, 52-5-H
Ball & Socket



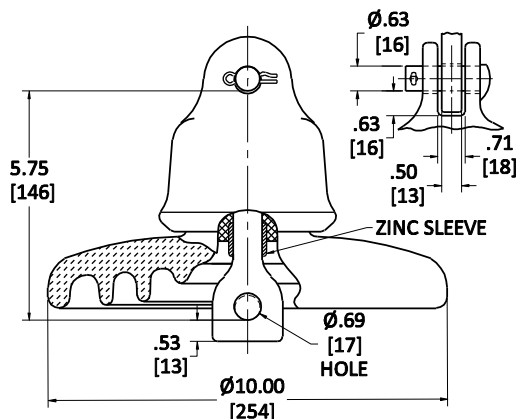
52-4-H, 52-6-H
Clevis – Tongue

Characteristics

Catalog Number (Light Gray-ANSI 70)	8200-70	8100-70	5960A-70	2300-70
Catalog Number (Brown)	8200	8100	5960A	2300
ANSI Class	52-3-H	52-4-H	52-5-H	52-6-H
Connection Type	B&S Type B	Clevis	B&S Type J	Clevis
Dimensions				
Leakage Distance, in. [mm]	11.5 [292]	11.5 [292]	11 [279]	11 [279]
Mechanical Values				
Combined M&E Strength, lbs. [kN]	20,000 [89]	20,000 [89]	30,000 [133]	30,000 [133]
Impact Strength, in-lbs. [Nm]	90 [10]	90 [10]	90 [10]	90 [10]
Routine Proof Test Load, lbs. [kN]	10,000 [44.5]	10,000 [44.5]	15,000 [66.5]	15,000 [66.5]
Maximum Working Load, lbs. [kN]	10,000 [44.5]	10,000 [44.5]	15,000 [66.5]	15,000 [66.5]
Electrical Values				
Low Frequency Dry Flashover, kV	80	80	80	80
Low Frequency Wet Flashover, kV	50	50	50	50
Critical Impulse Flashover, Positive, kV	125	125	125	125
Critical Impulse Flashover, Negative, kV	130	130	130	130
Low Frequency Puncture Voltage, kV	110	110	110	110
Radio Influence Voltage [RIV] Data				
Test Voltage-RMS to Ground, kV	10	10	10	10
Maximum RIV-Microvolts at 1000 kHz	50	50	50	50



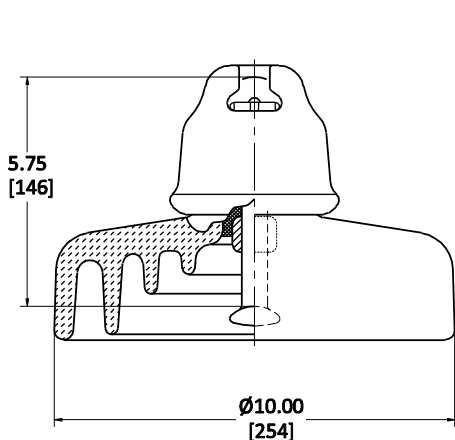
52-3-H, 52-5-H
Ball & Socket
w/ Zinc Sleeve



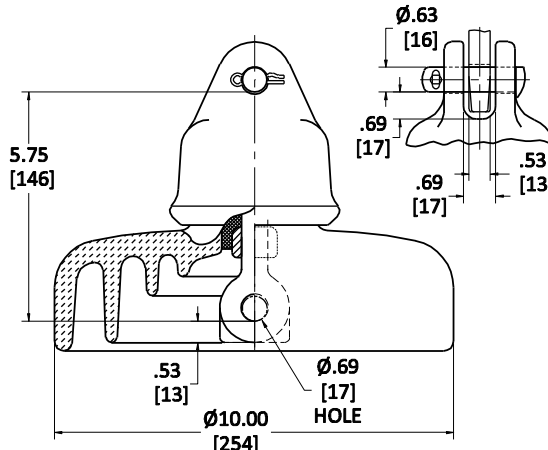
52-4-H, 52-6-H
Clevis - Tongue
w/ Zinc Sleeve

Characteristics

Catalog Number (Light Gray-ANSI 70)	8200Z-70	8100Z-70	5960AZ-70	2300Z-70
Catalog Number (Brown)	8200Z	8100Z	5960AZ	---
ANSI Class	52-3-H	52-4-H	52-5-H	52-6-H
Connection Type	B&S Type B	Clevis	B&S Type J	Clevis
Dimensions				
Leakage Distance, in. [mm]	11.5 [292]	11.5 [292]	11 [279]	11 [279]
Mechanical Values				
Combined M&E Strength, lbs. [kN]	20,000 [89]	20,000 [89]	30,000 [133]	30,000 [133]
Impact Strength, in.-lbs. [Nm]	90 [10]	90 [10]	90 [10]	90 [10]
Routine Proof Test Load, lbs. [kN]	10,000 [44.5]	10,000 [44.5]	15,000 [66.5]	15,000 [66.5]
Maximum Working Load, lbs. [kN]	10,000 [44.5]	10,000 [44.5]	15,000 [66.5]	15,000 [66.5]
Electrical Values				
Low Frequency Dry Flashover, kV	80	80	80	80
Low Frequency Wet Flashover, kV	50	50	50	50
Critical Impulse Flashover, Positive, kV	125	125	125	125
Critical Impulse Flashover, Negative, kV	130	130	130	130
Low Frequency Puncture Voltage, kV	110	110	110	110
Radio Influence Voltage [RIV] Data				
Test Voltage-RMS to Ground, kV	10	10	10	10
Maximum RIV-Microvolts at 1000 kHz	50	50	50	50



**Ball & Socket
w/ Zinc Sleeve**

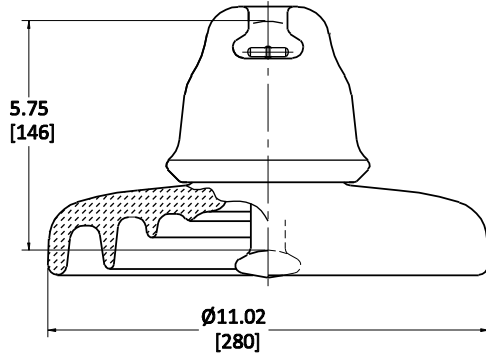


**Clevis – Tongue
w/ Zinc Sleeve**

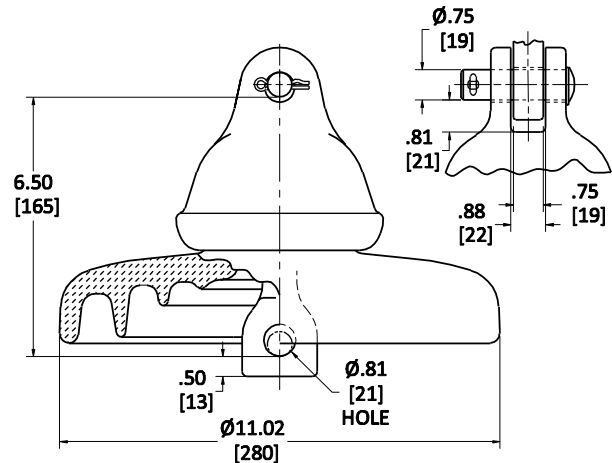
Characteristics

Catalog Number (Light Gray-ANSI 70)	302268Z-70	302500-70	302718EZ-70	303025-70
Catalog Number (Brown)	302268Z	302500	302718AEZ	303025A
ANSI Class	---	---	---	---
Connection Type	B&S Type B	Clevis	B&S Type J	Clevis
Dimensions				
Leakage Distance, in. [mm]	17 [432]	17 [432]	17 [432]	17 [432]
Mechanical Values				
Combined M&E Strength, lbs. [kN]	20,000 [89]	20,000 [89]	30,000 [133]	30,000 [133]
Impact Strength, in-lbs. [Nm]	90 [10]	90 [10]	90 [10]	90 [10]
Routine Proof Test Load, lbs. [kN]	10,000 [44.5]	10,000 [44.5]	15,000 [66.5]	15,000 [66.5]
Maximum Working Load, lbs. [kN]	10,000 [44.5]	10,000 [44.5]	15,000 [66.5]	15,000 [66.5]
Electrical Values				
Low Frequency Dry Flashover, kV	80	80	80	80
Low Frequency Wet Flashover, kV	50	50	50	50
Critical Impulse Flashover, Positive, kV	125	125	125	125
Critical Impulse Flashover, Negative, kV	130	130	130	130
Low Frequency Puncture Voltage, kV	110	110	110	110
Radio Influence Voltage [RIV] Data				
Test Voltage-RMS to Ground, kV	10	10	10	10
Maximum RIV-Microvolts at 1000 kHz	50	50	50	50

Note: all insulators tested per ANSI C29.2B



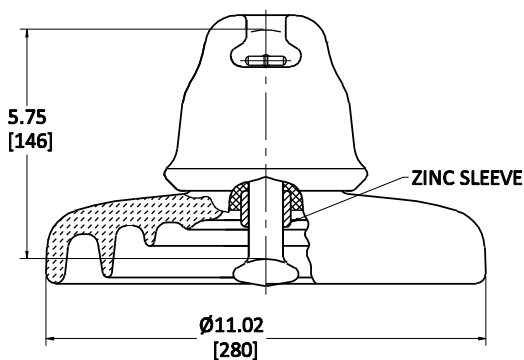
Ball & Socket



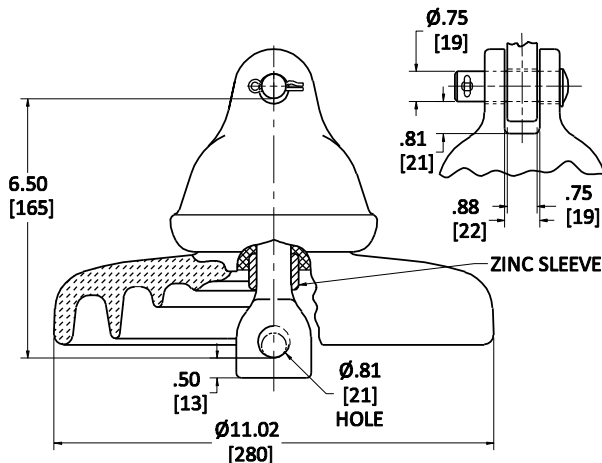
Clevis - Tongue

Characteristics

Catalog Number (Light Gray-ANSI 70)	61236H-70	97503-70	---	---
Catalog Number (Brown)	61236H	97503	---	---
ANSI Class	52-8-H	52-10-H	---	---
Connection Type	B&S Type K	Clevis	---	---
Dimensions				
Leakage Distance, in. [mm]	11 [279]	12.8 [325]	---	---
Mechanical Values				
Combined M&E Strength, lbs. [kN]	40,000 [178]	40,000 [178]	---	---
Impact Strength, in-lbs. [Nm]	100 [11.3]	100 [11.3]	---	---
Routine Proof Test Load, lbs. [kN]	20,000 [89]	20,000 [89]	---	---
Maximum Working Load, lbs. [kN]	20,000 [89]	20,000 [89]	---	---
Electrical Values				
Low Frequency Dry Flashover, kV	80	80	---	---
Low Frequency Wet Flashover, kV	50	50	---	---
Critical Impulse Flashover, Positive, kV	125	125	---	---
Critical Impulse Flashover, Negative, kV	130	130	---	---
Low Frequency Puncture Voltage, kV	110	110	---	---
Radio Influence Voltage [RIV] Data				
Test Voltage-RMS to Ground, kV	10	10	---	---
Maximum RIV-Microvolts at 1000 kHz	50	50	---	---



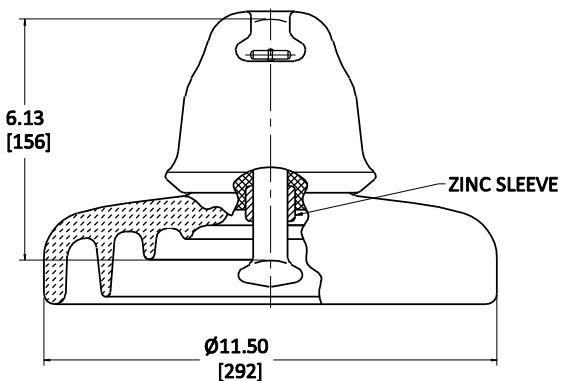
**Ball & Socket
w/ Zinc Sleeve**



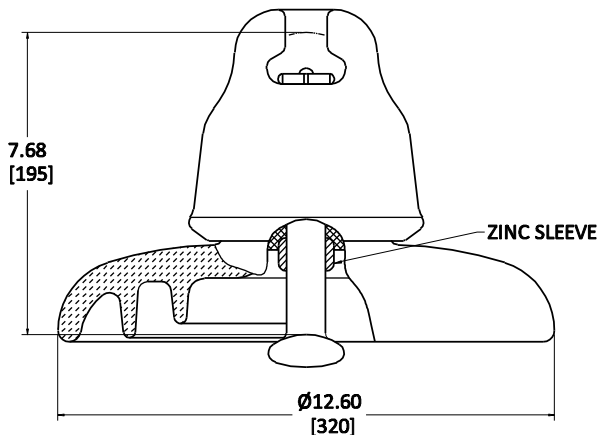
**Clevis - Tongue
w/ Zinc Sleeve**

Characteristics

Catalog Number (Light Gray-ANSI 70)	61236HZ-70	97503Z-70	---	---
Catalog Number (Brown)	61236HZ	97503Z	---	---
ANSI Class	52-8-H	52-10-H	---	---
Connection Type	B&S Type K	Clevis	---	---
Dimensions				
Leakage Distance, in. [mm]	11 [279]	12.8 [325]	---	---
Mechanical Values				
Combined M&E Strength, lbs. [kN]	40,000 [178]	40,000 [178]	---	---
Impact Strength, in-lbs. [Nm]	100 [11.3]	100 [11.3]	---	---
Routine Proof Test Load, lbs. [kN]	20,000 [89]	20,000 [89]	---	---
Maximum Working Load, lbs. [kN]	20,000 [89]	20,000 [89]	---	---
Electrical Values				
Low Frequency Dry Flashover, kV	80	80	---	---
Low Frequency Wet Flashover, kV	50	50	---	---
Critical Impulse Flashover, Positive, kV	125	125	---	---
Critical Impulse Flashover, Negative, kV	130	130	---	---
Low Frequency Puncture Voltage, kV	110	110	---	---
Radio Influence Voltage [RIV] Data				
Test Voltage-RMS to Ground, kV	10	10	---	---
Maximum RIV-Microvolts at 1000 kHz	50	50	---	---



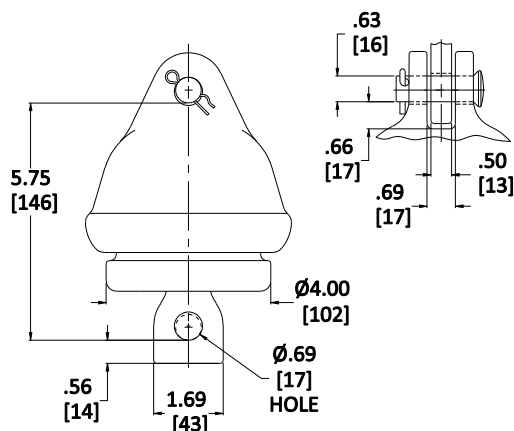
95000Z
Ball & Socket
w/ Zinc Sleeve (50,000 lbs.)



321108Z
Ball & Socket
w/ Zinc Sleeve (66,000 lbs.)

Characteristics

Catalog Number (Light Gray-ANSI 70)	95000Z-70	321108Z-70	---	---
Catalog Number (Brown)	95000Z	321108Z	---	---
ANSI Class	52-11	---	---	---
Connection Type	B&S Type K	B&S	---	---
Dimensions				
Leakage Distance, in. [mm]	15.9 [405]	15.35 [390]	---	---
Mechanical Values				
Combined M&E Strength, lbs. [kN]	50,000 [222]	66,000 [300]	---	---
Impact Strength, in-lbs. [Nm]	100 [11.3]	90 [10.2]	---	---
Routine Proof Test Load, lbs. [kN]	25,000 [111]	33,000 [150]	---	---
Maximum Working Load, lbs. [kN]	25,000 [111]	33,000 [150]	---	---
Electrical Values				
Low Frequency Dry Flashover, kV	80	75	---	---
Low Frequency Wet Flashover, kV	50	45	---	---
Critical Impulse Flashover, Positive, kV	140	110	---	---
Critical Impulse Flashover, Negative, kV	140	-	---	---
Low Frequency Puncture Voltage, kV	125	120	---	---
Radio Influence Voltage [RIV] Data				
Test Voltage-RMS to Ground, kV	10	10	---	---
Maximum RIV-Microvolts at 1000 kHz	50	50	---	---



93823-70

Characteristics

Catalog Number (Light Gray-ANSI 70)	93823-70
Connection Type	Clevis
Dimensions	
Leakage Distance, in. [mm]	1.5 [38.1]
Mechanical Values	
Combined M&E Strength, lbs. [kN]	30,000 [133]
Impact Strength, in-lbs. [Nm]	15,000 [67]
Routine Proof Test Load, lbs. [kN]	18,000 [80]
Maximum Working Load, lbs. [kN]	15,000 [67]
Electrical Values	
Low Frequency Dry Flashover, kV	25
Low Frequency Wet Flashover, kV	10
Critical Impulse Flashover, Positive, kV	45
Critical Impulse Flashover, Negative, kV	40
Low Frequency Puncture Voltage, kV	110
Radio Influence Voltage [RIV] Data	
Test Voltage-RMS to Ground, kV	10
Maximum RIV-Microvolts at 1000 kHz	50

Based on laboratory results in accordance with ANSI standards. FOR REFERENCE ONLY

5 3/4" x 10" Suspension Discs					
Units in string	60 Hz Flashover-kV		Impulse Flashover-kV		Dry Arcing Distance, inches
	Dry	Wet	Pos.	Neg.	
2	155	90	250	250	13.50
3	215	130	355	340	19.25
4	270	170	440	415	25.00
5	325	215	525	495	30.50
6	380	255	610	585	36.25
7	435	295	695	670	42.00
8	485	335	780	760	47.75
9	540	375	860	845	53.50
10	590	415	945	930	59.25
11	640	455	1025	1015	65.00
12	690	490	1105	1105	70.75
13	735	525	1185	1190	76.50
14	785	565	1265	1275	82.25
15	830	600	1345	1360	88.00
16	875	630	1425	1445	93.75
17	920	660	1505	1530	99.50
18	965	690	1585	1615	105.25
19	1010	720	1665	1700	111.00
20	1055	750	1745	1785	116.75
21	1080	845	1760	1845	122.50
22	1120	885	1835	1925	128.25
23	1155	925	1915	2010	134.00
24	1190	965	1995	2095	139.75
25	1220	1005	2075	2180	145.50
26	1255	1045	2155	2265	151.25
27	1285	1085	2235	2350	157.00
28	1320	1125	2315	2435	162.75
29	1350	1165	2395	2520	168.50
30	1380	1205	2475	2605	174.25

LAPP Catalog Number	M&E Rating Lbs.	Internal LAPP Code	Net Weight, Each, pounds	Number in Standard Package	Count Per Pallet	Pallet Weight, Pounds at 72 Count	Pallet Weight, Pounds at 96 Count	Truckload Quantity, 1 Tier at 96 Count per Pallet and 1 Tier at 72 Count per Pallet (Unless Otherwise Noted)
Porcelain Suspensions: Standard strength units								
8100	20,000	D	16.4	6	72/96	1,181	1,574	2,592
8200	20,000	D	14.2	6	72/96	1,022	1,363	3,024
8200	20,000	K	11.8	6	72/96	850	1,133	3,528
8200Z	20,000	D	14.3	6	72/96	1,030	1,373	3,024
8200Z	20,000	K	11.8	6	72/96	850	1,133	3,528
5960A, G	30,000	D	16.1	6	72/96	1,159	1,546	2,688
5960A, G	30,000	K	13.1	6	72/96	943	1,258	3,192
5960AZ, GZ, YCR	30,000	D	16.3	6	72/96	1,174	1,565	2,688
5960AZ, GZ, YCR	30,000	K	13.2	6	72/96	950	1,267	3,192
2300	30,000	K	13.7	6	72/96	986	1,315	3,024
Porcelain Suspensions: High strength units								
61236, E	40,000	D	20.2	6	72/96	1,441	1,922	2,160
61236, E	40,000	K	15.3	6	72/96	1,102	1,469	2,688
61236H	40,000	D	20.2	6	72/96	1,441	1,922	2,160
61236H	40,000	K	15.6	6	72/96	1,123	1,498	2,688
61236Z, HZ, EZ	40,000	D	20.5	6	72/96	1,476	1,968	2,160
61236Z, HZ, EZ	40,000	K	15.7	6	72/96	1,130	1,507	2,688
61236BCR	40,000	D	20.5	6	72/96	1,968	1,968	2,160
97503	40,000	D	17	6	72/96	1,324	1,732	2,160
97503	40,000	K	17	6	72/96	1,324	1,732	2,688
095000	50,000	D	23.1	6	72/96	1,764	2,318	1,872
095000	50,000	K	23.1	6	72/96	1,764	2,318	1,980 (90 per pallet only; 1 tier only)
095000Z	50,000	D	23.39	6	72/96	1,684	2,245	1,872
095000Z	50,000	K	22.26	6	72/96	1,764	2,003	1,980 (90 per pallet only; 1 tier only)

LAPP Catalog Number	M&E Rating Lbs.	Internal LAPP Code	Net Weight, Each, pounds	Number in Standard Package	Count Per Pallet	Pallet Weight, Pounds at 72 Count	Pallet Weight, Pounds at 96 Count	Truckload Quantity, 1 Tier at 96 Count per Pallet and 1 Tier at 72 Count per Pallet (Unless Otherwise Noted)
Porcelain Suspensions: Fog type units								
302268Z	20,000	D	18.6	6	72/96	1,339	1,786	2,304
302268Z	20,000	K	17.6	6	72/96	1,267	1,690	2,352
302500Z	20,000	K	14.0	6	72/96	1,063	1,399	2,352
302718, EZ, AEZ	30,000	K	17.6	6	72/96	1,267	1,690	2,352
302718YCR	30,000	K	17.6	6	72/96	1,267	1,690	2,352
303025Z	30,000	D	15.3	6	72/96	1102	1469	2,352
303025Z	30,000	K	15.3	6	72/96	1102	1469	2,352
303026Z	40,000	D	19.0	6	72/96	1368	1824	2,352
303026Z	40,000	K	19.0	6	72/96	1368	1824	2,352
303027Z	40,000	D	19.0	6	72/96	1368	1824	2,352
303027Z	40,000	K	19.0	6	72/96	1368	1824	2,352
Porcelain Suspensions: Ground Wire insulator								
93823	30,000	N/A	8.5 (3.9)	6	216	N/A	1,968 (892.7)	N/A