Piedmont Bushings & Insulators, LLC

"Quality Products at Competitive Prices"

ANSI A20 Indoor Apparatus Insulator Catalog

Piedmont Bushings & Insulators, LLC
251 Harris Bridge Road
P.O. Box 849
Woodruff, SC 29388

Phone: (864) 476-6360
Fax: (864) 476-6376

PBI Supplies ANSI A-20 Indoor Bus Type Insulators Manufactured to ANSI C29.10 Standards Ranging in Height from 3.5" to 7.5"

Piedmont Bushings & Insulators, LLC
251 Harris Bridge Road
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Woodruff, SC 29388

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Data Sheet - ANSI A20 Bus Insulators

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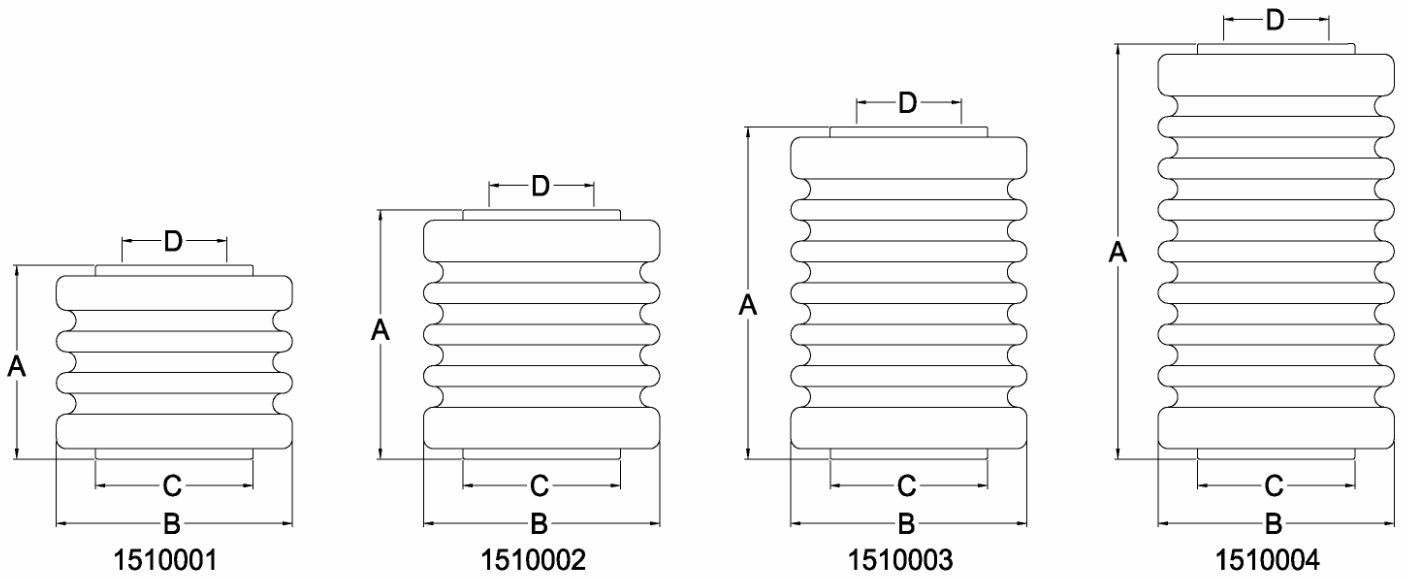
Piedmont Bushings & Insulators, LLC

"Quality Products at Competitive Prices"

A-20 Indoor Bus Type Insulators



Part Number	1510001	1510002	1510003	1510004
Perimeter Tapped Holes	3/8-16	3/8-16	3/8-16	3/8-16
Center Tapped Hole	1/2-13	1/2-13	1/2-13	1/2-13
Height - A (Inches)	3.5	4.5	6	7.5
Outside Diameter - B (Inches)	4.5	4.5	4.5	4.5
Fitting Diameter - C (Inches)	2.75	2.75	2.75	2.75
Bolt Circle - D (Inches)	2	2	2	2
Voltage Rating (kV)	4.8	7.2	13.2	14.4
Impulse Withstand (kV)	60	75	95	110
Low Freq. Dry Withstand (kV)	19	26	36	50
Cantilever Strength (Lbs.)	1000	1500	1250	1000
Torsion Strength (In.-Lbs.)	2500	3500	3500	3500
Tension Strength (Lbs.)	2000	3000	3000	3000
Compression Strength (Lbs.)	20000	20000	20000	20000

Piedmont Bushings & Insulators, LLC
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Test Reports with Drawings - ANSI A20 Bus Insulators

Piedmont Bushings & Insulators, LLC
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Phone: (864) 476-6360
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Piedmont Bushings & Insulators, LLC

"Quality Products At Competitive Prices"

Design and Quality Conformance Test Report

Test Unit: ANSI 3.5" A-20 Indoor Apparatus Insulator

Test Unit:	ANSI 3.5” A-20 Indoor Apparatus Insulator
Part Number:	1510001
Sample Quantity:	15 Units
Test Type:	Design and Quality Conformance Test
Referenced Standards:	ANSI C29.10- 1989
	ANSI C29.1-1988
Original Test Report Provided By:	Manufacturer
Report Number:	YG03-031
Date Testing Was Conducted:	September 28, 2003
Date Report Was Prepared:	October 28, 2003
Report Prepared By:	Tom Martin, MSCE

Testing Conclusion:

All units tested passed the testing according to all applicable requirements of the referenced standards.

Table of Contents:

1.0 General Unit Design and Specifications

Refer to Appendix 1.

2.0 Quality Conformance Test Results

2.1 Visual Inspection and Dimensional Verification

Three sample units were visually inspected for glaze, cement joint and hardware quality. All units inspected had good quality glaze, cement joint and galvanizing. The units were then subjected to verification of dimensions according to Clause 8.3.1 in ANSI C29.10-1989. The data for these measurements are shown in Table 1 below.

Sample Number	Height (Inches)	Porcelain Diameter (Inches)	Creepage Distance (Inches)
Specification	3.50 +/- 0.03	4.50 Maximum	5.00 Minimum
13	3.50	4.45	5.04
14	3.51	4.43	5.08
15	3.52	4.49	5.12
Average	3.51	4.45	5.08
Std. Deviation	0.01	0.03	0.04

Table 1

2.2 Cantilever Strength Test

Samples 13, 14 and 15 were subjected to a Cantilever Strength Test in accordance with Clause 8.3.4 of ANSI C29.10-1989. The results of this testing are shown in Table 2 below. All samples met the minimum Cantilever Strength requirements.

Sample Number	Cantilever Strength (Lbs.)	Specification (Lbs.)
13	1709	1000
14	1754	
15	1619	
Average	1694	
Standard Deviation	69	N/A

Table 2

2.3 Galvanizing Test

A galvanizing thickness test was conducted on 5 randomly selected samples in accordance with Clause 8.3.3 of ANSI C29.10-1989. The visual inspection showed that the coating was continuous, uniform and smooth. The results of the galvanizing thickness measurement are shown in Table 3 below.

Galvanizing Thickness (Mils.)

Sample Number	Average of Individual Samples		Average of All Samples	
	Specification	Measured	Specification	Measured
1	3.1	3.8	3.4	3.8
2		3.8		
3		3.9		
4		3.7		
5		3.9		

Table 3

2.4 Porosity Test

A porosity test was carried out on porcelain fragments from samples 13, 14 and 15 according to Clause 8.3.2 of ANSI C29.10-1989. A pressure of 4000 PSI was applied to the dye chamber for 5 hours. No penetration of the dye into the porcelain was observed.

3.0 Design Test Results

3.1 Impulse Withstand Test

Samples 4, 5 and 6 were subjected to an Impulse Withstand Test in accordance with Clause 8.2.2 of ANSI C29.10-1989. The results of this testing are shown in Table 4 below. All units passed the testing.

Sample Number	Applied Voltage (kV)	Corrected Voltage (kV)	Rated Voltage (kV)
4	62	61.9	60
5	62		
6	62		

Table 4

3.2 Low Frequency Dew Withstand Test

Samples 10, 11and 12 were subjected to a Low-Frequency Dew Withstand Test in accordance with Clause 8.2.6 of ANSI C29.10-1989. The results of this testing are shown in Table 5 below.

Sample Number	Applied Voltage (kV)	Corrected Voltage (kV)	Rated Voltage (kV)
10	20	18.2	15
11	20		
12	20		

Table 5

3.3 Tensile Strength Testing

Samples 1, 2 and 3 were subjected to Tensile Strength Testing in accordance with Clause

8.2.1 of ANSI C29.10-1989. The results of this testing are shown in Table 6 below. All samples met the minimum Tensile Strength requirements.

Sample Number	Tensile Strength (Lbs.)	Specification (Lbs.)
1	2293	2000
2	2383	
3	2316	
Average	2331	
Standard Deviation	47	N/A

Table 6

3.4 Torsional Strength Testing

Samples 7, 8 and 9 were subjected to Torsional Strength Testing in accordance with Clause 8.2.5 of ANSI C29.10-1989. The results of this testing are shown in Table 7 below. All samples met the minimum Torsional Strength requirements.

Sample Number	Torsional Strength (In-Lbs.)	Specification (In-Lbs.)
7	3523	2500
8	3717	
9	3638	
Average	3626	
Standard Deviation	98	N/A

Table 7

3.5 Compressive Strength Testing

Samples 4, 5 and 6 were subjected to a Compressive Strength Test in accordance with Clause 8.2.3 of ANSI C29.10-1989. The results of this testing are shown in Table 8 below. All units met the minimum Compressive Strength requirements without failure.

Sample Number	Compressive Strength (Lbs.)	Specification (Lbs.)
4	22212	20000
5	22190	
6	21695	
Average	22032	
Standard Deviation	292	N/A

Table 8

3.6 Thermal Shock Test

Thermal Shock testing was conducted on Samples 7, 8 and 9 according to Clause 8.2.4 of ANSI C29.10-1989. The temperature of the hot and cold water bathes were 150°F and

39°F respectively. Upon completion of the thermal cycle testing, all samples were inspected visually and subjected to a one minute Power Frequency Flashover Test with no failures.

Appendix 1

Piedmont Bushings and Insulators, LLC
251 Harris Bridge Road
Woodruff, SC 29388
Phone: (864) 476-6360
FAX: (864) 476-6376

PIEDMONT BUSHINGS & INSULATORS, LLC

Drawing Number: 1510001	Catalog Number: 1510001	
Date: October 17, 2002	Description: 3.5" ANSI A-20 Indoor Apparatus Insulator	
Reference:	Drawn By: T. Martin	Approved By:

Revision Desription	Revision Date
Added one decimal place general tolerance.	09-01-04

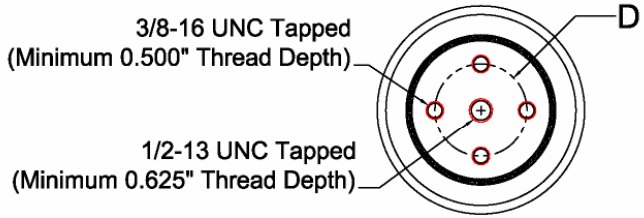
Tolerances Unless Otherwise Noted

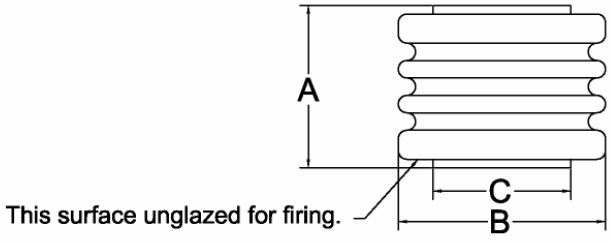
Three Place Decimal General Tolerance: 0.005
Two Place Decimal General Tolerance: 0.03
One Place Decimal General Tolerance: +/-3%
Angle Tolerance: 1 Degree

Materials

Porcelain Body	ANSI/IEC C-120 Wet Process Porcelain - Light Gray Glazed
Hardware	Hot Dip Galvanized Malleable Iron

Physical Data	
Perimeter Tapped Holes (UNC)	3/8 - 16
Center Tapped Hole (UNC)	1/2 - 13
Height - A (Inches) [mm]	3.50 [89]
Outside Diameter - B (Inches) [mm]	4.5 [114]
Fitting Diameter - C (Inches) [mm]	3.0 [76]
Bolt Circle - D (Inches) [mm]	2.00 [51]
Electrical Data	
Voltage Rating (kV)	4.8
Impulse Withstand (kV)	60.0
Low Frequency Dew Withstand (kV)	15.0
Mechanical Data	
Cantilever Strength (Lbs) [kN]	1000 [4]
Torsional Strength (In-Lbs) [N-m]	2500 [282]
Tensile Strength (Lbs) [kN]	2000 [9]
Compressive Strength (Lbs) [kN]	20000 [89]





Piedmont Bushings & Insulators, LLC

"Quality Products At Competitive Prices"

Design and Quality Conformance Test Report

Test Unit: ANSI 4.5" A-20 Indoor Apparatus Insulator

Piedmont Bushings and Insulators, LLC
251 Harris Bridge Road
Woodruff, SC 29388

Phone: (864) 476-6360
FAX: (864) 476-6376

Test Unit:	ANSI 4.5” A-20 Indoor Apparatus Insulator
Part Number:	1510002
Sample Quantity:	15 Units
Test Type:	Design and Quality Conformance Test
Referenced Standards:	ANSI C29.10- 1989
	ANSI C29.1-1988
Original Test Report Provided By:	Manufacturer
Report Number:	YG03-032
Date Testing Was Conducted:	September 28, 2003
Date Report Was Prepared:	October 28, 2003
Report Prepared By:	Tom Martin, MSCE

Testing Conclusion:

All units tested passed the testing according to all applicable requirements of the referenced standards.

Table of Contents:

1.0 General Unit Design and Specifications

Refer to Appendix 1.

2.0 Quality Conformance Test Results

2.1 Visual Inspection and Dimensional Verification

Three sample units were visually inspected for glaze, cement joint and hardware quality. All units inspected had good quality glaze, cement joint and galvanizing. The units were then subjected to verification of dimensions according to Clause 8.3.1 in ANSI C29.10-1989. The data for these measurements are shown in Table 1 below.

Sample Number	Height (Inches)	Porcelain Diameter (Inches)	Creepage Distance (Inches)
Specification	4.50 +/- 0.03	4.50 Maximum	6.50 Minimum
13	4.49	4.45	6.57
14	4.52	4.43	6.57
15	4.50	4.49	6.65
Average	4.50	4.45	6.60
Std. Deviation	0.02	0.03	0.05

Table 1

2.2 Cantilever Strength Test

Samples 13, 14 and 15 were subjected to a Cantilever Strength Test in accordance with Clause 8.3.4 of ANSI C29.10-1989. The results of this testing are shown in Table 2 below. All samples met the minimum Cantilever Strength requirements.

Sample Number	Cantilever Strength (Lbs.)	Specification (Lbs.)
13	2091	1500
14	2136	
15	2023	
Average	2083	
Standard Deviation	57	N/A

Table 2

2.3 Galvanizing Test

A galvanizing thickness test was conducted on 5 randomly selected samples in accordance with Clause 8.3.3 of ANSI C29.10-1989. The visual inspection showed that the coating was continuous, uniform and smooth. The results of the galvanizing thickness measurement are shown in Table 3 below.

Galvanizing Thickness (Mils.)				
Sample Number	Average of Individual Samples		Average of All Samples	
	Specification	Measured	Specification	Measured
1	3.1	3.8	3.4	3.8
2		3.8		
3		3.9		
4		3.7		
5		3.9		

Table 3

2.4 Porosity Test

A porosity test was carried out on porcelain fragments from samples 13, 14 and 15 according to Clause 8.3.2 of ANSI C29.10-1989. A pressure of 4000 PSI was applied to the dye chamber for 5 hours. No penetration of the dye into the porcelain was observed.

3.0 Design Test Results

3.1 Impulse Withstand Test

Samples 4, 5 and 6 were subjected to an Impulse Withstand Test in accordance with Clause 8.2.2 of ANSI C29.10-1989. The results of this testing are shown in Table 4 below.

Sample Number	Applied Voltage (kV)	Corrected Voltage (kV)	Rated Voltage (kV)
4	78	77.4	75
5	78		
6	78		

Table 4

3.2 Low Frequency Dew Withstand Test

Samples 10, 11and 12 were subjected to a Low-Frequency Dew Withstand Test in accordance with Clause 8.2.6 of ANSI C29.10-1989. The results of this testing are shown in Table 5 below.

Sample Number	Applied Voltage (kV)	Corrected Voltage (kV)	Rated Voltage (kV)
10	26	25.0	24
11	26		
12	26		

Table 5

3.3 Tensile Strength Testing

Samples 1, 2 and 3 were subjected to Tensile Strength Testing in accordance with Clause 8.2.1 of ANSI C29.10-1989. The results of this testing are shown in Table 6 below. All samples met the minimum Tensile Strength requirements.

Sample Number	Tensile Strength (Lbs.)	Specification (Lbs.)
1	3462	3000
2	3327	
3	3462	
Average	3417	
Standard Deviation	78	N/A

Table 6

3.4 Torsional Strength Testing

Samples 7, 8 and 9 were subjected to Torsional Strength Testing in accordance with Clause 8.2.5 of ANSI C29.10-1989. The results of this testing are shown in Table 7 below. All samples met the minimum Torsional Strength requirements.

Sample Number	Torsional Strength (In-Lbs.)	Specification (In-Lbs.)
7	4806	3500
8	5196	
9	5001	
Average	5001	
Standard Deviation	195	N/A

Table 7

3.5 Compressive Strength Testing

Samples 4, 5 and 6 were subjected to a Compressive Strength Test in accordance with Clause 8.2.3 of ANSI C29.10-1989. The results of this testing are shown in Table 8 below. All units met the minimum Compressive Strength requirements without failure.

Sample Number	Compressive Strength (Lbs.)	Specification (Lbs.)
4	22032	20000
5	23381	
6	22932	
Average	22782	
Standard Deviation	687	N/A

Table 8

3.6 Thermal Shock Test

Thermal Shock testing was conducted on Samples 7, 8 and 9 according to Clause 8.2.4 of ANSI C29.10-1989. The temperature of the hot and cold water bathes were 150°F and 39°F respectively. Upon completion of the thermal cycle testing, all samples were inspected visually and subjected to a one minute Power Frequency Flashover Test with no failures.

Appendix 1

PIEDMONT BUSHINGS & INSULATORS, LLC

Drawing Number: 1510002 | Catalog Number: 1510002

Date: October 17, 2002

Reference:

Description: 4.5" ANSI A-20 Indoor Apparatus Insulator

Drawn By: T. Martin | Approved By:

Revision Description	Revision Date
Added one decimal place general tolerance.	09-01-04

Tolerances Unless Otherwise Noted

Three Place Decimal General Tolerance: 0.005
Two Place Decimal General Tolerance: 0.03
One Place Decimal General Tolerance: +/-3%
Angle Tolerance: 1 Degree

Materials

Porcelain Body	ANSI/IEC C-120 Wet Process Porcelain - Light Gray Glazed
Hardware	Hot Dip Galvanized Malleable Iron

Physical Data

Perimeter Tapped Holes (UNC)	3/8 - 16
Center Tapped Hole (UNC)	1/2 - 13
Height - A (Inches) [mm]	4.50 [114]
Outside Diameter - B (Inches) [mm]	4.5 [114]
Fitting Diameter - C (Inches) [mm]	3.0 [70]
Bolt Circle - D (Inches) [mm]	2.00 [51]

Electrical Data

Voltage Rating (kV)	7.2
Impulse Withstand (kV)	75.0
Low Frequency Dew Withstand (kV)	24.0

Mechanical Data

Cantilever Strength (Lbs) [kN]	1500 [7]
Torsional Strength (In-Lbs) [N-m]	3500 [395]
Tensile Strength (Lbs) [kN]	3000 [13]
Compressive Strength (Lbs) [kN]	20000 [89]

Piedmont Bushings & Insulators, LLC

"Quality Products At Competitive Prices"

Design and Quality Conformance Test Report

Test Unit: ANSI 6.0" A-20 Indoor Apparatus Insulator

Piedmont Bushings and Insulators, LLC
251 Harris Bridge Road
Woodruff, SC 29388

Phone: (864) 476-6360
FAX: (864) 476-6376

Test Unit:	ANSI 6.0” A-20 Indoor Apparatus Insulator
Part Number:	1510003
Sample Quantity:	15 Units
Test Type:	Design and Quality Conformance Test
Referenced Standards:	ANSI C29.10- 1989 ANSI C29.1-1988
Original Test Report Provided By:	Manufacturer
Report Number:	YG03-033
Date Testing Was Conducted:	September 28, 2003
Date Report Was Prepared:	October 28, 2003
Report Prepared By:	Tom Martin, MSCE

Testing Conclusion:

All units tested passed the testing according to all applicable requirements of the referenced standards.

Table of Contents:

1.0 General Unit Design and Specifications

Refer to Appendix 1.

2.0 Quality Conformance Test Results

2.1 Visual Inspection and Dimensional Verification

Three sample units were visually inspected for glaze, cement joint and hardware quality. All units inspected had good quality glaze, cement joint and galvanizing. The units were then subjected to verification of dimensions according to Clause 8.3.1 in ANSI C29.10-1989. The data for these measurements are shown in Table 1 below.

Sample Number	Height (Inches)	Porcelain Diameter (Inches)	Creepage Distance (Inches)
Specification	6.00 +/- 0.03	4.50 Maximum	9.00 Minimum
13	6.01	4.49	9.21
14	6.02	4.49	9.29
15	6.01	4.49	9.21
Average	6.01	4.49	9.24
Std. Deviation	0.00	0.00	0.05

Table 1

2.2 Cantilever Strength Test

Samples 13, 14 and 15 were subjected to a Cantilever Strength Test in accordance with Clause 8.3.4 of ANSI C29.10-1989. The results of this testing are shown in Table 2 below. All samples met the minimum Cantilever Strength requirements.

Sample Number	Cantilever Strength (Lbs.)	Specification (Lbs.)
13	1754	1250
14	1799	
15	1888	
Average	1814	
Standard Deviation	69	N/A

Table 2

2.3 Galvanizing Test

A galvanizing thickness test was conducted on 5 randomly selected samples in accordance with Clause 8.3.3 of ANSI C29.10-1989. The visual inspection showed that the coating was continuous, uniform and smooth. The results of the galvanizing thickness measurement are shown in Table 3 below.

Galvanizing Thickness (Mils.)				
Sample Number	Average of Individual Samples		Average of All Samples	
	Specification	Measured	Specification	Measured
1	3.1	3.8	3.4	3.8
2		3.8		
3		3.9		
4		3.7		
5		3.9		

Table 3

2.4 Porosity Test

A porosity test was carried out on porcelain fragments from samples 13, 14 and 15 according to Clause 8.3.2 of ANSI C29.10-1989. A pressure of 4000 PSI was applied to the dye chamber for 5 hours. No penetration of the dye into the porcelain was observed.

3.0 Design Test Results

3.1 Impulse Withstand Test

Samples 4, 5 and 6 were subjected to an Impulse Withstand Test in accordance with Clause 8.2.2 of ANSI C29.10-1989. The results of this testing are shown in Table 4 below.

Sample Number	Applied Voltage (kV)	Corrected Voltage (kV)	Rated Voltage (kV)
4	100	98.1	95
5	100		
6	100		

Table 4

3.2 Low Frequency Dew Withstand Test

Samples 10, 11and 12 were subjected to a Low-Frequency Dew Withstand Test in accordance with Clause 8.2.6 of ANSI C29.10-1989. The results of this testing are shown in Table 5 below.

Sample Number	Applied Voltage (kV)	Corrected Voltage (kV)	Rated Voltage (kV)
10	36	34.6	26
11	36		
12	36		

Table 5

3.3 Tensile Strength Testing

Samples 1, 2 and 3 were subjected to Tensile Strength Testing in accordance with Clause 8.2.1 of ANSI C29.10-1989. The results of this testing are shown in Table 6 below. All samples met the minimum Tensile Strength requirements.

Sample Number	Tensile Strength (Lbs.)	Specification (Lbs.)
1	3372	3000
2	3417	
3	3507	
Average	3432	
Standard Deviation	69	N/A

Table 6

3.4 Torsional Strength Testing

Samples 7, 8 and 9 were subjected to Torsional Strength Testing in accordance with Clause 8.2.5 of ANSI C29.10-1989. The results of this testing are shown in Table 7 below. All samples met the minimum Torsional Strength requirements.

Sample Number	Torsional Strength (In-Lbs.)	Specification (In-Lbs.)
7	5196	3500
8	5240	
9	5151	
Average	5196	
Standard Deviation	44	N/A

Table 7

3.5 Compressive Strength Testing

Samples 4, 5 and 6 were subjected to a Compressive Strength Test in accordance with Clause 8.2.3 of ANSI C29.10-1989. The results of this testing are shown in Table 8 below. All units met the minimum Compressive Strength requirements without failure.

Sample Number	Compressive Strength (Lbs.)	Specification (Lbs.)
4	25854	20000
5	32149	
6	27653	
Average	28552	
Standard Deviation	3242	N/A

Table 8

3.6 Thermal Shock Test

Thermal Shock testing was conducted on Samples 7, 8 and 9 according to Clause 8.2.4 of ANSI C29.10-1989. The temperature of the hot and cold water bathes were 150°F and 39°F respectively. Upon completion of the thermal cycle testing, all samples were inspected visually and subjected to a one minute Power Frequency Flashover Test with no failures.

Appendix 1

PIEDMONT BUSHINGS & INSULATORS, LLC

Drawing Number: 1510003 | Catalog Number: 1510003

Date: October 10, 2002 | Description: 6.0" ANSI A-20 Indoor Apparatus Insulator

Reference: | Drawn By: T. Martin | Approved By:

Revision Desription	Revision Date
Added one decimal place general tolerance.	09-01-04

Tolerances Unless Otherwise Noted

Three Place Decimal General Tolerance: 0.005
Two Place Decimal General Tolerance: 0.03
One Place Decimal General Tolerance: +/-3%
Angle Tolerance: 1 Degree

Materials

Porcelain Body	ANSI/IEC C-120 Wet Process Porcelain - Light Gray Glazed
Hardware	Hot Dip Galvanized Malleable Iron
Physical Data	
Perimeter Tapped Holes (UNC)	3/8 - 16
Center Tapped Hole (UNC)	1/2 - 13
Height - A (Inches) [mm]	6.00 [152]
Outside Diameter - B (Inches) [mm]	4.5 [114]
Fitting Diameter - C (Inches) [mm]	3.0 [70]
Bolt Circle - D (Inches) [mm]	2.00 [51]
Electrical Data	
Voltage Rating (kV)	13.2
Impulse Withstand (kV)	95.0
Low Frequency Dew Withstand (kV)	26.0
Mechanical Data	
Cantilever Strength (Lbs) [kN]	1250 [6]
Torsional Strength (In-Lbs) [N-m]	3500 [395]
Tensile Strength (Lbs) [kN]	3000 [13]
Compressive Strength (Lbs) [kN]	20000 [89]

Piedmont Bushings & Insulators, LLC

"Quality Products At Competitive Prices"

Design and Quality Conformance Test Report

Test Unit: ANSI 7.5" A-20 Indoor Apparatus Insulator

Piedmont Bushings and Insulators, LLC
251 Harris Bridge Road
Woodruff, SC 29388

Phone: (864) 476-6360
FAX: (864) 476-6376

Test Unit:	ANSI 7.5” A-20 Indoor Apparatus Insulator
Part Number:	1510004
Sample Quantity:	15 Units
Test Type:	Design and Quality Conformance Test
Referenced Standards:	ANSI C29.10- 1989
	ANSI C29.1-1988
Original Test Report Provided By:	Manufacturer
Report Number:	YG03-034
Date Testing Was Conducted:	September 28, 2003
Date Report Was Prepared:	October 28, 2003
Report Prepared By:	Tom Martin, MSCE

Testing Conclusion:

All units tested passed the testing according to all applicable requirements of the referenced standards.

Table of Contents:

1.0 General Unit Design and Specifications

Refer to Appendix 1.

2.0 Quality Conformance Test Results

2.1 Visual Inspection and Dimensional Verification

Three sample units were visually inspected for glaze, cement joint and hardware quality. All units inspected had good quality glaze, cement joint and galvanizing. The units were then subjected to verification of dimensions according to Clause 8.3.1 in ANSI C29.10-1989. The data for these measurements are shown in Table 1 below.

Sample Number	Height (Inches)	Porcelain Diameter (Inches)	Creepage Distance (Inches)
Specification	7.50 +/- 0.03	4.50 Maximum	11.00 Minimum
13	7.52	4.49	11.54
14	7.51	4.45	11.57
15	7.50	4.49	11.46
Average	7.51	4.48	11.52
Std. Deviation	0.01	0.02	0.06

Table 1

2.2 Cantilever Strength Test

Samples 13, 14 and 15 were subjected to a Cantilever Strength Test in accordance with Clause 8.3.4 of ANSI C29.10-1989. The results of this testing are shown in Table 2 below. All samples met the minimum Cantilever Strength requirements.

Sample Number	Cantilever Strength (Lbs.)	Specification (Lbs.)
13	1281	1000
14	1394	
15	1529	
Average	1401	
Standard Deviation	124	N/A

Table 2

2.3 Galvanizing Test

A galvanizing thickness test was conducted on 5 randomly selected samples in accordance with Clause 8.3.3 of ANSI C29.10-1989. The visual inspection showed that the coating was continuous, uniform and smooth. The results of the galvanizing thickness measurement are shown in Table 3 below.

Galvanizing Thickness (Mils.)				
Sample Number	Average of Individual Samples		Average of All Samples	
	Specification	Measured	Specification	Measured
1	3.1	3.8	3.4	3.8
2		3.8		
3		3.9		
4		3.7		
5		3.9		

Table 3

2.4 Porosity Test

A porosity test was carried out on porcelain fragments from samples 13, 14 and 15 according to Clause 8.3.2 of ANSI C29.10-1989. A pressure of 4000 PSI was applied to the dye chamber for 5 hours. No penetration of the dye into the porcelain was observed.

3.0 Design Test Results

3.1 Impulse Withstand Test

Samples 4, 5 and 6 were subjected to an Impulse Withstand Test in accordance with Clause 8.2.2 of ANSI C29.10-1989. The results of this testing are shown in Table 4 below.

Sample Number	Applied Voltage (kV)	Corrected Voltage (kV)	Rated Voltage (kV)
4	114	113.5	110
5	114		
6	114		

Table 4

3.2 Low Frequency Dew Withstand Test

Samples 10, 11and 12 were subjected to a Low-Frequency Dew Withstand Test in accordance with Clause 8.2.6 of ANSI C29.10-1989. The results of this testing are shown in Table 5 below.

Sample Number	Applied Voltage (kV)	Corrected Voltage (kV)	Rated Voltage (kV)
10	50	48.0	30
11	50		
12	50		

Table 5

3.3 Tensile Strength Testing

Samples 1, 2 and 3 were subjected to Tensile Strength Testing in accordance with Clause 8.2.1 of ANSI C29.10-1989. The results of this testing are shown in Table 6 below. All samples met the minimum Tensile Strength requirements.

Sample Number	Tensile Strength (Lbs.)	Specification (Lbs.)
1	3395	3000
2	3440	
3	3462	
Average	3432	
Standard Deviation	34	N/A

Table 6

3.4 Torsional Strength Testing

Samples 7, 8 and 9 were subjected to Torsional Strength Testing in accordance with Clause 8.2.5 of ANSI C29.10-1989. The results of this testing are shown in Table 7 below. All samples met the minimum Torsional Strength requirements.

Sample Number	Torsional Strength (In-Lbs.)	Specification (In-Lbs.)
7	4992	3500
8	5063	
9	5010	
Average	5022	
Standard Deviation	37	N/A

Table 7

3.5 Compressive Strength Testing

Samples 4, 5 and 6 were subjected to a Compressive Strength Test in accordance with Clause 8.2.3 of ANSI C29.10-1989. The results of this testing are shown in Table 8 below. All units met the minimum Compressive Strength requirements without failure.

Sample Number	Compressive Strength (Lbs.)	Specification (Lbs.)
4	22212	20000
5	22190	
6	22999	
Average	22467	
Standard Deviation	461	N/A

Table 8

3.6 Thermal Shock Test

Thermal Shock testing was conducted on Samples 7, 8 and 9 according to Clause 8.2.4 of ANSI C29.10-1989. The temperature of the hot and cold water bathes were 150°F and 39°F respectively. Upon completion of the thermal cycle testing, all samples were inspected visually and subjected to a one minute Power Frequency Flashover Test with no failures.

Appendix 1

PIEDMONT BUSHINGS & INSULATORS, LLC

Drawing Number: 1510004	Catalog Number: 1510004	
Date: October 10, 2002	Description: 7.5" ANSI A-20 Indoor Apparatus Insulator	
Reference:	Drawn By: T. Martin	Approved By:

Revision Desription	Revision Date
Added one decimal place general tolerance.	09-01-04

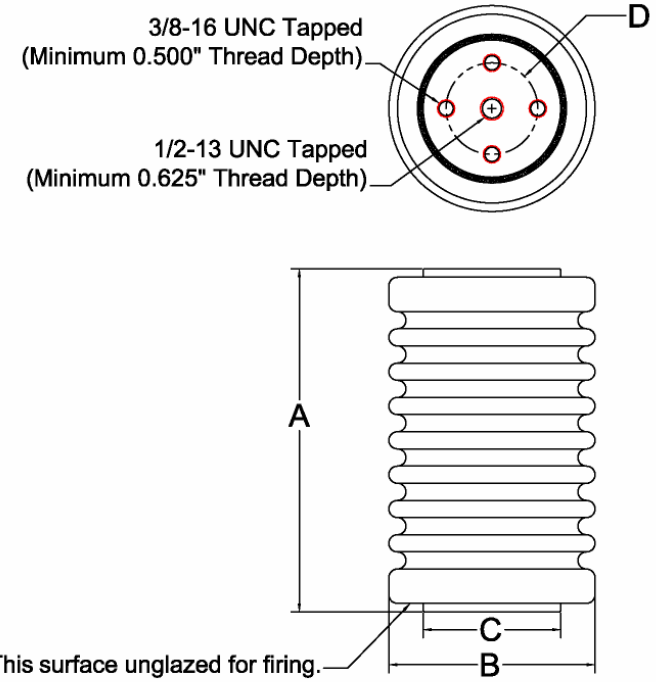
Tolerances Unless Otherwise Noted

Three Place Decimal General Tolerance: 0.005
Two Place Decimal General Tolerance: 0.03
One Place Decimal General Tolerance: +/-3%
Angle Tolerance: 1 Degree

Materials

Porcelain Body	ANSI/IEC C-120 Wet Process Porcelain - Light Gray Glazed
Hardware	Hot Dip Galvanized Malleable Iron

Physical Data	
Perimeter Tapped Holes (UNC)	3/8 - 16
Center Tapped Hole (UNC)	1/2 - 13
Height - A (Inches) [mm]	7.50 [191]
Outside Diameter - B (Inches) [mm]	4.5 [114]
Fitting Diameter - C (Inches) [mm]	3.0 [70]
Bolt Circle - D (Inches) [mm]	2.00 [51]
Electrical Data	
Voltage Rating (kV)	14.4
Impulse Withstand (kV)	110.0
Low Frequency Dew Withstand (kV)	30.0
Mechanical Data	
Cantilever Strength (Lbs) [kN]	1000 [4]
Torsional Strength (In-Lbs) [N-m]	3500 [395]
Tensile Strength (Lbs) [kN]	3000 [13]
Compressive Strength (Lbs) [kN]	20000 [89]



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