

ENGINEERING REPORT

SUBJECT ANSI C29.17 Prototype Test Report; Quadri*Sil Line Post Insulators – 2.5” Rod
DATE January 25th, 2018
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Prototype Test Report
ANSI C29.17
Quadri*Sil Line Post Insulators – 2.5” Dia. Rod
HPS Silicone rubber
R18-01-03

Introduction:

Sample Quadri*Sil line post insulators with 2.5” core diameter were evaluated according to the protocols established within ANSI C29.17. The samples tested varied in length to match the requirements of the standard. The polymer weathersheds were composed of Hubbell Power Systems proprietary silicone rubber. The fiberglass rod was an epoxy resin system reinforced with E-CR DD (Electrical grade – Corrosion Resistant Direct Draw) glass fibers.

Details:

A summary of the tests performed and their results is contained in Table 1.

Test Name	Standard/Clause	Request Number
Tests on interfaces and connection of end fittings	ANSI C29.17/7.1	E17-06-08
Core time-load test	ANSI C29.17/7.2.1	M17-03-44
Tensile load test	ANSI C29.17/7.2.2	M17-03-44
Housing tracking and erosion tests	ANSI C29.17/7.3	E17-09-08
Aging or weathering test	ANSI C29.17/7.4	M16-06-68
Dye penetration test	ANSI C29.17/7.5.1	E17-10-37
Water diffusion test	ANSI C29.17/7.5.2	E17-10-36
Flammability test	ANSI C29.17/7.6	E17-11-21

Table 1

Discussion:

All of the tests were successfully completed.

Conclusions:

The Quadri*Sil line post insulators with HPS silicone rubber met all of the requirements of the ANSI C29.17 prototype tests.



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Tests on Interfaces and Connection of End Fittings

ANSI C29.17 - Clause 7.1

Quadri*Sil Line Post Insulators – 2.5”

Catalog Number P250043S0030

E17-06-08

Introduction:

The tests on interfaces and connection of end fittings were performed on samples of Quadri*Sil line post insulators. The procedure employed was as defined by ANSI C29.17. The thermal-mechanical portion of the test was performed at Powertech Labs in Surrey, BC. The insulators tested were catalog number P250043S0030. The samples were manufactured with HPS proprietary silicone rubber.

Test Protocol:

The insulators were subjected to the test protocol that follows.

7.1 Tests on interfaces and connection of end fittings

7.1.1 Test specimens

Four insulators, representative of the production process and design, shall be selected. One of these shall be reserved as a reference for the power frequency voltage test in 7.1.3.3. The insulator length (metal-to-metal) will be at least 15 times the core diameter. If shorter insulators are tested, the results are valid only for insulators up to the length tested.

The insulators shall be subjected to the routine mechanical test, per section 10.

7.1.2 Pre-stressing

The following tests (7.1.2.1, 7.1.2.2) shall be carried out on three test insulators in the sequence indicated below.

7.1.2.1 Thermal-mechanical test

The three insulators will be loaded in cantilever and subjected to the temperature cycle described in Figure 2. The load shall be selected so as to produce the same bending moment at the base of the insulator as is exerted by 50% of the SCL in normal application.

Each 24 hour cycle has a minimum of 8 hours at both +50°C and -35°C ±5K. The 24 hour cycle shall be run twice, with the direction of the load reversed after the first cycle.

The test may be interrupted for the load direction reversal and for maintenance of the test equipment for a total duration of 2 hours.

7.1.2.2 Water immersion test

The three test insulators will be immersed in boiling water for 42 continuous hours (de-ionized water with 0.1% NaCl or tap water adjusted to a conductivity of 1650 µS/cm ±50 µS/cm at 20° C - 25°C). After the 42 hour boiling period, the insulators will remain in the vessel until the water



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cools to approximately 50°C. This temperature will be maintained until the verification tests are started.

7.1.3 Verification tests

The following verification tests (7.1.3.1, 7.1.3.2, 7.1.3.3) shall be completed within 48 hours following the removal of the insulators from the water.

7.1.3.1 Visual examination

The housing shall be inspected visually. No cracks or crazing of the elastomeric shed or housing are permitted.

7.1.3.2 Steep-front impulse test

The three test specimens will be fitted with a sharp edged electrode, consisting of a clip made of copper strip approximately 20mm wide and less than 1mm in thickness. The electrode will be firmly on the housing or sheath between the weathersheds, forming two sections of 500 mm or smaller axial length. If the test specimens have an insulating length that is less than or equal to 500mm, the voltage will be applied between the end fittings (no clip is necessary).

An impulse voltage with a steepness of at least 1000 kV/μs will be applied to each test section. Each section will be stressed with 25 impulses of positive polarity and 25 impulses of negative polarity. Each impulse shall cause an external flashover of the test section. No punctures of any part of the insulator shall occur.

The electrodes used to form the test sections will be removed prior to the power frequency voltage test.

7.1.3.3 Power frequency voltage test

The dry power frequency flashover voltage will be determined by averaging five flashover voltages on each insulator per ANSI/IEEE 4. The flashover voltage will be reached within 1 minute by increasing the voltage linearly from zero. The flashover voltage of the reference insulator will be determined using the same procedure.

The average flashover voltage for each test insulator will be at least 90% of the flashover voltage of the reference insulator.

The three test insulators and the reference insulator will be allowed to reach thermal equilibrium with the surrounding atmosphere. All four insulators will then be subjected to 80% of the reference insulator flashover voltage for 30 minutes. No puncture of any part of the insulator shall occur, and the temperature of the shank (measured immediately after the test) will not be more than 20°C above the ambient temperature.



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Test Results:

Clause 7.1.1 – Test specimens:

The samples evaluated were catalog number P250043S0030 with an S.C.L. of 3,250 lbf. A copy of the sales drawing is included as Figure 1.

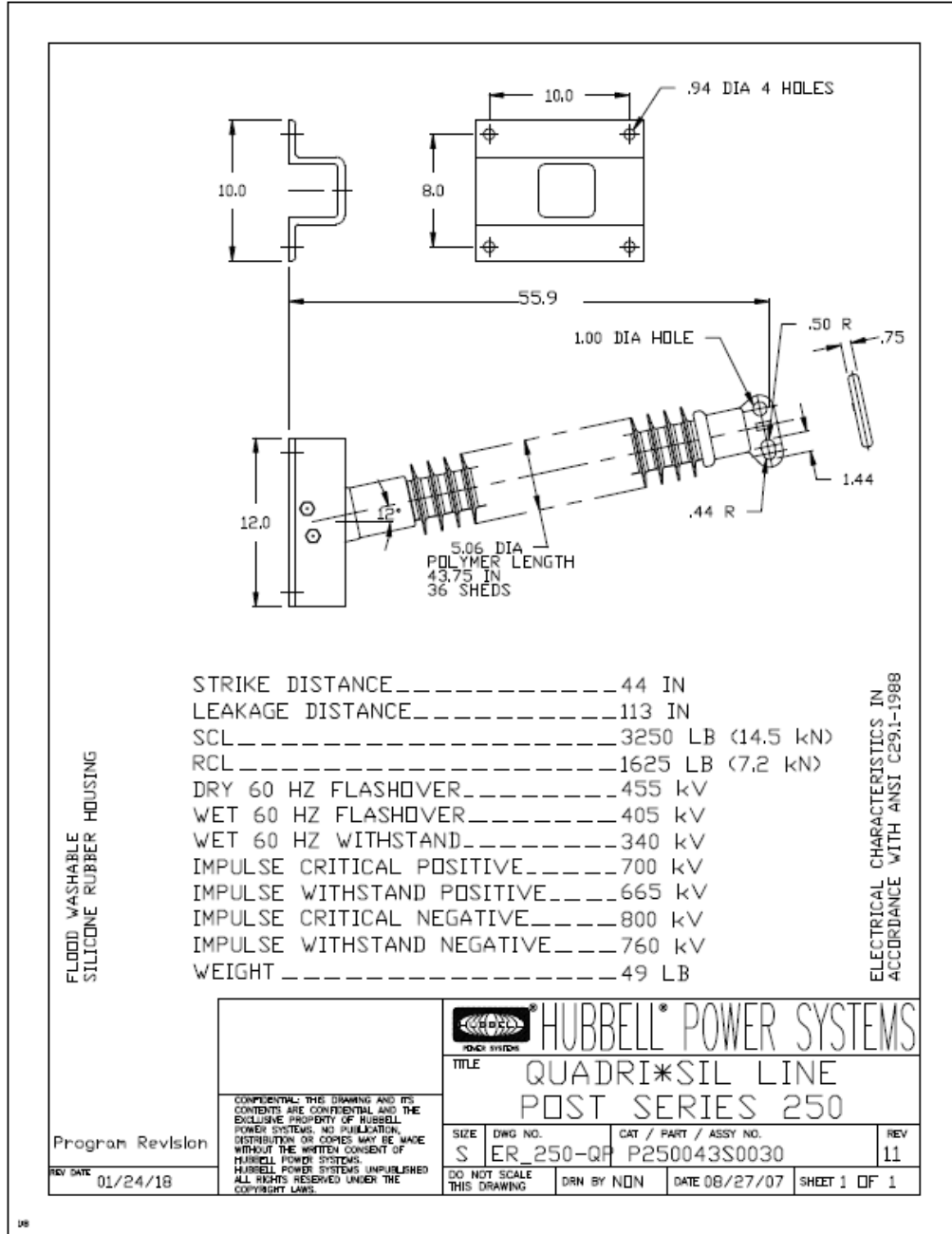


Figure 1



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Clause 7.1.2.1 – Thermal-mechanical Test:

The thermal-mechanical portion of the test was performed at Powertech Labs. A typical thermal-load profile is shown as Figure 2.

No breakage of the end fittings or visible deformation or pullout of the core rod occurred.

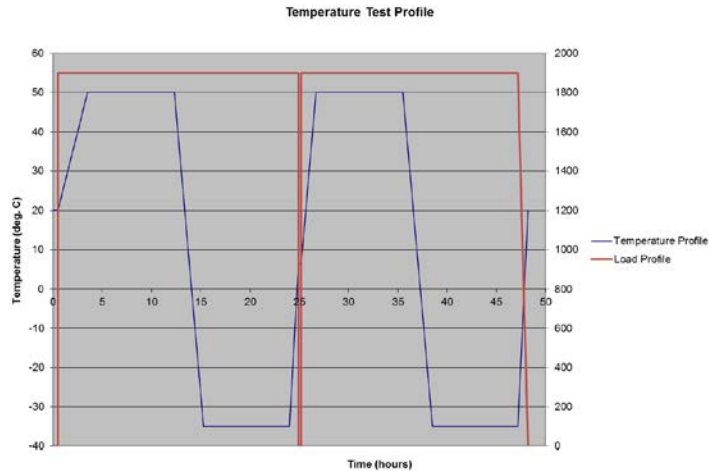


Figure 2

Clause 7.1.2.2 – Water Immersion Test:

The samples were immersed in boiling water in accordance with the standard. Data regarding the immersion is contained in Table 1.

Date	Time	Temperature, °C	Event
6/23/2017	8:38pm	96.5	Start boil
6/25/2017	3:38pm	96.1	End
6/28/2017	5:08pm	49.7	Samples removed

Table 1

Clause 7.1.3.1 – Visual examination:

Each of the insulators was examined. No cracks were found.

Clause 7.1.3.2 – Steep-front impulse voltage test:

Each of the insulators was subjected to a steep-front impulse voltage by sub-dividing the insulators into sections shorter than 500 mm. All flashovers were external. The data is contained in Tables 2, 3, and 4.



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Sample	Sample #1					
	Line 9 sheds		Mid 10 sheds		Ground 9 sheds	
End/Pol.	Top/+	Top/-	Mid/+	Mid/-	Grd./+	Grd./-
1	366	382	378	390	368	393
2	361	381	372	387	362	389
3	364	382	379	387	369	381
4	366	381	380	386	370	384
5	365	382	377	388	367	387
6	364	390	372	387	362	389
7	367	382	371	391	361	382
8	362	383	372	382	362	385
9	362	382	379	389	369	386
10	364	385	376	386	361	387
11	360	381	399	389	369	385
12	364	383	377	387	367	382
13	360	385	376	386	366	385
14	362	382	376	386	366	385
15	364	383	375	388	365	386
16	364	382	376	386	366	388
17	362	390	365	385	365	383
18	361	387	377	387	367	385
19	362	387	376	386	366	382
20	363	386	377	387	367	384
21	362	383	374	387	364	387
22	363	362	368	388	368	385
23	362	383	377	387	367	384
24	365	383	377	387	367	389
25	362	386	368	388	368	385
	Pass	Pass	Pass	Pass	Pass	Pass

Table 2



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Sample	Sample #2					
	Line 9 sheds		Mid 10 sheds		Ground 9 sheds	
End/Pol.	Top/+	Top/-	Mid/+	Mid/-	Grd./+	Grd./-
1	361	389	362	388	370	389
2	366	387	369	390	369	388
3	364	384	369	386	366	389
4	366	386	370	389	364	390
5	362	382	367	388	367	387
6	364	383	362	387	369	382
7	368	386	371	390	362	381
8	365	388	372	386	365	382
9	366	385	369	389	366	386
10	366	385	366	386	367	391
11	361	385	369	387	365	389
12	364	383	367	387	362	387
13	368	385	366	389	365	387
14	363	382	366	390	365	386
15	363	388	365	391	366	387
16	366	392	366	386	368	387
17	368	390	365	385	363	385
18	364	387	367	387	365	387
19	368	387	367	386	362	386
20	360	386	371	387	364	387
21	362	387	364	387	367	384
22	362	382	368	389	365	388
23	363	389	370	387	364	387
24	365	390	368	387	369	387
25	365	388	368	389	365	387
	Pass	Pass	Pass	Pass	Pass	Pass

Table 3



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Sample	Sample #3					
	Line 9 sheds		Mid 10 sheds		Ground 9 sheds	
End/Pol.	Top/+	Top/-	Mid/+	Mid/-	Grd./+	Grd./-
1	361	389	362	388	366	382
2	366	387	369	385	367	388
3	364	384	369	389	369	389
4	366	386	370	386	364	390
5	362	382	367	383	367	387
6	364	383	362	388	369	382
7	368	386	371	390	364	381
8	365	385	371	388	365	382
9	366	385	369	391	366	386
10	366	385	366	387	367	391
11	361	387	368	387	365	389
12	364	388	367	387	362	387
13	368	385	366	384	365	387
14	363	382	367	386	365	386
15	363	388	365	391	366	387
16	366	392	362	389	368	387
17	368	390	363	385	369	385
18	364	387	369	387	365	387
19	368	387	365	385	365	386
20	360	386	367	387	364	387
21	362	387	366	383	366	384
22	362	382	362	389	369	388
23	363	389	360	386	366	387
24	365	390	366	387	370	387
25	365	388	363	389	365	387
	Pass	Pass	Pass	Pass	Pass	Pass

Table 4

Clause 7.1.3.3 – Dry power frequency voltage test:

The 3 sample insulators were tested for dry flashover values and a 30-minute, 80% withstand test was performed. Data is contained in Tables 5 and 6. All corrections are in accordance with ANSI C29.1

	Reference	Unit 1	Unit 2	Unit 3
Bar (cmHg)	72.9	72.9	72.9	72.9
Temp dry (°C)	23.1	23.1	23.1	23.1
Rel. Hum.	55.8	55.8	55.8	55.8

Table 5



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Corrected Flashovers

Flashover No.	Reference	Unit 1	Unit 2	Unit 3		
1	470	484	482	464		
2	470	481	502	488		
3	470	487	463	470		
4	479	477	468	464		
5	474	465	472	470		
6	468	467	471	481		
7	470	485	476	480		
8	471	480	469	482		
9	467	467	468	467		
10	466	491	468	483		
Average Flashover	470	478	474	475		
30 Minute Withstand Test						
	kV	°C	kV	°C	kV	°C
Start Withstand	402	-	402	-	402	-
End Withstand	400	20.8	405	20.4	407	20.5
Temperature Differential		-		-		-
Differential from Ambient		2.3		2.7		2.6

Table 6

Conclusions:

The samples of the Quadri*Sil Line Post insulators manufactured with HPS proprietary silicone rubber met all of the requirements of the test protocol.



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Core Time-Load Test
ANSI C29.17 – Clause 7.2.1
Quadri*Sil Line Post Insulators – 2.5”
Catalog Number P250043S0030
M17-03-44

Introduction:

Three samples of Quadri*Sil line post insulators, catalog number P250043S0030 were used for the performance of the core time-load test in accordance with ANSI C29.17, clause 7.2.1. The insulators were manufactured with HPS proprietary silicone rubber and epoxy E-CR DD fiberglass rod.

Test Protocol:

The testing was performed in accordance with the following protocol.

7.2.1 Core time-load test

7.2.1.1 Test specimens

Three insulators manufactured on the production line using the standard end fittings shall be selected. The section length (pole face to line attachment) shall be between 15 and 24 times the diameter of the core, or the longest length to be manufactured, whichever is less.

7.2.1.2 Core time load test

Each insulator shall be gradually loaded to 40% of the SCL or the manufacturer’s RCL (whichever is greater) at a temperature of 20°C ± 10°C. The load shall be applied to the insulator at the conductor position, approximately perpendicular to the intended orientation of the conductor and approximately perpendicular to the core of the insulator. The load shall be maintained for at least 96 hours.

7.2.1.3 Evaluation

7.2.1.3.1 Visual examination

After removal of the load, visually inspect the base end fitting for cracks or permanent deformation. All threaded connections must be intact and usable.

7.2.1.3.2 Dissection and dye penetration

Cut each insulator 90° to the axis of the core and about 50 mm from the base end fitting, then cut the base end fitting longitudinally into two halves in the plane of the previously applied cantilever load. The cut surfaces shall be smoothed by means of fine abrasive cloth (grain size 180).

The cut halves shall be visually inspected for cracks and delamination. The presence of cracks or delamination in the fiberglass rod shall constitute failure.



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A dye penetration test shall be performed on the cut surfaces in accordance with ISO 3452 to reveal cracks. The presence of cracks or delamination in the fiberglass rod shall constitute failure.

Test Results:

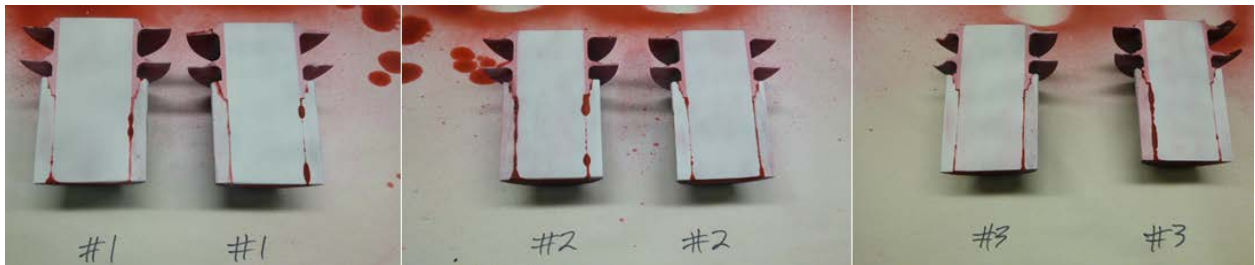
The RCL for this insulator model is 1,625 lbs. The first two insulators were loaded in opposition to one another. A load cell was included in the connecting link. The third sample was loaded against a reference insulator for which the data was not included.

Sample No.	Catalog No.	Date	Time	Load, lb	Comments
1 & 2	P250043S0030	3/30/2017	3:45pm	1630	Start of Test
		4/3/2017	3:45pm	1630	End of Test
3	P250043S0030	3/30/2017	3:00pm	1630	Start of Test
		4/3/2017	3:00pm	1630	End of Test

Table 1

No failures occurred during the period of applied load. An examination of the bases and associated hardware for each of the insulators found no damage.

The dye penetration test was performed on each of the samples. No dye penetration was found, rod free of cracks.



Picture 1 – View of samples cut after dye penetration

Conclusions:

The sample Quadri*Sil series 250 line post insulators met the requirements of the test.

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Tensile Load Test
ANSI C29.17 – Clause 7.2.2
Quadri*Sil Line Post Insulators – 2.5”
Catalog Number P250043S0030
M17-03-44

Introduction:

The tensile load test was performed on samples of Quadri*Sil Series 250 line posts, catalog number P250043S0030. These insulators were manufactured with epoxy E-CR DD fiberglass rod (2.5” nominal diameter) and HPS proprietary silicone rubber. The test was performed in accordance with ANSI C29.17, clause 7.2.2.

Test Protocol:

The test protocol is listed below.

7.2.2 Specified tensile load test

7.2.2.1 Test specimens

Three insulators manufactured on the production line using the standard end fittings shall be selected.

7.2.2.2 Test procedures

A tensile load shall be applied to each insulator in line with the axis of the core of the insulator. The load shall be increased rapidly but smoothly from zero to 75% of the Specified Tensile Load (S.T.L.) and shall then gradually increased in a time between 30 and 90 seconds until the STL is reached. If the S.T.L. is reached in less than 90 seconds, the load shall be maintained for the remainder of the 90 seconds. At the conclusion of 90s, the load shall be removed.

7.2.2.3 Test evaluation

The test shall be regarded as passed if there is no evidence of:

- *Pull out of the core from the end fitting*
- *Breakage of the end fitting*

Test Results:

The results of the test are contained in Table 1.

Sample Number	Catalog Number	STL (lbf)	Sample Status
1	P250043S0030	25,138	No pull out of the core, no breakage - PASS
2	P250043S0030	25,148	No pull out of the core, no breakage - PASS
3	P250043S0030	25,151	No pull out of the core, no breakage - PASS

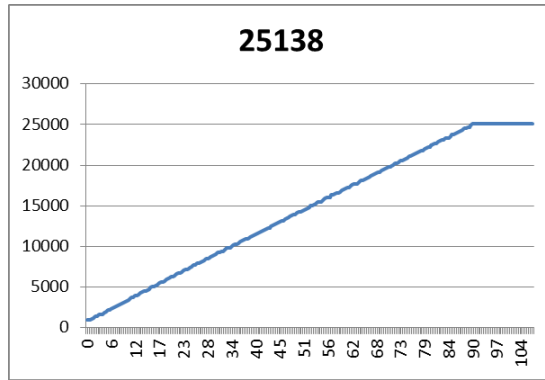
Table 1



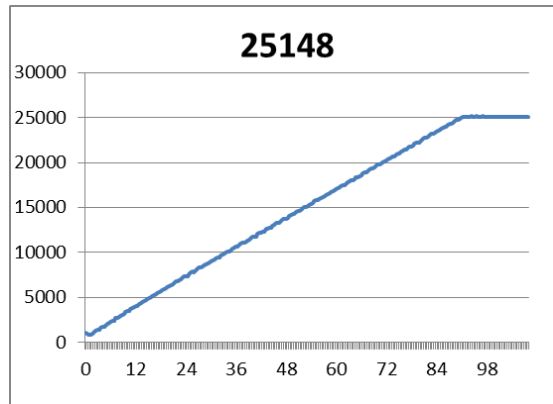
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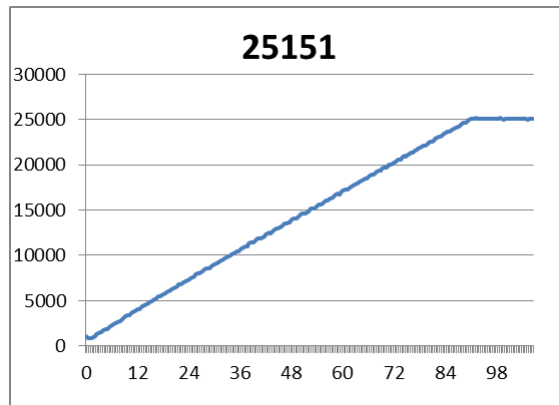
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Graph 1 – Sample #4 tensile results



Graph 2 – Sample #5 tensile results



Graph 3 – Sample #6 tensile results

Conclusions:

The Quadri*Sil line post insulators manufactured with epoxy E-CR DD fiberglass rod and HPS proprietary silicone rubber passed the tensile load test.



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Housing Tracking and Erosion Test ANSI C29.17 – Clause 7.3 Quadri*Sil Line Post Insulator – 2.5” E17-09-08

Introduction:

Two samples of Quadri*Sil line post insulators, catalog number P250009S0360, were tested using the protocol described in ANSI C29.17, clause 7.3. The insulators were manufactured with HPS proprietary silicone rubber polymer, and epoxy resin system reinforced with E-CR DD glass fibers rod.

Test Protocol:

The test protocol of the standard follows:

7.3 Housing tracking and erosion tests

7.3.1 Test Specimen.

Two insulators or test specimens will be tested, in accordance with ANSI C29.11. The specimen length will be chosen such that the leakage distance falls between 200 and 700 mm and includes at least two weathersheds.

If the same elastomeric materials and manufacturing method have been previously qualified, per ANSI C29.11, this qualification section will not be repeated.

7.3.1.1 Test chamber.

The test is to be performed in a test apparatus as defined in ANSI C29.11.

7.3.1.2 Test Conditions.

The test is to be performed for a duration of 1000 hours as described in ANSI C29.11.

7.3.1.3 Evaluation.

No tracking is allowed. No weathershed punctures are allowed. Erosion is not allowed to reach the core.

The IEC method regarding flashovers was adopted from standard 62217 as a modification.

If more than one flashover occurs at the initial NaCl content, the test shall be re-started at a halved value of the NaCl content. The insulators are washed by tap water and the test re-started within 8 h (interruption times shall not be counted as part of the test duration). This may be repeated until interruptions no longer occur. The application of any of the above measures shall be noted.

The numbers of flashovers and trip-outs shall be recorded and noted in the test report.



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Test Data:

The samples evaluated would have been catalog number P250009S0360. The smallest insulator that can be manufactured would include 20 weathersheds. These insulators only utilized 6 weathersheds and so had one end with a normal seal, with the opposite seal filled with RTV at the end fitting.

The two sample insulators were mounted as prescribed in the test protocol. The test was initiated on November 8th, 2017 and concluded on January 3rd, 2018. The applied voltage was 18.4 kV.

A synopsis of the event log for the salt fog chamber is shown in Table 1.

Date	Stop Time	Start Time	Timer hours	Remarks
11/08/17	-	9:45am	0	Start test – 18.4 kV – 4 kg/m ³
12/18/17	6:30pm	7:15pm	951	1 st voltage interruption, trip out fuse, samples ok
12/19/17	8:00am	8:45am	963	2 nd voltage interruption, trip out fuse, salt halved
12/20/17	7:45am	7:45am	969	3 rd voltage interruption, trip out fuse, samples ok
12/21/17	8:00am	8:45am	981	4 th voltage interruption, trip out fuse, salt halved
1/3/2018	10:00am	-	1297	End of testing – no punctures or erosion - PASS

Table 2



Picture 1: Samples in salt fog chamber

Conclusion:

The Quadri*Sil line post insulators, (catalog number P250009S0360), met all of the requirements of the protocol for ANSI C29.17, clause 7.3.

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Aging or Weathering Test
ANSI C29.17 – Clause 7.3.2
HPS Silicone Rubber
M16-06-68

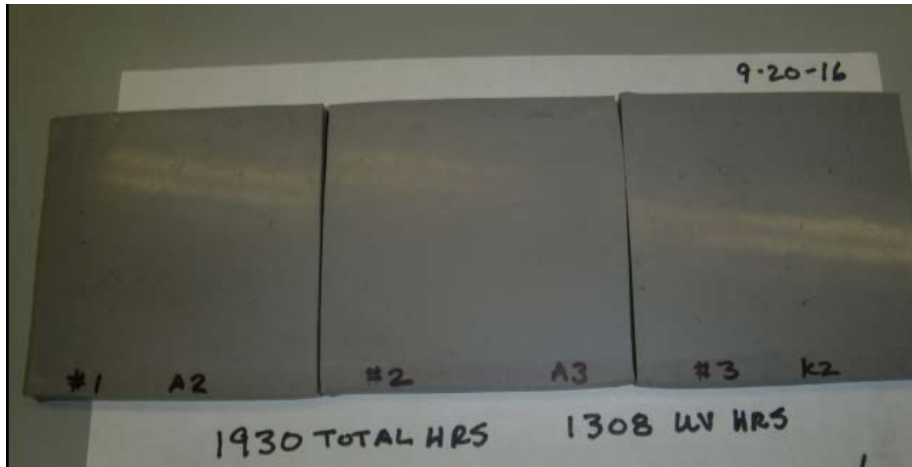
Introduction:

The Aging or Weathering Test as outlined in ANSI C29.17 – clause 7.3.2, was performed using the Fluorescent UV Method (ASTM G53). The test was performed in QUV machines using UVB-313 bulbs. The samples tested were Hubbell Power Systems proprietary silicone rubber.

Details:

The test was performed on three unstressed sample plaques of the polymer of a thickness of 0.25”. The daily exposure cycle was 16 hours of UV exposure and 8 hours of condensation. The test protocol requires a minimum of 1000 hours exposure without evidence of cracking or crazing. The average temperature with the UV on, was 52 °C.

Date	Stop Time	Start Time	Total time	Lamp Time	Remarks
06/26/16	-	11:45am	0	0	Start of test
09/20/16	4:00pm	-	1930	1308	End of test



Picture 1: Samples after removed from test chamber

Conclusions:

The samples were exposed for 1,930 hours total time. There were no indications of degradation, cracking, fading, chalking or loss of hydrophobicity.



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Dye Penetration test
ANSI C29.17 Clause 7.5.1 / ANSI C29.11 7.4.1
Quadri*Sil Line Post Insulators – 2.5”
E17-10-37

Introduction:

The dye penetration test was performed on samples cut from Quadri*Sil line post insulator shed assembly part number PSPITP20025433001. The insulators were manufactured with epoxy E-CR DD fiberglass rod and HPS proprietary silicone rubber.

Test Protocol:

The test was performed in accordance with ANSI C29.17 clause 7.5.1

7.4.1 Dye Penetration Test

Ten samples will be prepared and tested in accordance with section 7.4.1 of ANSI C29.11. There will be no dye solution penetration through the sample after fifteen minutes of exposure.

ANSI C29.11

7.4.1 Dye Penetration Test

7.4.1.1 Test specimens

Ten core samples shall be cut from an insulator. The length of the samples shall be 10 mm \pm 0.5 mm. They shall be cut nominally 90° to the axis of the core with diamond-coated circular saw blade under cool running water. The cut surfaces shall be smoothed with a 180-grit abrasive cloth. The cut ends shall be clean and approximately parallel

7.4.1.2 Test

The samples shall be placed on a layer of steel or glass balls in a vessel with the fiber vertical. The balls shall be of the same diameter and in the range of 1 mm to 2 mm. The dye, composed of 1 gram of fuchsin in 100 grams of methanol, is poured into the vessel until its level is 2 mm to 3 mm above the top of the balls.

7.4.1.3 Evaluation

The time for the dye to rise through the samples by capillarity shall be more than 15 minutes.



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Test Results:

The characteristics of the samples and the results of the dye penetration test are contained in Table 1.

Sample	Length	Time	Pass/Fail
1	10.46	> 15 minutes	PASS
2	10.42	> 15 minutes	PASS
3	9.84	> 15 minutes	PASS
4	9.97	> 15 minutes	PASS
5	10.11	> 15 minutes	PASS
6	10.33	> 15 minutes	PASS
7	9.78	> 15 minutes	PASS
8	9.92	> 15 minutes	PASS
9	9.93	> 15 minutes	PASS
10	9.80	> 15 minutes	PASS

Table 3



Picture 1: Samples 1 thru 5 after 15min



Picture 2: Samples 6 thru 10 after 15min

Conclusion:

All of the samples of the rod manufactured with the HPS proprietary silicone rubber met the requirements of the Dye Penetration test.



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Water Diffusion Test ANSI C29.17 Clause 7.5.2 / ANSI C29.11 7.4.1 Quadri*Sil Line Post Insulators – 2.5” E17-10-36

Introduction:

The water diffusion test was performed on samples cut from a Quadri*Sil line post shed assembly PSPITP20025433001. The insulator was manufactured with epoxy E-CR DD fiberglass rod and HPS proprietary silicone rubber.

Test Protocol:

The test was performed in accordance with ANSI C29.17 clause 7.5.2 / ANSI C29.11 clause 7.4.2:

7.5.2 Water diffusion test

The test shall be performed in accordance with section 7.4.2 of ANSI C29.11, except the electrodes shown in Figure 1 shall be used. No puncture or surface flashover is allowed. The current during the whole test shall not exceed 1mA rms.

ANSI C29.11

7.4.2 Water Diffusion Test

7.4.2.1 Test specimen

Six samples shall be cut from an insulator. The housing material may be removed from the core, but removal is not mandatory. The length of the specimens shall be 30 mm +0.5 mm (1.181 in ± 0.020 in). They shall be cut approximately 90 degrees to the axis of the core with a diamond coated circular saw blade under cool running water. The cut surfaces shall be smoothed with a 180-grit abrasive cloth.

7.4.2.2 Pre-stressing

The surfaces of the specimens shall be cleaned with isopropyl alcohol and filter paper immediately before boiling. The specimens shall be boiled in de-ionized water with 0.1% by weight NaCl in a glass container for 100 hours + 0.5 hours. Only one core material may be boiled at one time in the same container.

After boiling, the specimens shall be removed from the salt water and placed into tap water in a glass container at room temperature for at least 15 minutes. The following test shall begin within 3 hours of removal of the specimens from the salt water.

7.4.2.3 Test

The test arrangement is shown in Figure 6. Immediately before the test, the specimens shall be removed from the water and their surfaces dried with filter paper. The specimens shall be placed between the electrodes and the voltage increased at a rate of approximately 1 kV per second to a value of 12 kV where it shall remain for 1 minute.

7.4.1.3 Evaluation

No puncture or surface flashover is allowed. The current during the whole test shall not exceed 1 mA r.m.s.



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Test Results:

Samples were cut and prepared as prescribed in ANSI C29.11. Boiling was initiated on October 19th, 2017, at 10:30 a.m. and ended on October 23th, 2017, at 2:30 p.m. The samples were removed from the vessel and subjected to the electrical test. The data is contained in Table 1.

Sample No.	Length (mm)	Voltage (kV)	Current (rms)	Time (minutes)	Results
T-2	30.40	12.0	92	1	Pass
T-3	30.42	12.0	94	1	Pass
M-1	30.38	12.0	94	1	Pass
M-2	30.36	12.0	93	1	Pass
B-1	30.45	12.0	94	1	Pass
B-2	30.43	12.0	95	1	Pass

Table 4



Picture 1: Samples cut from the top, middle, and bottom of sample insulator



Picture 2: Sample dried with filter paper and placed between the electrodes

Conclusion

All of the samples of the Quadri*Sil line post insulator shed assembly met the requirements of the water diffusion test protocol.



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FLAMMABILITY ANSI C29.11 Clause 7.5 / IEC 60695-11-10 Quadri*Sil Insulator material sample E17-11-21

Introduction:

The flammability test was performed on samples of Quadri*Sil line post insulator material plaques sized according to the IEC 60695-11-10 specifications. The material plaque was manufactured with HPS proprietary silicone rubber.

Test Protocol:

The test was performed in accordance with ANSI C29.11 clause 7.5 which calls for the procedure as described in IEC 60695-11-10.

7.5 Flammability Test

The manufacturer shall test and provide information on the ignition and self-extinguishing properties of the elastomeric materials of the insulator. The test specimen and procedure shall be according to IEC 60695-11-10. The evaluation shall be as defined in the appropriate product standard.

Test Results:

Vertical Burn Test	Sample	T1 (time of after flame 1)	T2 (time of after flame 2)	T3 (time of afterglow)	Classification	Thickness (mm)
Samples conditioned at 70C for 168 hrs. 70C start- 11/22/17 @ 11:30A, Out of oven on 11/29/17 @ 11:35A and into desiccant. Out of desiccant @ 3:30P on 11/29/17, tested within 30 mins.						
70C Conditioned Samples	1	0	0	0	Meets V-0	6.52
	2	0	0	0	Meets V-0	6.79
	3	0	0	1	Meets V-0	6.53
	4	0	0	1	Meets V-0	6.61
	5	0	0	1	Meets V-0	6.85
Conditioned at 23C and 50% RH. 23C and 50% start- 11/27/17 @ 8:30A. Taken out for test on 11/29/17 @ 10:30A.						
50% humidity/ 23C conditioned samples	6	0	0	1	Meets V-0	6.81
	7	0	0	0	Meets V-0	6.55
	8	0	0	0	Meets V-0	6.55
	9	0	0	1	Meets V-0	6.83
	10	0	0	0	Meets V-0	6.56



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Picture 1: Test Set-up



Picture 2 & 3: Sample condition after test

Conclusions:

All of the samples of the Quadri*Sil line post insulator material HPS proprietary silicone rubber met the requirements of the flammability test with a V-0 rating.