



“Evaluation and Adaptation with Production Standards Council”.

High Voltage Ref. Lab.

IEC 61952 (2008), IEC 62217(2005)

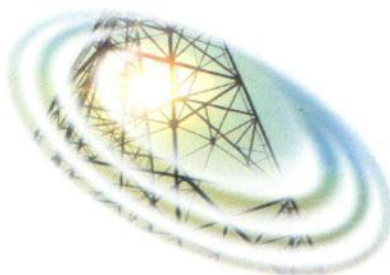
Line post Composite Insulator (36kV, 5kN)

Client: Evaluation and Adaptation with Production Standards Council”.

Manufacturer: DOROOD KELID Electric Co.

Report Number: TH91104e

Date of issue: 25/02/2013



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Line post Composite Insulator (36kV,5kN)

Ref. Standards: IEC61952 (2008),IEC62217(2005)

Tested by: S.YEGANEH

Approved by: S. ABYAZI

Tests witnessed by: ----

Date of issue: 25/02/2013

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Client: Evaluation and Adaptation with Production Standards Council".

Request number: 27500/22/8830

Request date: 29/11/2011

Ref. Standards: IEC61952 (2008),IEC62217(2005)

Test method: Standard

Non-standard test methods: -

Report number: TH91104e

Samples code: STH91104-1 to STH91104-11

Sample: Line post Composite Insulator (36kV,5kN)

Model: ----

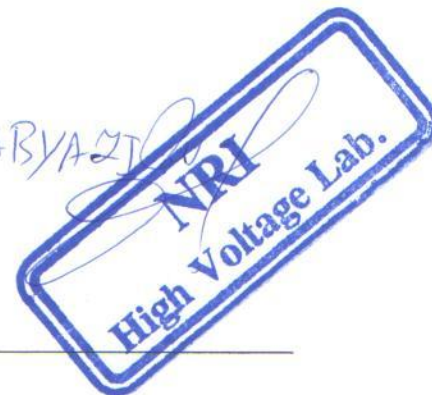
Serial number: ----

Remarks:

- The copy of this report is not valid without the laboratory confirmation.
- This report consists of 16 pages and 3 appendix.

Tested by: *S. Yeganeh*

Approved by: *ABYAZI*



Evaluation and Adaptation with Production Standards Council".

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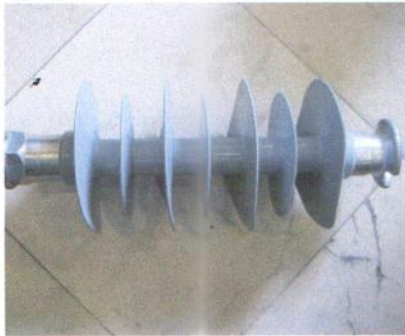


1- ABSTRACT OF TEST RESULTS

Row	Test/Examination	Std, Clause	Result
1	VERIFICATION OF DIMENSIONS	11	Passed
2	DRY LIGHTNING IMPULSE WITHSTAND VOLTAGE TEST	11.1	Passed
3	WET POWER FREQUENCY WITHSTAND VOLTAGE TEST	11.1	Passed
4	TESTS ON INTERFACES AND CONNECTIONS OF END FITTINGS	10.2.1	Passed
5	CANTILEVER FAILING LOAD TEST	11.2.1	Passed
6	HARDNESS TEST	IEC62217	Passed
7	ASSEMBLED CORE LOAD-TIME TESTS	10.4	Passed
8	FLAMMABILITY TEST	IEC62217	Passed
9	TESTS ON THE CORE MATERIAL	10.2.3	Passed
10	TRACKING AND EROSION TEST	10.2.2	Passed
11	ACCELERATED WEATHERING TEST	IEC62217	Passed



2- Picture of the test object:



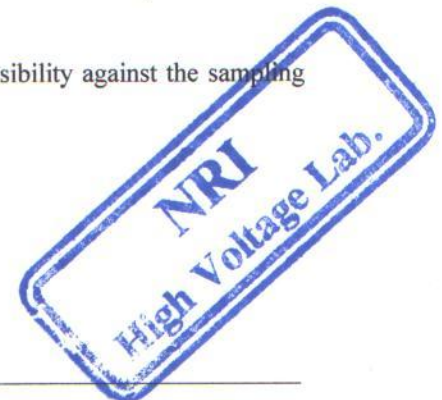
3- Technical specifications of the test object (assigned by the client)

High voltage:	36kV
Maximum design cantilever load	3kN
Specified cantilever failing load	5kN
Creepage distance	1000mm
Arcing distance	370mm
Number of sheds	7(3/4)

4- Remarks

The Client has a right to send his/her official and written claim against the results or the test method within one month after issuing the test results; if any mistake has occurred by the laboratory which has influenced on test results, re-testing would be done with no charge. Tested samples will be kept by the laboratory for 6 months after the test; otherwise, no client claim will be accepted.

Sampling has been done by Niroo research institute, so the laboratory has responsibility against the sampling and related subjects.



5- Brief description of test methods

5.1- Verification of the dimensions

Parameters	Measured Values (mm)	Assigned by Manufacturer (mm)	Tolerances (mm)
Creepage Distance	995	1000	From 969 to 1031
Length	419	420	From 403.5 to 436.5
Big Shed Diameter	156.2	161	From 153.1 to 168.9
Small Shed Diameter	130.7	132	From 125.2 to 138.8
Distance Between Two Same Sheds	80	80	From 75.3 to 84.7
Arcing Distance	367	370	From 354.7 to 385.2

Formula for the Permissible tolerances:

$d \leq 300$ $\pm (0.04d + 1.5)$ mm

$d > 300$ (With a maximum tolerance of ± 50 mm) $\pm (0.025d + 6)$ mm

d: Checked dimension in millimeters

Result
PASSED



5.2- Dry lightning impulse withstand Voltage test

Laboratory ambient conditions			
Temperature:	t=21.1 °C	Atmospheric pressure:	P= 857.4 hPa
Relative humidity:	R= %29.4	Correction factor:	k=0.84

Specified lightning impulse withstand voltage by manufacturer:	Positive:230kV
	Negative:240kV

Sample no	Measured flashover lightning impulse voltage in up and down method (kV)	Corrected Flashover lightning impulse voltage (kV)	Polarity
STH91104-2	210.5	250.6	Positive
STH91104-2	241.2	287.1	Negative

Acceptance Criteria
The insulator passes the test if the <u>corrected flashover lightning impulse voltage</u> is not less than <u>1.04 times the Specified lightning impulse withstand voltage by manufacturer.</u>

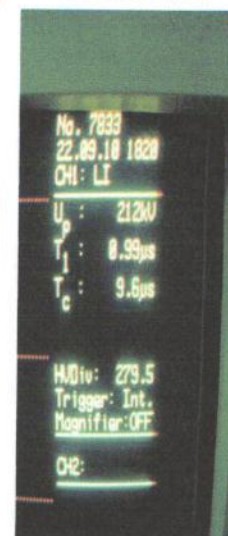
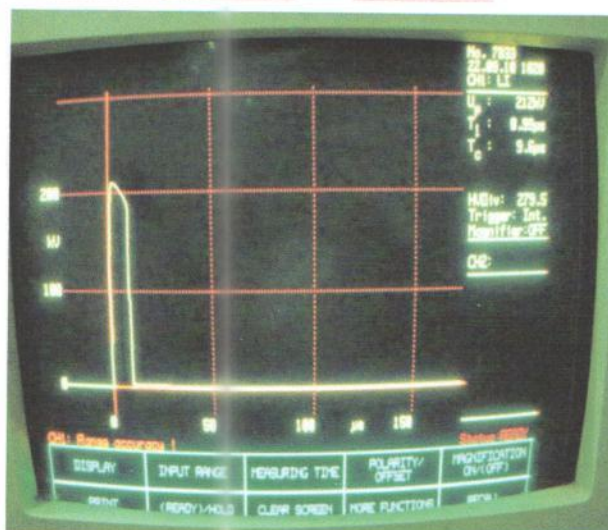
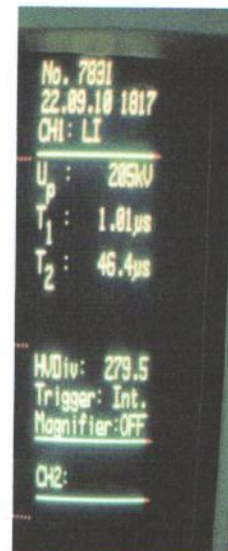
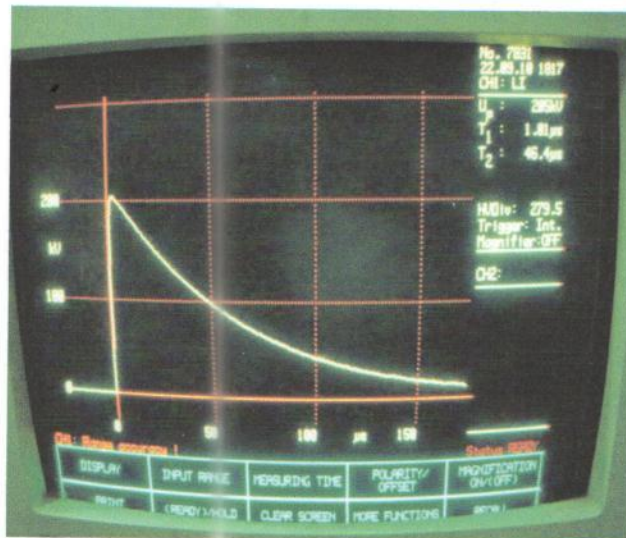
Result
PASSED

This test was carried out by lightning impulse generator (SGEK-400/20) Produced by Haefely-Trench Company.

The test arrangement was setup according to IEC 61952 (2008) ,clause 11.1.

All the requirements have been fulfilled according to IEC 60060-1 (2010) ,clause 7.3.1.4(b).





5.3- Wet Power frequency withstand voltage test

Laboratory ambient conditions			
Temperature:	t= 22.5 °C	Atmospheric pressure:	P= 853.1hPa

This test was carried out by a Power frequency transformer-CS200-0.25 produced by Haefely-Trench company . The test arrangement was set up according to IEC61952(2008), clause 11.1.

All the requirements for wet test have fulfilled according to IEC60060-1 (2010), table 2.

1- Average precipitation rate of all measurements (Vertical and Horizontal): (1-2) mm/min

2- Conductivity of water: (100±15)Ω.m

3- Temperature of water: 19.1°C

The test object was pre-wetted initially for 15minutes under the above specified conditions.

Specified Power frequency withstand Voltage by manufacturer:	75kV
Correction factor:	K=0.96
Corrected Power frequency withstand voltage:	72kV

Sample no	Corrected and applied test voltage (kV)	Duration (s)
STH91104-2	72	60

Acceptance criteria
The insulator should withstand the corrected voltage for 60 seconds.

Result
PASSED



5.4- Tests on interfaces and connections of end fittings

These tests were carried out on four insulators assembled on the production line.

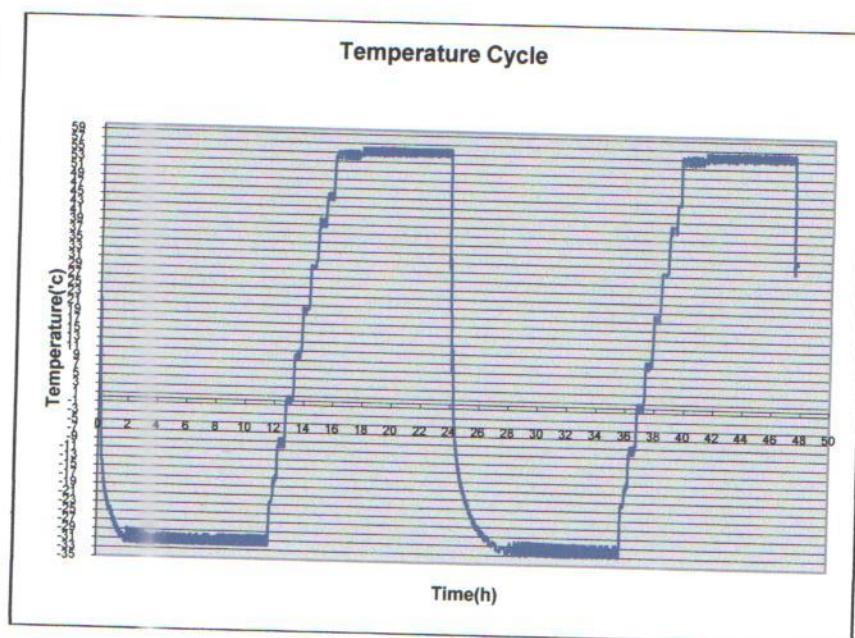
Mechanical routine test was carried out on all four insulators.

5.1.1- Pre-Stressing tests

5.1.1.1 Thermal mechanical pre-stress

The specimens then were submitted to temperature cycles under a maximum design cantilever load (3kN) in two opposite directions.

The specimens were loaded at ambient temperature before beginning the first thermal cycle.



5.1.1.2- Water immersion pre-stressing

The specimens were kept immersed in a vessel, in boiling de-ionized water with conductivity of $1750 \frac{\mu S}{cm} \pm 80 \frac{\mu S}{cm}$ at $20^{\circ}C$.

At the end of boiling, the specimens were allowed to cool and remained in water until the verification tests started in the following sequence.

5.1.2- Verification tests

The verification tests were carried out with in 48h.

5.1.2.1- Visual examination

The housing of end specimen was inspected visually. No cracks were observed.

5.1.2.2- Steep front impulse voltage test

According to clause 9.2.6.2 of IEC 62217, each insulator was stressed individually with 25 impulses of positive and 25 impulses of negative polarity with a steepness of at least $1000 \frac{kV}{\mu s}$

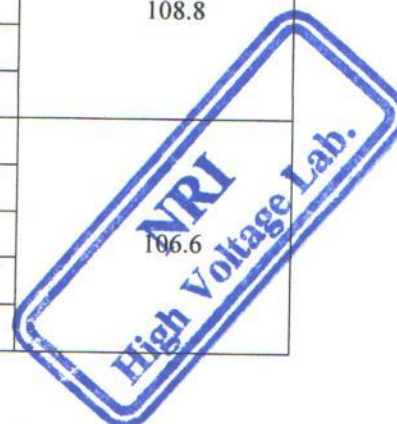
No puncture of any part of the insulators was occurred.

5.1.3- Dry power frequency voltage test

The dry power frequency voltage of all three insulators and a reference insulator were determined.

Laboratory ambient conditions		
P=851.4hPa	R=21.3%	t=20.6 °C

No	Measured dry power frequency flashover voltage (kV)	Mean value (kV)
STH91104-3	106	106.6
	108	
	105	
	109	
	105	
STH91104-4	108	108.8
	110	
	107	
	109	
	110	
STH91104 -5	105	106.6
	108	
	107	
	107	
	106	



STH91104-1 (Reference Insulator)	111	111
	108	
	111	
	113	
	112	

Then the test insulators and the reference test insulator, were subjected for 30 min to 80% of the reference flashover voltage (88.8kV).

Immediately after the removal of the test voltage, the temperature of the housing of specimens was measured.

No	Measured temperature (°C)
STH91104-3	24.6
STH91104-4	24.6
STH91104-5	24.6
STH91104-1 (Reference)	24.6

Acceptance criteria

- 1- The flashover voltage of each of the test specimens shall be greater than or equal 90% of the flashover voltage of the reference test specimen.
- 2- No puncture of any part of the insulator shall occur.
- 3- The maximum temperature rise of each insulator housing with respect to the temperature of the reference test specimen shall be less than 10k.

Result

Passed



5-5- Cantilever failing load test

Three insulators made on the production line using the standard base fitting were selected.

The cantilever load was increased rapidly but smoothly from zero to approximately 75% of SCL and then was gradually increased in a time between 30 s and 300 s until breakage of either the core or the end fitting occurs.

Sample No	Recorded cantilever failing load (kN)
Sth91104-6	5.9
Sth91104-7	5.7
Sth91104-8	5.9

Acceptance Criteria
The three failing load values shall be greater than SCL(5kN)

Result
Passed



5.6- HARDNESS TEST

This test was carried out in Polymer Laboratory and its result has been attached in appendix
(Report no: TH91049e)

5.7- ASSEMBLED CORE LOAD-TIME TESTS

This test was carried out in Polymer Laboratory and its result has been attached in appendix
(Report no: CR91003)

5.8- FLAMMABILITY TEST

This test was carried out in Polymer Laboratory and its result has been attached in appendix
(Report no: TH91049e)

5.9- TESTS ON THE CORE MATERIAL

This test was carried out in Polymer Laboratory and its result has been attached in appendix
(Report no: CR85001-1)

5.10- TRACKING AND EROSION TEST

This test was carried out in Salt fog Laboratory and its result has been attached in appendix
(Report no: TS91007)

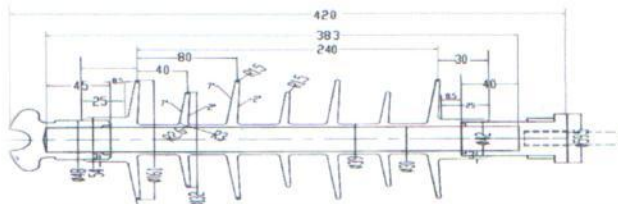
5.11- ACCELERATED WEATHERING TEST

This test was carried out in Metra Academy and its result has been attached in appendix
(Report no: TH91049e)



6- Technical specifications assigned by client

SPIN93036001



Catalog Number	Ur	Specified Cantilever load (SCL)	Specified Tensile load (STL)	Section Length	Creepage Distance	Arcing Distance	Lightning Impulse Withstand Voltage >		Power Frequency Withstand Voltage >	
	[kV]	[kN]	[kN]	[mm]	[mm]	[mm]	Pos. [kV]	Neg. [kV]	Dry [kV]	Wet [kV]
PT-13.4-420-PTF-28-N	36	5	13.4	420	1000	370	230	245	90	75

Material	
Insulator	ECR Fiberglass Rod with HTV Silicone Rubber Housing
End Fitting	Aluminum alloy or Forged Steel
Complies with IEC62217	

Line End Fitting	Tower End Fitting
Line post composite insulator (M20)	
Complies with IEC 61952	

Number of sheds	7
Big sheds num* diameter [mm]	4*160
Small sheds num* diameter [mm]	3*130

Diameter rod (mm)	30
Length of rod (mm)	355
Housing Thickness (mm)	4.5
Total weight (g)	2350

Dorood Kelid Electric Company			
Designed by	Checked by	Approved by	Date
M. GHASEMI	R. KHORDECHI	M. SHARIATI	
36 kV Line Post Composite Insulator			
Client:		SPIN93036001	
Ref:		Number of page :1	

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7- Appendixes

