Introduction

This report describes the testing performed to certify that the ECI 480 volt surge arrester catalog number 9F96DA480 meets performance requirements as specified in IEEE C62.11-1999 modified in a manner required to make the test meaningful for a device rated below 1KV. Since several facilities were selected to perform the testing based on their respective capabilities, this report is a summary of a number of different test reports. Participating laboratories were evaluated by ECI prior to testing to insure that the proper capability existed.

Tests Performed

1.	Arrester Insulation Withstand Test	per IEEE C62.11-1999 sect 8.1
2.	Discharge Voltage Characteristics	per IEEE C62.11-1999 sect 8.3
3.	Accelerated Aging of Polymeric Housing	per IEEE C62.11-1999 sect 8.6
4.	Contamination Test	per IEEE C62.11-1999 sect 8.7
5.	Discharge Current Withstand Test	per IEEE C62.11-1999 sect 8.10
6.	Front of Wave Test	per IEEE C62.11-1999 sect 8.3
7.	Duty Cycle Test	per IEEE C62.11-1999 sect 8.11
8.	TOV Test	per IEEE C62.11-1999 sect 8.12

Results

The 9F96DA480 met all performance requirements.

Test 1 Insulation Withstand

The arrester samples were subjected to impulse and power frequency tests per IEEE C62.11-1999 section 8.1. The values for arresters having a duty cycle voltage rating of 1KV were used. The arrester was mounted on a conducting boss attached to a ground plane to simulate expected service conditions. The voltage was applied to one line lead. The arresters passed the test as no flashover or physical damage was observed.

Test 2 Discharge Voltage Characteristics

A prorated section of the arrester was subjected to increasing levels of current impulses and the clamping voltage recorded as a function of current. The values are shown in Table 1 in Appendix 1.

Test 3 Accelerated Aging of Polymeric Housing

Samples of the housing material compatible with QUV test equipment were prepared and tested according to ASTMG53-96 as called for in IEEE C62.11-1999. Exposure time was 2000 hours. Inspection revealed no cracks and only minimal change in color. Consequently, the samples passed the test.

Test 4 Contamination Test

Complete arresters were connected to a power source with equipment capable of measuring watts loss connected. The IEEE C62.11-1999 procedure for time at voltage and application of contaminant was followed. The watts loss was measured as specified and monitored for the amount of time indicated. Based on the watts loss measurement thermal stability was demonstrated. Accordingly, the arrester passed the test.

Test 5 Discharge Current Withstand Test

Complete arresters were subjected to a pre-test classification and the values recorded. The pre-test classification tests were Voltage at 1mA and Voltage at 500A, 8/20microseconds. Subsequently, for the High Current Short Duration test, three samples were subjected to two shots at 40KA 4/10 microseconds. Post-test classification values were recorded and compared with the pre test values. MCOV was applied and maintained for up to 30 minutes to demonstrate thermal recovery. The same general procedure was followed for the Low Current Long Duration tests except for the number of shots, which

was a total of twenty, and the current amplitude and waveform which was 75A, 2ms rectangular. In both cases thermal recovery was demonstrated and changes in classifying values were within acceptable limits. The arresters passed the test.

Test 6 Front of Wave Protective Level

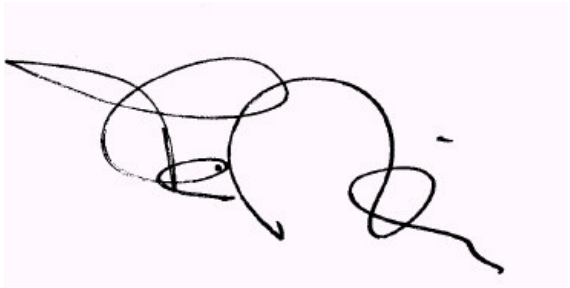
Three pro-rated sections were tested at 5kA with the following waveforms: 1/20, 2/20 and 8/20 microseconds. An extrapolation to a .5/20microsecond wave was made and the result recorded.

Test 7 Duty Cycle Test

In preparation for this test, the elevated voltage ratios k_C and k_R were determined per IEEE C62.11-1999 section 8.5. Both we found to be one. Before the arresters were subjected to twenty duty cycles plus two impulses at elevated temperature, the classification voltage was determined using the classifying current per table 6 in the standard. Following thermal recovery, the classification test was repeated and the values compared to the pre-test values. Changes were within specified limits.

Test 8 TOV Test

A no prior duty test was performed on complete arresters. The results are shown in graph 1 and table 2 in Appendix 1. TOV capability as defined by IEEE C62.11-1999 was demonstrated.



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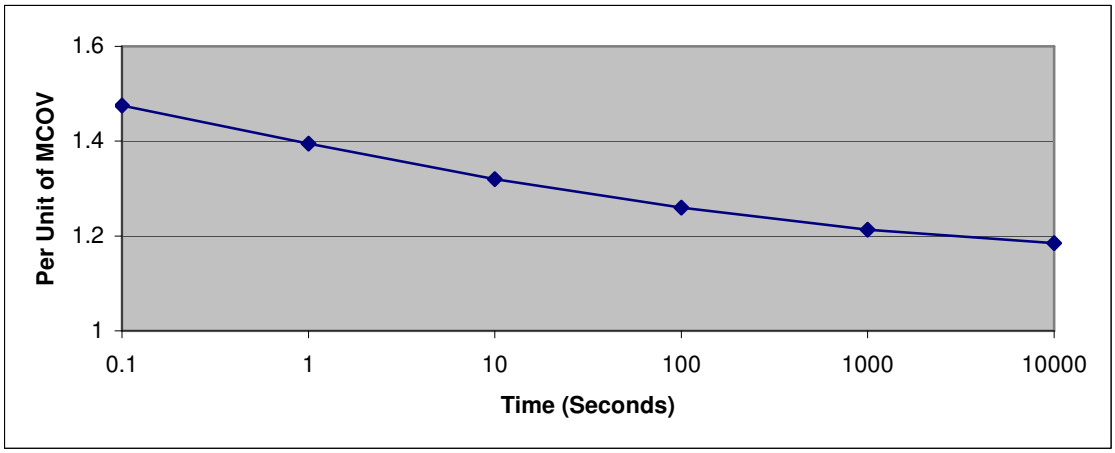
Appendix 1

			Maximum Discharge Voltage (kV crest) 8/20microseconds wave					
Duty Cycle Voltage Rating (V)	MCOV (V)	Equivalent Front-of-Wave (kV)	1.5 kA	3 kA	5 kA	10 kA	20 kA	40 kA
480	480	2.1	1.3	1.5	1.6	1.9	2.2	2.7

Table 1

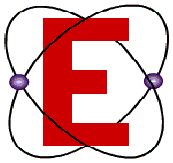
Time, Seconds	Per Unit of MCOV
0.1	1.475
1	1.395
10	1.32
100	1.26
1000	1.213
10000	1.185

Table 2



Graph 1 TOV Recovery Curve

Certified Test Report



ERMCO Components Inc.

480 VOLT MOV
SURGE ARRESTER WIRE

Report No. ECI-052004LVA **May 2004**

Introduction

The testing described in this report was performed to assess the performance of the leads used to connect the Low Voltage Distribution Arrester to the transformer when subjected to accelerated weathering.

There are no prescribed ANSI or ASTM tests for arrester wire, therefore the wire was subjected to 1000 hours of ultraviolet accelerated weathering (QUV) test which is 2X the pole transformer paint standard C57.12.31-2002 and to a 20 kV dielectric test which is 166X the typical operating voltage.

The wire used is standard hookup wire meeting the following type designation: MTW or THNN or THWN. The insulation on this wire consists of an inner layer of PVC covered with a Nylon jacket.

Tests Performed

Six inch long pieces of wire were cut and placed in a QUV tester and exposed for 1000 hours per ASTM G154-00, using the FS-40 bulb with a cycle of 4 hours ultraviolet at 60°C (140°F) followed by 4 hours condensation at 50°C (122°F).

Following this exposure, the wires were removed from the test equipment and examined visually. It was noticed that the Nylon jacket showed deterioration (cracking and flaking) while the PVC was unaffected except for loss of gloss.

In order to determine if the insulation qualities were affected by the exposure, two pieces of wire were twisted together. One end of the twisted pair was capped with epoxy and the other end bent apart to avoid flashover during test.

One wire was connected to ground and the other wire was connected to a voltage source. Increasing voltage was applied until 20KV was reached. At that time the test was discontinued.

No flashover or insulation failure was detected.

Conclusion

Since no insulation breakdown was detected at 20KV, which is a much higher voltage level than what is required for successful operation in the field, we conclude that wire of this type is suitable for the application.

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