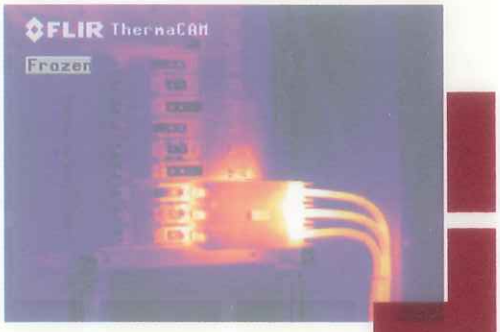
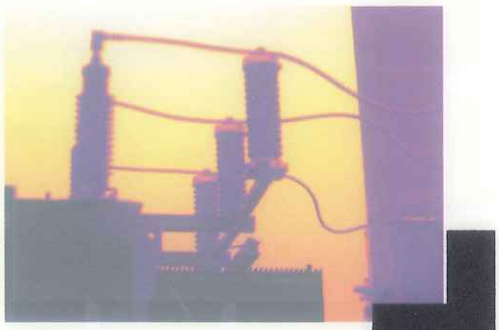
REVIEWED

for general conformance
with project requirements
Jeff Sultan, Electrical Engineer

Acceptance Test Report of

7/25/2011





Project:

College of San Mateo
1700 W. Hillsdale Blvd
San Mateo, Ca

Prepared For:

Contra Costa Electric
825 Howe Rd
Martinez, California

Prepared By:

Power Systems Testing Co.
2267 Claremont Court
Hayward, California 94545
510.783.5096

June 30, 2011

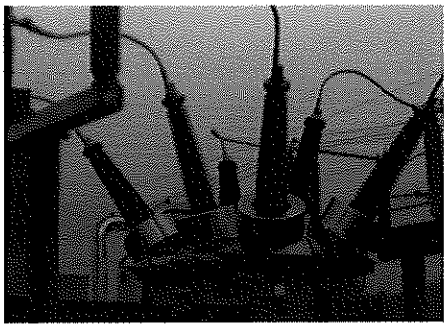
Reference: H12270

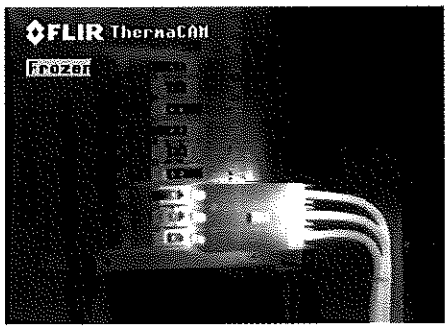
POWER SYSTEMS TESTING CO.

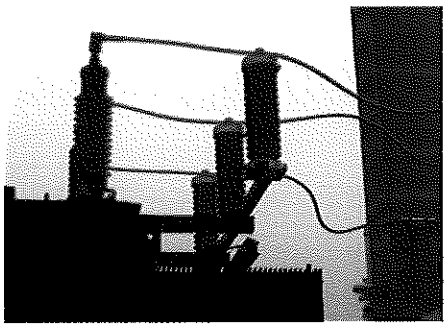
Report Prepared By: Carlos Gasca

Report Approved By: Jonathan Kropf

LOADCENTER 8 - UTILITIES UPGRADE







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1.0 INTRODUCTION

Acceptance tests are performed to provide assurance that the equipment tested and inspected is in proper operating condition. As well as maintaining continuous, reliable service; free from unscheduled electrical power interruptions and costly unplanned "down time" maintenance.

Protective devices are tested to assure protection against faults, overloads, and/or improper voltage conditions. Circuit breakers and relays are mechanically checked for conformance to manufacturer's specifications. Switchgear control wiring is checked for circuit integrity. Engineers' specifications are followed with regard to relay settings and electrical system operation.

The results of these tests when compared to results from future maintenance testing will provide a written track record on the performance of your electrical system.

2.0 SUMMARY

Power Systems Testing Company was awarded the contract to perform acceptance testing of the College of San Mateo, San Mateo, CA. The testing was performed on June 8, 2011 and June 9, 2011 by Carlos Gasca, Matt Hart, and Shane Carnine. The work was coordinated with Dave of Contra Costa Electric.

Equipment that was found with problems of a minor nature, were remedied immediately. Problems that will require additional work for correction are noted on the data sheets. A list of any discrepancies uncovered and recommendations for corrective action appear under the "Results and Recommendations" heading of this report.

3.0 EQUIPMENT TESTED AND INSPECTED

- **NEW PADMOUNT SWITCH:**

  1. One (1) Medium Voltage Padmount Switch, G & W, Type Gas Insulated Switch, 630 amps.

  2. One (1) Protective Relay, G & W.

  3. Nine (9) Medium Voltage Cables, Okonite, 15KV, 2/0 AWG.

- **NEW PADMOUNT TRANSFORMER:**

  1. One (1) Oil Filled Transformer, CG Power Systems, 1500KVA.

- **NEW MAIN SWITCHBOARD 480V:**

  1. One (1) Low Voltage Circuit Breaker, Cutler Hammer, Type Magnum SB, 2000 amps.

  2. One (1) Low Voltage Circuit Breaker, Cutler Hammer, Type HND, 1200 amps.

  3. Six (6) Low Voltage Circuit Breakers, Cutler Hammer, Type HKD, 225 amps to 400 amps.

  4. One (1) Dry Type Transformer, Cutler Hammer, 30KVA.

  5. One (1) Grounding System.

4.0 TEST PROCEDURES

- **SWITCHES, VACUUM, MEDIUM-VOLTAGE (NETA 7.5.3)**

1. VISUAL AND MECHANICAL INSPECTION

a. Compared equipment nameplate data with drawings and specifications.

b. Inspected physical and mechanical condition.

c. Inspected anchorage, alignment, grounding, and required clearances.

d. Verified the unit was clean.

e. Performed mechanical operator tests in accordance with manufacturer's published data, if applicable.

f. Verified correct operation of all indicating and control devices, if applicable.

g. Verified appropriate lubrication on moving current-carrying parts and on moving and sliding surfaces.

2. ELECTRICAL TESTS

a. Performed contact-resistance test across each switchblade and fuseholder.

b. Performed insulation-resistance tests for one minute on each pole, phase-to-phase and phase-to-ground with switch closed, and across each open pole. Applied voltage in accordance with manufacturer's published data. In the absence of manufacturer's published data, used Table 100.1.

c. Performed a dielectric withstand voltage test on each pole with switch closed. Tested each pole-to-ground with all other poles grounded. Test voltage was in accordance with manufacturer's published data. In the absence of manufacturer's published data, used Table 100.19.

4.0 TEST PROCEDURES CONT'D

- **SWITCHES, VACUUM, MEDIUM-VOLTAGE (NETA 7.5.3) CONT'D**

3. TEST VALUES

a. Microhm or dc millivolt drop values did not exceed the high levels of the normal range as indicated in the manufacturer's published data. In the absence of manufacturer's published data, investigated values that deviated from adjacent poles or similar switches by more than 50 percent of the lowest value.

b. Insulation-resistance values were in accordance with manufacturer's published data. In the absence of manufacturer's published data, used Table 100.1. Values of insulation resistance less than this table or manufacturer's recommendations were investigated. Dielectric withstand voltage tests did not proceed until insulation-resistance levels were raised above minimum values.

c. If no evidence of distress or insulation failure was observed by the end of the total time of voltage application during the dielectric withstand test, the test specimen was considered to have passed the test.

4.0 TEST PROCEDURES CONT'D

- **PROTECTIVE RELAYS, ELECTROMACHANICAL AND SOLID-STATE (NETA 7.9.1)**

1. VISUAL AND MECHANICAL INSPECTION

a. Compared equipment nameplate data with drawings and specifications.

b. Inspected relays and cases for physical damage. Removed shipping restraint material.

c. Verified the unit is clean.

d. Relay Case

1. Tightened case connections.

2. Inspected cover for correct gasket seal.

3. Cleaned cover glass. Inspected shorting hardware, connection paddles, and knife switches.

4. Removed any foreign material from the case.

5. Verified target reset.

e. Set relays in accordance with coordination study.

2. ELECTRICAL TESTS

a. Inspected targets and indicators.

1. Determined pickup and dropout of electromechanical targets.

2. Verified operation of all light-emitting diode indicators.

3. Set contrast for liquid-crystal display readouts.

4.0 TEST PROCEDURES CONT'D

- **PROTECTIVE RELAYS, ELECTROMACHANICAL AND SOLID-STATE (NETA 7.9.1) CONT'D**

3. FUNCTIONAL OPERATION

a. 50 Instantaneous Overcurrent Relay

1. Determined pickup.

2. Determined dropout.

3. Determined time delay.

b. 51 Time Overcurrent

1. Determined minimum pickup.

2. Determined time delay at two points on the time current curve.

4. CONTROL VERIFICATION

a. Functional tests

1. Verified that each of the relay contacts performed its intended function in the control scheme including breaker trip tests, close inhibit tests, 86 lockout tests, and alarm functions. Referred to Section 8.0.

5. TEST VALUES

a. When not otherwise specified, used manufacturer's recommended tolerances.

4.0 TEST PROCEDURES CONT'D

- **CABLES-MEDIUM AND HIGH VOLTAGE (NETA 7.3.3)**

1. VISUAL AND MECHANICAL INSPECTION

a. Compared cable data with drawings and specifications.

b. Inspected exposed sections of cables for physical damage.

c. Inspected compression-applied connectors for correct cable match and indentation.

d. Inspected shield grounding, cable supports, and terminations.

e. Verified that visible cable bends met or exceeded ICEA and manufacturer's minimum published bending radius.

f. Inspected fireproofing in common cable areas.

g. Inspected for correct identification and arrangements.

h. Inspected cable jacket and insulation condition.

2. ELECTRICAL TESTS

a. Performed an insulation-resistance test individually on each conductor with all other conductors and shields grounded. Applied voltage in accordance with manufacturer's published data. In the absence of manufacturer's published data, used Table 100.1.

b. Performed a shield-continuity test on each power cable.

c. In accordance with ICEA, IEC, IEEE and other power cable consensus standards, testing can be performed by means of direct current, power frequency alternating current, or very low frequency alternating current. These sources may be used to perform insulation-withstand tests, and baseline diagnostic tests such as partial discharge analysis, and power factor or dissipation factor. The selection was made after an evaluation of the available test methods and a review of the installed cable system. Some of the available test methods are listed below.

4.0 TEST PROCEDURES CONT'D

- **CABLES-MEDIUM AND HIGH VOLTAGE (NETA 7.3.3) CONT'D**

1. Dielectric Withstand

   A. Direct current (dc) dielectric withstand voltage

2. Baseline Diagnostic Tests

   A. Power factor/ dissipation factor (tan delta)

      I. Power frequency (50/60 Hz)

      II. Very low frequency (VLF)

   B. DC insulation resistance

3. **TEST VALUES**

   a. Insulation-resistance values were in accordance with manufacturer's published data. In the absence of manufacturer's published data, used Table 100.1. Values of insulation resistance less than this table or manufacturer's recommendations were investigated.

   b. Shielding exhibited continuity. Investigated resistance values in excess of ten ohms per 1000 feet of cable.

   c. If no evidence of distress or insulation failure was observed by the end of the total time of voltage application during the dielectric withstand test, the test specimen was considered to have passed the test.

   d. Based on the test methodology chosen, referred to applicable standards or manufacturer's literature for acceptable values.

4.0 TEST PROCEDURES CONT'D

- **TRANSFORMERS, LIQUID-FILLED (NETA 7.2.2)**

1. VISUAL AND MECHANICAL INSPECTION

a. Compared equipment nameplate data with drawings and specifications.

b. Inspected physical and mechanical condition.

c. Inspected impact recorder prior to unloading.

d. Tested dew point of tank gases, if applicable.

e. Inspected anchorage, alignment, and grounding.

f. Verified the presence of PCB content labeling.

g. Verified removal of any shipping bracing after placement.

h. Verified the bushings are clean.

i. Verified that alarm, control, and trip settings on temperature and level indicators are as specified.

j. Verified correct liquid level in tanks and bushings.

k. Verified that positive pressure was maintained on gas-blanketed transformers.

m. Performed inspections and mechanical tests as recommended by the manufacturer.

n. Tested load tap-changer in accordance with Section 7.12.

o. Verified presence of transformer surge arresters.

p. Verified de-energized tap-changer position was left as specified.

4.0 TEST PROCEDURES CONT'D

- **TRANSFORMERS, LIQUID-FILLED (NETA 7.2.2) CONT'D**

2. ELECTRICAL TESTS

a. Performed insulation-resistance tests, winding-to-winding and each winding-to-ground. Applied in accordance with manufacturer's published data. In the absence of manufacturer's published data, used Table 100.5. Calculated polarization index.

b. Performed turns-ratio tests at all tap positions.

c. Performed insulation power-factor or dissipation-factor tests on all windings in accordance with test equipment manufacturer's published data.

d. Performed excitation-current tests in accordance with test equipment manufacturer's published data.

e. Measured the resistance of each high-voltage winding in each de-energized tap-changer position.Measured the resistance of each low-voltage winding in each de-energized tap-changer position, if applicable.

f. Removed a sample of insulating liquid in accordance with ASTM D 923. Sample was tested for the following.

1. Dielectric breakdown voltage: ASTM D 877 and/or ASTM D 1816

2. Acid neutralization number: ANSI/ASTM D 974

3. Specific gravity: ANSI/ASTM D 1298

4. Interfacial tension: ANSI/ASTM D 971 or ANSI/ASTM D 2285

5. Color: ANSI/ASTM D 1500

6. Visual Condition: ASTM D 1524

g. Removed a sample of insulating liquid in accordance with ASTM D 3613 and performed dissolved-gas analysis (DGA) in accordance with ANSI/IEEE C57.104 or ASTM D3612.

4.0 TEST PROCEDURES CONT'D

- **TRANSFORMERS, LIQUID-FILLED (NETA 7.2.2) CONT'D**

3. TEST VALUES

a. Liquid levels in the transformer tanks and bushings were within indicated tolerances.

b. Positive pressure was indicated on pressure gauge for gas-blanketed transformers.

c. Minimum insulation-resistance values of transformer insulation were in accordance with manufacturer's published data. In the absence of manufacturer's published data, used Table 100.5. Values of insulation resistance less than this table or manufacturer's recommendations were investigated. The polarization index was not less than 1.0.

d. Turns-ratio test results did not deviate by more than one-half percent from either the adjacent coils or the calculated ratio.

e. Maximum winding insulation power-factor/dissipation-factor values of liquid-filled transformers were in accordance with the manufacturer's published data. In the absence of manufacturer's published data used Table 100.3.

f. Typical excitation-current test data pattern for a three-legged core transformer was two similar current readings and one lower current reading.

g. Temperature corrected winding-resistance values were compared within one percent of previously obtained results.

h. Insulating liquid values were in accordance with Table 100.4.

i. Evaluated results of dissolved-gas analysis in accordance with ANSI/IEEE Standard C57.104.

4.0 TEST PROCEDURES

- **SWITCHGEAR AND SWITCHBOARD ASSEMBLIES (NETA 7.1)**

1. VISUAL AND MECHANICAL INSPECTION

a. Compared equipment nameplate data with drawings and specifications.

b. Inspected physical and mechanical condition.

c. Inspected anchorage, alignment, grounding, and required area clearances.

d. Verified the unit was clean and all shipping bracing, loose parts, and documentation shipped inside cubicles have been removed.

e. Verified that fuse and circuit breaker sizes and types correspond to drawings and coordination study as well as to the circuit breaker's address for microprocessor-communication packages.

f. Inspected bolted electrical connections for high resistance using the following method:

1. Used a low-resistance ohmmeter in accordance with Section 7.1.2.

g. Verified appropriate lubrication on moving current-carrying parts and on moving and sliding surfaces.

h. Inspected insulators for evidence of physical damage or contaminated surfaces.

i. Verified correct barrier and shutter installation and operation.

j. Exercised all active components.

k. Inspected mechanical indicating devices for correct operation.

l. Verified that filters are in place and vents are clear.

4.0 TEST PROCEDURES CONT'D

- **SWITCHGEAR AND SWITCHBOARD ASSEMBLIES (NETA 7.1) CONT'D**

2. ELECTRICAL TESTS

a. Performed resistance measurements through bolted electrical connections with a low-resistance ohmmeter, if applicable, in accordance with Section 7.1.1.

b. Performed insulation-resistance tests on each bus section, phase-to-phase and phase-to-ground, for one minute in accordance with Table 100.1.

e. Performed ground-resistance tests in accordance with Section 7.13.

k. Verified operation of cubicle switchgear/switchboard space heaters.

3. TEST VALUES

a. Compared bolted connection resistance values to values of similar connections. Investigated values which deviated from those of similar bolted connections by more than 50 percent of the lowest value.

b. Insulation-resistance values of bus insulation were in accordance with manufacturer's published data. In the absence of manufacturer's published data, used Table 100.1. Values of insulation resistance less than this table or manufacturer's recommendations were investigated.

c. Results of ground-resistance tests were in accordance with Section 7.13.

d. Heaters were operational.

4.0 TEST PROCEDURES CONT'D

- **CIRCUIT BREAKERS, AIR, INSULATED CASE/MOLDED-CASE (NETA 7.6.1.1)**

1. VISUAL AND MECHANICAL INSPECTION

a. Compared equipment nameplate data with drawings and specifications.

b. Inspected physical and mechanical condition.

c. Inspected anchorage and alignment.

d. Verified the unit was clean.

e. Operated the circuit breaker to insure smooth operation.

f. Performed adjustments for final protective device settings in accordance with the coordination study.

2. ELECTRICAL TESTS

a. Performed insulation-resistance tests for one minute on each pole, phase-to-phase and phase-to-ground with the circuit breaker closed, and across each open pole. Applied voltage in accordance with manufacturer's published data. In the absence of manufacturer's published data, used Table 100.1.

b. Performed a contact/pole-resistance test.

c. Determined long-time pickup and delay by primary current injection.

d. Determined short-time pickup and delay by primary current injection.

e. Determined ground-fault pickup and time delay by primary current injection.

f. Determined instantaneous pickup by primary current injection.

g. Verified operation of charging mechanism.

4.0 TEST PROCEDURES CONT'D

- **CIRCUIT BREAKERS, AIR, INSULATED CASE/MOLDED-CASE (NETA 7.6.1.1) CONT'D**

3. TEST VALUES

a. Settings complied with coordination study recommendations.

b. Insulation-resistance values were in accordance with manufacturer's published data. In the absence of manufacturer's published data, used Table 100.1. Values of insulation resistance less than this table or manufacturer's recommendations were investigated.

c. Microhm or dc millivolt drop values did not exceed the high levels of the normal range as indicated in the manufacturer's published data. If manufacturer's published data was not available, investigated values that deviated from adjacent poles or similar breakers by more than 50 percent of the lowest value.

d. Long-time pickup values were as specified, and the trip characteristic did not exceed manufacturer's published time-current characteristic tolerance band, including adjustment factors. If manufacturer's curves were not available, trip times did not exceed the value shown in Table 100.7.

e. Short-time pickup values were as specified, and the trip characteristic did not exceed manufacturer's published time-current tolerance band.

f. Ground fault pickup values were as specified, and the trip characteristic did not exceed manufacturer's published time-current tolerance band.

g. Instantaneous pickup values were as specified and within manufacturer's published tolerances. In the absence of manufacturer's published data, referred to Table 100.8.

h. Pickup values and trip characteristics were within manufacturer's published tolerances.

i. The charging mechanism operated in accordance with manufacturer's published data.

4.0 TEST PROCEDURES CONT'D

- **TRANSFORMERS, DRY-TYPE, AIR-COOLED, LOW-VOLTAGE, SMALL (NETA 7.2.1.1)**

1. VISUAL AND MECHANICAL INSPECTION

a. Compared equipment nameplate data with drawings and specifications.

b. Inspected physical and mechanical condition.

c. Inspected anchorage, alignment, and grounding.

d. Verified that resilient mounts were free and that any shipping brackets were removed.

e. Verified that as-left tap connections were as specified.

2. ELECTRICAL TESTS

a. Performed insulation-resistance tests winding-to-winding and each winding-to-ground. Applied voltage in accordance with manufacturer's published data or in the absence of manufacturer's published data, used Table 100.5. Calculated polarization index.

b. Performed turns-ratio tests at all tap positions.

3. TEST VALUES

a. Tap connections were left as found unless otherwise specified.

b. Minimum insulation-resistance values of transformer insulation were in accordance with manufacturer's published data. In the absence of manufacturer's published data, used Table 100.5. Values of insulation resistance less than this table or manufacturer's recommendations were investigated. The polarization index was not less than 1.0.

c. Turns-ratio test results did not deviate by more than one-half percent from either the adjacent coils or the calculated ratio.

d. Phase-to-phase and phase-to-neutral secondary voltages were in agreement with nameplate data.

4.0 TEST PROCEDURES CONT'D

- **GROUNDING SYSTEMS (NETA 7.13)**

1. VISUAL AND MECHANICAL INSPECTION

a. Verified ground system was in compliance with drawings, specifications, and NFPA 70 National Electrical Code Article 250.

b. Inspected physical and mechanical condition.

c. Inspected anchorage.

2. ELECTRICAL TESTS

a. Performed fall-of-potential or alternative test in accordance with ANSI/IEEE 81 on the main grounding electrode or system.

b. Performed point-to-point tests to determined the resistance between the main grounding system and all major electrical equipment frames, system neutral, and derived neutral points.

3. TEST VALUES

a. Grounding system electrical and mechanical connections were free of corrosion.

b. The resistance between the main grounding electrode and ground was no greater than five ohms for large commercial or industrial systems and 1.0 ohm or less for generating or transmission station grounds unless otherwise specified by the owner. (Referenced ANSI/IEEE Standard 142)

c. Investigated point-to-point resistance values that exceed 0.5 ohm.

5.0 RESULTS AND RECOMMENDATIONS

All equipment, listed in section 3.0 "**Equipment Inspected and Tested**", tested satisfactory as installed and is operational and acceptable for service.

This is for your information and documentation.

NETA Reference Tables

TABLE 100.1

Insulation Resistance Test Values
Electrical Apparatus and Systems

Nominal Rating of Equipment in Volts	Minimum Test Voltage, DC	Recommended Minimum Insulation Resistance in Megohms
250	500	25
600	1,000	100
1,000	1,000	100
2,500	1,000	500
5,000	2,500	1,000
8,000	2,500	2,000
15,000	2,500	5,000
25,000	5,000	20,000
34,500 and above	15,000	100,000

In the absence of consensus standards dealing with insulation-resistance tests, the Standards Review Council suggests the above representative values.

See Table 100.14 for temperature correction factors.

Test results are dependent on the temperature of the insulating material and the humidity of the surrounding environment at the time of the test.

Insulation-resistance test data may be used to establish a trending pattern. Deviations from the baseline information permit evaluation of the insulation.

TABLE 100.3

Recommended Dissipation Factor/Power Factor at 20° C Liquid-Filled Transformers, Regulators, and Reactors Acceptance Test Values

Oil, Silicone, and Less-Flammable Hydrocarbon Maximum Value (Percent)	
New Power Transformers and Reactors	0.5%
New Distribution Transformers and Regulators	1.0%
Remanufactured Power Transformers and Reactors	1.0%
Remanufactured Distribution Transformers and Regulators	1.5%

In the absence of consensus standards dealing with transformer dissipation-factor or power-factor values, the NETA Standards Review Council suggests the above representative values.

TABLE 100.4.1

Insulating Fluid Limits

Table 100.4.1 Test Limits for New Insulating Oil Received in New Equipment					
Mineral Oil					
Test	**ASTM Method**	**≤ 69 kV and Below**	**>69 kV - < 230 kV**	**≥230 kV - < 345 kV**	**≥345 kV and Above**
Dielectric breakdown, kV minimum	D877	30	30	30	
Dielectric breakdown, kV minimum @ 1mm (0.04") gap	D1816	25	30	32	35
Dielectric breakdown, kV minimum @ 2 mm (0.08") gap	D1816	45	52	55	60
Interfacial tension mN/m minimum	D971 or D2285	38	38	38	38
Neutralization number, mg KOH/g maximum	D974	0.015	0.015	0.015	0.015
Water content, ppm maximum	D1533	20	10	10	10
Power factor at 25° C, %	D924	0.05	0.05	0.05	0.05
Power factor at 100° C, %	D924	0.40	0.40	0.30	0.30
Color	D1500	1.0	1.0	1.0	0.5
Visual condition	D1524	Bright and clear	Bright and clear	Bright and clear	Bright and clear

ANSI/IEEE C57.106-2002, *Guide for Acceptance and Maintenance of Insulating Oil in Equipment*, Tables 1, 2, and 3.

Table 100.5

Transformer Insulation Resistance Acceptance Testing

Transformer Coil Rating Type in Volts	Minimum DC Test Voltage	Recommended Minimum Insulation Resistance in Megohms	
		Liquid Filled	Dry
0 - 600	1000	100	500
601 - 5000	2500	1000	5000
Greater than 5000	5000	5000	25000

In the absence of consensus standards, the NETA Standards Review Council suggests the above representative values.

See Table 100.14 for temperature correction factors.

NOTE: Since insulation resistance depends on insulation rating (kV) and winding capacity (kVA), values obtained should be compared to manufacturer's published data.

.TABLE 100.7

Inverse Time Trip Test at 300% of Rated Continuous Current of Circuit Breaker Molded-Case Circuit Breakers

Range of Rated Continuous Current (Amperes)	Maximum Trip Time in Seconds For Each Maximum Frame Rating[a]	
	≤ 250 V	251 – 600V
0-30	50	70
31-50	80	100
51-100	140	160
101-150	200	250
151-225	230	275
226-400	300	350
401-600	- - - - -	450
601-800	- - - - -	500
801-1000	- - - - -	600
1001 – 1200	- - - - -	700
1201-1600	- - - - -	775
1601-2000	- - - - -	800
2001-2500	- - - - -	850
2501-5000	- - - - -	900
6000	- - - - -	1000

Derived from Table 5-3, NEMA Standard AB 4-1996, *Guidelines for Inspection and Preventive Maintenance of Molded-Case Circuit Breakers Used in Commercial and Industrial Applications.*

a. Trip times may be substantially longer for integrally-fused circuit breakers if tested with the fuses replaced by solid links (shorting bars).

TABLE 100.8

Instantaneous Trip Tolerances for Field Testing of Circuit Breakers

		Tolerances of Manufacturer's Published Trip Range	
Breaker Type	**Tolerance of Settings**	**High Side**	**Low Side**
Adjustable	+40% -30%	- - - - -	- - - - -
Nonadjustable	- - - - -	+25%	-25%

Reproduction of Table 5-4 from NEMA publication AB4-1996.

For circuit breakers with nonadjustable instantaneous trips, tolerances apply to the manufacturer's published trip range, i.e., +40 percent on high side, -30 percent on low side.

TABLE 100.14.1

Insulation Resistance Conversion Factors (20° C)

Table 100.14.1 Test Temperatures to 20° C			
Temperature		**Multiplier**	
° C	**° F**	**Apparatus Containing Immersed Oil Insulation**	**Apparatus Containing Solid Insulation**
-10	14	0.125	0.25
-5	23	0.180	0.32
0	32	0.25	0.40
5	41	0.36	0.50
10	50	0.50	0.63
15	59	0.75	0.81
20	68	1.00	1.00
25	77	1.40	1.25
30	86	1.98	1.58
35	95	2.80	2.00
40	104	3.95	2.50
45	113	5.60	3.15
50	122	7.85	3.98
55	131	11.20	5.00
60	140	15.85	6.30
65	149	22.40	7.90
70	158	31.75	10.00
75	167	44.70	12.60
80	176	63.50	15.80
85	185	89.789	20.00
90	194	127.00	25.20
95	203	180.00	31.60
100	212	254.00	40.00
105	221	359.15	50.40
110	230	509.00	63.20

Derived from *Stitch in Time...The Complete Guide to Electrical Insulation Testing*, Megger.

Formula:
$R_c = R_a \times K$
Where: R_c is resistance corrected to 20° C
R_a is measured resistance at test temperature
K is applicable multiplier

Example: Resistance test on oil-immersion insulation at 104°
R_a = 2 megohms @ 104° F
K = 3.95
$R_c = R_a \times K$
R_c = 2.0 x 3.95
R_c = 7.90 megohms @ 20° C

TABLE 100.19

Dielectric Withstand Test Voltages
Electrical Apparatus Other than Inductive Equipment

Nominal System (Line) Voltage[a] (kV)	Insulation Class	AC Factory Test (kV)	Maximum Field Applied AC Test (kV)	Maximum Field Applied DC Test (kV)
1.2	1.2	10	6.0	8.5
2.4	2.5	15	9.0	12.7
4.8	5.0	19	11.4	16.1
8.3	8.7	26	15.6	22.1
14.4	15.0	34	20.4	28.8
18.0	18.0	40	24.0	33.9
25.0	25.0	50	30.0	42.4
34.5	35.0	70	42.0	59.4
46.0	46.0	95	57.0	80.6
69.0	69.0	140	84.0	118.8

In the absence of consensus standards, the NETA Standards Review Council suggests the above representative values.

a. Intermediate voltage ratings are placed in the next higher insulation class.

Test Data Sheets

POWER SYSTEMS TESTING CO.

Northern • Central
Southern • California

HIGH VOLTAGE VACUUM INTRRUPTER TEST REPORT

CUSTOMER Contra Costa Electric	LOCATION College of San Mateo	JOB NO. H12270
	1700 W. Hillsdale BLVD.	DATE 6-8-11
	San Mateo, CA.	TESTED BY CG
SWGR PNL. IDENTIFICATION: New Padmount Switch	TEST EQUIPMENT USED: 5KV megger CAL# 1010431, AC Hipot 1010551	
	DLRO 100 AMP CAL# 100 7417	

MFG./TYPE G&W / Gas Insulated Switch
STYLE NO. LPF142-376-12-9F
VOLTAGE RATING 15.5KV
CURRENT RATING 630A main / 630A Trap
INTERRUPTING RATING 20KA
S/N 2011 0315 0002
BIL - 110 KV
GAS REQ: 18 lbs

	MFG. TOLERANCE	AS FOUND			AS LEFT		
	MIN/MAX	A	B	C	A	B	C
VACUUM BOTTLE TEST @ 27kv / 1min	Pass/Fail	Pass	Pass	Pass.			
AC Hipot open @ 27KV / 1min	Pass/Fail	Pass	Pass	Pass			
AC Hipot closed @ 27KV / 1min	Pass/Fail	Pass	Pass	Pass			
Feeder #1 To Feeder #2	contact Resist.	344.8μΩ	383.9μΩ	369.5μΩ			
Feeder #2 To Feeder #4	Contact Resist.	931.1μΩ	949.8μΩ	935.7μΩ			
Feeder #1 To Feeder #4	Contact Resist.	855.3μΩ	803μΩ	808.4μΩ			
CONTACT RESISTANCE (MICRO-OHMS)							

MEGGER TEST	BREAKER OPEN			BREAKER CLOSED					
	A	B	C	A-GRN	B-GRN	C-GRN	A-B	B-C	C-A
@ 1min 2500 VOLTS	606Ω	606Ω	606Ω	606Ω	606Ω	606Ω	606Ω	606Ω	606Ω

COUNTER START	N/A	BARRIERS	✓	CONTROL CONNECTIONS	✓	AUX. DEVICES	✓		
COUNTER STOP	N/A	BUSHINGS	✓	INTERLOCKS		LUBRICATION	✓		
		SECONDARY CONTACTS	N/A	AUX.CONTACTS	N/A	RACKING MECHANISM	N/A		

REMARKS:

POWER SYSTEMS TESTING CO.

LOS ANGELES • SAN DIEGO
HAYWARD • FRESNO • SACRAMENTO

OVERCURRENT RELAY TEST REPORT

CUSTOMER Contra Costa Electric	LOCATION College of San Mateo	JOB NO. H 12270
		DATE 6-9-11
		TESTED BY CG

SWGR. PNL. IDENTIFICATION 12kV Switch Science Bldg

TEST EQUIPMENT USED CB 845 CAL# 1009855

CIRCUIT IDENTIFICATION	RELAY		SETTINGS			TEST DATA							
	MFG.	TYPE	TAP	TIME DIAL	INST.	PICKUP (AMPS)	TIME IN SECONDS @ 150 %	200 %	300 %	%	INST. (AMPS)	TARGET OPERATION	INSUL. RES.
						187.5A	250A	375A					
A4 ØA	G&W	2 vac Inte control	125	0 coil	x7	128	6.30	3.18	1.19		883	✓	
B4 ØB	G&W	↓	125	↓		128	6.49	3.39	1.22		870	✓	
C4 ØC	↓	↓	125	↓		128	6.56	3.20	1.21		872	✓	
A4 GF	↓	↓	35%	↓		46	6.71	3.40	1.21			✓	
B4 GF	↓	↓	35%	↓		46	6.63	3.36	1.2			✓	
C4 GF	↓	↓	35%	↓		46	6.54	3.45	1.2			✓	

REMARKS

Form # 020A

POWER SYSTEMS TESTING CO.

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DC HIGH POTENTIAL TEST REPORT

CUSTOMER: CONTRA COSTA ELECTRIC	LOCATION: COLLEGE OF SAN MATEO 1700 W. HILLSDALE BLVD. SAN MATEO CA	JOB NO.: H12270 DATE: 6.9.11 TESTED BY: MH
SWGR PNL. IDENTIFICATION: G&W SWITCH FEEDER 1	TEST EQUIPMENT USED: DC HIPOT CAL. 1009892 5 KV MEGGER CAL. 1010032	

CABLE DATA

Cable Mfg.: OKONITE

Insulation type: OKOGAURD EP 133% | Mils: 220

Voltage: 15KV | Gnd: ✓ | Ungnd:

Conductor Size: 2/0 AWG | CU: ✓ | AL:

Length: 200 FT. | Shld: ✓ | Unshld:

Date Installed: | No Term: 2

Term Type: 200A LOAD BREAK

TEST INFORMATION

Test voltage: 50KV | Steps: 10

Temp: 90°F | Humidity: 33%

Megger@ 2500 V

A-G	B-G	C-G
60G	60G	60G

Shield continuity

A	B	C

TEST DATA

STEP VOLTAGE TEST

Kilovolts	Microamps A	Microamps B	Microamps C
5KV	.15	.10	.11
10KV	.19	.13	.15
15KV	.23	.20	.20
20KV	.27	.26	.25
25KV	.29	.29	.30
30KV	.33	.33	.33
35KV	.38	.39	.38
40KV	.42	.41	.41
45KV	.50	.50	.50
50KV	.54	.50	.49

LEAKAGE @ TEST VOLTAGE

Time	Microamps A	Microamps B	Microamps C
:30	.55	.52	.53
1:00	.54	.50	.49
2:00	.42	.42	.43
3:00	.40	.40	.40
4:00	.39	.40	.40
5:00	.38	.38	.36
6:00	.37	.37	.34
7:00	.37	.36	.33
8:00	.36	.36	.33
9:00	.34	.36	.31
10:00	.31	.33	.30
11:00	.31	.33	.30
12:00	.30	.32	.29
13:00	.30	.31	.29
14:00	.29	.31	.29
15:00	.29	.30	.29

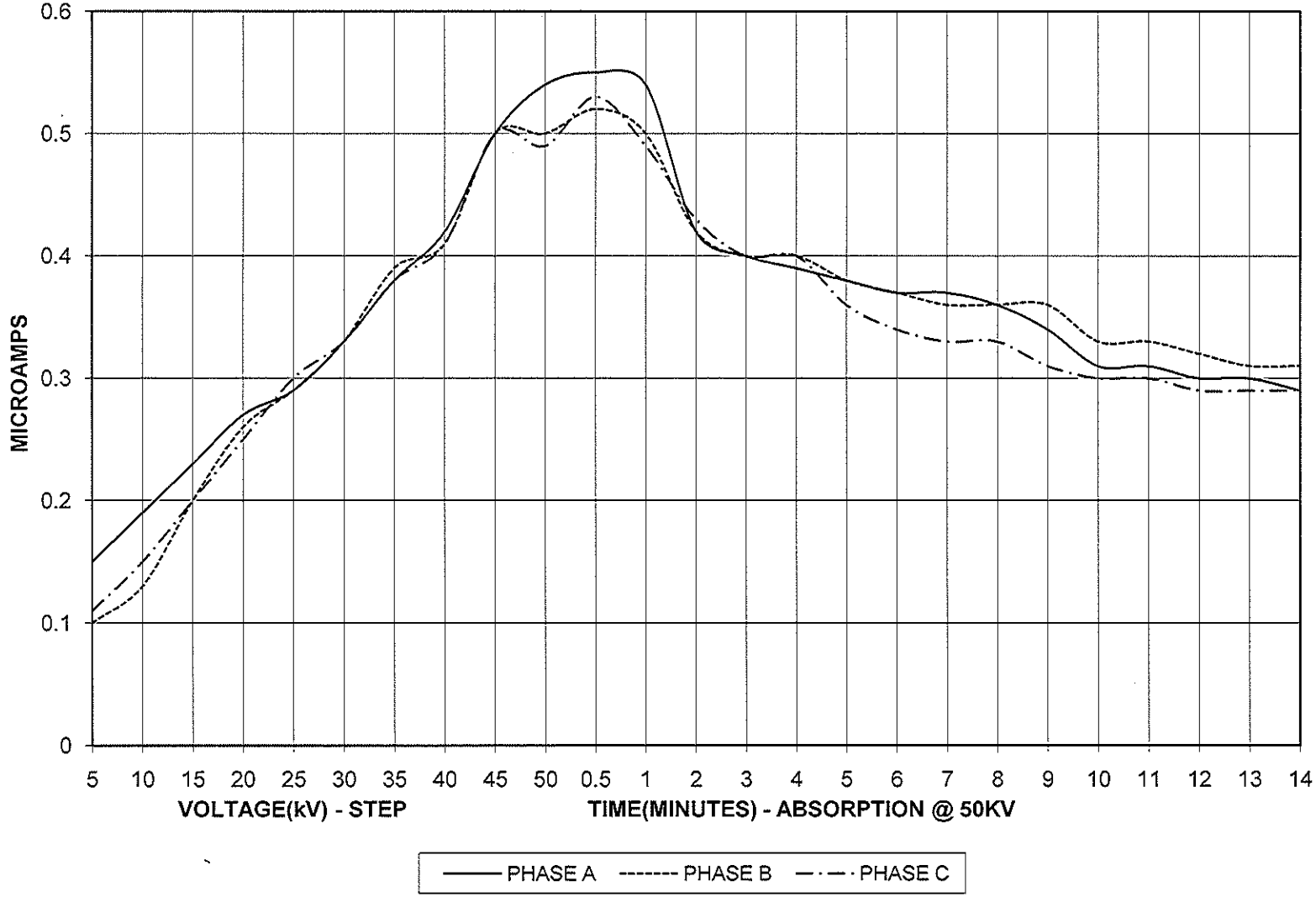
VOLTAGE DECAY

Time	Kilovolts A	Kilovolts B	Kilovolts C
:02	30KV	31KV	31KV
:05	10KV	10KV	11KV
:07	7KV	7KV	8KV
:10	5KV	4KV	5KV
:12	2KV	1KV	1KV
:15	Ø	Ø	Ø

REMARKS:

POWER SYSTEMS TESTING CO.

CABLE HIGH POTENTIAL TEST
COLLEGE OF SAN MATEO
FEEDER 1



POWER SYSTEMS TESTING CO.

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California

DC HIGH POTENTIAL TEST REPORT

CUSTOMER: CONTRA COSTA ELECTRIC	LOCATION: COLLEGE OF SAN MATEO 1700 W. HILLSDALE BLVD. SAN MATEO CA	JOB NO.: H12270 DATE: 6.9.11 TESTED BY: MH
SWGR PNL. IDENTIFICATION: G3W SWITCH FEEDER 2	TEST EQUIPMENT USED: DC HIPOT CAL. 1009892 5KV MEGGER CAL 1010632	

CABLE DATA

Cable Mfg. OKONITE		
Insulation type: OKOGUARD EP 133%	Mils: 220	
Voltage: 15KV	Gnd: ✓	Ungnd
Conductor Size: 2/0 AWG	CU: ✓	AL
Length: 200 FT.	Shld: ✓	Unshld
Date Installed	No Term: 2	
Term Type: 200A LOAD BREAK		

TEST INFORMATION

Test voltage: 50KV	Steps: 10
Temp: 90°F	Humidity: 33%

Megger@ 2500 V

A-G	B-G	C-G
60G	60G	60G

Shield continuity

A	B	C

TEST DATA

STEP VOLTAGE TEST

Kilovolts	Microamps A	B	C
5KV	.11	.20	.15
10KV	.16	.34	.20
15KV	.29	.52	.25
20KV	.44	.70	.36
25KV	.60	.83	.50
30KV	.80	1.1	.63
35KV	1.00	1.40	.78
40KV	1.40	1.60	.98
45KV	1.70	2.00	1.20
50KV	2.00	2.30	1.25

LEAKAGE @ TEST VOLTAGE

Time	Microamps A	B	C
:30	2.00	2.30	1.25
1:00	2.00	2.30	1.25
2:00	2.00	2.30	1.21
3:00	2.00	2.30	1.16
4:00	1.90	2.30	1.00
5:00	1.90	2.20	1.00
6:00	1.90	2.20	.95
7:00	1.90	2.20	.90
8:00	1.90	2.20	.90
9:00	1.90	2.10	.80
10:00	1.90	2.10	.80
11:00	1.90	2.00	.75
12:00	1.90	2.00	.75
13:00	1.90	2.00	.75
14:00	1.90	1.90	.75
15:00	1.90	1.90	.75

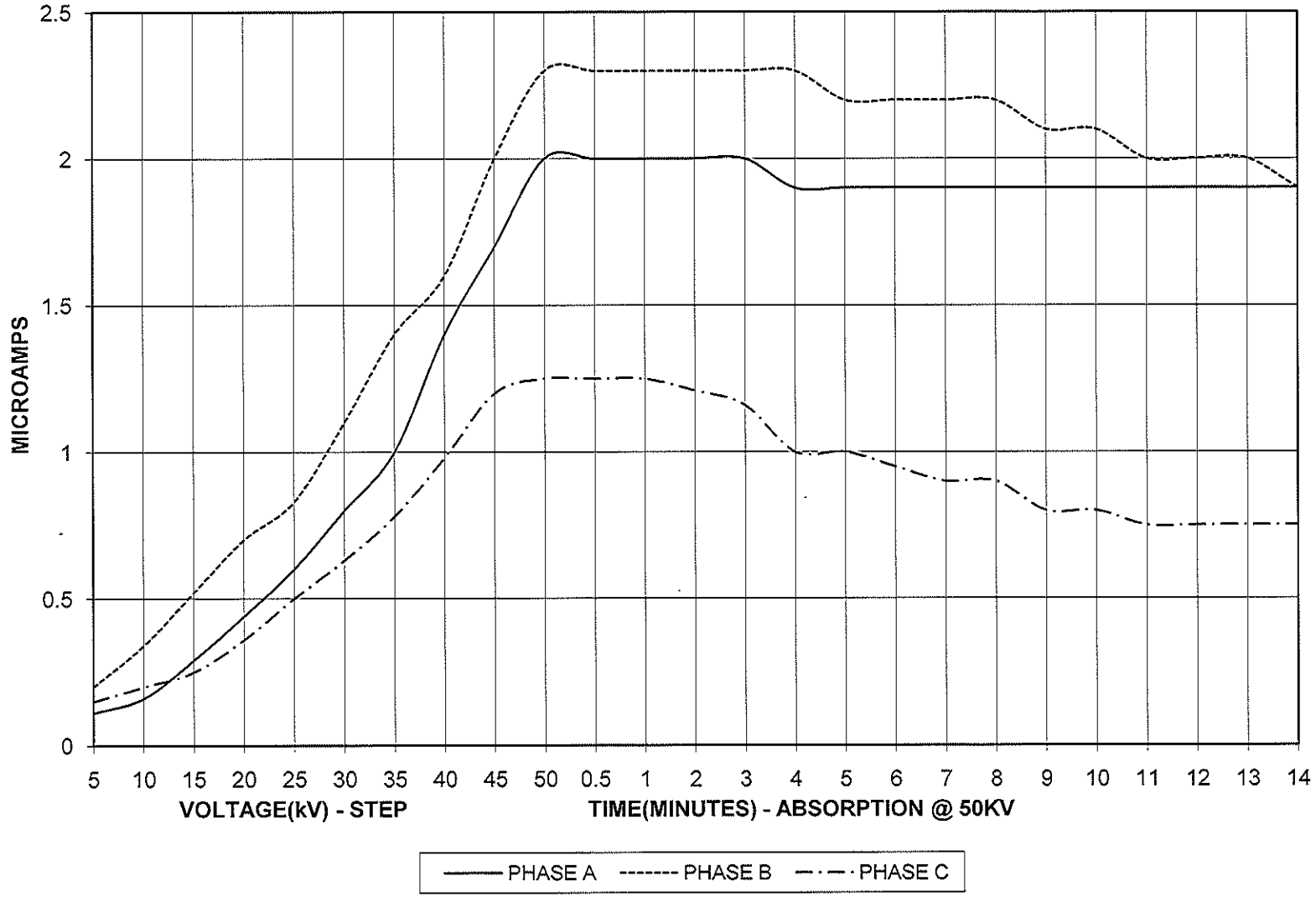
VOLTAGE DECAY

Time	Kilovolts A	B	C
:02	30KV	32KV	30KV
:05	15KV	11KV	10KV
:07	7KV	4KV	3KV
:10	2KV	1KV	1KV
:12	Ø	Ø	Ø
:15	Ø	Ø	Ø

REMARKS: * USED DIFFERENT POWER SUPPLY FOR A & B PHASE.

POWER SYSTEMS TESTING CO.

CABLE HIGH POTENTIAL TEST
COLLEGE OF SAN MATEO
FEEDER 2



POWER SYSTEMS TESTING CO.

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DC HIGH POTENTIAL TEST REPORT

CUSTOMER: CONTRA COSTA ELECTRIC	LOCATION: COLLEGE OF SAN MATEO 1700 W. HILLSDALE BLVD. SAN MATEO CA	JOB NO.: H12270 DATE: 6.9.11 TESTED BY: MH
SWGR PNL. IDENTIFICATION: G3W BREAKER FEEDER CABLES TO TRANSFORMER	TEST EQUIPMENT USED: DC HIPOT CAL. 1009892 5KV MEGGER CAL. 1010632	

CABLE DATA

Cable Mfg. OKONITE

Insulation type DKOSAURD EP 133% | Mils 220

Voltage 15 KV | Gnd ✓ | Ungnd

Conductor Size 2/0 AWG | CU ✓ | AL

Length 50 FT | Shld ✓ | Unshld

Date Installed | No Term 2

Term Type 200A LOAD BREAK

TEST INFORMATION

Test voltage 50 KV | Steps 10

Temp 90°F | Humidity 33%

Megger@ 2500 V

A-G	B-G	C-G
60G	60G	60G

Shield continuity

A	B	C
0.2Ω	0.2Ω	0.2Ω

TEST DATA

STEP VOLTAGE TEST

Kilovolts	Microamps A	Microamps B	Microamps C
5 KV	.05	.08	.010
10 KV	.09	.10	.10
15 KV	.11	.12	.11
20 KV	.14	.15	.15
25 KV	.19	.20	.20
30 KV	.22	.23	.24
35 KV	.28	.28	.29
40 KV	.33	.32	.33
45 KV	.38	.38	.38
50 KV	.39	.38	.39

LEAKAGE @ TEST VOLTAGE

Time	Microamps A	Microamps B	Microamps C
:30	.42	.43	.43
1:00	.39	.38	.39
2:00	.35	.35	.38
3:00	.30	.32	.35
4:00	.30	.31	.34
5:00	.30	.31	.34
6:00	.30	.30	.33
7:00	.30	.30	.33
8:00	.29	.30	.33
9:00	.28	.30	.33
10:00	.28	.29	.33
11:00	.28	.29	.33
12:00	.28	.29	.33
13:00	.28	.29	.32
14:00	.28	.28	.32
15:00	.28	.28	.32

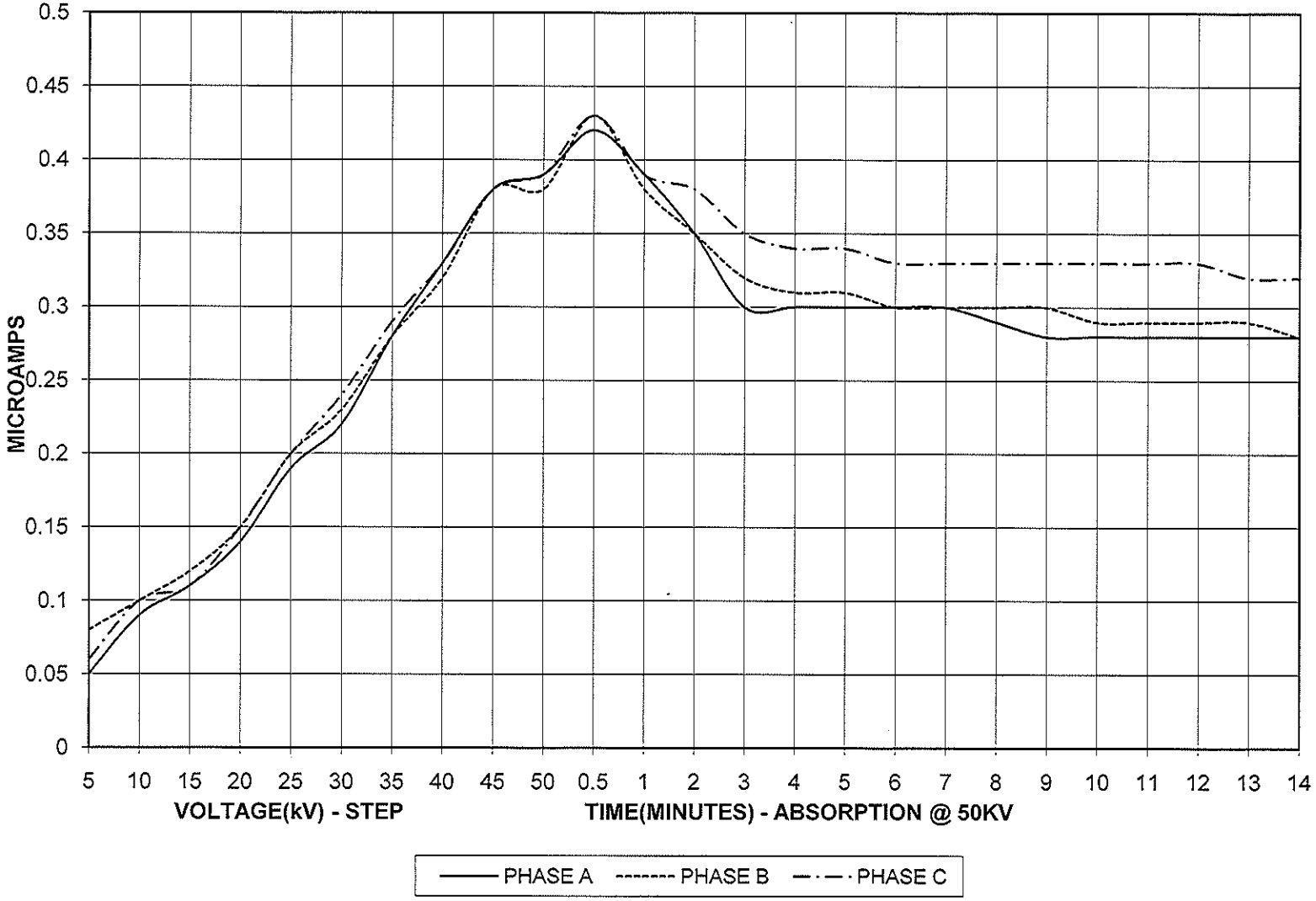
VOLTAGE DECAY

Time	Kilovolts A	Kilovolts B	Kilovolts C
:02	15KV	15KV	16KV
:05	4KV	4KV	4KV
:07	Ø	Ø	Ø
:10	Ø	Ø	Ø
:12	Ø	Ø	Ø
:15	Ø	Ø	Ø

REMARKS:

POWER SYSTEMS TESTING CO.

CABLE HIGH POTENTIAL TEST
COLLEGE OF SAN MATEO
FEEDER 4 TO TRANSFORMER



POWER SYSTEMS TESTING CO.

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TRANSFORMER TEST REPORT

CUSTOMER Contra Costa Electric	LOCATION College of San Mateo	JOB NO. H12270
		DATE 6-8-11
		TESTED BY CG, SC

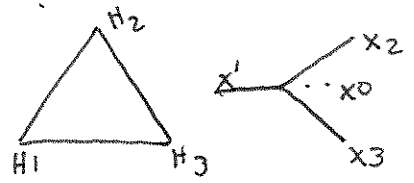
TRANSFORMER IDENTIFICATION: BLDG Science XFMR
New Padmount Transformer.

TEST EQUIPMENT USED: AEMC TTR CAL# 1010696, MRM-40CAL# 1010761
5kv megger CAL# 101043

NAMEPLATE INFORMATION

MFG. CG Power Systems
KVA 1500 KVA
VOLTAGE 12470 480Y/277
SERIAL NO. 201111 26724
5.75 %Z @ 65 °C
OIL [✓] DRY [ ] OIL SAMPLE TAKEN YES [✓] NO [ ]
Model - MA 150124 BE 48019
BIL - 95KV, 30KV
Liquid gallon 335 gals
Date 04/11
Total lb ~~8850 LB~~ 8050 LB.

DIAGRAM



ELECTRICAL TEST DATA

MEGGER TEST @ 5000/1000 V.

Time	H-L	H-L&G	L-H&G
:30	11.76	15.36	4.156
1:00	15.46	17.06	4.976
10:00	30.46	24.66	66
A.I 1/:30	1.32	1.11	1.19
P.I 10/1	1.97	1.44	1.2

TEMP 60°F HUM 30%

WINDING RESISTANCE @TAP C

HI-H2	633.3mΩ	X1-X0	389μΩ
H2-H3	629.6mΩ	X2-X0	363μΩ
H3-H1	627.7mΩ	X3-X0	352μΩ

TURNS RATIO TEST

TAP POSITION	CALCULATED RATIO	CONNECTIONS $H^1-H^3X^1-X^0$	$H^2-H^1X^2-X^0$	$H^3-H^2X^3-X^0$
A - 13095	47.274:1	47.264:1	47.263:1	47.264:1
B - 12780	46.137:1	46.139:1	46.138:1	46.140:1
C - 12470	45.018:1	45.012:1	45.012:1	45.014:1
D - 12160	43.898:1	43.886:1	43.886:1	43.888:1
E - 11845	42.761:1	42.761:1	42.760:1	42.763:1
Winding	Resistance	H^1-H^2	H^2-H^3	H^3-H^1
	TAP-A	667.8mΩ	664.1mΩ	662.5mΩ
	TAP-B	650.3mΩ	646.5mΩ	645mΩ
	TAP-D	615.2mΩ	611.5mΩ	609.9mΩ
	TAP-E	597.4mΩ	594.2mΩ	592.2mΩ

VISUAL INSPECTION

BUSHINGS	✓	GROUNDING	✓	TEMP. GAUGE	20°C ✓	SUDDEN PRES. DEV.	
INSULATORS	✓	ANCHORING	✓	LIQUID LEVEL GA	FULL Normal	PRES. RELIEF. DEV.	✓
CONNECTIONS	✓	FANS/CONTROLS	N/A	PRES. GAUAGE			

REMARKS:

Two-Winding Transformers
Capacitance and Power Factor Tests

COMPANY Contra Costa Electric	DATE 6-8-11
TEST LOCATION College of San Mateo	TESTED BY CG, SC
XFMR IDENT.	TEST SET NO. BIDDLE Delta-2000 CAL#1010220
XFMR SERIAL NO. 20111267Z4	AIR TEMPERATURE 55°F
XFMR MFR CG Power System TYPE 11 Oil KVA 1500	OIL TEMPERATURE 20°C
HIGH KV 12470 SGL ☐ Y ☐ Δ ☑	% RH 40%
HIGH KV BUSH	WEATHER Good
LOW KV 4804/277 SGL ☐ Y ☑ Δ ☐	TERTIARY KV SGL ☐ Y ☐ Δ ☐
LOW KV BUSH	TERTIARY BUSH

TRANSFORMER OVERALL TESTS

TEST NO.	INSULATION TESTED	TEST MODE	TEST CONNECTIONS (WINDINGS) ENG	GND	GAR	UST	TEST KV	CAPACITANCE C (PF)	% POWER FACTOR MEASURED	20°C %PF	CORR FCTR	WATTS ☐ EQUIV 10 KV ☐ EQUIV 2.5 KV	INSUL-ATION RATING
1	$C_{HG} + C_{HL}$	GST GND	H	L			9.98	9013.1	.25%			.7188	
2	C_{HG}	GST	H		L		10.02	1037	.19%			.0606	
3	C_{HL}	UST	H			L	10.05	7976.2	.26%			.6561	
4	C_{HL}	—	TEST 1 MINUS TEST 2				—	7976.1					
5	$C_{LG} + C_{HL}$	GST GND	L	H			.28	16537	.33%			1.728	
6	C_{LG}	GST	L		H		.28	8586.8	.28%			.7576	
7	C_{HL}	UST	L			H	.28	7978.1	.29%			.6863	
8	C_{HL}	—	TEST 5 MINUS TEST 6				—	7950.2					
9	C_{HG}'	—	C_{HG} MINUS HIGH BUSH.				—						
10	C_{LG}'	—	C_{LG} MINUS LOW BUSH.				—						

BUSHING TESTS

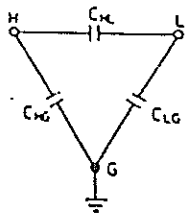
TEST NO.		BUSHING NO.	SER. NO.	ϕ											
											Excitation Test @ 10KV				
HI kV	11				UST						H^1-H^2=	26.7mA			
	12				UST						H^2-H^3=	53.6mA			
	13				UST						H^3-H^1=	51.1mA			
	14	N			UST										
LO kV	15				UST										
	16				UST										
	17				UST										
	18	N			UST										
	19	OIL TEST			UST										

INSULATION RATING KEY

G = GOOD
D = DETERIORATED
I = INVESTIGATE
B = BAD (REMOVE OR RECONDITION)

H = HIGH-VOLTAGE WINDING
L = LOW-VOLTAGE WINDING
G = GROUND
N = NEUTRAL BUSHING
NOTE: SHORT EACH WINDING ON ITSELF.

EQUIVALENT CIRCUIT



REMARKS
Test No. 4, 8, 9, 10 are calculated interchack values.

Test#1 = 28.30 mA Test#5 = 51.78 mA.
Test#2 = 3.255 mA Test#6 = 26.93 mA.
Test#3 = 25.04 mA Test#7 = 25.04 mA.

SDMYERS

Date Printed 07/05/2011

TC# 9389

Customer	3177500 POWER SYSTEMS TESTING	**City**	HAYWARD, CA	**Location**	OUTDOOR/GROUND
Sub-Name	COLLEGE OF SAN MATEO	**Unit No.**	NEW OADMOUNT XFMR	**Other**	BLDG. SCIENCE

NAMEPLATE DATA

Manufacturer	CG POWER	**Equipment Type**	TRANSFORMER
Manufacture Date	04/20/2011	**Transformer Class**	OA
Serial No.	20000026724	**Impedance %**	5.75
KVA Rating	1,500	**Phase/Cycle**	3/60
High Voltage	12,470 D	**Liquid Type**	OIL
Low Voltage	480 Y	**Gallons**	335
Weight	8,050 lbs	**Other Access**	

ADDITIONAL EQUIPMENT

Radiators	Yes	**Conservator Tank**	No
Fans	No	**LTC Compartment**	No
Water Cooled	No	**Bushing Location**	Side Encl.
Oil Pumps	No	**Breather**	
Top FPV	1.50 in Plug	**Hose Length**	0 ft
Bottom FPV	1.50 in Valve	**Service Online**	
Insulation Type	65C	**Power Available**	

VISUAL INSPECTION

DATE	LEVEL	SAMPLE TEMP	TOP TEMP	P/V	PAINT	LEAKS
06/15/2011	NORMAL	15	25	0.00	GOOD	NONE

FIELD SERVICE

DATE	SERVICE

Additional Information

Reason Not Tested

LIQUID SCREEN TEST DATA

DATE	SERVICE	ACID	IFT	DIEL 877	DIEL 1816	COLOR	SP.GRAV.	VISUAL	SEDIMENT
06/15/2011		0.020 AC	39.8 AC	48 AC		0.50 AC	0.890 AC	CLEAR AC	NONE AC

INHIBITOR CONTENT

DATE	PCT. BY WEIGHT

NOTE: STUDIES SHOW THAT A LEVEL OF .3% INHIBITOR IS OPTIMUM FOR PRESERVATION OF IN-SERVICE TRANSFORMER OILS. OILS WITH A LEVEL BELOW .08% ARE CONSIDERED TO BE UNINHIBITED.

LIQUID POWER FACTOR

DATE	25 C	100 C

This test was not run on this transformer.

KEY TO ABBREVIATIONS: AC -- ACCEPTABLE QU -- QUESTIONABLE UN -- UNACCEPTABLE

Customer	3177500 POWER SYSTEMS TESTING	S/N	20000026724				
Sub-Name	COLLEGE OF SAN MATEO	Mfg.	CG POWER	Gal Liq	335 gal	Primary	12,470 D
Location	OUTDOOR/GROUND	Unit No.	NEW OADMOUNT XFMR	KVA	1500	Secondary	480 Y

KARL FISCHER TESTING MOISTURE CONTENT EXPRESSED IN PPM

DATE	AVG TEMP	PPM	PCT. SATURATION		MOIST./DRY WGT. PCT.	GRADE
06/15/2011	20	6	10.0	AC	1.18	A

FURAN ANALYSIS EXPRESSED IN PPB

DATE	5H2F	2FOL	2FAL	2ACF	5M2F	TOTAL

This test was not run on this transformer.

GAS-IN-OIL ANALYSIS GAS CHROMATOGRAPHY EXPRESSED IN PPM

DATE	HYDROGEN	OXYGEN	NITROGEN	METHANE	CARBON MONOXIDE	CARBON DIOXIDE	ETHANE	ETHYLENE	ACETYLEN	TOTAL COMBUST.	TOTAL GAS
06/15/2011	7	19,546	78,851	2	6	261	ND	ND	ND	15	98,673

RECOMMENDATION RETEST 3 MONTHS
A-THE ANALYSIS OF THIS SAMPLE SHOWS ONLY MINOR AMOUNTS OF COMBUSTIBLE GAS. THIS BASELINE INDICATES NORMAL OPERATION.

ICP METALS-IN-OIL EXPRESSED IN PPM

DATE	ALUMINUM	IRON	COPPER

This test was not run on this transformer.

PCB CONTENT EXPRESSED IN PPM

DATE	1242	1254	1260	OTHER	TOTAL

This test was not run on this transformer.

POWER SYSTEMS TESTING CO.

Northern • Central
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SWITCHGEAR INSPECTION REPORT

CUSTOMER: CONTRA COSTA ELECTRIC	LOCATION: COLLEGE OF SAN MATEO 1700 W. HILLSDALE BLVD. SAN MATEO CA	JOB NO.: H12270 DATE: 6-8-11 TESTED BY: MH/SC

SWITCHGEAR DATA

SWGR. IDENTIFICATION: MSB 480V	MANUFACTURE: EATON/CUTLER HAMMER/POW-R-LINE C RATINGS: VOLTAGE 480/277 AMPERAGE 2000A	S.O./REQ NO: SSF0224570 SERIAL NO.: 3PHASE 4WIRE

VISUAL INSPECTION

GROUND LOCATION	✓	BUS CONNECTIONS	✓	CURRENT TRANSFORMERS	N/A	MIMIC BUS	N/A	INTERLOCKS	N/A
GROUND SIZE	✓	CABLE CONNECTIONS	✓	POTENTIAL TRANSFORMERS	✓	CIRCUIT INDENTIFICATION	✓	DO MECHS	N/A
GROUND FAULT PROTECTION	✓	BUS SUPPORTS	✓	CUBICLE HEATERS	✓	INTERIOR CONDITION	✓	SEC CONTACTS	N/A
ANCHORING	✓	CABLE SUPPORTS	✓	CONTROL FUSES	✓	EXTERIOR CONDITION	✓	BAT/BAT CHARGER	N/A
BUS SIZING	✓	BUS INSULATION	N/A	CONTROL WIRING	✓	DOOR ADJUSTMENTS	✓	DRAWINGS ON SITE	✓
BUS SPACING	✓	CABLE INSULATION	✓	CONTROL CONNECTIONS	✓	INDICATING LAMPS	N/A		
BUSHINGS	✓								

BUS OVERPOTENTIAL@ N/A KV:	DURATION	A PHASE	B PHASE	C PHASE
BUS RESISTANCE MEASURED IN MICRO-OHMS		A PHASE 78.4 μΩ	B PHASE 71.6 μΩ	C PHASE 80.9 μΩ

MEGGER TEST	TEMP/HUMID	BUS IDENTIFICATION	BUS SIZE	CU/AL	A-GRN	B-GRN	C-GRN	A-B	B-C	C-A
@ 1000 VOLTS METER INV. #: 1010783	72.3°F/31%	MAIN BUS	3"x1/4" (2)	CU	>2.2G	>2.2G	>2.2G	>2.2G	>2.2G	>2.2G

REMARKS

POWER SYSTEMS TESTING CO.

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LOW VOLTAGE CIRCUIT BREAKER TEST REPORT

CUSTOMER Contra Costa Electric	LOCATION College of San Mateo	JOB NO. H12270
		DATE 6-8-11
		TESTED BY MH/SC
SWGR PNL ID: MSB 480V	TEST EQUIPMENT USED: 20 KA CAL.	
FEEDER DESIGNATION: MAIN		

BREAKER INFORMATION

MFG./TYPE EATON/MAGNUM SB		DRAWOUT
	X	FIXED
STYLE NO. SBS620		
TRIP UNIT TYPE DIGITRIP 520		
LTD RANGE .4-1.0 DELAY 2-24		
STD RANGE 2-M1 DELAY .1-.5		I²T ON / I²T OFF ☑ ☑
INST. RANGE OFF-M1		
G.F. RANGE .25-1.0 DELAY .1-.5		I²T ON / I²T OFF ☑ ☑
CABLE/BUS SIZE		
Frame Rating 2000 A	Trip Rating 2000 A	

BREAKER SETTINGS

LT Pickup 1	Time Delay @ 2	
ST Pickup 2	Time Delay .1 I²T	I²T ON / I²T OFF ☐ ☑
INST. Pickup overide 36,000		
G.F. Pickup 1	Time Delay .5 I²T	I²T ON / I²T OFF ☐ ☑
AS FOUND ☐	AS LEFT ☐	AS Per STUDY ☑

TEST DATA

	MFG TOL. MIN/MAX	AS FOUND A	AS FOUND B	AS FOUND C	AS LEFT A	AS LEFT B	AS LEFT C
INSTANTANEOUS PICK UP @ 2 (4000)	±10%	3800	3800	3800			
LTD PICK UP @ 1.0 (2000)	±10%	2150	2140	2140			
STD PICK UP @ 2 (2000)	±10%	2000	2000	2000			
GR FAULT PICK UP @ 1.0 (1200)	±10%	1180	1160	1160			
LTD TIME @ .5 Del. Setting 2 @ 300 %	5.5-8	6	6	6			
STD TIME @ 2 Del. Setting .2 I²T OUT @ 150 %	.15-.25	.20	.20	.20			
GF TIME @ 1.0 Del. Setting .2 I²T OUT @ 150 %	.15-.25	.21	.21	.21			
MILLIVOLT DROP @ RATED CURRENT		103	98	106			
ANTI SINGLE PHASE DEVICE	—	N/A	N/A	N/A			
NEUTRAL RATIO AND POLARITY		✓	✓	✓	Rev. Trip @	670	

MEGGER RESULTS @ 1000 V

BRERAKER OPEN A	B	C	BREAKER CLOSED A-B	B-C	C-A	A-G	B-G	C-G
2.26	2.26	2.26	2.26	2.26	2.26	2.26	2.26	2.26

REMARKS

POWER SYSTEMS TESTING CO.

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LOW VOLTAGE CIRCUIT BREAKER TEST REPORT

CUSTOMER Contra Costa Electric	LOCATION College of San Mateo	JOB NO. H12270
		DATE 6-8-11
		TESTED BY MH/SC
SWGR PNL ID:	TEST EQUIPMENT USED: 20 KA CAL.	
FEEDER DESIGNATION: BLDG 36		

BREAKER INFORMATION

MFG./TYPE EATON/HND 05K		DRAWOUT
	X	FIXED
STYLE NO. 1488D02G16 CAT: HND312T36W		
TRIP UNIT TYPE DIGITRIP RMS 310		
LTD RANGE FIXED DELAY FIXED		
STD RANGE 2-8 DELAY INST-300		PT ON / PT OFF ☐ ☑
INST. RANGE N/A		
G.F. RANGE 1-6 DELAY INST.-500		PT ON / PT OFF ☐ ☑
CABLE/BUS SIZE N/A		
Frame Rating 1200 A	Trip Rating 1200 A	

BREAKER SETTINGS

LT Pickup 1	Time Delay FIXED	
ST Pickup 2	Time Delay INST I_2T	PT ON / PT OFF ☐ ☑
INST. Pickup 1400		
G.F. Pickup 4	Time Delay @ 300	PT ON / PT OFF ☐ ☐
AS FOUND ☐	AS LEFT ☐	AS Per STUDY ☑

TEST DATA

	MFG TOL. MIN/MAX	AS FOUND A	AS FOUND B	AS FOUND C	AS LEFT A	AS LEFT B	AS LEFT C
INSTANTANEOUS PICK UP ( )	N/A						
LTD PICK UP @ 1.0 (FIXED) (1200)	±10%	1230	1230	1240			
STD PICK UP @ 2 (2400)	±10%	2280	2280	2200			
GR FAULT PICK UP @ 5 (1000)	±10%	960	960	970			
LTD TIME @ 1.0 Del. Setting FIXED @ 300 %	30-50	35	35	35			
STD TIME @ 2 Del. Setting 200ms @ 150 %	.15-.25	.19	.19	.19			
GF TIME @ 5 Del. Setting 200ms @ 150 %	.25-.35	.30	.30	.30			
MILLIVOLT DROP @ RATED CURRENT		110	93	90			
ANTI SINGLE PHASE DEVICE	N/A	N/A	N/A	N/A			
NEUTRAL RATIO AND POLARITY		✓	✓	✓	Rev. Trip @	480	

MEGGER RESULTS @ 1000 V

BRERAKER OPEN A	BRERAKER OPEN B	BRERAKER OPEN C	BREAKER CLOSED A-B	BREAKER CLOSED B-C	BREAKER CLOSED C-A	BREAKER CLOSED A-G	BREAKER CLOSED B-G	BREAKER CLOSED C-G
2.26	2.26	2.26	2.26	2.26	2.26	2.26	2.26	2.26

REMARKS

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LOW VOLTAGE CIRCUIT BREAKER TEST REPORT

CUSTOMER: Contra Costa Electric	LOCATION: College of San Mateo	JOB NO.: H12270
		DATE: 6-8-11
		TESTED BY: MH/SC
SWGR PNL ID: 480V MSB	TEST EQUIPMENT USED: 20 KA CAL.	
FEEDER DESIGNATION: SPARE		

BREAKER INFORMATION

MFG./TYPE: EATON/HKD65K	☐ DRAWOUT ☒ FIXED
STYLE NO.: 1492D82G03 CAT: HKD3400F	
TRIP UNIT TYPE: DIGITRIP RMS 310	
LTD RANGE: FIXED DELAY: FIXED	
STD RANGE: 2-8 DELAY: INST-300	PT ON / PT OFF ☐ ☑
INST. RANGE: N/A	
G.F. RANGE: 1-5 DELAY: INST-500	PT ON / PT OFF ☐ ☑
CABLE/BUS SIZE	
Frame Rating: 400 A Trip Rating: 250 A	

BREAKER SETTINGS

LT Pickup: 1	Time Delay: Fixed		
ST Pickup: 3	Time Delay: INST 1/2T	PT ON / PT OFF	☐ ☑
INST. Pickup: Fixed			
G.F. Pickup: 5	Time Delay: 300	PT ON / PT OFF	☐ ☐
AS FOUND ☐	AS LEFT ☐	AS Per STUDY ☑	

TEST DATA

	MFG TOL. MIN/MAX	AS FOUND A	AS FOUND B	AS FOUND C	AS LEFT A	AS LEFT B	AS LEFT C
INSTANTANEOUS PICK UP ( )	N/A						
LTD PICK UP @ 1.0 (FIXED) (250)	±10%	270	270	270			
STD PICK UP @ 2 (500)	±10%	480	480	480			
GR FAULT PICK UP @ 5 (400)	±10%	390	390	390			
LTD TIME @ 1.0 Del. Setting FIXED @ 300 %	30-50	36	36	36			
STD TIME @ 2 Del. Setting 200ms @ 150 %	.15-.25	.19	.19	.19			
GF TIME @ 5 Del. Setting 300 ms @ 150 %	.25-.35	.29	.29	.29			
MILLIVOLT DROP @ RATED CURRENT		47	53	50			
ANTI SINGLE PHASE DEVICE	N/A	N/A	N/A	N/A			
NEUTRAL RATIO AND POLARITY		✓	✓	✓	Rev. Trip @	190	

MEGGER RESULTS @ 1000 V

BRERAKER OPEN A	B	C	BREAKER CLOSED A-B	B-C	C-A	A-G	B-G	C-G
2.26	2.26	2.26	2.26	2.26	2.26	2.26	2.26	2.26

REMARKS

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LOW VOLTAGE CIRCUIT BREAKER TEST REPORT

CUSTOMER: Contra Costa Electric	LOCATION: College of San Mate.	JOB NO.: H12270
		DATE: 6-8-11
		TESTED BY: MH/SC

SWGR PNL ID: MSB 480 V
FEEDER DESIGNATION: SPARE
TEST EQUIPMENT USED: 20 KA CAL.

BREAKER INFORMATION

MFG./TYPE: EATON / HKD05K
☐ DRAWOUT ☒ FIXED
STYLE NO.: 1492D82G03 CAT: HKD3H00F
TRIP UNIT TYPE: DIGITRIP RMS 310
LTD RANGE: FIXED DELAY: FIXED
STD RANGE: 2-8 DELAY: INST. -300 PT ON / PT OFF ☐ ☑
INST. RANGE: N/A
G.F. RANGE: 1-5 DELAY: INST-500 PT ON / PT OFF ☐ ☑
CABLE/BUS SIZE: N/A
Frame Rating: 400 A Trip Rating: 300 A

BREAKER SETTINGS

LT Pickup: 1 Time Delay: Fixed
ST Pickup: 3 Time Delay: INST I.T PT ON / PT OFF ☐ ☑
INST. Pickup: Fixed
G.F. Pickup: 5 Time Delay: 300 PT ON / PT OFF ☐ ☒
AS FOUND ☐ AS LEFT ☐ AS Per STUDY ☑

TEST DATA

	MFG TOL. MIN/MAX	AS FOUND A	AS FOUND B	AS FOUND C	AS LEFT A	AS LEFT B	AS LEFT C
INSTANTANEOUS PICK UP ( )	N/A						
LTD PICK UP @ 1.0 (FIXED) (300)	±10%	320	320	320			
STD PICK UP @ 2 (600)	±10%	600	600	600			
GR FAULT PICK UP @ 5 (400)	±10%	380	380	380			
LTD TIME @ 1.0 Del. Setting FIXED @ 300 %	30-50	38	38	38			
STD TIME @ 2 Del. Setting 200MS @ 150 %	.15-.25	.19	.19	.19			
GF TIME @ 5 Del. Setting 200 ms @ 150 %	.25-.35	.29	.29	.29			
MILLIVOLT DROP @ RATED CURRENT		50	55	49			
ANTI SINGLE PHASE DEVICE							
NEUTRAL RATIO AND POLARITY		✓	✓	✓	Rev. Trip @	190	

MEGGER RESULTS @ 1000 V

BRERAKER OPEN A	BRERAKER OPEN B	BRERAKER OPEN C	BREAKER CLOSED A-B	BREAKER CLOSED B-C	BREAKER CLOSED C-A	BREAKER CLOSED A-G	BREAKER CLOSED B-G	BREAKER CLOSED C-G
2.26	2.26	2.26	2.26	2.26	2.26	2.26	226	2.26

REMARKS

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LOW VOLTAGE CIRCUIT BREAKER TEST REPORT

CUSTOMER: Contra Costa Electric	LOCATION: College of San Mateo	JOB NO.: H12270
		DATE: 6-8-11
		TESTED BY: MH/SC
SWGR PNL ID: MSB 480V		TEST EQUIPMENT USED: 20 KA CAL.
FEEDER DESIGNATION: B20		

BREAKER INFORMATION

MFG./TYPE: EATON/HKD 65K		DRAWOUT
	X	FIXED
STYLE NO.: 1492D82G03 CAT: HKD3H00F		
TRIP UNIT TYPE: DIGITRIP RMS 310		
LTD RANGE: FIXED	DELAY: FIXED	
STD RANGE: 2-8	DELAY: INST-.300	PT ON / PT OFF ☐ ☑
INST. RANGE: N/A		
G.F. RANGE: 1-5	DELAY: INST-.500	PT ON / PT OFF ☐ ☑
CABLE/BUS SIZE		
Frame Rating: H00 A	Trip Rating: 300 A	

BREAKER SETTINGS

LT Pickup: 1	Time Delay: Fixed			
ST Pickup: 3	Time Delay: INST I2T	PT ON / PT OFF	☐	☑
INST. Pickup: Fixed				
G.F. Pickup: 5	Time Delay: 300	PT ON / PT OFF	☐	☑
AS FOUND ☐	AS LEFT ☐	AS Per STUDY ☑		

TEST DATA

	MFG TOL. MIN/MAX	AS FOUND A	AS FOUND B	AS FOUND C	AS LEFT A	AS LEFT B	AS LEFT C
INSTANTANEOUS PICK UP ( )	N/A						
LTD PICK UP @ 1.0 (FIXED) (300)	±10%	310	310	310			
STD PICK UP @ 2 (600)	±10%	600	600	600			
GR FAULT PICK UP @ 5 (H00)	±10%	370	370	370			
LTD TIME @ 1.0 Del. Setting FIXED @ 300 %	30-50	35	35	35			
STD TIME @ 2 Del. Setting 200 ms @ 150 %	.15-.25	.19	.19	.19			
GF TIME @ 5 Del. Setting 300ms @ 150 %	.25-.35	.29	.29	.29			
MILLIVOLT DROP @ RATED CURRENT		56	52	53			
ANTI SINGLE PHASE DEVICE	N/A	N/A	N/A	N/A			
NEUTRAL RATIO AND POLARITY		✓	✓	✓	Rev. Trip @	190	

MEGGER RESULTS @ 1000 V

BRERAKER OPEN A	B	C	BREAKER CLOSED A-B	B-C	C-A	A-G	B-G	C-G
2.26	2.26	2.26	2.26	2.26	2.26	2.26	2.26	2.26

REMARKS

POWER SYSTEMS TESTING CO.

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LOW VOLTAGE CIRCUIT BREAKER TEST REPORT

CUSTOMER: Contra Costa Electric	LOCATION: College of San Mateo	JOB NO.: H12270
		DATE: 6-8-11
		TESTED BY: MH/SC
SWGR PNL ID: MSB 480V	TEST EQUIPMENT USED: 20 KA CAL.	
FEEDER DESIGNATION: B18		

BREAKER INFORMATION

MFG./TYPE: EATON/HKD165K	DRAWOUT: ☐ FIXED: ☒
STYLE NO.: 1492D82G03 CAT:HKD3H00F	
TRIP UNIT TYPE: DIGITRIP RMS 310	
LTD RANGE: FIXED DELAY: FIXED	
STD RANGE: 2-8 DELAY: INST-300	PT ON / PT OFF: ☐ ☒
INST. RANGE: N/A	
G.F. RANGE: 1-5 DELAY: INST-500	PT ON / PT OFF: ☐ ☒
CABLE/BUS SIZE: N/A	
Frame Rating: 400 A Trip Rating: 400 A	

BREAKER SETTINGS

LT Pickup: 1	Time Delay: Fixed	
ST Pickup: 3	Time Delay: 1ST INT	PT ON / PT OFF: ☐ ☒
INST. Pickup: Fixed		
G.F. Pickup: 5	Time Delay: 300	PT ON / PT OFF: ☐ ☒
AS FOUND ☐ AS LEFT ☐ AS Per STUDY ☒		

TEST DATA

	MFG TOL. MIN/MAX	AS FOUND A	AS FOUND B	AS FOUND C	AS LEFT A	AS LEFT B	AS LEFT C
INSTANTANEOUS PICK UP ( )	N/A						
LTD PICK UP @ 1.0 (FIXED) (400)	±10%	420	420	420			
STD PICK UP @ 2 (800)	±10%	800	800	800			
GR FAULT PICK UP @ 5 (400)	±10%	380	380	380			
LTD TIME @ 1.0 Del. Setting FIXED @ 300 %	30-50	35	35	35			
STD TIME @ 2 Del. Setting 200 ms @ 150 %	.15-.25	.19	.19	.19			
GF TIME @ 5 Del. Setting 200 ms @ 150 %	.25-.35	.29	.29	29			
MILLIVOLT DROP @ RATED CURRENT		68	65	63			
ANTI SINGLE PHASE DEVICE	N/A	N/A	N/A	N/A			
NEUTRAL RATIO AND POLARITY		✓	✓	✓	Rev. Trip @	190	

MEGGER RESULTS @ 1000 V

BRERAKER OPEN A	BRERAKER OPEN B	BRERAKER OPEN C	BREAKER CLOSED A-B	BREAKER CLOSED B-C	BREAKER CLOSED C-A	BREAKER CLOSED A-G	BREAKER CLOSED B-G	BREAKER CLOSED C-G
2.26	2.26	2.26	2.26	2.26	2.26	2.26	2.26	2.26

REMARKS

POWER SYSTEMS TESTING CO.

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LOW VOLTAGE CIRCUIT BREAKER TEST REPORT

CUSTOMER: CONTRA COSTA ELECTRIC	LOCATION: COLLEGE OF SAN MATEO	JOB NO.: H12270
		DATE: 6-8-11
		TESTED BY: MH/SC
SWGR PNL ID: 480V MSB		TEST EQUIPMENT USED: 20 KV CAL.
FEEDER DESIGNATION: BLDG 25		

BREAKER INFORMATION

MFG./TYPE: EATON/ HKD 65K		DRAWOUT
	X	FIXED
STYLE NO.: 1492D82G03 CAT: HKD3400F		
TRIP UNIT TYPE: DIGITRIP RMS 310		
LTD RANGE: FIXED DELAY: FIXED		
STD RANGE: 2-8 DELAY: INST. - 300		PT ON / PT OFF ☐ ☑
INST. RANGE: N/A		
G.F. RANGE: 1-5 DELAY: INST. - 500		PT ON / PT OFF ☐ ☑
CABLE/BUS SIZE: N/A		
Frame Rating: 400 A Trip Rating: 225 A		

BREAKER SETTINGS

LT Pickup: 1	Time Delay: Fixed	
ST Pickup: 3	Time Delay: INST F2T	PT ON / PT OFF ☐ ☐
INST. Pickup: Fixed		
G.F. Pickup: 5	Time Delay: 300	PT ON / PT OFF ☐ ☑
AS FOUND ☐ AS LEFT ☐ AS Per STUDY ☑		

TEST DATA

	MFG TOL. MIN/MAX	AS FOUND A	AS FOUND B	AS FOUND C	AS LEFT A	AS LEFT B	AS LEFT C
INSTANTANEOUS PICK UP ( )	N/A						
LTD PICK UP @ 1.0 (FIXED) (225)	±10%	235	235	235			
STD PICK UP @ 2 (450)	±10%	440	440	440			
GR FAULT PICK UP @ 5 (400)	±10%	380	380	380			
LTD TIME @ 1.0 Del. Setting FIXED @ 300 %	30-50	36	36	36			
STD TIME @ 2 Del. Setting 200 ms @ 150 %	.15-.25	.19	.19	.19			
GF TIME @ 5 Del. Setting 300 ms @ 150 %	.25-.35	.29	.29	.29			
MILLIVOLT DROP @ RATED CURRENT		50	40	52			
ANTI SINGLE PHASE DEVICE	N/A	N/A	N/A	N/A			
NEUTRAL RATIO AND POLARITY		✓	✓	✓	Rev. Trip @	190	

MEGGER RESULTS @ 1000 V	BRERAKER OPEN A	BRERAKER OPEN B	BRERAKER OPEN C	BREAKER CLOSED A-B	BREAKER CLOSED B-C	BREAKER CLOSED C-A	BREAKER CLOSED A-G	BREAKER CLOSED B-G	BREAKER CLOSED C-G
	2.26	2.26	2.26	2.26	2.26	2.26	2.26	2.26	2.26

REMARKS

POWER SYSTEMS TESTING CO.

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LOW VOLTAGE CIRCUIT BREAKER TEST REPORT

CUSTOMER: Contra Costa Electric	LOCATION: College of San Mateo	JOB NO.: H12270
		DATE: 6-8-11
		TESTED BY: MH/SC
SWGR PNL ID: MSB 480V	TEST EQUIPMENT USED: 20 KA CAL.	
FEEDER DESIGNATION: B27		

BREAKER INFORMATION

MFG./TYPE: EATON/HKD65K	DRAWOUT: ☐ FIXED: ☒
STYLE NO.: 1492D82G03 CAT: HKD3400F	
TRIP UNIT TYPE: DIGITRIP RMS 310	
LTD RANGE: FIXED DELAY: FIXED	
STD RANGE: 2-8 DELAY: INST.-300	I²T ON / I²T OFF: ☐ / ☒
INST. RANGE: N/A	
G.F. RANGE: 1-5 DELAY: INST-500	I²T ON / I²T OFF: ☐ / ☒
CABLE/BUS SIZE: N/A	
Frame Rating: 400 A Trip Rating: 400 A	

BREAKER SETTINGS

LT Pickup: 1	Time Delay: Fixed		
ST Pickup: 3	Time Delay: INST I²t	I²T ON / I²T OFF: ☐ / ☒	
INST. Pickup: Fixed			
G.F. Pickup: 5	Time Delay: 300	I²T ON / I²T OFF: ☐ / ☐	

AS FOUND ☐ AS LEFT ☐ AS Per STUDY ☒

TEST DATA

	MFG TOL. MIN/MAX	AS FOUND A	AS FOUND B	AS FOUND C	AS LEFT A	AS LEFT B	AS LEFT C
INSTANTANEOUS PICK UP ( )	N/A						
LTD PICK UP @ 1.0 (FIXED) (400)	±10%	410	410	410			
STD PICK UP @ 2 (800)	±10%	800	800	800			
GR FAULT PICK UP @ 5 (400)	±10%	380	380	380			
LTD TIME @ 1.0 Del. Setting FIXED @ 300%	30-50	36	36	36			
STD TIME @ 2 Del. Setting 200 ms @ 150%	.15-.25	.19	.19	.19			
GF TIME @ 5 Del. Setting 200 ms @ 150%	.25-.35	.29	.29	.29			
MILLIVOLT DROP @ RATED CURRENT		70	82	87			
ANTI SINGLE PHASE DEVICE	N/A	N/A	N/A	N/A			
NEUTRAL RATIO AND POLARITY		✓	✓	✓	Rev. Trip @	190	

MEGGER RESULTS @ 1000 V

BRERAKER OPEN A	BRERAKER OPEN B	BRERAKER OPEN C	BREAKER CLOSED A-B	BREAKER CLOSED B-C	BREAKER CLOSED C-A	BREAKER CLOSED A-G	BREAKER CLOSED B-G	BREAKER CLOSED C-G
2.2G	2.2G	2.2G	2.2G	2.2G	2.2G	2.2G	2.2G	2.2G

REMARKS

POWER SYSTEMS TESTING CO.

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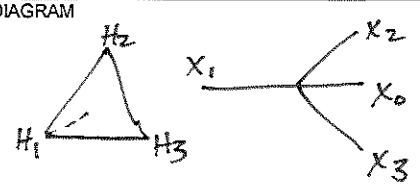
TRANSFORMER TEST REPORT

CUSTOMER: Contra Costa Electric	LOCATION: College of San Mateo 1700 W. Hillsdale Blvd San Mateo CA	JOB NO.: H12270 DATE: 6.8.11 TESTED BY: MH
TRANSFORMER IDENTIFICATION: Lighting Transformer.	TEST EQUIPMENT USED: TTR CAL. 10/06/96	

NAMEPLATE INFORMATION

MFG. Eaton / Dry Type Transformer
KVA 30 KVA
VOLTAGE 480/208/120
SERIAL NO. J11C116160
2.82 %Z @ 135 °C
OIL [ ] DRY [X] OIL SAMPLE TAKEN YES [ ] NO [ ]
CAT# Y48M28T30N

DIAGRAM



ELECTRICAL TEST DATA

MEGGER TEST @ 1000/500 V.

Time	H-L	H-L&G	L-H&G
:30	2.2G	2.2G.	550M
1:00	2.2G	2.2G	550M
10:00	2.2G	2.2G	550M
A.I 1/:30	1.0	1.0	1.0
P.I 10/1	1.0	1.0	1.0

TEMP 72.3°F HUM 31%

WINDING RESISTANCE N/A

HI-H2	X1-X0
H2-H3	X2-X0
H3-H1	X3-X0

TURNS RATIO TEST

TAP POSITION	CALCULATED RATIO	CONNECTIONS H1H3/X1X0	CONNECTIONS H2H1/X2X0	CONNECTIONS H3H2/X3X0
1H - 480V	4.0:1	4.0005	4.0006	4.0005

VISUAL INSPECTION

BUSHINGS	N/A	GROUNDING	✓	TEMP. GAUGE	N/A	SUDDEN PRES. DEV.	N/A
INSULATORS	✓	ANCHORING	✓	LIQUID LEVEL GA	N/A	PRES. RELIEF. DEV.	N/A
CONNECTIONS	✓	FANS/CONTROLS	N/A	PRES. GAUAGE	N/A		

REMARKS:

POWER SYSTEMS TESTING CO.

LOS ANGELES - SAN DIEGO
HAYWARD - FRESNO - SACRAMENTO

GROUND SYSTEM RESISTANCE TEST REPORT

CUSTOMER: Contra Costa Electric	LOCATION: College of San Mateo	JOB#: H12270
		DATE: 6-8-11
		TESTED BY: SC

TEST METHOD: Fall of Potential

TEST EQUIPMENT USED: AFMC Earth MEGGER M#4500
CAL # 1010715

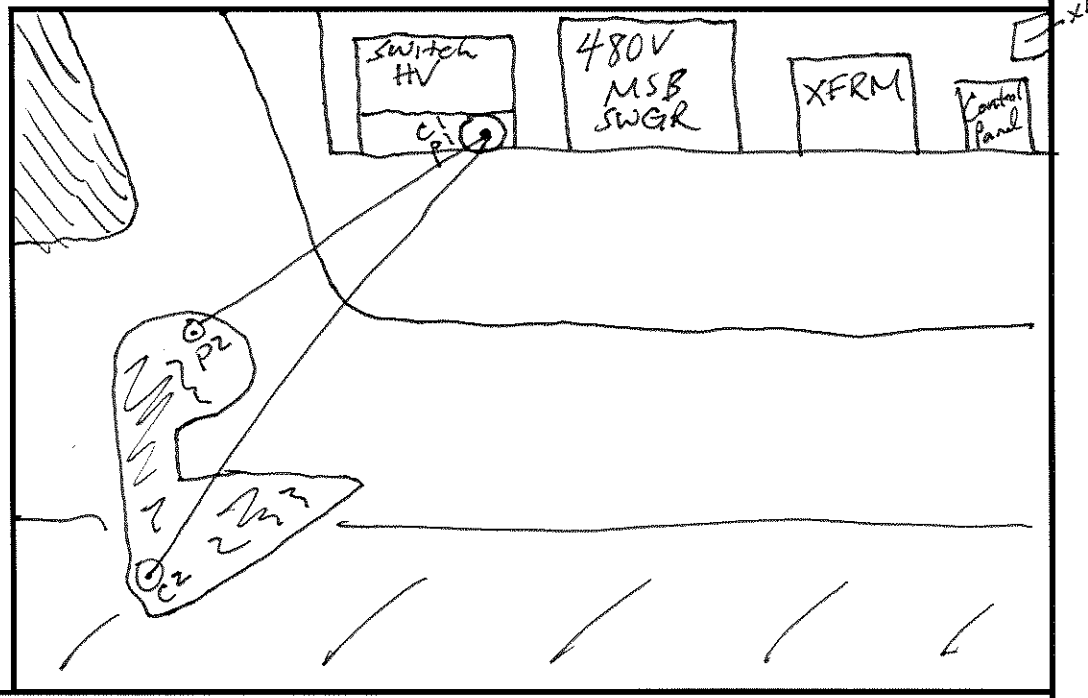
TEST DATA

GROUND IDENTIFICATION	TYPE/SIZE/DEPTH	RESISTANCE
Main	GRID	2.92Ω

TEST CONDITIONS

No rainfall within the last 72 hrs.

GROUND SYSTEM TEST LAYOUT



REMARKS:

POWER SYSTEMS TESTING CO.

Northern • Central • Southern California

GROUND ROD RESISTANCE TEST REPORT

CUSTOMER: Contra Costa Electric	LOCATION: College of San Mateo	JOB NO.: H12270
		DATE: 6-8-11
		TESTED BY: SC

TEST METHOD: Point to Point

TEST EQUIPMENT USED: AEMC Earth MEGGER Model #4500 CAL # 1010715

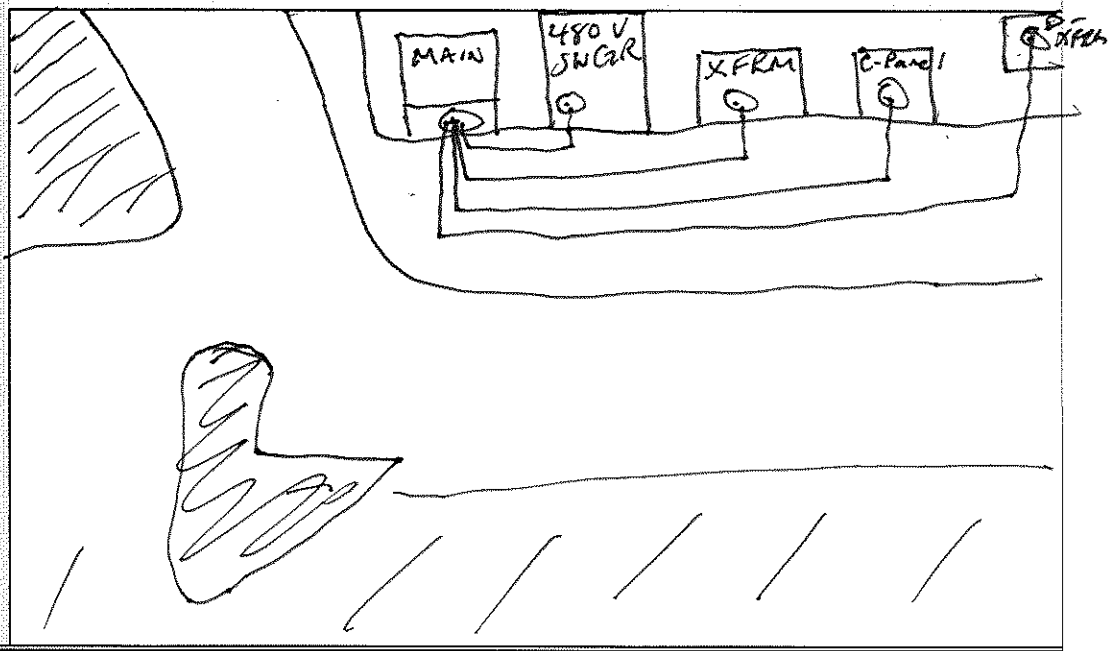
TEST DATA

GROUND INDENTIFICATION	ROD SIZE/DEPTH	RESISTANCE
Main to 480V SWGR	Point to Point	.120 Ω
Main to XFMR	Point to Point	.120 Ω
Main to Control Panel	Point to Point	.090 Ω
Main to Distribution XFRM	Point to Point	.100 Ω

TEST CONDITIONS

No rainfall within the last 72 hrs.

GROUND ROD LAYOUT



REMARKS: