

PEARL Reconditioning Standards			
MEDIUM VOLTAGE TRANSFORMERS POWER OIL-FILLED	Revision		
	Section	Number	Date
	2440	3	2-11-03

The term "reconditioning" is defined as "the process of returning electrical equipment to safe and reliable operating condition based on the design of the original manufacturer at the time of manufacturing."

Note: This standard is for large medium voltage oil-filled power transformers that have separate tap changer compartments.

I TEST EQUIPMENT

The following test equipment is required to perform the testing requirements of this reconditioning standard:

1. Insulation Resistance Test Set (Megohmmeter) 1000 Vdc minimum

One of the following pieces of test equipment is required to perform the turn-to-turn ratio verification testing requirements of this reconditioning standard:

1. Transformer Turns Ratiometer
2. AC Voltage Supply and Voltmeter (+/- 0.5%)

One of the following pieces of test equipment is required to perform the insulation resistance testing requirements of this reconditioning standard:

1. Power Factor Test Set
2. Dissipation Factor Test Set

One of the following pieces of test equipment is required to perform the overpotential testing requirements of this reconditioning standard if it is required by the customer:

1. AC Overpotential Test Set
2. DC Overpotential Test Set

PEARL Reconditioning Standards			
MEDIUM VOLTAGE TRANSFORMERS POWER OIL-FILLED	Revision		
	Section	Number	Date
	2440	3	2-11-03

II RECONDITION EVALUATION

These steps are used to determine what will be required to recondition this product under this standard.

1 INSPECTION

1.1 Frame/Enclosure

- 1.1.1 Ensure that the nameplate data is legible.
- 1.1.2 Ensure that the third party listing service label is legible.
- 1.1.3 Inspect the overall exterior for missing screws, bolts, nuts, fasteners, retainers and keepers.
- 1.1.4 Inspect for unused openings.
- 1.1.5 Inspect for improper covers.
- 1.1.6 Inspect for rust and corrosion.
- 1.1.7 Inspect for proper alignment of all panels.
- 1.1.8 Inspect for leaks.
- 1.1.9 Verify proper liquid level.
- 1.1.10 Record results on appropriate PEARL Inspection and Test Form.

1.2 Cooling Fans

- 1.2.1 Inspect all control wiring for signs of:
 - 1.2.1.1 Deterioration
 - 1.2.1.2 Overheating
 - 1.2.1.3 Loose connections
- 1.2.2 Check for proper lubrication.
- 1.2.3 Record results on appropriate PEARL Inspection and Test Form.

1.3 Bushings

- 1.3.1 Inspect for signs of overheating.
- 1.3.2 Inspect for signs of deterioration.
- 1.3.3 Verify proper liquid level.
- 1.3.4 Inspect for tracking or corona damage.
- 1.3.5 Inspect for chips, cracks, or broken insulators.
- 1.3.6 Record results on appropriate PEARL Inspection and Test Form.

1.4 Surge/Lightning Arrestors

- 1.4.1 Inspect for signs of overheating.
- 1.4.2 Inspect for signs of deterioration.
- 1.4.3 Inspect for tracking or corona damage.
- 1.4.4 Inspect for chips, cracks, or broken insulators.
- 1.4.5 Record results on appropriate PEARL Inspection and Test Form.

PEARL Reconditioning Standards			
MEDIUM VOLTAGE TRANSFORMERS POWER OIL-FILLED	Revision		
	Section	Number	Date
	2440	3	2-11-03

1.5 Monitor Panel

- 1.5.1 Check all lens covers.
- 1.5.2 Check all light bulbs for operation.
- 1.5.3 Check all control knobs and switches.
- 1.5.4 Inspect for signs of rust or corrosion.
- 1.5.5 Inspect for signs of overheating.
- 1.5.6 Inspect all meters.
- 1.5.7 Inspect all control wiring for signs of deterioration or overheating.
- 1.5.8 Record results on appropriate PEARL Inspection and Test Form.

1.6 Gauges & Meters

- 1.6.1 Inspect pressure vacuum gauge.
- 1.6.2 Inspect oil temperature gauge.
- 1.6.3 Inspect top oil temperature gauge.
- 1.6.4 Inspect sudden pressure device.
- 1.6.5 Inspect pressure/vacuum control device.
- 1.6.6 Record results on appropriate PEARL Inspection and Test Form.

1.7 Radiator

- 1.7.1 Inspect for rust.
- 1.7.2 Inspect for signs of overheating.
- 1.7.3 Inspect for leaks.
- 1.7.4 Record results on appropriate PEARL Inspection and Test Form.

1.8 Load Tap Changer

- 1.8.1 Ensure that the nameplate data is legible.
- 1.8.2 Inspect the overall exterior for missing screws, bolts, nuts, fasteners, retainers or keepers.
- 1.8.3 Inspect for unused openings in control cabinets.
- 1.8.4 Check for improper covers.
- 1.8.5 Inspect for proper alignment of all panels.
- 1.8.6 Check all lens covers.
- 1.8.7 Check all light bulbs for operation.
- 1.8.8 Check all control knobs and switches.
- 1.8.9 Inspect for signs of rust or corrosion.
- 1.8.10 Inspect for signs of overheating on all electrical devices.
- 1.8.11 Inspect all oil level gauges.
- 1.8.12 Verify proper liquid level.
- 1.8.13 Inspect all control wiring for signs of deterioration or overheating.
- 1.8.14 Record results on appropriate PEARL Inspection and Test Form.

PEARL Reconditioning Standards			
MEDIUM VOLTAGE TRANSFORMERS POWER OIL-FILLED	Revision		
	Section	Number	Date
	2440	3	2-11-03

1.9 Gas Cylinder Cabinet

- 1.9.1 Ensure that the nameplate data is legible.
- 1.9.2 Inspect the overall exterior for missing screws, bolts, nuts, fasteners, retainers or keepers.
- 1.9.3 Inspect for unused openings in control cabinets.
- 1.9.4 Check for improper covers.
- 1.9.5 Inspect for proper alignment of all panels.
- 1.9.6 Check all lens covers.
- 1.9.7 Check all light bulbs for operation.
- 1.9.8 Check all control knobs and switches.
- 1.9.9 Inspect for signs of rust or corrosion.
- 1.9.10 Inspect for signs of overheating.
- 1.9.11 Inspect all pressure gauges.
- 1.9.12 Inspect all control wiring for signs of deterioration or overheating.
- 1.9.13 Check all terminals for proper torque.
- 1.9.14 Record results on appropriate PEARL Inspection and Test Form.

PEARL Reconditioning Standards			
MEDIUM VOLTAGE TRANSFORMERS POWER OIL-FILLED	Revision		
	Section	Number	Date
	2440	3	2-11-03

2 TESTING

2.1 Insulation Resistance

- 2.1.1 Connect all primary terminals together.
- 2.1.2 Connect all secondary terminals together.
- 2.1.3 Primary to secondary and ground test.
 - 2.1.3.1 Perform an insulation resistance test at test voltage specified in Table 6.
 - 2.1.3.2 The test duration shall be for 1 minute.
 - 2.1.3.3 Correct for temperature, if necessary (Table 11).
 - 2.1.3.4 Record results on appropriate PEARL Inspection and Test Form.
 - 2.1.3.5 Compare test results to manufacturer's recommendations or Table 2 of Section 6000.
- 2.1.4 Primary to secondary test
 - 2.1.4.1 Perform an insulation resistance test at test voltage specified in Table 6.
 - 2.1.4.2 The test duration shall be for 1 minute.
 - 2.1.4.3 Correct for temperature, if necessary (Table 11).
 - 2.1.4.4 Record results on appropriate PEARL Inspection and Test Form.
 - 2.1.4.5 Compare test results to manufacturer's recommendations or Table 2 of Section 6000.
- 2.1.5 Secondary to primary and ground test
 - 2.1.5.1 Perform an insulation resistance test at test voltage specified in Table 6.
 - 2.1.5.2 The test duration shall be for 1 minute.
 - 2.1.5.3 Correct for temperature, if necessary (Table 11).
 - 2.1.5.4 Record results on appropriate PEARL Inspection and Test Form.
 - 2.1.5.5 Compare test results to manufacturer's recommendations or Table 2 of Section 6000.

2.2 Transformer Turns Ratio Verification

- 2.2.1 Perform a turns ratio test on each phase from primary to secondary on all taps.
- 2.2.2 Record results on appropriate PEARL Inspection and Test Form.
- 2.2.3 Compare results to manufacturer's recommendations or industrial standards.

2.3 Core Ground

- 2.3.1 Perform a core ground test.
- 2.3.2 Record results on appropriate PEARL Inspection and Test Form.
- 2.3.3 Compare results to manufacturer's recommendations or industrial standards.

2.4 Power Factor or Dissipation Factor

PEARL Reconditioning Standards			
MEDIUM VOLTAGE TRANSFORMERS POWER OIL-FILLED	Revision		
	Section	Number	Date
	2440	3	2-11-03

- 2.4.1 Connect all primary terminals together.
- 2.4.2 Connect all secondary terminals together.
- 2.4.3 Primary to secondary and ground test (“GROUND” mode)
 - 2.4.3.1 Perform a power factor or dissipation factor test at rated primary coil voltage or less to measure C_{HL} and C_{HG}
 - 2.4.3.2 Correct for temperature. Refer to test set manufacturer’s literature.
 - 2.4.3.3 Record results on appropriate PEARL Inspection and Test Form.
- 2.4.4 Primary to secondary and ground test (“GUARD” mode)
 - 2.4.4.1 Perform a power factor or dissipation factor test at rated primary coil voltage or less to measure C_{HG}
 - 2.4.4.2 Correct for temperature. Refer to test set manufacturer’s literature. Refer to test set manufacturer’s literature.
 - 2.4.4.3 Record results on appropriate PEARL Inspection and Test Form.
- 2.4.5 Primary to secondary and ground test (“UST” mode)
 - 2.4.5.1 Perform a power factor or dissipation factor test at rated primary coil voltage or less to measure C_{HL}
 - 2.4.5.2 Correct for temperature. Refer to test set manufacturer’s literature.
 - 2.4.5.3 Record results on appropriate PEARL Inspection and Test Form.
- 2.4.6 Secondary to primary and ground test (“GROUND” mode)
 - 2.4.6.1 Perform a power factor or dissipation factor test at rated secondary coil voltage or less to measure C_{HL} and C_{LG}
 - 2.4.6.2 Correct for temperature. Refer to test set manufacturer’s literature.
 - 2.4.6.3 Record results on appropriate PEARL Inspection and Test Form.
- 2.4.7 Secondary to primary and ground test (“GUARD” mode)
 - 2.4.7.1 Perform a power factor or dissipation factor test at rated secondary coil voltage or less to measure C_{LG}
 - 2.4.7.2 Correct for temperature. Refer to test set manufacturer’s literature.
 - 2.4.7.3 Record results on appropriate PEARL Inspection and Test Form.
- 2.4.8 Secondary to primary and ground test (“UST” mode)
 - 2.4.8.1 Perform a power factor or dissipation factor test at rated secondary coil voltage or less to measure C_{HL}
 - 2.4.8.2 Correct for temperature. Refer to test set manufacturer’s literature.
 - 2.4.8.3 Record results on appropriate PEARL Inspection and Test Form.

PEARL Reconditioning Standards			
MEDIUM VOLTAGE TRANSFORMERS POWER OIL-FILLED	Revision		
	Section	Number	Date
	2440	3	2-11-03

2.4.9 Compare results to manufacturer's recommendations or industrial standards.

2.5 Core Excitation

2.5.1 Perform a core excitation test on each phase.

2.5.2 Record results on appropriate PEARL Inspection and Test Form.

2.5.3 Compare results to manufacturer's recommendations or industrial standards.

2.6 Oil Testing (An oil sample may be sent to a lab to complete this section.)

2.6.1 Visual Condition

2.6.1.1 Perform a visual condition test in accordance with ASTM D-1524.

2.6.1.2 Record results on appropriate PEARL Inspection and Test Form.

2.6.1.3 Compare results to industrial standards.

2.6.2 Color

2.6.2.1 Perform a color test in accordance with ASTM D-1500.

2.6.2.2 Record results on appropriate PEARL Inspection and Test Form.

2.6.2.3 Compare results to industrial standards.

2.6.3 Dielectric Breakdown

2.6.3.1 Perform a dielectric breakdown test in accordance with ASTM D-877 or ASTM D-1816.

2.6.3.2 Record results on appropriate PEARL Inspection and Test Form.

2.6.3.3 Compare results to industrial standards.

2.6.4 Neutralization Number

2.6.4.1 Perform a neutralization number test in accordance with ASTM D-974.

2.6.4.2 Record results on appropriate PEARL Inspection and Test Form.

2.6.4.3 Compare results to industrial standards.

2.6.5 Interfacial Tension

2.6.5.1 Perform a neutralization number test in accordance with ASTM D-971 or D-2285.

2.6.5.2 Record results on appropriate PEARL Inspection and Test Form.

2.6.5.3 Compare results to industrial standards.

2.6.6 Power/Dissipation Factor

2.6.6.1 Perform a power/dissipation factor test in accordance with ASTM D-924 @ 25C.

2.6.6.2 Record results on appropriate PEARL Inspection and Test Form.

2.6.6.3 Compare results to industrial standards.

PEARL Reconditioning Standards			
MEDIUM VOLTAGE TRANSFORMERS POWER OIL-FILLED	Revision		
	Section	Number	Date
	2440	3	2-11-03

2.6.7 Water Content

2.6.7.1 Perform a water content test in accordance with ASTM D-1533.

2.6.7.2 Record results on appropriate PEARL Inspection and Test Form.

2.6.7.3 Compare results to industrial standards.

2.6.8 Dissolved Gas Analysis

2.6.8.1 Perform a dissolved gas analysis in accordance with ANSI/IEEE C57.104 or ASTM D-3612.

2.6.8.2 Record results on appropriate PEARL Inspection and Test Form.

2.6.8.3 Compare results to industrial standards.

PEARL Reconditioning Standards			
MEDIUM VOLTAGE TRANSFORMERS POWER OIL-FILLED	Revision		
	Section	Number	Date
	2440	3	2-11-03

III RECONDITIONING PROCEDURES

The following procedures are in a recommended order and are required to recondition this product. PEARL recognizes that, based on actual product design and as found condition, some of these procedures may not be applicable. The testing requirement must be completed before the product can be labeled as a PEARL reconditioned product.

1 RECONDITIONING

1.1 Frame/Enclosure

- 1.1.1 Disassemble to clean.
- 1.1.2 Cover or remove all high and low side bushing.
- 1.1.3 Cover or remove all gauges.
- 1.1.4 Cover or remove all nameplates.
- 1.1.5 Clean all parts of contamination and corrosion.
- 1.1.6 Prepare the frame/enclosure to paint, as necessary.
- 1.1.7 Paint frame/enclosure.

1.2. Bushings

- 1.2.1 Clean all bushings of contamination and corrosion.
- 1.2.2 Verify the integrity of all bushings.

1.3. Oil

- 1.3.1 Oil will be reconditioned or reclaimed based on the oil test result during the inspection section.
- 1.3.2 Record results on appropriate PEARL Inspection and Test Form.

1.4 Missing or Defective Components, Parts and Hardware

- 1.4.1 Replace or repair any missing or defective components, parts and hardware found during the inspection phase of this standard.

1.5 Molded Case Circuit Breakers

- 1.5.1 Molded case circuit breakers will be reconditioned in accordance with applicable PEARL Reconditioning Standards found in Section 1200.

1.6 Control Power or Instrumentation Transformers

- 1.6.1 Control power or instrumentation transformers will be reconditioned in accordance with applicable PEARL Reconditioning Standards found in Section 1400.

1.7 Surge Arrestors

- 1.7.1 Surge arrestors will be reconditioned in accordance with applicable PEARL Reconditioning Standards found in Sections 1600 and 2600.

1.8 Lubrication

- 1.8.1 Lubricate hinges.

1.9 Torque

- 1.9.1 Check all screw and bolt connections for the proper torque per manufacturer's recommendations or industrial standards (Table 1).
- 1.9.2 Record results on Medium Voltage Switchgear Inspection and Test Form.

PEARL Reconditioning Standards			
MEDIUM VOLTAGE TRANSFORMERS POWER OIL-FILLED	Revision		
	Section	Number	Date
	2440	3	2-11-03

1.10 Final Assembly

1.10.1 Ensure that frame is plumb and square.

1.10.2 Cover any unused openings.

1.10.3 Ensure that the nameplate/label data is complete, correct and legible.

PEARL Reconditioning Standards			
MEDIUM VOLTAGE TRANSFORMERS POWER OIL-FILLED	Revision		
	Section	Number	Date
	2440	3	2-11-03

2 TESTING

2.1 Insulation Resistance

- 2.1.1 Connect all primary terminals together.
- 2.1.2 Connect all secondary terminals together.
- 2.1.3 Primary to secondary and ground test.
 - 2.1.3.1 Perform an insulation resistance test at test voltage specified in Table 6.
 - 2.1.3.2 The test duration shall be for 1 minute.
 - 2.1.3.3 Correct for temperature, if necessary (Table 11).
 - 2.1.3.4 Record results on appropriate PEARL Inspection and Test Form.
 - 2.1.3.5 Compare test results to manufacturer's recommendations or Table 2 of Section 6000.
 - 2.1.3.6 The test results must be within the guidelines recommended in order for the product to become a PEARL labeled product.
- 2.1.4 Primary to secondary test
 - 2.1.4.1 Perform an insulation resistance test at test voltage specified in Table 6.
 - 2.1.4.2 The test duration shall be for 1 minute.
 - 2.1.4.3 Correct for temperature, if necessary (Table 11).
 - 2.1.4.4 Record results on appropriate PEARL Inspection and Test Form.
 - 2.1.4.5 Compare test results to manufacturer's recommendations or Table 2 of Section 6000.
 - 2.1.4.6 The test results must be within the guidelines recommended in order for the product to become a PEARL labeled product.
- 2.1.5 Secondary to primary and ground test
 - 2.1.5.1 Perform an insulation resistance test at test voltage specified in Table 6.
 - 2.1.5.2 The test duration shall be for 1 minute.
 - 2.1.5.3 Correct for temperature, if necessary (Table 11).
 - 2.1.5.4 Record results on appropriate PEARL Inspection and Test Form.
 - 2.1.5.5 Compare test results to manufacturer's recommendations or Table 2 of Section 6000.
 - 2.1.5.6 The test results must be within the guidelines recommended in order for the product to become a PEARL labeled product.

PEARL Reconditioning Standards			
MEDIUM VOLTAGE TRANSFORMERS POWER OIL-FILLED	Revision		
	Section	Number	Date
	2440	3	2-11-03

2.2 Transformer Turns Ratio Verification

- 2.2.1 Perform a turns ratio test on each phase from primary to secondary on all taps.
- 2.2.2 Record results on appropriate PEARL Inspection and Test Form.
- 2.2.3 Compare results to manufacturer's recommendations or industrial standards.
- 2.2.4 The test results must be within the guidelines recommended in order for the product to become a PEARL labeled product.

2.3 Core Ground

- 2.3.1 Perform a core ground test.
- 2.3.2 Record results on appropriate PEARL Inspection and Test Form.
- 2.3.3 Compare results to manufacturer's recommendations or industrial standards.
- 2.3.4 The test results must be within the guidelines recommended in order for the product to become a PEARL labeled product.

2.4 Power Factor or Dissipation Factor

- 2.4.1 Connect all primary terminals together.
- 2.4.2 Connect all secondary terminals together.
- 2.4.3 Primary to secondary and ground test ("GROUND" mode)
 - 2.4.3.1 Perform a power factor or dissipation factor test at rated primary coil voltage or less to measure C_{HL} and C_{HG}
 - 2.4.3.2 Correct for temperature. Refer to test set manufacturer's literature.
 - 2.4.3.3 Record results on appropriate PEARL Inspection and Test Form.
- 2.4.4 Primary to secondary and ground test ("GUARD" mode)
 - 2.4.4.1 Perform a power factor or dissipation factor test at rated primary coil voltage or less to measure C_{HG}
 - 2.4.4.2 Correct for temperature. Refer to test set manufacturer's literature.
 - 2.4.4.3 Record results on appropriate PEARL Inspection and Test Form.
- 2.4.5 Primary to secondary and ground test ("UST" mode)
 - 2.4.5.1 Perform a power factor or dissipation factor test at rated primary coil voltage or less to measure C_{HL}
 - 2.4.5.2 Correct for temperature. Refer to test set manufacturer's literature.
 - 2.4.5.3 Record results on appropriate PEARL Inspection and Test Form.

PEARL Reconditioning Standards			
MEDIUM VOLTAGE TRANSFORMERS POWER OIL-FILLED	Revision		
	Section	Number	Date
	2440	3	2-11-03

- 2.4.6 Secondary to primary and ground test (“GROUND” mode)
 - 2.4.6.1 Perform a power factor or dissipation factor test at rated secondary coil voltage or less to measure C_{HL} and C_{LG}
 - 2.4.6.2 Correct for temperature. Refer to test set manufacturer’s literature.
 - 2.4.6.3 Record results on appropriate PEARL Inspection and Test Form.
- 2.4.7 Secondary to primary and ground test (“GUARD” mode)
 - 2.4.7.1 Perform a power factor or dissipation factor test at rated secondary coil voltage or less to measure C_{LG}
 - 2.4.7.2 Correct for temperature. Refer to test set manufacturer’s literature.
 - 2.4.7.3 Record results on appropriate PEARL Inspection and Test Form.
- 2.4.8 Secondary to primary and ground test (“UST” mode)
 - 2.4.8.1 Perform a power factor or dissipation factor test at rated secondary coil voltage or less to measure C_{HL}
 - 2.4.8.2 Correct for temperature. Refer to test set manufacturer’s literature.
 - 2.4.8.3 Record results on appropriate PEARL Inspection and Test Form.
- 2.4.9 Compare results to manufacturer's recommendations or industrial standards.
- 2.4.10 The test results must be within the guidelines recommended in order for the product to become a PEARL labeled product.
- 2.5 **Bushing Power Factor or Dissipation Factor**
 - 2.5.1 High Side Bushing
 - 2.5.1.1 Perform a power factor or dissipation factor test on each high side bushing at recommended voltage or less.
 - 2.5.1.2 Correct for temperature. Refer to test set manufacturer’s literature.
 - 2.5.1.3 Record results on appropriate PEARL Inspection and Test Form.
 - 2.5.2 Low Side Bushing
 - 2.5.2.1 Perform a power factor or dissipation factor test on each low side bushing at recommended voltage or less.
 - 2.5.2.2 Correct for temperature. Refer to test set manufacturer’s literature.
 - 2.5.2.3 Record results on appropriate PEARL Inspection and Test Form.
 - 2.5.3 Compare results to manufacturer's recommendations or industrial standards.
 - 2.5.4 The test results must be within the guidelines recommended in order for the product to become a PEARL labeled product.

PEARL Reconditioning Standards			
MEDIUM VOLTAGE TRANSFORMERS POWER OIL-FILLED	Revision		
	Section	Number	Date
	2440	3	2-11-03

2.6 Core Excitation

2.6.1 Perform a core excitation test on each phase.

2.6.2 Record results on appropriate PEARL Inspection and Test Form.

2.6.3 Compare results to manufacturer's recommendations or industrial standards.

2.6.4 The test results must be within the guidelines recommended in order for the product to become a PEARL labeled product.

2.7 Oil Testing (An oil sample may be sent to a lab to complete this section.)

2.7.1 Visual Condition

2.7.1.1 Perform a visual condition test in accordance with ASTM D-1524.

2.7.1.2 Record results on appropriate PEARL Inspection and Test Form.

2.7.1.3 Compare results to industrial standards.

2.7.1.4 The test results must be within the guidelines recommended in order for the product to become a PEARL labeled product.

2.7.2 Color

2.7.2.1 Perform a color test in accordance with ASTM D-1500.

2.7.2.2 Record results on appropriate PEARL Inspection and Test Form.

2.7.2.3 Compare results to industrial standards.

2.7.2.4 The test results must be within the guidelines recommended in order for the product to become a PEARL labeled product.

2.7.3 Dielectric Breakdown

2.7.3.1 Perform a dielectric breakdown test in accordance with ASTM D-877 or ASTM D-1816.

2.7.3.2 Record results on appropriate PEARL Inspection and Test Form.

2.7.3.3 Compare results to industrial standards.

2.7.3.4 The test results must be within the guidelines recommended in order for the product to become a PEARL labeled product.

2.7.4 Neutralization Number

2.7.4.1 Perform a neutralization number test in accordance with ASTM D-974.

2.7.4.2 Record results on appropriate PEARL Inspection and Test Form.

2.7.4.3 Compare results to industrial standards.

2.7.4.4 The test results must be within the guidelines recommended in order for the product to become a PEARL labeled product.

PEARL Reconditioning Standards			
MEDIUM VOLTAGE TRANSFORMERS POWER OIL-FILLED	Revision		
	Section	Number	Date
	2440	3	2-11-03

2.7.5 Interfacial Tension

2.7.5.1 Perform a neutralization number test in accordance with ASTM D-971 or D-2285.

2.7.5.2 Record results on appropriate PEARL Inspection and Test Form.

2.7.5.3 Compare results to industrial standards.

2.7.5.4 The test results must be within the guidelines recommended in order for the product to become a PEARL labeled product.

2.7.6 Power/Dissipation Factor

2.7.6.1 Perform a power/dissipation factor test in accordance with ASTM D-924 @ 25C.

2.7.6.2 Record results on appropriate PEARL Inspection and Test Form.

2.7.6.3 Compare results to industrial standards.

2.7.6.4 The test results must be within the guidelines recommended in order for the product to become a PEARL labeled product.

2.7.7 Water Content

2.7.7.1 Perform a water content test in accordance with ASTM D-1533.

2.7.7.2 Record results on appropriate PEARL Inspection and Test Form.

2.7.7.3 Compare results to industrial standards.

2.7.7.4 The test results must be within the guidelines recommended in order for the product to become a PEARL labeled product.

2.7.8 Dissolved Gas Analysis

2.7.8.1 Perform a dissolved gas analysis in accordance with ANSI/IEEE C57.104 or ASTM D-3612.

2.7.8.2 Record results on appropriate PEARL Inspection and Test Form.

2.7.8.3 Compare results to industrial standards.

2.7.8.4 The test results must be within the guidelines recommended in order for the product to become a PEARL labeled product.

PEARL Reconditioning Standards			
MEDIUM VOLTAGE TRANSFORMERS POWER OIL-FILLED	Revision		
	Section	Number	Date
	2440	3	2-11-03

The DC overpotential test of liquid-filled transformers is not recommended. However, if the customer requires that a DC overpotential test be performed, then the values given in Table 5 should be used.

2.8 Overpotential Test

- 2.8.1 Connect all primary terminals together.
- 2.8.2 Connect all secondary terminals together.
- 2.8.3 Primary to secondary and ground test.
 - 2.8.3.1 Perform an overpotential test at test voltage specified in Table 5. The test duration shall be for 1 minute once maximum test voltage is achieved.
 - 2.8.3.2 Record results on appropriate PEARL Inspection and Test Form.
- 2.8.4 Primary to secondary test
 - 2.8.4.1 Perform an overpotential test at test voltage specified in Table 5. The test duration shall be for 1 minute once maximum test voltage is achieved.
 - 2.8.4.2 Record results on appropriate PEARL Inspection and Test Form.
- 2.8.5 Secondary to primary and ground test
 - 2.8.5.1 Perform an overpotential test at test voltage specified in Table 5. The test duration shall be for 1 minute once maximum test voltage is achieved.
 - 2.8.5.2 Record results on appropriate PEARL Inspection and Test Form.
- 2.8.6 Record results on appropriate PEARL Inspection and Test Form.
- 2.8.7 Compare results to manufacturer's recommendations or industrial standards.
- 2.8.8 The test results must be within the guidelines recommended in order for the product to become a PEARL labeled product.

2.9 DC Winding Resistance

- 2.9.1 Perform a DC winding resistance test on each phase on all taps.
- 2.9.2 Record results on appropriate PEARL Inspection and Test Form.
- 2.9.3 Compare results to manufacturer's recommendations or industrial standards.
- 2.9.4 The test results must be within the guidelines recommended in order for the product to become a PEARL labeled product.

2.10 Surge Arrestors

- 2.10.1 Surge arrestors will be tested in accordance with applicable PEARL Reconditioning Standards found in Sections 1600 and 2600.

PEARL Reconditioning Standards			
MEDIUM VOLTAGE TRANSFORMERS POWER OIL-FILLED	Revision		
	Section	Number	Date
	2440	3	2-11-03

2.11 Instrumentation and Controls

2.11.1 Verify the electric operation of all control lights.

2.11.2 Verify the electric operation of all control switches.

2.11.3 Test all cooling fans to verify operation at specific operating temperature set points.

2.11.4 Test all meters and monitors for proper functioning.

2.11.5 Perform an insulation resistance test to the control wiring at 1000 Vdc to ground.

2.11.6 Record results on appropriate PEARL Inspection and Test Form.

2.12 Molded Case Circuit Breakers

2.12.1 Molded case circuit breakers will be tested in accordance with applicable PEARL Reconditioning Standards found in Section 1200.

2.13 Control Power or Instrumentation Transformers

2.13.1 Control power or instrumentation transformers will be tested in accordance with PEARL Reconditioning Standards found in Sections 1400 and 2400.

2.14 Surge Arrestors

2.14.1 Surge arrestors will be tested in accordance with applicable PEARL Reconditioning Standards found in Sections 1600 and 2600.

IV PEARL CERTIFICATION

This product has now been reconditioned under the PEARL Reconditioning Standard. The PEARL label and/or seal may be placed on it.