

<i>PEARL Reconditioning Standards</i>			
<i>MEDIUM VOLTAGE ENCLOSED VACUUM DISCONNECT SWITCHES ELECTRICALLY OPERATED NON-FUSIBLE</i>	<i>PROPOSED STANDARD</i>		
	<i>Standard</i>	<i>Number</i>	<i>Date</i>
	<i>2140</i>	<i>5</i>	<i>11-2008</i>

This standard is designed to verify that a medium voltage electrically operated non-fusible vacuum disconnect switch is in a safe and reliable operating condition. In the event that the disconnect switch is not in this condition then this standard will establish the reconditioning requirements. The term "reconditioning" is defined as "the process of returning electrical equipment to safe and reliable operating condition based upon the design of the original manufacturer at the time of manufacturing."

REFERENCES

The following references are use in this standard. Each of these references can be found in their respective listed locations.

Table References: Section 6000

- Table 1: US Standard bus connection bolt torque values.
- Table 2: Insulation resistance and test values for electrical apparatus.
- Table 5: Overpotential Test Voltages for Non-Inductive Electrical Apparatus
- Table 11: Insulation resistance and test temperature conversion to 20°C values.

I TEST EQUIPMENT

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

1. Insulation Resistance Test Set (Megohmmeter) 2500 Vdc minimum
2. DC Overpotential Test Set (Hipot)

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

1. Digital Low Resistance Ohmmeter (DLRO – 10 amp unit is sufficient.)
2. DC Current Source and a Millivoltmeter

One of the following pieces of test equipment may be required to perform the testing requirements of this reconditioning standard, depending on the accessories:

1. AC Voltage Supply
2. DC Voltage Supply
3. Millivoltmeter or a Multimeter

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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 for missing screws, bolts, nuts, fasteners, retainers and keepers.
- 1.1.4 Inspect for rust and corrosion.
- 1.1.5 Record results on an approved PEARL Evaluation Form.

1.2 Viewing Window

- 1.2.1 Inspect for missing screws, bolts, nuts, fasteners, retainers and keepers.
- 1.2.2 Inspect viewing window glass for cracks and clarity.
- 1.2.3 Inspect viewing window glass weather stripping.
- 1.2.4 Record results on an approved PEARL Evaluation Form.

1.3 Insulators

- 1.3.1 Inspect for missing bolts or nuts.
- 1.3.2 Inspect for defects, cracks, or chips.
- 1.3.3 Inspect for signs of overheating or tracking.
- 1.3.4 Inspect for signs of deterioration or contamination.
- 1.3.5 Record results on an approved PEARL Evaluation Form.

1.4 Insulating Links/Push Rods

- 1.4.1 Inspect for missing screws, bolts, nuts, fasteners, retainers and keepers.
- 1.4.2 Inspect for defects, cracks, or chips.
- 1.4.3 Inspect for signs of overheating or tracking.
- 1.4.4 Inspect for signs of deterioration or contamination.
- 1.4.5 Record results on an approved PEARL Evaluation Form.

1.5 Interlocks

- 1.5.1 Inspect for proper door interlock operation.
- 1.5.2 Inspect for proper Kirk lock assembly, if necessary.
- 1.5.3 Record results on an approved PEARL Evaluation Form.

1.6 Inter-phase Barriers

- 1.6.1 Inspect for dust, dirt and foreign materials.
- 1.6.2 Inspect for defects, cracks, or chips.
- 1.6.3 Inspect for signs of overheating or tracking.
- 1.6.4 Inspect for signs of deterioration or contamination.
- 1.6.5 Record results on an approved PEARL Evaluation Form.

1.7 Vacuum Bottle

- 1.7.1 Ensure that the nameplate data is legible.
- 1.7.2 Inspect for cracks and chips.
- 1.7.3 Check erosion gap on each phase if available.
- 1.7.4 Record results on an approved PEARL Evaluation Form.

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1.8 Operating Mechanism

- 1.8.1 Inspect for signs of rust and corrosion.
- 1.8.2 Inspect for excessive and inappropriate lubrication.
- 1.8.3 Inspect closing spring.
- 1.8.4 Inspect opening spring.
- 1.8.5 Inspect operating chain or belt.
- 1.8.6 Inspect operation motor.
- 1.8.7 Inspect for missing screws, bolts, nuts, fasteners, retainers and keepers.
- 1.8.8 Manually operate disconnect switch a minimum of five (5) times while checking for proper operation of the quick-make and quick-break feature.
- 1.8.9 Electrically operate disconnect switch a minimum of five (5) times while checking for proper operation of the quick-make and quick-break feature.
- 1.8.10 Record results on an approved PEARL Evaluation Form.

1.9 Control Wiring

- 1.9.1 Inspect for overheating.
- 1.9.2 Inspect for damage and deteriorated insulation.
- 1.9.3 Check for loose and defective terminal connectors.
- 1.9.4 Record results on an approved PEARL Evaluation Form.

1.10 Limit Switches

- 1.10.1 Inspect all limit switches for proper operation.
- 1.10.2 Check all terminal connections.
- 1.10.3 Inspect for chips, cracks and defective limit switch cases.
- 1.10.4 Record results on an approved PEARL Evaluation Form.

1.11 Checks and Adjustments

- 1.11.1 Make all other checks per manufacturer's recommendations. In the absence of a manufacturer's recommendations, any checks made will be based upon procedures that will ensure the original manufacturer's design.
- 1.11.2 Record results on an approved PEARL Evaluation Form

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2 TESTING

2.1 Insulation Resistance

- 2.1.1 Consult manufacturer's instructions for any precautions before performing this test.
- 2.1.2 Perform an insulation resistance test at test values specified in Table 2 of Section 6000 as follows:
- 2.1.2.1 Disconnect switch in the open position
- 2.1.2.1.1 Line to load
- 2.1.2.2 Disconnect switch in the closed position
- 2.1.2.2.1 Phase to phase
- 2.1.2.2.2 Phase to ground
- 2.1.3 Correct for temperature, if necessary (Table 11).
- 2.1.4 Record results on an approved PEARL Evaluation Form.
- 2.1.5 Compare test results to manufacturer's recommendations or Table 2 of Section 6000.

2.2 Contact Resistance

- 2.2.1 Perform a contact resistance, millivolt drop test or watt-loss test from line to load on each phase of a closed switch with the test points at the line and load lug landings.
- 2.2.2 Record results on an approved PEARL Evaluation Form.
- 2.2.3 Compare test results to manufacturer's recommendations.
- 2.2.4 A PEARL recognized method for evaluation of the current carrying path is comparing the test results of each pole. Results should be within 50% for any of the poles. Any other industrial standard used for evaluation of the current carrying path shall provide at least the same integrity as the PEARL recognized standard of comparing the test results of each pole and ensuring that they are within 50% of each other.

2.3 Overpotential Test

- 2.3.1 Perform an overpotential test at test voltage specified in Table 5 as follows:
- 2.3.1.1 Switch in the closed position
- 2.3.1.1.1 Phase to phase
- 2.3.1.1.2 Phase to ground
- 2.3.2 Record results on an approved PEARL Evaluation Form.
- 2.3.3 Compare results to manufacturer's guidelines or industrial standards.

2.4 Vacuum Bottle Integrity Test

- 2.4.1 Consult manufacturer's instructions for any precautions concerning radiation warnings before performing this test.
- 2.4.2 Perform a vacuum bottle integrity test on each phase using specific manufacturer's literature guidelines for test voltage and test sets.
- 2.4.3 Switch in the open position - Line to Load
- 2.4.4 Record results on an approved PEARL Evaluation Form.
- 2.4.5 Compare results to manufacturer's guidelines or company guidelines.

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III RECONDITIONING PROCEDURES

The following procedures 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 Enclosure

- 1.1.1** Ensure that the frame/enclosure is plumb and square.
- 1.1.2** Cover any unused openings.
- 1.1.3** Disassemble to clean, as necessary.
- 1.1.4** Clean all parts of contamination and corrosion.
- 1.1.5** Prepare the enclosure to paint, as necessary.
- 1.1.6** Paint enclosure, as necessary.

1.2 Missing or Defective Components, Parts and Hardware

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

1.3 Operating Mechanism

- 1.3.1** Disassemble operating mechanism, as necessary.
- 1.3.2** Clean operating mechanism.
- 1.3.3** Replace any defective parts.
- 1.3.4** Replate operating mechanism parts, as necessary.
- 1.3.5** Apply proper lubrication
- 1.3.6** Assemble operating mechanism.
- 1.3.7** Manually operate disconnect switch a minimum of ten (10) times while checking for proper operation of the quick-make and quick-break feature.
- 1.3.8** Record results on an approved PEARL Reconditioning Test Form.

1.4 Control Wiring

- 1.4.1** Replace any control wire that is damaged or shows signs of overheating.
- 1.4.2** Replace any loose and defective terminal connectors.

1.5 Vacuum Bottles

- 1.5.1** Replace any vacuum bottles that fail the vacuum integrity test during the evaluation phase.
- 1.5.2** Replace any defective parts.
- 1.5.3** Check for proper torque on connections.
- 1.5.4** Adjust bottles for proper gap.
- 1.5.5** Record results on an approved PEARL Reconditioning Test Form.

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- 1.6 Current Carrying Components**
 - 1.6.1 Hinge/pivot joints.**
 - 1.6.1.1** Disassemble hinge/pivot joints
 - 1.6.1.2** Clean and degrease.
 - 1.6.1.3** Replate, as necessary.
 - 1.6.1.4** Lubricate hinge/pivot joints
 - 1.6.1.5** Assemble hinge/pivot joints
 - 1.6.1.6** Record results on an approved PEARL Reconditioning Test Form.
- 1.7 Checks and Adjustments**
 - 1.7.1 General**
 - 1.7.1.1** Adjust all mechanical settings per manufacturer's instructions.
 - 1.7.1.2** Check all adjustments for proper tolerance per manufacturer's recommendations.
 - 1.7.1.3** Record results on an approved PEARL Reconditioning Test Form.
 - 1.7.2 Vacuum Bottles**
 - 1.7.2.1** Check for erosion gap or other manufacturer's recommendations.
 - 1.7.2.2** Check for proper sequence.
 - 1.7.2.3** Record results on an approved PEARL Reconditioning Test Form.
 - 1.7.3 Hinge/ Pivot**
 - 1.7.3.1** Check for proper adjustment and operation based on manufacturer's recommendations.
 - 1.7.3.2** Record results on an approved PEARL Reconditioning Test Form.
 - 1.7.4 Limit Switches**
 - 1.7.4.1** Check for proper adjustment and operation based on manufacturer's recommendations.
 - 1.7.4.2** Record results on an approved PEARL Reconditioning Test Form.
 - 1.7.5 Safety Interlocks**
 - 1.7.5.1** Check for proper adjustment and operation based on manufacturer's recommendations.
 - 1.7.5.2** Record results on an approved PEARL Reconditioning Test Form.
 - 1.7.5.3** Check and adjust for proper sequence.
 - 1.7.6** Make any additional checks and adjustments per manufacturer's instructions. In the absence of a manufacturer's instructions, any adjustments will be based on procedures that will ensure that the original manufacturer's design.
 - 1.7.7** All checks and adjustments must be within the guidelines recommended in order for the product to become a PEARL labeled product.
 - 1.7.8** Record results on an approved PEARL Reconditioning Test Form.

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1.8 Torque

- 1.8.1 Check all screw and bolt connections for the proper torque per manufacturer's recommendations or industrial standards (Table 1).
- 1.8.2 Record results on an approved PEARL Reconditioning Test Form.

1.9 Final Assembly

- 1.9.1 Ensure that the nameplate/label data is complete, correct and legible.
- 1.9.2 Manually operate disconnect switch a minimum of ten (10) times while checking for proper operation of the quick-make and quick-break feature.
- 1.9.3 Electrically operate disconnect switch a minimum of ten (10) times while checking for proper operation of the quick-make and quick-break feature.
- 1.9.4 Record results on an approved PEARL Reconditioning Test Form.

2 TESTING

2.1 Contact Resistance

- 2.1.1 Perform a contact resistance, millivolt drop test and/or watt-loss test from line to load on each phase of a closed switch as follows:
- 2.1.2 Record results on an approved PEARL Reconditioning Test Form.
- 2.1.3 A PEARL recognized method for evaluation of the current carrying path is comparing the test results of each pole. Results should be within 50% for any of the poles. Any other industrial standard used for evaluation of the current carrying path shall provide at least the same integrity as the PEARL recognized standard of comparing the test results of each pole and ensuring that they are within 50% of each other.
- 2.1.4 The test results must be within the guidelines recommended in order for the product to become a PEARL labeled product.

2.2 Overpotential Test

- 2.2.1 Perform an overpotential test at test voltage specified in Table 5 as follows:
 - 2.2.1.1 Switch in the closed position
 - 2.2.1.1.1 Phase to phase
 - 2.2.1.1.2 Phase to ground
- 2.2.2 Record results on an approved PEARL Reconditioning Test Form.
- 2.2.3 Compare results to manufacturer's guidelines or industrial standards.

2.3 Vacuum Bottle Integrity Test

- 2.3.1 Consult manufacturer's instructions for any precautions concerning radiation warnings before performing this test.
- 2.3.2 Perform a vacuum bottle integrity test on each phase using specific manufacturer's literature guidelines for test voltage and test sets.
 - 2.3.2.1 Switch in the open position
 - 2.3.2.1.1 Line to Load
- 2.3.3 Record results on an approved PEARL Reconditioning Test Form.
- 2.3.4 Compare results to manufacturer's guidelines or company guidelines.

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2.4 Insulation Resistance

- 2.4.1** Perform an insulation resistance test at test values specified in Table 2 of Section 6000 as follows:
 - 2.4.1.1** Disconnect switch in the open position
 - 2.4.1.1.1** Line to load
 - 2.4.1.2** Disconnect switch in the closed position
 - 2.4.1.2.1** Phase to phase
 - 2.4.1.2.2** Phase to ground
- 2.4.2** Correct for temperature, if necessary (Table 11).
- 2.4.3** Record results on an approved PEARL Reconditioning Test Form.
- 2.4.4** Compare test results to manufacturer's recommendations or Table 2 of Section 6000.
- 2.4.5** The test results must be within the guidelines recommended in order for the product to become a PEARL labeled product

IV PEARL CERTIFICATION

This product has now been reconditioned under the PEARL Reconditioning Standard. The blue PEARL Reconditioning Quality Seal may now be placed on the device.