

PEARL Reconditioning Standards			
<b>LOW VOLTAGE DISCONNECT SWITCHES ELECTRIC TRIP POWER FUSIBLE</b>	Revision		
	Standard	Number	Date
	1144	5	11-2008

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."

**NOTE:** This standard pertains disconnects that are typically found as service entrance disconnects or feeder disconnects that provide power to other downstream panelboard, switchboard or equipment. Some of examples of these disconnects are Boltswitch, Bolt-Loc, BP Switch, General Electric THPC and Pringle.

**NOTE:** If fuses are installed, they are to be properly designed and rated with respect to voltage and interrupting rating for the device and specific application for which they are intended, and must be approved by the customer for said purpose. The final determination is ultimately the responsibility of the end user.

## 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 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) 1000 Vdc minimum

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 other testing requirements of this reconditioning standard depending on the accessories:

1. AC Voltage Supply
2. DC Voltage Supply

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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

- 1.1.1 Ensure that the nameplate/label data is legible.
- 1.1.2 Ensure that the third party listing service label is legible.
- 1.1.3 Inspect the overall frame for missing screws, bolts, nuts, fasteners, retainers and keepers.
- 1.1.4 Inspect for rust and corrosion.
- 1.1.5 Inspect for signs of overheating at the fuse connection.
- 1.1.6 Inspect insulation structure for signs of overheating and deterioration.
- 1.1.7 Record results on an approved PEARL Evaluation Form.

#### 1.2 Operating Mechanism

- 1.2.1 Inspect for signs of rust and corrosion.
- 1.2.2 Inspect for excessive and inappropriate lubrication.
- 1.2.3 Inspect for missing screws, bolts, nuts, fasteners, retainers and keepers.
- 1.2.4 Manually operate disconnect switch three (3) times while checking for proper operation of the quick-make and quick-break feature.
- 1.2.5 Record results on an approved PEARL Evaluation Form.

#### 1.3 Interphase Barriers

- 1.3.1 Inspect for dust, dirt and foreign materials.
- 1.3.2 Inspect for chips, cracks and deterioration.
- 1.3.3 Inspect for overheating.
- 1.3.4 Record results on an approved PEARL Evaluation Form.

#### 1.4 Arc Extinguishers

- 1.4.1 Inspect for loose and missing parts.
- 1.4.2 Inspect for dust, dirt, foreign material, cracks, chips and signs of overheating.
- 1.4.3 Inspect for excessive deterioration and carbon buildup on the metal separator.
- 1.4.4 Inspect arc runners for excessive deterioration.
- 1.4.5 Record results on an approved PEARL Evaluation Form.

#### 1.5 Arcing Contacts

- 1.5.1 Inspect for excessive deterioration.
- 1.5.2 Inspect for cracks, chips and pitting.
- 1.5.3 Check for proper alignment/seating in the closed position.
- 1.5.4 Record results on an approved PEARL Evaluation Form.

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- 1.6 Main Contacts**
  - 1.6.1 Inspect for excessive deterioration.
  - 1.6.2 Inspect for cracks, chips and pitting.
  - 1.6.3 Check for proper alignment/seating in the closed position.
  - 1.6.4 Record results on an approved PEARL Evaluation Form.
- 1.7 Current Carrying Components**
  - 1.7.1 Inspect line and load connections for signs of overheating.
  - 1.7.2 Inspect line and load connections for missing and defective parts.
  - 1.7.3 Inspect line and load fuse connections plates for signs of overheating.
  - 1.7.4 Inspect hinge/pivot joints for signs of overheating.
  - 1.7.5 Inspect hinge/pivot joints for missing and defective parts.
  - 1.7.6 Inspect any other current carrying components for signs of overheating.
  - 1.7.7 Inspect any other current carrying components for missing and defective parts.
  - 1.7.8 Record results on an approved PEARL Evaluation Form.
- 1.8 Fuse Assembly**
  - 1.8.1 Inspect fuse clips or terminal pads for signs of overheating.
  - 1.8.2 Inspect fuse clips or terminal pads assemblies for missing and defective parts.
  - 1.8.3 Inspect the fuse clips or terminal pads for proper connection and tension.
  - 1.8.4 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 Interlocks**
  - 1.10.1 Inspect all interlocks for proper operation.
  - 1.10.2 Record results on an approved PEARL Evaluation Form.
- 1.11 Shunt Trip Devices**
  - 1.11.1 Inspect shunt trip unit for missing and defective screws, bolts, nuts, fasteners and keepers.
  - 1.11.2 Inspect shunt trip unit for signs of overheating and deteriorated insulation.
  - 1.11.3 Check shunt trip unit for loose and defective terminal connectors.
  - 1.11.4 Record results on an approved PEARL Evaluation Form.
- 1.12 Blown Fuse Indicator Devices**
  - 1.12.1 Inspect blown fuse indicator trip unit for missing and defective screws, bolts, nuts, fasteners and keepers.
  - 1.12.2 Inspect blown fuse indicator trip unit for signs of overheating and deteriorated insulation.

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**1.12.3** Check blown fuse indicator trip unit for loose and defective terminal connectors.

**1.12.4** Record results on an approved PEARL Evaluation Form.

## **2 TESTING**

### **2.1 Insulation Resistance**

**2.1.1** Perform an insulation resistance test at test values specified in Table 2 of Section 6000 as follows:

**2.1.1.1** Switch in the open position

**2.1.1.1.1** Line to load

**2.1.1.2** Switch in the closed position

**2.1.1.2.1** Phase to phase

**2.1.1.2.2** Phase to frame/enclosure

**2.1.2** Correct for temperature, if necessary (Table 11).

**2.1.3** Record results on an approved PEARL Evaluation Form.

**2.1.4** 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 and/or watt-loss test from line to load on each phase of a closed switch as follows:

**2.2.1.1** Switch

**2.2.1.1.1** Line terminal of switch to load terminal of switch

**2.2.1.2** Fuses, if fuses are included.

**2.2.1.2.1** Load terminal of switch to load terminal of fuse

**2.2.1.3** Overall (if fuses are included)

**2.2.1.3.1** Line terminal of switch to load terminal of Fuse)

**2.2.2** Record results on an approved PEARL Evaluation Form.

**2.2.3** A PEARL recognized method is comparing the test results of each pole. Results should be within 50% for any of the poles. Any industrial standard used 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 Shunt Trip Test**

**2.3.1** Close switch.

**2.3.2** Connect appropriate voltage source to shunt trip input leads.

**2.3.3** Increase voltage until shunt trip unit operates. Verify that the device operates properly at its minimum rated voltage recommended by the manufacturer.

**2.3.4** Record results on an approved PEARL Evaluation Form.

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**2.4 Blown Fuse Indicator Device**

- 2.4.1** Connect voltage source to fuse trip indicator input leads for A phase (left pole).
- 2.4.2** Close switch.
- 2.4.3** Apply rated voltage to the fuse trip indicator unit for A phase.
- 2.4.4** Ensure that switch trips (opens) and fuse indicator trip unit for A phase shows proper trip indicator, attempt to close tripped switch (Note - switch should not close).
- 2.4.5** Repeat for B phase (center pole) and C phase (right pole).
- 2.4.6** Record results on an approved PEARL Evaluation Form.
- 2.4.7** Compare results to manufacturer's recommendations.

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### **III RECONDITION PROCEDURES**

The following procedures are in a recommended order and are required to recondition this product. PEARL recognizes that, based upon actual product design and/or 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**

- 1.1.1 Disassemble to clean.
- 1.1.2 Clean all parts of contamination and corrosion.
- 1.1.3 Prepare the frame to paint, as necessary.
- 1.1.4 Paint frame.
- 1.1.5 Ensure that the nameplate/label data is complete, correct and legible.

##### **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 mechanism.
- 1.3.3 Replace any defective parts.
- 1.3.4 Replate operating mechanism parts, as necessary.
- 1.3.5 Assemble operating mechanism.
- 1.3.6 Apply proper lubrication.
- 1.3.7 Manually operate switch a minimum of five (5) times while checking for proper operation of the quick-make and quick-break feature.
- 1.3.8 Electrically trip the disconnect switch a minimum of five (5) times while checking for proper operation.

##### **1.4 Arc Extinguishers**

- 1.4.1 Remove arc extinguishers.
- 1.4.2 Clean arc extinguishers.
- 1.4.3 Replace any defective arc extinguishers.
- 1.4.4 Assemble arc extinguishers.

##### **1.5 Arcing Contacts**

- 1.5.1 Remove and replace any defective arcing contacts.
- 1.5.2 Stationary arcing contacts.
  - 1.5.2.1 Clean and dress.
  - 1.5.2.2 Remove and replate, as necessary.
  - 1.5.2.3 Replace contacts.
- 1.5.3 Movable arcing contacts.
  - 1.5.3.1 Clean and dress.
  - 1.5.3.2 Remove and replate, as necessary.
  - 1.5.3.3 Replace contacts.
- 1.5.4 Check for proper wipe and alignment.

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- 1.5.5 Check for proper torque on connections.
- 1.6 **Main Contacts**
  - 1.6.1 Remove and replace any defective main contacts.
  - 1.6.2 Stationary main contacts.
    - 1.6.2.1 Clean and dress.
    - 1.6.2.2 Remove and replate, as necessary.
    - 1.6.2.3 Replace contacts.
  - 1.6.3 Movable main contacts.
    - 1.6.3.1 Clean and dress.
    - 1.6.3.2 Remove and replate, as necessary.
    - 1.6.3.3 Replace contacts.
  - 1.6.4 Check for proper wipe and alignment.
  - 1.6.5 Check for proper torque on connections.
- 1.7 **Current Carrying Components**
  - 1.7.1 Line and load connections.
    - 1.7.1.1 Clean and degrease.
    - 1.7.1.2 Replate, as necessary.
  - 1.7.2 Hinge/pivot joints.
    - 1.7.2.1 Clean and degrease.
    - 1.7.2.2 Replate, as necessary.
  - 1.7.3 Other current carrying components.
    - 1.7.3.1 Clean and degrease.
    - 1.7.3.2 Replate, as necessary.
- 1.8 **Fuse Assembly**
  - 1.8.1 Replace defective line side fuse clips or terminal pads.
  - 1.8.2 Replace defective load side fuse clips or terminal pads.
  - 1.8.3 Clean, replate or replace any defective fuse clips or terminal pads.
  - 1.8.4 Reinstall fuse clips or terminal pads.
  - 1.8.5 Check for proper tension of fuse clips or torque on fuse terminal pads.
- 1.9 **Shunt Trip Unit**
  - 1.9.1 Replace or repair any defective shut trip unit.
  - 1.9.2 Adjust any shunt trip unit to operate within the design range recommended by the manufacturer. In the absence of manufacturer's instructions, these adjustments will be based upon a procedure that will ensure the original manufacturer's design.
  - 1.9.3 Record results on an approved PEARL Reconditioning Test Form.
- 1.10 **Blown Fuse Indicator Device**
  - 1.10.1 Replace or repair any defective blown fuse indicator device unit.
  - 1.10.2 Adjust any blown fuse indicator device to operate within the design range recommended by the manufacturer. In the absence of manufacturer's instructions, these adjustments will be based upon a procedure that will ensure the original manufacturer's design.
  - 1.10.3 Record results on an approved PEARL Reconditioning Test Form.

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### 1.11 Checks and adjustments

1.11.1 Check arcing contacts for proper wipe, pressure and gap.

1.11.2 Check main contacts for proper wipe, pressure and gap.

1.11.3 Make all adjustments per manufacturer's instructions. In the absence of a manufacturer's instructions, these adjustments will be based upon procedures that will ensure the original manufacturer's design.

1.11.4 Record results on an approved PEARL Reconditioning Test Form.

### 1.12 Torque

1.12.1 Check all screw and bolt connections for the proper torque per manufacturer's recommendations or Table 1 of Section 6000.

1.12.2 Record results on an approved PEARL Reconditioning Test Form.

### 1.13 Final Operation

1.13.1 Ensure that all components, structures, devices and assemblies are complete and equipment is ready for service prior to beginning operations.

1.13.2 Manually operate switch a minimum of ten (10) times while checking for proper operation of the quick-make and quick-break feature.

1.13.3 Electrically trip the disconnect switch a minimum of ten (10) times while checking for proper operation.

1.13.4 Record results on an approved PEARL Reconditioning Test Form.

## 2 TESTING

### 2.1 Insulation Resistance

2.1.1 Perform an insulation resistance at test values specified in Table 2 of Section 6000 as follows:

2.1.1.1 Switch in the open position

2.1.1.1.1 Line to load

2.1.1.1.2 Line to frame/enclosure

2.1.1.1.3 Load to frame/enclosure

2.1.1.1.4 Phase to phase on line side

2.1.1.1.5 Phase to phase on load side

2.1.1.2 Switch in the closed position

2.1.1.2.1 Phase to phase

2.1.1.2.2 Phase to frame/enclosure

2.1.2 Correct for temperature, if necessary (Table 11).

2.1.3 Record results on an approved PEARL Reconditioning Test Form.

2.1.4 Compare results to manufacturer's recommendations or Table 2 of Section 6000.

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

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## **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 Reconditioning Test Form.
- 2.2.3** Compare test results to manufacturer's recommendations.
- 2.2.4** In the absence of a manufacturer's recommendation, these results will be compared to industrial standards that will ensure integrity of the current carrying path. A PEARL recognized method is comparing the test results of each pole. Results should be within 50% for any of the poles.
- 2.2.5** The test results must be within the guidelines recommended in order for the product to become a PEARL labeled product.

## **2.3 Shunt Trip Test**

- 2.3.1** Close switch.
- 2.3.2** Connect appropriate voltage source to shunt trip input leads.
- 2.3.3** Increase voltage until shunt trip unit operates. Verify that the device operates properly at its minimum rated voltage recommended by the manufacturer.
- 2.3.4** Record results on an approved PEARL Reconditioning Test Form.

## **2.4 Blown Fuse Indicator Device**

- 2.4.1** Connect voltage source to fuse trip indicator input leads for A phase (left pole).
- 2.4.2** Close switch.
- 2.4.3** Apply rated voltage to the fuse trip indicator unit for A phase.
- 2.4.4** Ensure that switch trips (opens) and fuse indicator trip unit for A phase shows proper trip indicator, attempt to close tripped switch (Note - switch should not close).
- 2.4.5** Repeat for B phase (center pole) and C phase (right pole).
- 2.4.6** Compare results to manufacturer's recommendations.
- 2.4.7** Record results on an approved PEARL Reconditioning Test Form.

## **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.