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## **Test Report for Low Voltage Polemount Bushings**

**Date:** 12/12/2012

The following tests were performed to verify the low voltage polemount bushing performance:

### **Electrical Testing – Test values per IEEE C57.12.00 table 13**

1. Impulse test: Five bushings were impulse tested. Three positive and three negative full wave impulse shots were applied at 30kV. All bushings passed impulse test with no flashover or damage.
2. Impulse withstand test: Five bushings were impulse tested with increasing voltage until flashover occurred. The average impulse flashover voltage was 39kV.
3. 60 Hz Dry Withstand test: Five bushings were tested for 1 minute at 10kV. All bushings passed the test with no flashover or damage.
4. 60 Hz Dry Flashover test: Five bushings were tested with increasing voltage at 60 Hz until flashover. The wetting procedure was per IEEE std. 4 section 14.2. The average flashover voltage was 23kV.
5. Continuous Current Temperature rise test:  
The temperature rise for the 3/8" stud was 4.5° C at 300A (100% load), 6° C at 330A (110% load) and 7.5° C at 360A (120% load).  
The temperature rise for the 1/2" stud was 7.5° C at 530A (100% load), 10.9° C at 583A (110% load) and 15.1° C at 636A (120% load).
6. 60 Hz Wet Withstand test: Five bushings were tested for 1 minute at 6kV. The wetting procedure was per IEEE std. 4 section 14.2. All bushings passed the test with no flashover or damage.
7. 60 Hz Wet Flashover test: Five bushings were tested with increasing voltage at 60 Hz until flashover. The average flashover voltage was 19kV.

### **Mechanical Testing**

1. Mounting nut clamp down torque: Three bushings were mounted on a polemount tank and the mounting nut was tightened until failure. The average breakage torque was 29.7 ft. lb. Recommended torque value is 16 to 19 ft. lb.
2. Stud failure torque: Torque was applied to the bushing stud nut until failure. Average failure torque was 42.8 ft. lb for the 1/2" stud and 19.3 ft. lb for the 3/8" stud. In all cases the failure mode was damage or stripping of the threads. Recommended torque value for the 3/8" stud is 12 to 14 ft. lb. Recommended torque for the 1/2" stud is 16 to 18 ft. lb.
3. Stud torque for gasket seal: Gaskets sealed at 60 in. lb. and maintained the seal up to the failure point of the stud.
4. Cantilever break test: Cantilever force was applied to the (10) 3/8" stud bushings and (10) 1/2" stud bushings until failure. The 3/8" stud bushings withstood an average of 81.2 ft. lb with the failure occurring at the bushing basket neck. The 1/2" stud bushings withstood and average of 125.6 ft. lb with the failure point being breakage of the bushing body at the tank wall.

5. Eyebolt withstand test: The eyebolts were placed in the appropriate basket and the assembly was mounted on a steel plate. A bolt bent at a right angle was mounted in the eyebolt. Torque was applied to the eyebolt nut until failure. The average failure torque value for the eyebolt was 41.7 ft. lb. for the 3/8" eyebolt and 82.9 ft. lb. for the 1/2" eyebolt.

#### **Environmental Testing**

1. Thermo cycle test: Bushings were subjected to (10) thermo cycles followed by leak test and 60 Hz. dry withstand test. The cycle consists of a 7 ½ hour ramp to 150° C, hold at 150° C for 2 hours, 9 hour ramp down to -40° C, hold at -40° C for 2 hours, 3 hour ramp up to room temperature. All bushings passed testing after thermo cycle aging. A slight discoloration was noted in the bushing appearance.
2. UV aging test: The bushings were UV aged for 1000 hours followed by leak test and 60 Hz. dry withstand test. Aging was performed with constant UVA-340 nm lamps at 60° C per ASTM G154-06. All bushings passed testing after UV aging. A slight discoloration was noted in the bushing appearance.

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