

EXPERIMENTAL PROCEDURES

Wet Arc Tracking:

The Wet Arc Tracking Test followed the SAE standard AS4373 4.5.9 method 509 test procedures with certain deviations. In this test, a bundle of 7 wires (six around one) is suspended horizontally in a test chamber (Figure 3). The insulation on the top two wires (A1, B1) in this bundle have been pre-damaged with circumferential cuts such that the conductor is clearly visible. The cuts are aligned so that they are separated by 6 mm.

The bundle is connected to a 10 kVA, 3 phase, 400 Hz, 120 Vac line to neutral generator using the circuit shown in Figure 4. In this circuit, a 7.5 Amp circuit breaker and a 1 ohm resistor (simulating a long run of wire) are placed in series with each of the top 5 wires (A1, B1, C, A2, B2) which are called the active wires. The bottom two wires (D1, D2) are not connected to the generator (they are floating) and are called the passive wires.

An Electrolytic solution is dripped on the wire such that the drop lands between the cuts in the insulation. In these tests two different electrolytes were used; A 1% by weight NaCl solution or lavatory waste water. The electrolyte was dripped at a rate of six drops per minute (100 mg/min) except in Test 1 when the rate was 10 drops/min.

The experiment was allowed to run for 10 to 25 minutes or until a circuit breaker tripped. The circuit breakers were sometimes reset once or twice. After the test, the bundle was removed and a wet dielectric test was run on the 5 wires that were not pre-damaged (C, A2, B2, D1, D2).

Shaving Short Circuit

In this test a 7 wire bundle is used with two of the wires having circumferential cuts (~ 1 mm wide) placed in the insulation so that the conductor is visible. These pre-damaged wires are placed on opposite sides of the bundle and a metal shaving is woven through the bundle so that it touches both of the exposed conductors. The bundle is suspended horizontally and the wires are connected to the generator (see Figure 5). The experiment is started when the contactor is closed and ends when a circuit breaker is tripped or the circuit opens due to evaporation of the shaving.

Metal Shavings Abrasion Test

Many different experimental setups were tried for the metal shavings abrasion tests with varying results. Some created damage to the wire insulation and flashing events and others did not. Two setups used are described here while others are described in Appendix B.

90° (Right Angle) Test

In this test, one bundle of seven wires was used with a metal shaving, at least 0.5" long, woven into the bundle. One end of the wire was secured to a stationary platform with a P-clamp while the other end was secured several inches away at 90 degrees from the direction of the first P-clamp, on an oscillating bar. The bundle had the form of a circular arc of about a 2" radius