

ENCLOSURE 3

QA RECORD

TEST PLAN R1
January 26, 1993Development of Ampacity Derating Factors
For Fire Wrapped Raceways

1.0 SCOPE

This test plan describes the methods and guidelines for performing tests which identify the derating values for raceways with fire barrier wrap materials applied to them. This test plan covers assembly of the test setup, instrumentation requirements, test sequence and documentation requirements.

2.0 OBJECTIVE

The objective of this test is to obtain the data necessary to establish a derating factor for fire barrier material applied to conduit. The application of the fire barrier materials on the conduits is identical to configurations fire tested by TVA in accordance with Underwriters Laboratories, Inc. (UL) Subject 1724, "Outline of Investigation for Fire Tests for Electrical Circuit Protective Systems," Issue Number 2, August 1991. Ampacity tests on 1" and 4" conduits shall be conducted using test methodologies identified in draft 11 of IEEE Standard P-848 "Procedure for the Determination Of The Ampacity Derating Of Fire Protected Cables". The results of the test will allow determination of a single derating factor for each configuration of fire barrier material, regardless of conduit size.

3.0 ACCEPTANCE CRITERIA

There are no pass fail criteria for this test. The cables shall be maintained at a equilibrium temperature of 90° C to establish the ampacity values which will be used to calculate the derating factor for each insulation configuration.

4.0 REFERENCES

IEEE P-848 DRAFT 11 "Procedure For The Determination Of The Ampacity Derating Of Fire Protected Cables"

IEEE S-135 IPCEA P-46-426 IEEE-IPCEA Power Cable Ampacities

5.0 RESPONSIBILITIES

5.1 TVA NUCLEAR ENGINEERING

Establish the criteria, guidelines drawings (as required), etc., to govern the installation of the test items.

Supply personnel to assemble raceway and install fire barrier material.

5.2 TVA CENTRAL LABORATORY

Prepare test items in accordance with Appendix B Quality Assurance and Quality Control Programs and other applicable procedures.

Conduct all required testing.

Document the test parameters, including test steps and procedure changes made during the test and provide formal detailed written report(s) of the test program and test results.

Verify and document that Nuclear Engineering's installation procedures and directions, including those contained in IEEE P-848, are used in the installation of the test items. (Nuclear Engineering's directions will serve to resolve any questions or discrepancies identified during the test).

Inspect and document the construction and instrumentation of the test items.

Provide documentation of calibration of all equipment used during the test.

6.0 QA REQUIREMENTS

This test is required to be performed by a laboratory with an approved QA program and all documentation of the tests shall be produced as a QA document.

7.0 TEST SEQUENCE

This test involves the assembly of two setups which are identical with respect to the raceway and cables. One of the raceways will be "unwrapped" and will provide the baseline ampacity values as a result of the test process. The second test setup will have the fire wrap installed and will experience the same process as the first, providing a second ampacity value. An assessment of these values will provide the derating factor.

8.0 PROCEDURE

8.1 CONDUIT TEST

The following is a overview of the test that shall be performed following IEEE P-848 DRAFT 11, unless directed otherwise by this document or a Corporate Engineering Cable Specialist, in writing. Since the application of the fire system may result in deratings which vary for different conduit sizes, two sizes of conduits shall be tested (see table below). All installed of fire barrier materials shall be allowed to cure 30 days (per vendor instructions) to allow evaporation of moisture, and thereby eliminate it's affect on ampacity. The raceways shall be a minimum of 20' long to minimize end effects.

	Conduit	Thermolag	Cable
1	1" steel	1/2"	3/C # 6 awg
2	1" steel	1/2" + 1/4"	3/C # 6 awg
3	1" steel	1/4" + 1/4"	3/C # 6 awg
4	4" steel	1/2"	3 - 1/C 750 MCM tie wrapped every two feet
5	4" steel	1/2" + 1/4"	3 - 1/C 750 MCM tie wrapped every two feet
6	4" steel	1/4" + 1/4"	3 - 1/C 750 MCM tie wrapped every two feet

8.2 The cables shall be instrumented with thermocouples. The cable and T/C leads shall be tied with wraps every 2 feet, and pulled into position in the conduit. The conduit shall be thermally isolated from the support mechanism and thermal dams shall be utilized to minimize end effects. The test shall also be performed inside a temperature controlled enclosure. Thermocouples shall be located at three points along the length. The cables shall be connected as single series electrical circuit, which contains all conductors in the system.

8.3 Baseline Evaluation

Each conduit system (i.e. 1" and 4") shall have a baseline experiment conducted to establish the cable ampacity in the unwrapped condition.

8.4 Each conduit system (i.e. 1" and 4") shall have an experiment conducted to establish the cable ampacity for each wrapped configuration.

9.0 REPORT

The report shall contain for permanent record all information pertaining to the test including the Test Plan, laboratory notebook, all raw data, interpretations, and observations. The report shall provide the documentation of all the above parameters and evidence of calibration to NIST standards for equipment used in obtaining this data (including before and after calibration of thermocouples), and appropriate resolution of any test anomalies. All calculations, conclusions or interpretations shall have been checked and approved by a authorized individuals certified by the testing organization to be knowledgeable of the techniques used.

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