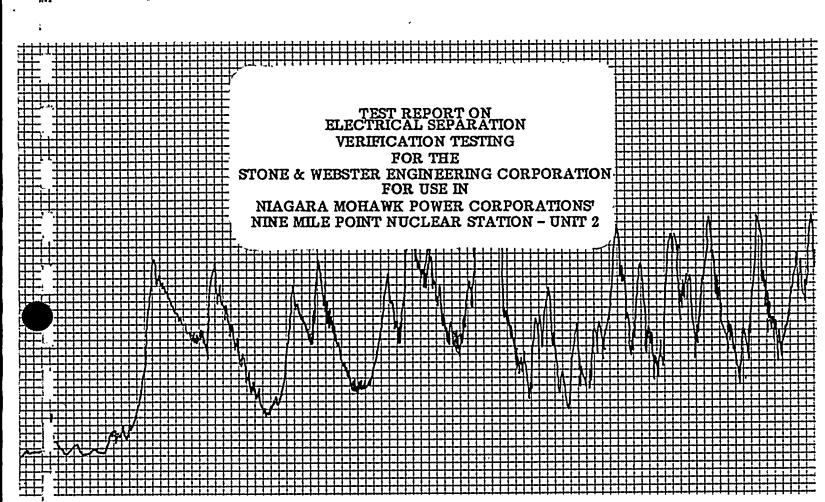
Y L.C. RATORIES SCIENTIFIC SERVICES & SYSTEMS GROUP

> 8512170328 851210 PDR ADUCK 05000410 A PDR



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Nuclear Environmental Qualification

	Test Report
I	REPORT NO47906-02
	WYLE JOB NO. 47906 CUSTOMER NMP2-E0907 P. O. NO. PAGE REPORT PAGE 1 OF 429 PAGE 1 OF 9000000000000000000000000000000000000
Stone & Webster Engineering C	orporation
3 Executive Campus, Cherry H	ill, New Jersey 08034
Various Power, Control, and In	strumentation Cables
as described in Paragraph	6.0
Okonite and Rockbestos	
ribed herein was performed to	test the design adaptions of worst acre

. The test program described configurations of electric electrical systems at Niagara Mohawk Power Corporation's Nine Mile Point Nuclear Station — Unit 2 (NMP2), and to demonstrate the adequacy of the physical separation of these electrical systems when an electrical fault occurred. The test results apply to the cables and raceways for 600 volt levels and below.

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1.0 CUSTOMER __

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2.0 TEST SPECIMEN .

3.0 MANUFACTURER .

4.0 SUMMARY

	(jmk)
Alabama Professional Eng.	Whe shall have no Eably for damages of any kind to person or property. Including special or
Reg. No. 13475	consequential damages, resulting from White providing the services covered by this report.
<u>Gerald R. Carbonneau</u> , being duly swom,	PREPARED BY J. Kings
deposes and says: The information contained in this report is the result of complete	APPROVED BY J. 122/45
and carefully conducted tests and is to the best of his knowledge true and correct in	J. Kings
all respects.	WYLE Q. A. <u>G. Wayne Light '/22/55 KTI1-30</u>
<u>Junion</u>	G. Wayne Hight
SUBSCRIBED and swom to before me this <u>Source</u>	WAYLE Scientific Services & SySTEMS GROUP
<u>My Commission expires</u> , 1987	HUNTSVILLE, ALABAMA

Test Report No. 47906-02

4.0 SUMMARY (Continued)

4.1 Purpose

NMP2-specific tests were successfully conducted to provide a positive basis for plantspecific spatial separation. IEEE 384-1974 (as endorsed by Regulatory Guide 1.75, Revision-2), Paragraphs 5.1.1.2 and 5.1.1.3, allows for lesser minimum distances when substantiated by analysis (tests). Where the required spatial separation distances are not achieved, barriers will be used.

4.2 Objectives

The test program described here had the following primary objectives:

- a. Demonstrate the acceptability of separation distances that are less than those specified in IEEE 384-1974.
- b. Determine the minimum allowable separation between various types of raceways.
- c. Demonstrate the use of SWEC protective wraps (Siltemp 188 CH) as effective barriers, as defined in Regulatory Guide 1.75 and IEEE 384, in cases where provided separation between Class 1E raceways and cables and Class 1E and non-Class 1E raceways and cables is less than specified.

. 4.3 Scope

-7

The electrical separation tests address the potential hazard of electrically generated fires in raceways. These tests use NMP2-specific materials in NMP2-specific configurations, use conservative assumptions to establish a worst-case cable fault-current and worst-case cable, and establishes margin.

The program was limited to all 600 V cables and below. Cables rated at 15 and 5 kV were not part of the program. The tests were done with unaged NMP2 cables. Identical cables previously passed IEEE 383 flame tests, both aged and unaged.

4.4 Test Sequence

The test program was conducted as specified in References 5.1 and 5.3. The test results are presented in the appropriate sections of this report as follows:

- Section I Screening Tests (Worst Case Cable Determination)
- Section II Configuration Number 1 Test (Separation of Cable in Free Air to Cable in Free Air Without Barriers)
- Section III Configuration Number 2 Test (Separation of Cable in Free Air to Cable in Free Air With Siltemp 188 CH Barriers)

Test Report No. 47906-02

4.0 SUMMARY (Continued)

4.4 Test Sequence (Continued)

- Section IV Configuration Number 3 Tests (Horizontal Tray To Parallel Conduit Separation)
- Section V Configuration Number 4 Tests (Vertical Separation of Horizontal Cable Trays in a Vertical Stack)
- Section VI Configuration Number 5 Tests (Conduit to Conduit and Cable in Free Air Separation)
- Section VII Configuration Number 6 Tests (Separation Inside Control/Instrumentation Cabinets)
- Section VIII Wyle Laboratories Test Procedure Number 47906-01, Revision A.

Each configuration test was conducted in the following sequence as described in Reference 5.3:

- Baseline Functional Tests
- Overcurrent Test
- Post-Overcurrent Test Functional Tests
- 4.5 Test Anomalies

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Six anomalies occurred during this test program. These anomalies are detailed in the appropriate section of this report and are briefly described as follows:

Notice of Anomaly No.	Date	Description	Reference Section
1	09/06/85	Documents a procedural anomaly for Configur- ation Number 1, Test 1. During the Baseline Functional Test of the 7/C 12 AWG control cable, the conductor connections were not made. The lack of conductor connections was judged to have no impact because the Post- Overcurrent Test Functional Test was performed with the connections made properly, and results showed acceptable values for insula- tion resistance and no evidence of insulation breakdown.	П
2	09/12/85	Documents a test equipment anomaly which occurred during Configuration Number 1, Tests 1, 2 and 3, and Configuration Number 2, Test 1. During these tests, some of the currents on the target cables were out of tolerance after applying test current to the fault cable. This out-of-tolerance condition was attributed to three causes:	п, пі

4.0 SUMMARY (Continued)

4.5 Test Anomalies (Continued)

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Anomaly No.		Description	Reference Section
2	09/12/85	 (Continued) 1. Unbalanced current between phases. 2. Temperature changes in the target cable conductors causing impedance of the cable to change. 3. Voltage fluctuations in the facility power delivered by the local utility. The out-of-tolerance condition was judged to have no impact on the test because the test results showed that the target cables' ability to 	п, ш
3	09/12/85	carry current was not impaired by the test condition. Documents a procedural anomaly for Configuration Number 1, Test 1. Initially, the current on the No. 2 AWG target power cable was set to 37.9A which was 1.6% below the required $38.5A + 10\%$, -0% . Also, the current on the No. 16 AWG instrument cable was set to 1.152A which was 4.7% above the required 1A +10%, $-0%$. The out-of-tolerance currents were judged to have no impact on the test as discussed in NOA 2.	П
4	09/16/85	Documents a test equipment anomaly. During Configuration Number 4, Test 1 and Configuration Number 5, Tests 1, 2 and 3, some of the phase currents on the No. 2 AWG cable were above the $\pm 10\%$ tolerance by as much as 8.4 amperes, while test current was flowing in the worst case cable. During Configuration Number 5, Test 3, one of the phase currents was below the $\pm 10\%$ tolerance by 12.3 amperes while the other two phase currents were above the $\pm 10\%$ tolerance by 8.4 amperes and 6.7 amperes, respectively. The out-of- tolerance currents were judged to have no impact on the test for the following reasons:	V & VI

SUMMARY (Continued) 4.0

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4.5 Test Anomalies (Continued)

	Notice of Anomaly No.	Date	Description	Reference Section
	4	09/16/85	(Continued)	V & VI
			 Current above the tolerance results in additional conductor heating and therefore higher cable temperatures which is a more severe condition than required. In the case where one of the phase currents was below the -10% tolerance, the resulting lower conductor heating is compensated for by the additional heating in the other two phases. Heating due to rated current of 38.5 amperes is very low. Screening Test No. 5 of the No. 2 AWG cable showed no change in temperature of the cable conductor or jacket after 10 minutes of rated current. 	
rra ang aray aray aray aray aray aray	5 ,	09/26/85	Documents a procedural anomaly for Configuration Number 2, Test 1; Configuration Number 3, Test 2; and Configuration Number 5, Tests 2 and 3. During the warmup period, the cable jacket temperature was higher than the conductor temperature. Therefore, the jacket temperature was used to determine that the cable had been warmed to $189^{\circ}-199^{\circ}$ F instead of the conductor temperature as required by the procedure. This anomaly was judged to have no impact on the test for the following reasons:	Ш, IV & VI
			 During warmup of the cable, the conductor temperature would have to be higher than the temperature of the adjacent jacket. The conductor thermocouples can indicate a lower temperature than the jacket thermocouples because of differences in mounting and location along the cable segment. The heat transferred from the fault cable to the target cables during warmup to, and maintenance at, 189°-199°F is very small compared to the heat transferred during burning of the fault cable, which occurred in every test. 	·

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4.0 SUMMARY (Continued)

4.5 Test Anomalies (Continued)

	Notice of Anomaly No.	Date	Description	Reference Section
	6	09/26/85	Documents a procedural anomaly for Configur- ation Number 3, Test 2. Installation of Thermocouples 18 and 19 on the cable tray were omitted. This anomaly was judged to have no impact on the test because the temperatures of the target cable, fault cable, and the conduit enclosing the fault cable were measured which are data adequate to record the test conditions.	IV
	5.0	REFERENCE	S	
	5.1	Stone and We (ESSOW) No.	ebster Engineering Corporation Engineering Service E0907.	Scope of Work
	5.2		tories Technical Proposal for Cable Separation Tes ebster Engineering Corporation, No. 543/3965-2/GH,	
•	5 .3 .	Separation 1	tories' Test Procedure 47906-01, Revision A, "Elect Verification Testing for the Stone and Webste for use in Niagara Mohawk Power Corporation Ni ion - Unit 2."	r Engineering
	5.4		3-1974, "IEEE Standard for Type Test of Class 1E E and Connections for Nuclear Power Generating Stati	
	5.5	IEEE Std. 384 Equipment ar	4-1974, "IEEE Trial Use Standard Criteria for Separat nd Circuits."	ion of Class 1E
	5.6	United States Independence	s Nuclear Regulatory Commission Guide 1.75, Revisi of Electric Systems."	on 2, "Physical
	5.7	IEEE Std. 3 Nuclear Powe	23-1974, "IEEE Standard for Qualifying Class 1E er Generating Stations."	Equipment for
	5.8	Code of Fede	ral Regulations, Section 10, Part 21.	
	5.9	Code of Fede	ral Regulations, Section 10, Part 50, Appendix B.	
	5.10	Cable Vertica	al Flame Test Data for Nine Mile 2 Power Cable.	

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All cables used in this test program were qualified to meet the requirements of IEEE Standard 383-1974, "IEEE Standard for Type Test of Class 1E Electrical Cables, Field Splices, and Connections for Nuclear Power Generating Stations". The test specimens consisted of power, control, and instrumentation cables as described below:

Item No.	Description	Cable Type	SWEC LD. No.
1	Okonite Triplex 500 MCM Copper	L	NJM-46
2	Okonite Triplex 350 MCM Copper	\mathbf{L}	NJM-45
3	Okonite Triplex 250 MCM Copper	\mathbf{L}	NJM-33
4	Okonite Triplex 4/0 AWG Copper	L	NJM-31
5	Okonite Triplex 3/0 AWG Copper	\mathbf{L}	NJM-30
6	Okonite Triplex 2/0 AWG Copper	L	NJM-28
7	Okonite Triplex 1/0 AWG Copper	\mathbf{L}	NJM-34
8	Okonite Triplex 2 AWG Copper	K	NJM-25
9	Okonite Triplex 4 AWG Copper	K	NJM-41
10	Okonite Triplex 6 AWG Copper	K	NJM-40
11	Okonite 3/C 8 AWG Copper	K	NJM-12
12	Okonite 3/C 10 AWG Copper	K	NJM-08
13	Rockbestos 7C 12 AWG Copper	С	NJN-37
14	Okonite 2/C 16 AWG Copper	Х	NJP-05
15	Rockbestos 2/C 12 AWG Copper	С	NJN-34
16	Rockbestos 5/C 12 AWG Copper	С	NJN-36
17	Rockbestos 1/C 14 AWG Copper	С	NAF-52

7.0 TEST RATIONALE

7.1 Potential Hazards

Separation criteria are intended to protect redundant safety-related equipment from a common mode failure caused by a potential hazard. In order to determine that separation requirements are appropriate, the potential hazard to be protected against must be identified. For electrical raceways in nuclear power plants, the potential hazards are (1) damage due to missiles, (2) damage due to pipe break, (3) damage due to exposure fires, and (4) damage due to electrical fires in adjacent raceways. Justification of the minimum separation required against hazard (4) has been accomplished through this test program.

7.2 Assumptions of Failure Mode for Screening Tests and Configurations Number 1–5 Overcurrent Tests

In order to perform a test program to verify the adequacy of the raceway separation criteria, it was necessary to define the worst-case electrical fault that could occur internal to a cable in a raceway. Assumptions were made regarding the failure mode to be simulated to ensure that ample conservatism would be demonstrated by the test results as follows:

a. The cable or equipment in the circuit develops a fault that is not cleared.

Test Report No. 47906-02

7.0 TEST RATIONALE (Continued)

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- 7.2 Assumptions of Failure Mode for Screening Tests and Configurations Number 1–5 Overcurrent Tests (Continued)
 - b. The impedance of the fault adjusts itself automatically to maintain the fault current magnitude at a constant level.
 - c. The fault is not detected by an operator.
 - d. The maximum current during the worst case fault is considered to be the test current per Table I. The test current for each cable is equal to the locked rotor current of the motor fed by each cable. Currents higher than these values will result in a circuit breaker clearing the fault and/or a conductor open circuit.
 - e. The maximum effect on nearby cables is caused by a combination of high temperatures and the duration of these high temperatures.

f. The contribution of heat to a target cable from adjacent cables (other than a faulted cable) is negligible when compared to the heat generated by rated current flowing in the target cable and to the heat contributed by the faulted cable. The test procedure therefore required rated current be applied to the target cable during the Overcurrent Test and also that the fault cable be warmed to 1890-1990F prior to application of fault current.

Cable Size	Maximum Connected HP	Maximum Full Load Current	Test Current
10 AWG	5	5.6	34
8 AWG	10	10.3	51
6 AWG	20	20.6	156
4 AWG	20	20.6	156
2 AWG	40	38.5	264
1/0 AWG .	150	139.0	908
2/0 AWG	150	139.0	908
3/0 AWG	150	139.0	908
4/0 AWG	180	159.0	746
250 MCM	180	159.0	746
350 MCM	180	159.0	746
500 MCM	180	159.0	746

TABLE I

The above assumptions are applicable to tests that simulate the effects of cable faults which cause sustained overcurrent conditions. Heating effects of this type of failure with the above assumptions have the greatest impact on adjacent cables; therefore, this failure mode was selected as the design basis for the tests of Configurations Number 1-5.

Test Report No. 47906-02

7.0 TEST RATIONALE (Continued)

7.3 Assumptions of Failure Mode for Configuration Number 6 Overcurrent Test

To verify the acceptability of design where control/instrument cables are bundled together inside a control/instrument cabinet, it was necessary to define the worst case fault that could occur on a control cable. Assumptions were made regarding the failure mode to be simulated as follows:

- a. The cable or equipment in the circuit develops a fault that is cleared in 10 seconds or less.
- b. The impedance of the fault adjusts itself automatically to maintain the fault current magnitude at a constant level of 100 amperes.

7.4 Application of Configuration Test Results

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A configuration is demonstrated to be acceptable when the target cable(s) pass a functional test before and after simulation of a cable fault on the faulted conductor. Functional tests are measurements of insulation resistance and leakage current. Also, the target cable(s) are required to maintain continuity and carry current during the simulation of the fault.

Unaged cables were used in the tests. Identical cables, both unaged and aged at 150°C for three weeks, have passed 70,000-Btu/hour flame tests conducted in accordance with IEEE Std. 383-1974. Both the unaged and aged cables self-extinguished after removal of the flame source.

It should be noted that the cable separation distances used in the actual plant installation are greater than those used in the tests reported herein except where barriers have been used.

8.0 TEST DESCRIPTIONS

8.1 Screening Tests

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The Screening Tests consisted of 12 overcurrent tests to determine which cable size, if subjected to the worst case electrical fault at the NMP2, would have the most impact on the adjacent target cables in the subsequent configuration tests. The "worst case cable" was established based on the amount of damage to the faulted cables' insulation system, intensity, and duration of its temperature rise (and hence the heat released to the adjacent cables), and the time and current required to open circuit the cable.

The cables tested in the Screening Test, warmup currents, and fault currents are as follows.

1-1

	Test No.	Fault Cable Size	Warmup ⁽¹⁾ Currents	Fault ⁽²⁾ Currents
	1A*	3/C 10 AWG Cu	5.6A, 53A	34A, 455A
	2	3/C 8 AWG Cu	10.3A, 87A	51A, 660A
5 .82	3	Triplex 6 AWG Cu	20.6A, 105A	156A, 660A
474 181	4	Triplex 4 AWG Cu	20.6A, 145A	156A, 660A
ini nation	5	Triplex 2 AWG Cu	38.5A, 185A	264A, 660A
	6	Triplex 1/0 AWG Cu	139A, 235A	908A
at të L	7A*	Triplex 2/0 AWG	139A, 270A	908A
ुम्ब ∦° १	8A*	Triplex 3/0 AWG Cu	139A, 335A	908A
¥ =	9	Triplex 4/0 AWG Cu	159A, 335A	746A, 1860A
	10	Triplex 250 MCM Cu	159A, 400A	746A, 2200A
	11	Triplex 350 MCM Cu	159A, 520A	746A, 2200A
	12	Triplex 500 MCM Cu	159A, 650A	746A, 2200A

- (1) Rated Current and Final Warmup Current to reach 189-199°F.
- (2) Locked Rotor Current and Short Circuit Current, if applicable.
- * The "A" designation indicates a test that was repeated. Data for the initial tests are not included in this report. Test No. 1 was repeated because the current source was unable to supply 660A through the No. 10 AWG conductors in series. Test No. 7 was repeated because a conductor-to-bus connection was not tightened properly. Test No. 8 was repeated because the test was interrupted by power outages due to severe weather conditions.

The fault cable was mounted at the top layer in the centerline of a cable tray filled with cables for Screening Tests No. 1 through 5. The fault cable was mounted as the center cable in a single layer of L-type cables (cables spaced 3/8 inch apart) for Tests No. 6 through 12. For all 12 tests, an array of thermocouples, at three locations along the fault cable, mounted one inch vertically and horizontally away, six inches vertically and horizontally away, and 8.5 inches vertically away from the fault cable, were utilized to ascertain the heat delivered to the environment.

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8.0 TEST DESCRIPTIONS (Continued)

8.2 Configuration Number 1 Tests

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Configuration Number 1 consisted of three tests for separation of cables in free air. Test No. 1 consisted of a test between a horizontal fault cable, a parallel horizontally separated 2/C 16 AWG cable, a parallel vertically separated Triplex 2 AWG cable, and a perpendicular horizontally separated 7/C 12 AWG cable. Test No. 2 consisted of a test between a vertical fault cable and two perpendicular cables separated horizontally by 6 inches. Test No. 3 consisted of a test between a horizontal cable in free air and a parallel cable tray vertically separated by 9 inches. The tests can be differentiated as described below:

TEST NO. 1

Cable Size	Function/Location	Voltage/Current
Triplex 2/0 AWG	Fault Cable/Horizontal	139A, 270A, 908A *
Triplex 2 AWG	Target Cable/Horizontal (9 in. above the fault cable)	575 VAC, 3ø, 38.5A
7/C 12 AWG	Target Cable/Vertical (6 in. horizontal separation)	120VAC, 1ø, 10A
2/C 16 AWG	Target Cable/Horizontal (6 in. horizontal separation)	50VAC, 1ø, 1A
	TEST NO. 2	
Triplex 2/0 AWG	Fault Cable/Vertical	139A, 285A, 908A *
Triplex 2 AWG	Target Cable/Horizontal (6 in. above the fault cable)	575 VAC, 3ø, 38.5A
7/C 12 AWG	Target Cable/Horizontal (9 in. below Triplex 2 AWG)	120VAC, 1ø, 10A
	TEST NO. 3	
Triplex 2/0 AWG	Fault Cable/Horizontal	139A, 275A, 908A *
Triplex 2 AWG	Target Cable/Horizontal (In tray 9 in. above the fault cable)	575 VAC, 3ø, 38.5A
* Rated Cument	Final Warmup Current Fault Current	

* Rated Current, Final Warmup Current, Fault Current

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8.0 TEST DESCRIPTIONS (Continued)

8.2 Configuration Number 1 Tests (Continued)

The purpose of the Configuration Number 1 Tests was to demonstrate the acceptability of design where two cables in free air pass either 9 inches vertically or 6 inches horizontally from each other or from a cable tray, when the worst case electrical fault occurs to one of these cables. This configuration represents field installation of free air cables going from:

- a. Tray to tray
- b. Tray to conduit
- c. Conduit to conduit
- d. Tray/conduit to equipment
- e. Tray/conduit to wall sleeves, etc.

8.3 Configuration Number 2 Tests

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Configuration Number 2 Tests consisted of two tests in free air between a cable wrapped in the SWEC protective wrap (Siltemp 188 CH)and an unwrapped cable. For Test No. 1, the faulted cable was the wrapped cable. For Test No. 2, the faulted cable was unwrapped and the target cable was wrapped. The tests can be differentiated as described below:

TEST NO. 1

Cable Size	Function	Layers of SWEC Wrap	Voltage/Current
Triplex 2/0 AWG	Fault Cable	4 Layers	139A, 270A, 908A *
Triplex 1/0 AWG	Target Cable	Unwrapped	575 VAC, 3ø, 139A

TEST NO. 2

Cable Size	Function	Layers of SWEC Wrap	Voltage/Current
Triplex 2/0 AWG	Fault Cable	Unwrapped	139A, 280A, 908A *
Triplex 1/0 AWG	Target Cable	4 Layers	575 VAC, 3ø, 139A

* Rated Current, Final Warmup Current, Fault Current

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8.0 TEST DESCRIPTIONS (Continued)

8.3 Configuration Number 2 Tests (Continued)

The purposes of the Configuration Number 2 Tests were to:

- 1. Demonstrate the acceptability of design where two cables in free air come in contact with each other when a worst case electrical fault occurs to a bare cable in contact with a wrapped cable. This configuration represents field installations of free air cables going from:
 - a. Tray to tray
 - b. Tray to conduit
 - c. Conduit to conduit
 - d. Tray/conduit to equipment
 - e. Tray/conduit to wall sleeves, etc.
- 2. Demonstrate that a fault cable enclosed within SWEC protective wrap, and in contact with external cables, does not affect the external cables.
- 3. Demonstrate that a faulted cable external to, and in contact with, a wrapped cable does not affect the protected cable.
- 4. Demonstrate acceptability of the SWEC protective wrap as a thermal barrier during a worst case electrical fault.

8.4 Configuration Number 3 Tests

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Configuration Number 3 Tests consisted of two tests between a horizontal tray and a conduit mounted parallel to the tray. In Test 1, the faulted cable was in the cable tray 1 inch below the conduit. In Test 2, the faulted cable was in the conduit below the cable tray.

TEST NO. 1

Cable Size	Function/Location	Voltage/Current
Triplex 2/0 AWG	Fault Cable/Tray	139A, 280A, 908A*
7/C 12 AWG	Target Cable/1-in. Conduit (1 in. above the fault cable)	120 VAC, 1ø, 10A

* Rated Current, Final Warmup Current, Fault Current.

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8.0 TEST DESCRIPTIONS (Continued)

8.4 Configuration Number 3 Tests (Continued)

TEST NO. 2

Cable Size	Function/Location	Voltage/Current
Triplex 2/0 AWG	Fault Cable/4-in. Conduit	139A, 255A, 908A*
7/C 12 AWG	Target Cable/Tray (Immediately above the fault cable conduit)	120 VAC, 1ø, 10A

* Rated Current, Final Warmup Current, Fault Current.

The purpose of the Configuration Number 3 Tests was to demonstrate that target cables enclosed in rigid steel conduit running parallel and 1 inch above a filled cable tray are not adversely affected by a faulted cable in the tray, and also that target cables in a tray running parallel and immediately above a cable in a rigid steel conduit are not adversely affected when the worst case fault occurs in the conduit.

8.5 Configuration Number 4 Test

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Configuration Number 4 Test consisted of a test between three vertically separated cable trays with the fault cable located in the horizontal center tray. The trays were numbered T1, T2, and T3 from top to bottom.

TEST NO. 1

Cable Size	Function/Location	Voltage/Current
Triplex 2/0 AWG	Fault Cable/T2 (Top of tray)	139A, 280A, 908A
Triplex 2 AWG	Target Cable/T1 (Bottom of tray)	575 VAC, 3ø, 38.5A
7/C 12 AWG	Target Cable/T3 (Top of tray)	120 VAC, 1ø, 10A
2/C 16 AWG	Target Cable/T3 (Top of tray)	120 VAC, 1ø, 10A

The purpose of the Configuration Number 4 Test was to demonstrate the acceptability of design where three horizontal cable trays in a vertical stack were separated by 9 inches (from the top of one tray to the bottom of the next tray) when the worst case electrical fault occurs in the center cable tray.

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8.0 TEST DESCRIPTIONS (Continued)

8.6 Configuration Number 5 Tests

195 191 Configuration Number 5 Tests consisted of three tests between flexible conduit, rigid conduit, and cable in free air. The cables and conduit were mounted such that physical separation between the faulted cable (or conduit containing the faulted cable) was greater than 0 inches but less than 1/4 inch. For Test No. 1, the faulted cable was in free air. For Test No. 2, the faulted cable was in rigid conduit. For Test No. 3, the faulted cable was in flexible conduit.

TEST	NO.	1

Cable Size	Function	Raceway	Voltage/Current
7/C 12 AWG	Target Cable	3-in. Flexible Conduit (Anaconda)	120 VAC, 1ø, 10A
Triplex 2 AWG	Target Cable	4-in. Rigid Conduit	575 VAC, 3ø, 38.5A
Triplex 2/0 AWG	Fault Cable	Free Air	139A, 280A, 908A *
-5 - -	TES	<u>T NO. 2</u>	
7/C 12 AWG	Target Cable	Free Air	120 VAC, 1ø, 10A
Triplex 2 AWG	Target Cable	3-in. Flexible Conduit (BOA)	575 VAC, 3ø, 38.5A
Triplex 2/0 AWG	Fault Cable	4-in. Rigid Conduit	139A, 270A, 908A *
	TES	<u>T NO. 3</u>	
7/C 12 AWG.	Target Cable	4-in. Rigid Conduit	120 VAC, 1¢, 10A
Triplex 2 AWG	Target Cable	Free Air	575 VAC, 3ø, 38.5A
Triplex 2/0 AWG	Fault Cable	3-in. Flexible Conduit (Anaconda)	139A, 270A, 908A *

* Rated Current, Final Warmup Current, Fault Current

The purpose of the Configuration Number 5 Tests was to demonstrate the acceptability of design where a rigid conduit, flexible conduit, and a cable in free air are separated by less than 1/4-inch from each other (but not in contact), when the worst case electrical fault occurs in either conduit or to the free air cable.

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8.0 TEST DESCRIPTIONS (Continued)

8.7 Configuration Number 6 Test

The Configuration Number 6 Test consisted of a test of cables and bundled, insulated conductors terminated on terminal blocks inside an enclosure, wherein a fault occurs on one of the cable conductors.

TEST NO. 1

Cable Size	Function	Voltage/Current
12 AWG & 14 AWG	Fault Conductor Loop	10A, 100A *
12 AWG & 14 AWG	Target Conductor Loop No. 1	120 VAC, 10, 10A
12 AWG & 14 AWG	Target Conductor Loop No. 2	120 VAC, 1ø, 10A

* Rated Current and Fault Current

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The purpose of the Configuration Number 6 Test was to demonstrate the acceptability of design where control and/or instrumentation cables are bundled together inside any control and/or instrument cabinet when the worst case electrical fault occurs on any control cable.

9.0 CONCLUSIONS

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 The results of the cable separation verification tests demonstrated the following conclusions. These conclusions are separated into paragraphs for each test series to enhance the clarity of this report.

The successful testing of the test configurations demonstrates that the tested minimum separation distances are adequate to maintain independence of the redundant Class 1E raceways and cables from non-Class 1E raceways and cables at NMP2 for 600 volt level and below, and meets the requirements of IEEE 384-1974 and Regulatory Guide 1.75.

All target cables, in every test performed, maintained continuity of power during the overcurrent test and exhibited no significant degradation, as measured in the High Potential and Insulation Resistance Tests. The following results address observed temperatures, time to ignition, and time to open circuit.

9.1 Screening Tests

The results of the 12 Screening Tests are briefly summarized in the tables below:

Test	Maximum Temperatures (OF)			Time To*	Time To Open*
No.	Fault Cable	Jacket	1" Above	Ignition (sec)	-
1A	3/C 10 AWG	456	160	N/A	38
2	3/C 8 AWG	615	1244	48	48
3	Triplex 6 AWG	1876	1481	24	59
4	Triplex 4 AWG	1798	1570	93	164
5	Triplex 2 AWG	1896	1706	225	464
6	Triplex 1/0 AWG	1855	1566	412	576
7A	Triplex 2/0 AWG	2206	1566	650	1124
8A	Triplex 3/0 AWG	1739	249	N/A	2424
9	Triplex 4/0 AWG	1313	1675	50	190
10	Triplex 250 MCM	1494	1490	125	350
11	Triplex 350 MCM	1579	1561	390	710
12	Triplex 500 MCM	1827	1513	1085	1964

* After initiation of fault current.

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9.0 CONCLUSIONS (Continued)

9.1 Screening Tests (Continued)

BURN CHARACTERISTICS

Test No.	Fault Cable	Approximate Burn Time (min)	Max Current Applied
1A	3/C 10 AWG	N/A	455A
2	3/C 8 AWG	. 0.5	660A
3	Triplex 6 AWG	5.3	660A
4	Triplex 4 AWG	2.7	660A
5	Triplex 2 AWG	18.4	660A
6	Triplex 1/0 AWG	4.2	, 908A
7A	Triplex 2/0 AWG	. 9.0	908A
8A	Triplex 3/0 AWG	N/A	908A
9	Triplex 4/0 AWG	7.5	1860A
10	Triplex 250 MCM	8.8	2200A
11	Triplex 350 MCM	9.8	2200A
12	Triplex 500 MCM	20.0	2200A

- Based on the following considerations, the Triplex 2/0 AWG cable was selected as the "worst case cable" and used as the fault cable for all subsequent configuration tests.
 - 1. Only the 1/0 AWG and the 2/0 AWG cables ignited when subjected to the test current. Therefore, the "worst case cable" must be one of these two.
 - 2. The 2/0 AWG cable carried the test current (908A) longer than the 1/0 AWG cable before it ignited (650 seconds versus 412 seconds).
 - 3. The 2/0 AWG cable burned for a longer period than the 1/0 AWG cable (540 seconds versus 250 seconds).
 - 4. The 2/0 AWG cable had a higher jacket temperature than the 1/0 AWG cable (2206°F versus 1855°F). The 2/0 AWG cable also stayed at a high jacket temperature (above 800°F) for a longer period than the 1/0 AWG cable (24.4 minutes versus 16.5 minutes).
 - 5. The 2/0 AWG cable had as high a temperature 1 inch above the cable as did the 1/0 AWG cable (both were 1566°F).

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9.0 CONCLUSIONS (Continued)

9.2 Configuration Number 1 Test

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ี้ มูรไฟมี สารเหล The results of the Configuration Number 1 Test are briefly summarized below:

TEST NO. 1

Cable Size	Function	Location	Maximum Jacket <u>Temperature</u>			
Triplex 2/0 AWG	Fault Cable	Horizontal	15980F			
Triplex 2 AWG	Target Cable	Horizontal 9 in. Above Fault Cable	239°F			
7/C 12 AWG	Target Cable	Vertical 6 in. Separation	259°F			
2/C 16 AWG	Target Cable	Horizontal 6 in. Separation	284 ⁰ F			
Time to Ignition:	11.0 minu	Ites				
Time to Open Circu	it: 20.1 minu	ites				
	TE	<u>ST NO. 2</u>				
Triplex 2/0 AWG	Fault Cable	Vertical	1503 ⁰ F			
Triplex 2 AWG	Target Cable	Horizontal 6 in. Separation	167°F			
7/C 12 AWG	Target Cable	Horizontal 9 in. Below 2 AWG Cable	202 ⁰ F			
Time to Ignition:	11.5 minu	ites				
Time to Open Circu	it: 24.4 minu	ites				
TEST NO. 3						
Triplex 2/0 AWG	Fault Cable	Horizontal	1610°F			
Triplex 2 AWG	Target Cable	Horizontal 9 in. Above Fault Cable	296 ⁰ F			

Time to Ignition: 10.9 minutes

Time to Open Circuit: 19.2 minutes

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9.0 CONCLUSIONS (Continued)

9.2 Configuration Number 1 Test (Continued)

These results generated the following conclusions:

- 1. The test demonstrated the acceptability of design where two cables in free air pass either 9 inches vertically or 6 inches horizontally from each other or from a cable tray when the worst case electrical fault occurs on one of these cables.
- 2. It was demonstrated that a cable mounted parallel to and 9 inches above the worst case cable, which ignites during a fault condition, is not subjected to excessive temperature rise due to the flames.

9.3 Configuration Number 2 Tests

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The results of the Configuration Number 2 Tests are briefly summarized below:

<u>TEST NO. 1</u>					
Cable Size	Function	Layers of SWEC Wrap	Maximum Jacket Temperature		
Triplex 2/0 AWG	Fault Cable	4 Layers	1838 ⁰ F		
Triplex 1/0 AWG	Target Cable	Unwrapped	254 ⁰ F		
Time to Ignition: Time to Open Circuit:	Did not ignite 21.6 minutes				

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TEST NO. 2

Triplex 2/0 AWG	Fault Cable	Unwrapped	17830F
Triplex 1/0 AWG	Target Cable	4 Layers	370°F
Time to Ignition:	10.7 minutes		
Time to Open Circuit:	21.1 minutes		

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9.0 CONCLUSIONS (Continued)

9.3 Configuration Number 2 Tests (Continued)

These results generated the following conclusions:

- 1. The test demonstrated the acceptability of design where two cables in free air come in contact with each other when a worst case electrical fault occurs to a bare cable in contact with a wrapped cable.
- 2. The test demonstrated that a fault cable enclosed within SWEC protective wrap, and in contact with external cables, does not affect the external cables.
- 3. The test demonstrated that a faulted cable external to, and in contact with, a wrapped cable does not affect the protected cable.
- 4. The test demonstrated the acceptability of the SWEC protective wrap as a thermal barrier during a worst case electrical fault.

9.4 Configuration Number 3 Test

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The results of the Configuration Number 3 Test are briefly summarized below:

TEST NO. 1

Cable Size	Function	Location	Maximum Jacket Temperature
Triplex 2/0 AWG	Fault Cable	Tray	1830 ^o F
7/C 12 AWG	Target Cable	1-inch Conduit (1 inch above fault cable)	788°F*
Time to Ignition:	10 . 5 mir	utes	

Time to Open Circuit: 20.7 minutes

* The test conduit, 10 feet in length, was sealed at both ends during the test to prevent circulation of air and resultant cooling of the jacket. This configuration would result in higher jacket temperatures than would occur in the actual plant condition, where conduit runs are longer than 10 feet and air would circulate through the conduit.

9.0 CONCLUSIONS (Continued)

9.4 Configuration Number 3 Test (Continued)

TEST NO. 2

Cable Size	Function	Location	Maximum Jacket <u>Temperature</u>
Triplex 2/0 AWG	Fault Cable	4-inch Conduit	1212 ⁰ F
7/C 12 AWG	Target Cable	Tray (In contact and above fault cable conduit)	245 ⁰ F
Time to Ignition:	22.0 min	utes Fire was very small on one end inside the	and burned only e conduit.
Time to Open Circuit	: 22.0 mir	nutes	

These results generated the following conclusions:

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- 1. The test demonstrated that the target cable enclosed in rigid steel conduit running parallel to, and 1-inch above, a filled cable tray performed in accordance with the acceptance criteria when subjected to the effect of a faulted cable in the tray.
- 2. The test demonstrated that target cables in a tray running parallel to, and immediately above, a cable in a rigid steel conduit are not affected when the worst case fault occurs in the conduit.

9.5 Configuration Number 4 Tests

The results of the Configuration Number 4 Tests are briefly summarized below:

TEST NO. 1

Cable Size	Function	Location	Maximum Jacket <u>Temperature</u>
Triplex 2/0 AWG	Fault Cable	T2 - Top of Tray	1820°F
Triplex 2 AWG	Target Cable	T1 - Bottom of Tray	3430F
7/C 12 AWG	Target Cable	T3 – Top of Tray	86°F
2/C 16 AWG	Target Cable	T3 - Top of Tray	860F
Time to Ignition: Time to Open Circuit	10.8 minutes		
Time to open offent	· · · · · · · · · · · · · · · · · · ·	•	

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9.0 CONCLUSIONS (Continued)

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9.5 Configuration Number 4 Tests (Continued)

These results generated the following conclusion:

1. The test demonstrated the acceptability of design where three horizontal trays are separated by 9 inches (from the top of one tray to the bottom of the tray above) when the worst case electrical fault occurs in the center cable tray.

9.6 Configuration Number 5 Tests

The results of the Configuration Number 5 Tests are briefly summarized below:

Cable Size	Function	Raceway	Maximum Jacket Temperature
7/C 12 AWG	Target Cable	3-in. Flexible Conduit (Anaconda)	585 ⁰ F
[riplex 2 AWG	Target Cable	4-in. Rigid Conduit	387°F
iplex 2/0 AWG	Fault Cable	Free Air	1709°F
me to Ignition: me to Open Circui	10.9 minutes		

TEST NO.1

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TEST NO. 2

7/C 12 AWG	Target Cable	Free Air	3180F
riplex 2 AWG	Target Cable	3-in. Flexible Conduit (BOA)	162 ⁰ F
iplex 2/0 AWG	Fault Cable	4-in. Rigid Conduit	13920F
ie to Ignition: ie to Open Circuit	Did not ignite 18.9 minutes		

9.0 CONCLUSIONS (Continued)

9.6 Configuration Number 5 Tests (Continued)

TEST NO. 3

Cable Size	_Function_	Raceway	Maximum Jacket Temperature
7/C 12 AWG	Target Cable	4-in. Rigid Conduit	154°F
Triplex 2 AWG	Target Cable	Free Air	2480F
Triplex 2/0 AWG	Fault Cable	3-in. Flexible Conduit (Anaconda)	1759°F
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Time to Ignition:	Did not ignite
Time to Open Circuit:	20.0 minutes

The results generated the following conclusion:

The test demonstrated the acceptability of design where a rigid conduit, flexible conduit, and a cable in free air are separated by less than 1/4-inch from each other (but not in contact) when the worst case electrical fault occurs on a cable in either conduit or to the cable in free air.

9.7 Configuration Number 6 Test

The results of the Configuration Number 6 Test are briefly summarized below.

TEST NO. 1

Cable Size	Function	Maximum Jacket Temperature
12 AWG & 14 AWG	. Fault Conductor Loop	128 ⁰ F
12 AWG & 14 AWG	Target Conductor Loop No. 1	116°F
12 AWG & 14 AWG	Target Conductor Loop No. 2	91°F
Time to Ignition:	Did not ignite	
Time to Open Circuit:	Did not open circuit	

The results generated the following conclusion:

The test demonstrated the acceptability of design where control and/or instrumentation cables are bundled together inside any control and/or instrument cabinet when the worst case electrical fault occurs on any control cable.

10.0 QUALITY ASSURANCE

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All work performed on this test program was done in accordance with Wyle Laboratories' Quality Assurance Program, which complies with the applicable requirements of 10 CFR 50, Appendix B, ANSI N45.2, and the "daughter" standards. Defects are reported in accordance with the requirements of 10 CFR Part 21.

11.0 TEST EQUIPMENT AND INSTRUMENTATION

All instrumentation, measuring and test equipment used in the performance of this test program were calibrated in accordance with Wyle Laboratories' Quality Assurance Program, which complies with the requirements of Military Specification MIL-STD-45662. Standards used in performing all calibrations are traceable to the National Bureau of Standards by report number and date. When no national standards exist, the standards are traceable to international standards or the basis for calibration is otherwise documented.

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SCREENING TESTS (Worst Case Cable Determination)

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SECTION I

SCREENING TESTS (WORST CASE CABLE DETERMINATION)

1.0 REQUIREMENTS

1.1 Acceptance Criteria

There were no Acceptance Criteria for these tests. The Screening Tests were conducted to determine which cable, if faulted, would have the most impact on adjacent cables.

2.0 PROCEDURES

2.1 Test Specimen Identification

An inspection was performed upon receipt of the test specimen components at Wyle Laboratories. This inspection ensured that the test specimens were as described in Paragraph 6.0 of the Summary section. Applicable manufacturer, cable size, and SWEC ID Number were verified and recorded on Test Specimen Inspection Sheets. The test specimens were labeled, as necessary, to facilitate identification throughout the test program. The Test Specimen Inspection Sheets are contained in Appendix II of this section.

2.2 Test Specimen Preparation

1. The screening tests were conducted using a single run of the below listed cables supported by a 8-foot galvanized cable tray from NMP2 stock. The cable tray was filled to its siderails for the first five tests. The cables were spaced 3/8-inches apart for the last seven tests. The test cable was connected to the Multi-Amp Test Set per Figure 11 of Section VIII.

Test No.	Fault Cable
1A	3/C 10 AWG Cu
2	3/C 8 AWG Cu
3	Triplex 6 AWG Cu
4	Triplex 4 AWG Cu
5	Triplex 2 AWG Cu
6	Triplex 1/0 AWG Cu
7A	Triplex 2/0 AWG Cu
8	Triplex 3/0 AWG Cu
9	Triplex 4/0 AWG Cu
10	Triplex 250 MCM Cu 🐋
11	Triplex 350 MCM Cu
12	Triplex 500 MCM Cu

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2.0 PROCEDURES (Continued)

2.2 Test Specimen Preparation (Continued)

2. The ends of the faulted cable from their termination to the edge of the cable tray were wrapped with a single layer, 50% overlap, of SILTEMP WT-65 covered with a single layer, 50% overlap, of 3M No. 69 glass tape. This was done to ensure that any ignition that might occur was contained to the cable tray area.

2.3 Instrumentation Setup

2.3.1 Thermocouple Locations

A total of 33 Type "K" thermocouples were utilized for these tests. These thermocouples were mounted as described below:

	Channel No.	Location
u -	1–10	Mounted directly to the outer cable jacket. The thermocouples were mounted approximately ten inches apart.
C	11 & 12	Mounted to the conductor of the fault cable at the two series connections.
f- •	13-33	Mounted in free air and spaced as shown in Figure 1.

These thermocouples were monitored using a Fluke Datalogger feeding a high-speed printer. The datalogger was operated at its maximum scan rate throughout the screening test.

2.3.2 Electrical Monitoring

The current to the test specimen was recorded with the test time that current was changed. These readings were taken using the Multi-Amp Test Set.

2.4 Screening Tests

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The screening tests consisted of three sequential phases with no intentional time delay. The first phase consisted of powering the cable for 10 minutes with full load current. This was done to establish normal operating temperatures on this cable. The second phase consisted of raising the current to reach $90^{\circ}C + 3^{\circ}C$ conductor temperature. The third phase consisted of energizing the cable with the worst case electrical fault. The cable was subjected to this current level until either the cable open-circuited or the temperatures on the cable stabilized.

For Tests No. 1 through 12, when the fault cable temperatures stabilized (temperature rise less than 10°F over 15 minutes) but did not open-circuit, the fault current was increased to the maximum let-through current of the backup protective device, 660 amperes (Tests 1 through 5) or 2200 amperes (Tests 6 through 12), until the fault cable open-circuited.

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2.0 PROCEDURES (Continued)

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2.4 Screening Tests (Continued)

The screening tests were conducted using the following procedure:

- 1. The test specimen was connected to the Multi-Amp Test Set output stabs per Figure 11 of Section VIII. The cable termination was made in series or in parallel if necessary to obtain the required current.
- 2. The applicable full load current (FLA) from Table I was applied to the test specimen for 10 minutes.
- 3. The applied current and maximum cable temperature reached after the FLA current application were recorded.
- 4. The fault cable current was slowly increased until thermocouple Channels 1-11 or 12 indicated $90^{\circ}C \pm 3^{\circ}C$ (189°-199°F). Each current level was maintained for a minimum of 5 minutes where possible and conductor temperature recorded. The current level was adjusted to maintain a cable temperature of 189°-199°F for 15 minutes.
- 5. The applied current and maximum cable jacket temperature were recorded.
- 6. The applicable test current from Table I was applied to the test specimen.
- 7. The test time of application, applied current level, and maximum cable jacket temperature were recorded.
- 8. The cable was allowed to conduct the test current until either an open circuit occurred or the cable temperature stabilized.
- 9. If an open circuit occurred, the elapsed time and maximum cable temperature were recorded.
- 10. If a 15-minute period of stabilized temperature occurred, the maximum temperature, elapsed time and applied current level were recorded. The cable was then subjected to the conditions of Step 11.
- 11. The fault cable current was increased to 660 amperes (Tests 1 through 5) or 2200 amperes (Tests 6 through 12) until the fault cable open-circuited or the test was terminated at the customer's request.
- 12. The Multi-Amp Test Set output was de-energized.
- 13. Photographs were taken of the post-test conditions.
- NOTE: Steps 6-11 were skipped for tests where test current was less than the warmup current required to raise the conductor temperature to 189°F-199°F.

2.0 PROCEDURES (Continued)

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2.4 Screening Tests (Continued)

Test No.	Cable Size	SWEC LD No.	Maximum HP	Maximum Full-Load Current (FLA)	Test Current (Amperes)
1A	10 AWG-Cu	NJM-08	5	5.6	34
2	8 AWG-Cu	NJM-12	10	10.3	51
3	6 AWG-Cu	NJM-40	20	20.6	156
4	4 AWG-Cu	NJM-41	20	20.6	156
5	2 AWG-Cu	NJM-25	40	38.5	264
6	1/0 AWG-Cu	NJM-34	150	139	908
7A	2/0 AWG-Cu	NJM-28	150	139	908
8A	3/0 AWG-Cu	NJM-30	150	139	908
9	4/0 AWG-Cu	NJM-31	180	159	746
10	250 MCM-Cu	NJM-33	180	159	746
11	350 MCM-Cu	NJM-45	180	159	746
12	500 MCM-Cu	NJM-46	180	159	746

TABLE I

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WYLE LABORATORIES Huntsville Facility

Test Report No. 47906-02

3.0 RESULTS

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The twelve screening tests were conducted per Paragraph 2.0. Test No. 1 was repeated because the current source was unable to supply 660A through the No. 10 AWG conductors in series. Test No. 7 was repeated because a conductor-to-bus connection was not tightened properly. Test No. 8 was repeated because the test was interrupted by power outages due to severe weather conditions. The repeated tests are designated 1A, 7A and 8A.

The results obtained from the Screening Tests are summarized in Tables II, III and IV.

TABLE II. CURRENTS APPLIED AND TIME TO OPEN CIRCUIT

Test No.	Cable Size	Rated Current	Current at 90 ⁰ C Temp	Test <u>Current</u>	Let-Through <u>Current</u>	Time to Open Circuit
1A	10 AWG - Cu	5.6	. 53	34	455 (1)	57 sec
2	8 AWG - Cu	10.3	87	51	660	48 sec
3	6 AWG – Cu	20.6	105	156	660	59 sec
4	4 AWG - Cu	20.6	145	156	660	237 sec
5	2 AWG - Cu	38.5	185	264	660	460 sec
6	1/0 AWG - Cu	139	235	908	(2)	300 sec
7A	2/0 AWG - Cu	139	270	908	(2)	1131 sec
8A	3/0 AWG - Cu	139	335	908	(2)	2351 sec
9	4/0 AWG - Cu	159	355	746	1860 (1)	190 sec
10	250 MCM – Cu	159	410	746	2200	350 sec
11	350 MCM - Cu	159 ·	520	746	2200	732 sec
12	500 MCM - Cu	159	650	746	2200	1960 sec

Notes:

- (1) Maximum current capability of current source
- (2) Cable opened due to test current. Let-through current not applied.

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3.0 RESULTS (Continued)

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TABLE III. MAXIMUM TEMPERATURES

Test No.	Cable Size	Jacket	<u>1 In. Above</u>
1A	10 AWG - Cu	456°F	1600F
2	8 AWG - Cu	6150F	12440F
3 .	6 AWG - Cu	1876°F	14810F
4	4 AWG – Cu	17980F	1570°F
5	2 AWG - Cu	1896°F	1706°F
. 6	1/0 AWG - Cu	1855°F .	1566°F
7A	2/0 AWG - Cu	2206 ⁰ F	1566 ⁰ F
8A	3/0 AWG - Cu	1739 ⁰ F	249 ⁰ F
9	4/0 AWG - Cu	1313 ⁰ F	1675 ⁰ F
10	250 MCM - Cu	1494 ⁰ F	1490 ⁰ F
11	, 350 MCM - Cu	1599 ⁰ F	1561 ⁰ F
12	500 MCM - Cu	1827 ⁰ F	1513 ⁰ F

TABLE IV. TIME TO IGNITION AND BURN TIMES

Test No.	Cable Size	Time to Ignition	Approximate Burn Time	Max Current Applied
1A	10 AWG - Cu	N/A	N/A	455A
2	8 AWG – Cu	48 sec	30 sec	660A
3	6 AWG – Cu	24 sec	315 sec	660A
4	4 AWG – Cu	93 sec	160 sec	660A
5	2 AWG - Cu	225 sec	1103 sec	660A
6	1/0 AWG - Cu	412 sec	250 sec	908A
7A	2/0 AWG - Cu	650 sec	540 sec	908A
8A	3/0 AWG - Cu	N/A	N/A	908A
9	4/0 AWG - Cu	. 50 sec	450 sec	1860A
10	250 MCM - Cu	125 sec	• 525 sec	2200A
11	350 MCM – Cu	390 sec	585 sec	2200A
12	500 MCM - Cu	1085 sec	1200 sec	2200A

3.0 **RESULTS** (Continued)

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Based on the preceding data and the following considerations, the Triplex 2/0 AWG cable was selected as the "worst case cable" and used as the fault cable for all subsequent configuration tests.

- 1. Only the 1/0 AWG and 2/0 AWG cables ignited when subjected to the test current. Therefore, the "worst case cable" must be one of these two.
- 2. The 2/0 AWG cable carried the test current (908A) longer than the 1/0 AWG cable before it ignited (650 seconds versus 412 seconds).
- 3. The 2/0 AWG cable burned for a longer period than the 1/0 AWG cable (540 seconds versus 250 seconds).
- 4. The 2/0 AWG cable had a higher jacket temperature than the 1/0 AWG cable (2206°F versus 1855°F). The 2/0 AWG cable also stayed at a high jacket temperature (above 800°F) for a longer period than the 1/0 AWG cable (24.4 minutes versus 16.5 minutes).
- 5. The 2/0 AWG cable had as high a temperature 1 inch above the cable as did the 1/0 AWG cable (both were 1566° F).

Appendices I through III contain the following data from these data:

Appendix I: Test Specimen Inspection Sheets which document material received from SWEC to conduct all phases of testing.

Appendix II: Instrumentation Equipment Sheets which list the equipment utilized to take data in all phases of testing.

Appendix III: Individual Test Data. This data is separated into individual sections for each test conducted. Each section contains: 1) Photographs of the test setup and post-test conditions; 2) Highlights of the test;
3) A plot of temperature data recorded; and 4) Data Sheets.

NOTE: During the warmup to 189°F-199°F period of Screening Tests 2, 3, 4, and 5, the cable jacket temperature as monitored by TC Channels 1-10 was higher than the conductor temperature was used to determine that the cable had been warmed to 189°F-199°F. The indicated conductor temperature was lower than the indicated jacket temperature because thermocouples monitoring the conductor temperature were mounted near the conductor temperatures at the connection. During warmup of the cable, the conductor temperature would have to be higher than the temperature of the adjacent jacket, because the conductor is the heat source.

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Test Report No. 47906-02

APPENDIX I

TEST SPECIMEN INSPECTION SHEETS

Page No. I-10 Test Report No. 47906-02

TEST SPECIMEN INSPECTION

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CUSTOM	ER STONE & WEBSTER ENG	INEERING	COMPANY	CHECK AS APPRO				
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	CATION WLTP 47906-01			SI OTTO		\backslash		,
	8-20-85			IODEL NO.	SATIS	PHOTO TA:	`	
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ITEM NO.	DESCRIPTION	MANUF.	PART/N	IODEL NO.	3	32	E	•
1	500MCM TRIPLEX, 3-1/C+1 GAD	OKONITE	SWEC I.D.		~	~		
2	350 MCM TRIPLEX, 3-1/c +1 GHD	OKONITE	SWEC I.D.	NO. NJM . 45	-	2		
3	250MCM TRIPLEX, 3-1/C+16HD	OKONITE	SWEC I.D. 1	KO NJM-33	۲.	2		
4	4/0 AWG TRIPLEX, 3-1/C+2 GND	CKONITE	SWEC I.D.	No. NJM-31	~	~	۰ 	
5	310 AWG TRIPLEX, 3-1/C+2 GND	OKONITE	SWEC I.D. N	16. NJM-30	-			
6	210 AWG TRIPLEX, 3-1/c+2GND	OKON I TE	SWEC I.D. I	Yo. NJM-28	~	~		
7	1/0 AWG TRIPLEX, 3-1/C+2GND	OKON IT E	SWEC I.D	No. NJM - 34	~	~		
- 8	2 AWG TRIPLEK, 3-1/C+1GND	OKONITE	SWEC I.D.	No. NJM-25	~	~		
9	4 AWG TRIPLEK, 3-1/C+1 GND	OKONITE	SWEC E.D.	<u> No. Njm-41</u>	~	~		
10	6 AWG TRIPLER, 3-1/C+IGND	OKONITE	SWEC I.D.	No. NJM - +0	-	V		
11	8 AWG 3/C	OKONITE	SWEC I.D.	No. NJM-12	~	~		
			•	·····]

NOTES: <u>See attached list for items provided by SWEC to support</u> <u>cable testing. (Cable tray, conduit, fittings)</u>. <u>SWEC also provided miscellaueo</u>us <u>cables for use as filler cables.</u>

Specimen Failed	Inspected By B.M. Halling Date: 8-20-85
Specimen Passed	Inspected By B.N. Halling Date: 8-20-85
NOA Written	Approved J. P. King 8/20/95

'Page No. I-11 Test Report No. 47906-02

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TEST SPECIMEN INSPECTION

DATE	8-20-85		/	EI.D. AS SPEC
ITEM NO.	DESCRIPTION	MANUF.	PART/MODEL NO.	CONDITION SATISFACTOR
12	IO AWG 3/C	OKONITE	SWEC I.D. NO. NJM-08	
13	12 AWG 7/C	ROLKBESTOS	SWEC I.D. No. NJN-37	<u> </u>
14	14 AWG 2/c	OKONITE	SWEC I.D. No. NJP-05	
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NOTES:			- <u></u>	<u> </u>
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DITVIDE (I	RIES	Test Report No.	47906-02	180007- ε5-1043
	T A TA ANA 360	1013 5	TESTING FOR ELI TOR TOR	ECTRICAL SEPARATION JOB ORDER 12177
WEIGHT	QUANT. SIZE	MATER IRECORD IDENTIFIC	IAL ATION MARKEI	REMARKS « ISTATE CONDITIONI
775	4 BA -20 FT 10 FT 10 FT -10 FT 10 FT 10 FT 10 FT 100 FT 2 EA 2 EA 2 EA 2 EA 2 EA	1" RIGID CONDUI 3" RIGID CONDUI 5" RIGID CONDUI 5" RIGID CONDUI 1" BLACK ANACONI 3" BLACK ANACONI 5" BLACK ANACONI 3" BOA S.S. FILE SIL TEMP #188-CI 1" OZ GEDNEY #40 3" OZ GEDNEY #40 5" " # #\$4 1" REG. LOCKNUTS 3" REG. LOCKNUTS 5" REG. LOCKNUTS 1" GL. BUSHINGS 3" GL. BUSHINGS 5" GL. BUSHINGS	A FLEX A FLEX A FLEX 100LT ST SEALTIGE 300LT ST SEALTIGE Q500LT " "	IT CONNECTORS
	. —	5 51		
	UNWIDE (1 LABORATO GOVERNOR VILLE, A GEORGE	ALL PORT S/12 S/	Test Report No. SIDNE & WLST K	ORAVIDE (EXCLUSIVE) Your Action definition to the content of the c

Page No. I-13 Test Report No. 47906-02

TEST SPECIMEN INSPECTION

CUSTOM	ER STONE & WEBSTER	<u>ENGINEER</u>	UNG CORP. CHECK AS APPRO	
	47906 (CONFIGURA			
SPECIFI	CATION WLTP 47906-01,	IPR -02	Size	
DATE	10-17-85	_ <u></u>		SHI PHOTO
ITEM NO.	DESCRIPTION	MANUF.	PART/MODEL NO.	ON SATISFACTORY
	5/C, #12 CABLE	ROCKBESTOS	SWEC I.D. No. NJN-36	
2	2/C, #12 CABLE	ROCESES 705	SWEC J.D. NO. NJN.34	~ ~
3	1/C, #14 INSULATED COND.	ROCKBESTOS	SWEC I.D. No. NAF-52	~ ~
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NOTES: <u>SUPPORT ITEMS INCLUDED: NEMA (2 ENCLOSURE, 36" × 36" × 8"D, HOFFMAN # A36360LT</u> <u>WITH 33" × 33" PANEL # A-36P36; 12 POINT TERMINAL BLOCK, GE TYPE EB2SAIZW;</u> <u>12 POINT TERMINAL BLOCK, MARATHON ISIZ NUC</u> DJ.

Specimen Falled		Inspected By <u>V. Romao</u>	Date: <u>/0-17-85</u>
Specimen Passed		Witness <u>None</u>	Date:
NOA Written	······································	Sheet No Approved P. Iling	of 1 10/17/85

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APPENDIX II

INSTRUMENTATION EQUIPMENT SHEETS

INSTRUMENTATION EQUIPMENT SHEET

47906

Date	8 20/25				
Technicia	n <u>Victor</u>	Remao			

Job No. -Customer <u>NMPC</u>

Test Area ACONSTIC CHAMBER Type Test CABLE GEPTRATION

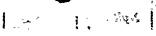
Page _____ of _____

No.	, Instrument	Manufacturer	Model No.	Serial No.	Wyle or Gov't No.	Range	Accuracy	Calib On	ration Due
1	VIGICOrper	HONEYWAII	1508	NA	11022	12042	± 2%	7-9-85	1-9-86
Z .	VISICOrper	HONEY Well	1508	NA	3085	12042	t 2%	5-7-85	11-7-85
3	GAIVO AMP	HONEY Well	166A-500	NA	94501	1:1	± 3.0%	7-9-85	1-9-86
4	GAINO AMP	HONEY WEII	T66A-500	NA	11472	1:1	t 2 ap	5-7-84	11-7-85
5	GAIND AMP	HENEY Well	T66A-500	NA	94502	1:1	t 2 m	5-21-85	11-21-85
6	GAIVE AMP	HONCY Well	T66A-500	NA	94505	<i>j:1</i>	= 2%	7-9-85	1-4-86
2	GAIND AMP	HONEY WEII	TK-6A-600	NA	96285	1:1	+ 230	7-9-85	1-9-86
8	PATA LOSGER	FILKE	2240B	NA	102141	mult	MFB.SPec	8-2-85	3-2-86
9	omm	FINKE	80 ZOA	NA	102060	250Yac	19000	12-2-84	12-7-85
10	DMM	Keithle Y	179	NA	0545	1000 V	±.04 %	7-23-85	1-23-86
11	HI GPREID LINE PRINTER	hear Suger FNC.	300	NA	E.R 75543	mult	MFG. GPer,	Prior TO 7-18-85	Test
12	TRANSFORMER	BROW Nell	55FT · 101	NA	100652	100 +0	+ 10 4/0	5-14-85	11-14-85
13	TRANSFORMER	BROWNEIL	59.FT 101	NA	100 666	100 705	t 10 470	F-14-85	11-14-85
14	TRANGERCMPC	BROWNell	SSFT 101	NA	100678	100 to 5	1.	5-14-85	11-14-85
15	TRANSForMer	BROWNEI	55FT ID	NĂ	102783	140 rg			11-14-85
16	TRANS For Mer	BROWNEI	55FT IOL	NA	100676	100+0	± 10 %	5-14-35	11 - 14 - 85
17	TRANG FORMER	BROWNEIL	5 SFT 101	NA	100 668	100 ₊₀	+ 10 mg	5-14-85	11-14-85
18	TRAN.SECTMER	BROWNEIL	53FT 101	NA	120 679.	100 10	5-10 176	4-12-85	10-12-85
:	Instrumentation 4	N.M. Milliama	. <u> </u>	<u> </u>	Nylo y Z2(5 Éhécked & I	Received By	\wedge	Henley 8.2	20.85
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Date _	<u> 8/20/21</u> cian <u>Victin Rom</u>	- Jo	ь No. <u>4</u>	7906		Te	est Area 🔟		Chamber	
Techni	cian <u>Lictin Rom</u>	<u></u>	istomer	MPC_		Tj	rpe`Test	Cable Sep	aration	•
No.	Instrument	Manufacturer	Model No.	Serial No.	Wyle or Gov't No.	Range	Accuracy	Calib On	Diration Due	.
19	CUPPENT TVHNGFormer	MAROWNE !!	55FT IDI	NA	100020	100 +0	+ 10 %	5-14-85	11-14-85	
20	IFYPOT	ASSOCIATED Begearch	4030	NA	96776	5K VAC	1.370	7-23- 85	10-23-85	
21	NEGOHM MOTOR	GeNERAL BADIO	1864	NA	11898	1000	MF9.	4-25-85	10-25-85	
22	DIM M	FILILE	8020A	NA	96778	750YAC	+.190	2-19-85	2-19-86	
23		KeitHIEY	130	NA	3105	150VAC		3-25-85		Tes
24	CIAMP ON AMP METER	FLUKE .	80 <i>2600</i>	NA	92675	2 FO	0 ± 390	6-3-85	12-3-85	Test Keport
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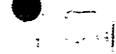
Instrumentation 14 WH 1029, Rev. A 11/82

Alliam 8-20-85

Checked & Received By

8.20.85

the <u>9.5-85</u> Job No. <u>47906</u> Test Area <u>ACOUSTIC CHAMBER</u> Customer <u>NMPC</u> Type Test <u>CABLE SEPARATION</u>									
chni	cian <u>VICIOR NO</u>	Cu	stomer	N/////		T)	/pe Test		EPAKATI IO
No.	Instrument	Manufacturer	Model No.	Serial No.	Wyle or Gov't No.	Range	Accuracy	Calit On	Due Due
/	TRAN'SFORMER	WESTON	461	16132	3022	MULT	±1%		11-16-85
2	TRANSFORMER	WESTON	461	24981	97427	MULT	±1%	5-16-85	11-16-85
3	TRANSFORMER	WESTON	461	24979	97428	MULT	±1%	5-16-85	11-16-85
2 Wyle	9-6-85								
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INSTRUMENTATION EQUIPMENT SHEET

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Date _	18/217285	Job	No. 4790	5	Test-Area <u>ACOUSTIC CHAMBER</u>					•
Techni	cian <u>G. WIRT</u>	Cust	tomer <u>SU</u>	EC	Type Test <u>CABLE_SEPARATION</u>					
No.	Instrument	Manufacturer	Model No.	Serial No.	Wyle or Gov't No.	Range	Accuracy	Calib On	ration Due	
1	DATALOGGER	FLUKE	2240	N/A	96375	MULTI	MFG	10/7/85	4,7,86	
2	LINE PRINTER	TEXAS INSTRUMENT	810 RO	N/A	3009	MULTI	PM	9/19/85	3/19/86	
3	VISICORDER	HONEYWELL	1508	N/A	11022	MULTI	+/-2%	7/9/85	1/9/86	
4	GALVO AMP	HONEYWELL	TEGA	N/A	94502	1:1	+/-2%	9/24/85	3/24/86	
5_	GALVO AMP	HONEYWELL	тебя	N/A	94505	1:1	+1-2%	7,9,85		Test
6	CURRENT X-FORMER	BROUNELL	55FT101	N/A	100667	100:5	+1-22 74	\$ 5/14/85	11/14/85	Report
Z_	CURRENT X-FORMER	BROUNELL	55FT101	N/A	100674	100:5	+1-22021	<u>ts 5/14/85</u>		
8_	MEGOHMMETER	GENERAL RADIO	1864	N/A	11898	MULTI	MFG	4/25/85	10/25/85	No.
		ASSO. RESEARCH	04030A	NZA	100165	MULTI	+/-3%	· 10/16/85	4/16/86	479
10	MULTI AMP	INDIAN HEAD CO.	CB8130	NZA	100413	MULTI	MFG	3/2/85	3/2/86	47906-02
	CLAMP-ON-AMP	FLUKE	801600	N/A	92675	MULTI	+/-3x	06/03/85	12/03/85	22
12	_DMM	KEITHLEY	178	NZA	11313	MULTI	MFG	9/25/85	3/25/86	
2 Viyis A	10-18-85					<u> </u>				
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	Instrumentation -	hBushart	- 10-1	7-85	Checked &	Received By	John-	P. King	10/18/85	

WH 1029, Rev. A 11/82

Test Report No. 47906-02

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WYLE LABORATORIES Huntsville Facility

Test Report No. 47906-02

APPENDIX III

INDIVIDUAL TEST DATA

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Test Report No. 47906-02

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Test Report No. 47906-02



SCREENING TEST 1A DATA

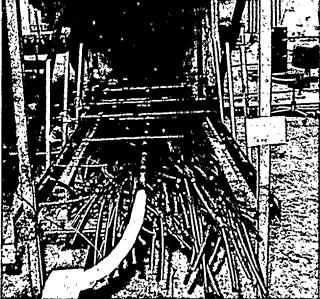
Test Report No. 47906-02

Page No. I-24

SCREENING TEST #1A

(3/C 10 AWG Cu)



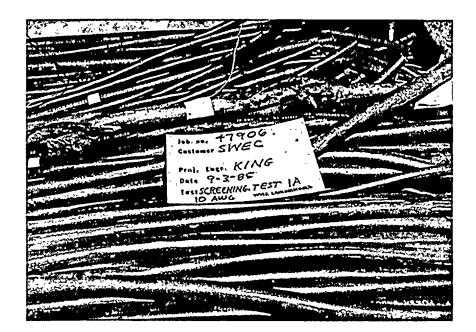


PHOTOGRAPH I-1

PRETEST VIEW - OVERALL

POST-TEST VIEW - OVERALL

PHOTOGRAPH I-2



PHOTOGRAPH I-3

POST-TEST VIEW - CLOSE-UP

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Test Report No. 47906-02

SCREENING TEST #1A

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(3/C 10 AWG Cu)

Approximat Test Time		
0 Min	880F	Energized cable with 5.6A
10 Min	880F	Energized cable with 59A
25 Min	1430F	Energized cable with 50A
30 Min	1490F	Energized cable with 55A
50 Min	170°F	Energized cable with 53A Conductor temp. at 189 ⁰ F
62.1 Min	172°F	Energized cable with 455A, decreasing as conductor heated (current source at maximum output)
62.9 Min	1656°F	Open circuit
63 Min	456°F	Peak jacket temperature (456°F) Peak array temperature (160°F)
63.7 Min	440°F	Peak conductor temp. (1656°F)

				LEGEND: <u>O</u>	EENING TEST NO. 1A FAULT CABLE JACKET TEHPERATURE (T/CS 1-10) FAULT CABLE CONDUCTOR TEHPERA- TURE (T/CS 11 & 12) ARRAY TEMPERATURE (T/CS 13-33) ECORDED: 1655.0°F (T/C /11) NT TEMP: 86°F DATE: SEPTEMBER 3, 1985 FIGURE 1-1 FIGURE	
	8 160 4 1 2 2 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	1111 - 1120 - 1123 - 11	1990	1195 1195	225	28

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Page No. 1-27 Test Report No. 47906-02

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DATA SHEET

Customer	Stone & Webst					WYLELABC	RATORIES
•	Cables			arn-	_		1,7006
^o art No	Various		Amb. Temp.	8607	, 	Job No	4/300
Spec	WLTP 47906-01	τ,ς, τ = ¥	Photo	Yes		Report No	4/906-2
⁵ ara	3.2.3		Test Med	ALL		,Start Date	9-3-85
5/N	N/A		Specimen Te	mp. <u>Amb</u>	ient		
GSI	No						
fest Title	Screening Tes	t No. 1A					
Fault Ca	ble Size:	10 AWG		······································	······		
No. Cond	uctors:	3					
	j	·					
3. readin	gs after 10 min	ute_applicat	ion of FLA:				
Cur	rent:	5.6 A	, 				. <u></u>
Max Cha	. Temp. F	88°F/7					
Tem	p. Channel 11:	85°F		Тетр.	Channel I	2: 87°F	
5. Readi	ngs at beginni	ng of 15-mi	nute ceriod	at 90°C	+3°C (18	9°F-199°F)
		55 A				<u> </u>	·
Max	. Temp. F nnels 1-10:			Channe	1 No 10	2	<u></u>
	p. Channel 11:					2: 189%	£
· <u>····</u> ·····	- <u></u>		+				
· · · · · · · · · · · · · · · · · · ·				•			
	,		•				
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				<u></u>	- H		
	•			Tested By	ATTION	hadf-	Date: <u></u>
				Witness _	VNon	<u>ec. '</u>	Date: of

Page No. I-28 Test Report No. 47906-02

DATA SHEET

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Cables Various WLTP 47906-01	Amb. Temp	110 E	WYLE LABORATORIES
WLTP 47906-01	Amb. Temo	1195	
			Job No. <u>47906</u>
7 7 7	Photo	Yes	Report No47906-2
3.2.3	Test Med		Start Date <u>9-3-85</u>
<u>N/A</u> No	Specimen Te	mp. <u>Ambient</u>	·
Screening Test No.	<u>A</u>		
	• •		
Readings at end of 15-	minute period a	t 90°C ±3 °C	(189°F-199°F)
Current:			
	•		
Channels 1-10	(72°F	. Cha	annel No. <u>/o</u>
			np Channel 12: 194°F
Final readings with tes	t current applie	d: N/A Test	current less than
9. If open circuit oc	curs:	warmup	current
Elapsed time:			
Max. Temp. F	····	Channel No	
Channels 1-12:			•
10. If 15-minute perio	d of stabilized	temperature o	scurs :
	· · · · · · · · · · · · · · · · · · ·		
			· · · · · · · · · · · · · · · · · · ·
Elapsed time to be	ginning of 15-mi	nute period:	
Max. Temp. F		•	
<u>Uhannels 1-12:</u>			
11. If fault cable ign	ites:		·····
Elapsed time to ig	nition:		
	······································	•	
	<u> </u>	<u></u>	<u> </u>
<u> </u>	······································	Tested By	Date: 9-3-
		• 1	whe Date:
			2 of _3
None		Λ.	Ming 9/3/85
	Readings at end of 15- Current: Max. Temp. °F Channels 1-10: Temp. Channel 11: Final readings with tes 9. If open circuit oc Elapsed time: Max. Temp. °F Channels 1-12: 10. If 15-minute perio Current: Elapsed time to be Max. Temp. °F Channels 1-12: 11. If fault cable ign Elapsed time to ign	Readings at end of 15-minute period a Current: \$3 A Max. Temp ^O F 172°F Channels 1-10. 172°F Temp. Channel 11: 192°F Final readings with test current applie 9. If open circuit occurs: Elapsed time: Max. Temp. °F Channels 1-12: 10. If 15-minute period of stabilized Current: Elapsed time to beginning of 15-mi Max. Temp. °F Channels 1-12: 11. If fault cable ignites: Elapsed time to ignition:	Readings at end of 15-minute period at 90°C ± 3°C Current: \$3 A Max. Temp. °F (172°F Channels 1-10. 172°F Temp. Channel 11: 192°F Final readings with test current applied: N/A Trest 9. If open circuit occurs: Warmop Elapsed time: Max. Temp. °F Channel No 10. If 15-minute period of stabilized temperature or Current: Channels 1-12: 10. If 15-minute period of stabilized temperature or Current: Channels 1-12: 11. If fault cable ignites: Elapsed time to ignition: 11. If fault cable ignites: Elapsed time to ignition: Mon_t Mon_t Approved Jft

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Page No. I-29 Test Report No. 47906-02

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DATA SHEET

Customer	Stone & Webster			WYLE LABORATORIES
Specimen	Cables			
Part No.	Various	Amh. Temn	86° F	Job No. 47906
Soec	WLTP 47906-01	Photo	Yes	Report No 47906-2
	3.2.3		Air	
S/N			emp. <u>Ambient</u>	
GSI		Specimen is	amp	
		Screening Test	: No. / A	
12. Rea	dinos with fault curre			les 1-5, 2200 amperes
	·	for	cables 6-12)	
** =* ** *				
	Current: 4	455A (Limit .	of test equipu	ment capability)
	Max. Temp. °F Channels 1-10:	456	Channel No	
	Elapsed time to open			
	circuit or stable ter Time to ignition	mp: 50 Sec		
	if applicable:	N/A		
				di t
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lotice of			Tested By Who Witness Sheet No	mao// Date: 9/3/2 Jow Date: 3of _3
Anomaly	None	•	Approved	7/3/85
-normaly			Vihionen ter 1.20	

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Test Report No. 47906-02

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SCREENING TEST 2 DATA

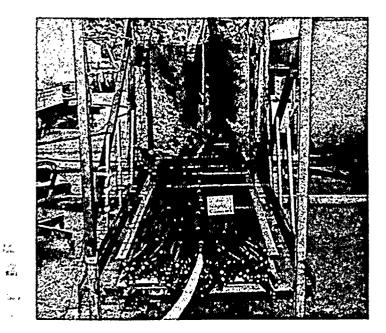
Test Report No. 47906-02

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Page No. I-32

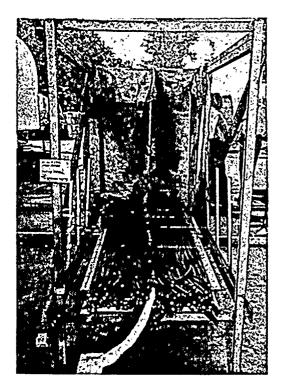
SCREENING TEST #2

(3/C 8 AWG Cu)



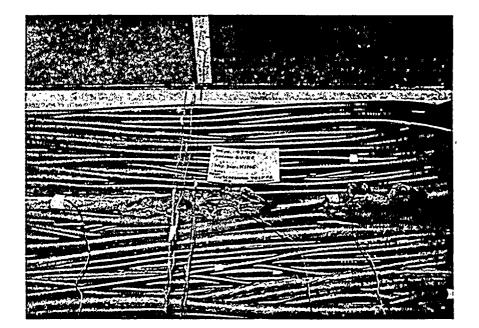
PHOTOGRAPH I-4





PHOTOGRAPH I-5

POST-TEST VIEW - OVERALL



PHOTOGRAPH I-6

POST-TEST VIEW - CLOSE-UP

Test Report No. 47906-02

SCREENING TEST #2

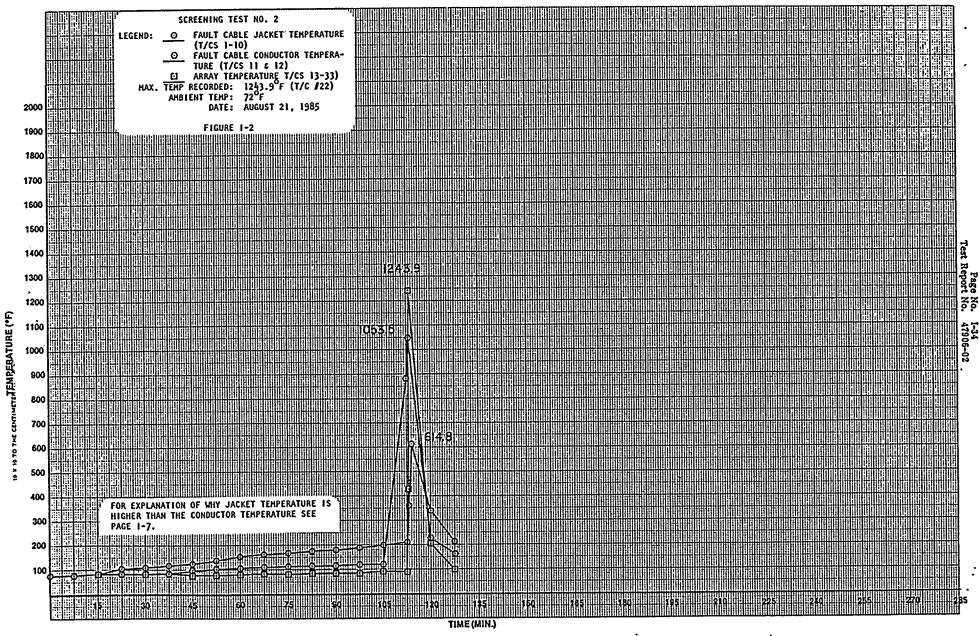
(3/C 8 AWG Cu)

Approximate Test Time	Approximate Jacket Temperature	Observation
0 Min	790F	Energized cable with 10.3A
10 Min	810F	Energized cable with 60A .
37.7 Min	1170F	Energized cable with 70A
47.7 Min	130°F	Energized cable with 84A
72.7 Min	166°F	Energized cable with 87A
83.3 Min	178°F	Energized cable with 89A
97 Min	189 ⁰ F	Jacket temp. at 189 ⁰ F
112 Min	199 ⁰ F	Energized cable with 660A (Max. let-through current of backup protection)
112.8 Min	614 ⁰ F	Ignition and Open Circuit
113.3 Min	362 ⁰ F	Fire out
113.3 Min	362 ⁰ F	Peak conductor temp. (1054 ⁰ F)
113.3 Min	362°F	Peak array temperature (1244ºF)
114 Min	615 ⁰ F	Peak jacket temp. (615 ⁰ F)

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DATA SHEET

Customer _						WYLELABO	ORATORIES
	<u>Cables</u>			29	0[47906
^p art No	Various		Amb. Temp.	<u> </u>	<u>r</u>	Job No	47906-2
Spec;	WLTP 47906-01			<u>Yes</u>		Report No.	
² ara		<u> </u>	iest med			Start Date_	0/4/85
S/N	<u>N/A</u> No	-	Specimen Te	emp. <u>Amb</u>	ient		
asi	NO						
Fest Title _	Screening Test	: No. 2					
						<u> </u>	
		8 AWG					
No. Cond	luctors:	3			<u> </u>		
							· · · · · · · · · · · · · · · · · · ·
3. readin	ngs after 10 minu	<u>ite_applicat</u>	ion of FLA:				
Cui	rrent:	10.3 A	· · · · · · · · · · · · · · · · · · ·			•	<u></u>
Ma: Ch:	<pre>c. Temp. F annels 1-10;</pre>	81° F / 9					
	np. Channel II:	80°F		Тетр.	Channel	12: 78°F	
					1290 /10		•\
	ngs at beginnin			at 90 L			<u></u>
<u>Cur</u> Max	rrent: K. Temp. F	92A		<u> </u>			
Cha	annels 1-10:	1890F1	9	Channe	1 No. 9		* /f
Ter	mp. Channel 11:	- [18° F				12: 111°E	:
			•				
							<u></u>
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					· · - · · · · · · · · · · · · · · · ·	·····	
							
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	•			Tested By	, Atta	maof	Date: 8/2
				Witness	U M	one /	Date:
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DATA SHEET

Customer	Stone & Webster			WYLE LABORATORIES
Specimen				
Part No	Various	Amb. Temp		Job No. <u>47906</u>
Spec	WLTP 47906-01		es	Report No. <u>47906-2</u> Start Date <i>\$/2.1_/ 8</i> .
Para	3.2.3			
S/N	<u>N/A</u> No	_ Specimen Temp	<u>Ambient</u>	
GSI	د	-		
Fest Title .	Screening Test No. 2	······································	- · · · ·	
·····				
7.	Readings at end of 15-mi	nute period at S	90°C ±3°C (189°F-199°F)
	Current: 87	*F		
		99 ° F	. Chan	nel No. <u>7</u>
1	Temp. Channel 11:	120	Тетр	Channel 12: //2
m9-11.	Final readings with test	current applied:		current is less that
E	9. If open circuit occu	irs:	warmu	p current.
	Elapsed time:			
	Max. Temp. F		Channel No.	
143	Channels 1-12:			4
	10. If 15-minute period	of stabilized ten	nperature occ	urs:
	Current:			
				· · · · · · · · · · · · · · · · · · ·
	Elapsed time to begi	nning of 15-minut	e period:	
	Max. Temp. F Channels 1-12:		Channel No.	
	11. If fault cable ignit	es:		· · · · · ·
	Elapsed time to igni	tion:		
	•		•	
				D
		Te	ested By	omaoff_ Date: 8/21
				Love Date:
		57	neet No	<u></u> of <u></u>
otice of	None	0.1	1001 HO	ling 8-21-85

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DATA SHEET

Customer	Stone & Webster			WYLE LABO	RATORIES
Specimen 🔔			7.000		
Part No			<u> </u>	Job No	47906
	WLTP 47906-01	Photo	Yes	Report No	47905-2
Para.		Test Med	Air	Start Date	<u> </u>
S/N		— Specimen T	Temp. <u>Ambient</u>		/
GSI	No	<u>``</u>			
Test Title		Screening Tes	st No. 2		
12. Rea	dings with fault curren	t applied (660) amperes for cab	les 1-5, 220	0_amperes
			• cables 6-12)		······
	Current: G	40 A			
	Max. Temp. °E			8	
	<u>Channels 1-10:</u> Elapsed time to open	<u>675°</u> F	Channel No.		
	circuit or stable tem	10: 48 sec	+0 00-l4		
	Time to ignition		•	·····	
	if applicable:	<u>48 sec</u>	د	•	
•		<u> </u>			
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			Tested By	14 FI	Date: 8/2/
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lotice of			Witness	3	Date:

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Test Report No. 47906-02

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Test Report No. 47906-02

SCREENING TEST 3 DATA

POST-TEST VIEW - CLOSE-UP

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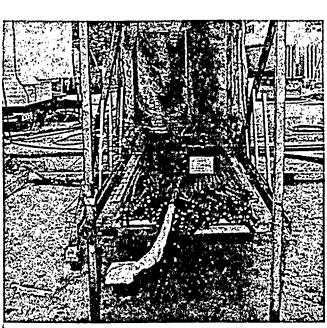
PHOTOGRAPH I-9

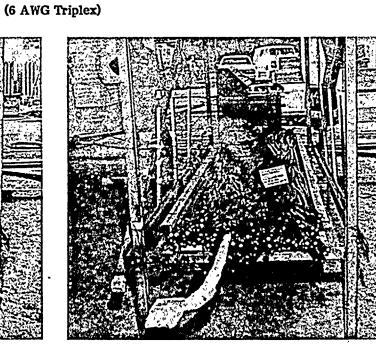


PHOTOGRAPH I-7 PRETEST VIEW - OVERALL

POST-TEST VIEW - OVERALL

PHOTOGRAPH I-8





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Test Report No. 47906-02

SCREENING TEST #3

Test Report No. 47906-02

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SCREENING TEST #3

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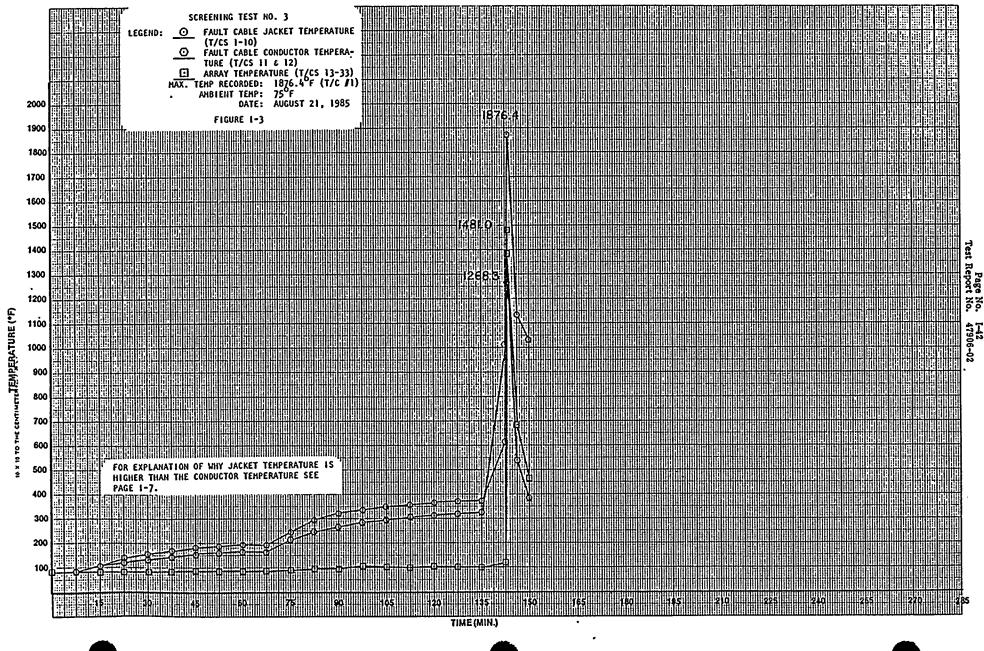
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(6 AWG Triplex)

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Approximate Test Time	Approximate Jacket Temperature	Observation
0 Min	82 ⁰ F ,	Energized cable with 20.7A
10 Min	830F	Energized cable with 100A
40 Min	164°F	Energized cable with 113A
44 Min	181 ⁰ F .	Energized cable with 105A
54.2 Min	189 ⁰ F	Jacket temp. at 189 ⁰ F
69.2 Min	191°F	Energized cable with 156A (Test current)
141.7 Min	373°F	Cable temperature stabilized for 15 minutes.
		Energized cable with 660A (Max. let-through current of backup protection)
142.2 Min	608°F	Ignition
142.6 Min	1876°F	Open Circuit
142.6 Min	1876°F	Peak conductor temp. (1268°F)
142.6 Min	1876°F	Peak jacket temp. (1876°F)
142.6 Min	1876°F	Peak array temp. (1481°F)
147.4 Min	1350°F	Fire Out



Report No Page No. I-43 Test Report No. 47906-02

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DATA SHEET

Customer <u>Stone & Webster</u> Specimen <u>Cables</u> Part No. <u>Various</u> Spec. <u>WLTP 47906-01</u> Para. <u>3.2.3</u> S/N <u>N/A</u> GSI <u>No</u>	Photo Test Med	フら ^o F Yes Air	Report No.	47906-2
Various Various Spec. WLTP 47906-01 Para. 3.2.3 S/N N/A	Photo Test Med	Yes Air	Report No.	47906-2
Spec. WLTP 47906-01 Para. 3.2.3 S/N N/A	Photo Test Med	Yes Air	Report No.	47906-2
Para. 3.2.3 S/NN/A	Test Med	AIF	_ Start Date_	8-21-85
5/NN/A	Specimen Te			
NO NO	- abeaunan re	amp. <u>Ambient</u>	-	
Test Title Screening Test No. 3				
Fault Cable Size: GAWG T	ripler			
No. Conductors: 3			<u> </u>	,
3. readings after 10 minute applicat	tion of FLA:			•
Current: 20.7A	•	·		•
Max. Temp. F Channels 1-10: \$3'F/9				
Temp. Channel 11: 84°F		Temo. Channel	12: 85°F	•
		<u> </u>		
5. Readings at beginning of 15-min Current: 105 A Max. Temp. F				
Channels 1-10: 189°F		Channel No. 2	•	
Temp. Channel 11:/6/		Temp. Channel		
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		Tested By	mart	Date: 8/21/0
		Tested By		Date: <u>8/2//</u> Date:
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DATA SHEET

Customer.	Stone & Webster			WYLE LABORATORIES
Specimen				• •
Part No	Various WLTP 47906-01	Amb. Temp.	<u></u>	Job No. <u>47906</u>
Spec		Photo	Yes	Report No. <u>47906-2</u>
Para	3.2.3			Start Date8-2/- 8:
S/N	N/A	Specimen To	emp. <u>Ambient</u>	
GSI	No			
Test Title _	Screening Test No. 3	· · · · · · · · · · · · · · · · · · ·		
7.	Readings at end of 15-	minute period a	at 96°C ±3°(C (189°F-199°F)
	Current:	los A		
	Max. Temp. ^O F Channels 1-10:	191°F	. Cł	nannel No. 3
	Temp. Channel 11:	174	Te	emp Channel 12: /73
9-11.	Final readings with tes			
	9. If open circuit oc	curs: N/A		
	Elapsed time:			
	Max. Temp. F		Channel No	<u> </u>
	Channels 1-12:	····		
	10. If 15-minuté perio	d of stabilized	temperature d	occurs :
	Current: 156 A			
·	Elapsed time to be	ginning of 15-mi	nute period:	3300 Sec
	Max. Temp. F Channels 1-12:	368°F	Channel No	
•	11. If fault cable ign	ites: N/A		··-
	Elapsed time to ig	nition:		
			Tested By	Mose Date: 8/2/
			withess	Mine Date:

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## DATA SHEET

| Customer     | Stone & Webster                       |                                       |                     | <b>WYLE LABORATORIES</b>              |
|--------------|---------------------------------------|---------------------------------------|---------------------|---------------------------------------|
|              | Cables de com                         |                                       | 7500                |                                       |
| Part No      | Various                               |                                       | <u></u>             | Job No. 47906                         |
|              | WLTP 47906-01                         |                                       | Yes                 | Report No47906-2                      |
|              | 3.2.3                                 | Test Med                              | Air                 | Start Date8-2/- 85                    |
| S/N          |                                       | Specimen Te                           | mp. <u>Ambient</u>  | <u> </u>                              |
| GSI          | No                                    |                                       |                     |                                       |
| Test Title   | ·····                                 | Screening Test                        | : No. 3             |                                       |
|              |                                       |                                       |                     |                                       |
|              |                                       | *                                     |                     |                                       |
| 17 80-       | diago with foult aver                 |                                       |                     | cables 1-5, 2200 amperes              |
|              | atings with fault curre               |                                       | cables 6-12)        |                                       |
|              |                                       | 101                                   | cables 6-12)        |                                       |
| ч.           |                                       |                                       |                     | ••                                    |
| ·            | Current:                              | GGOA                                  | ¢.                  |                                       |
|              | Max. Temp. °F<br>Channels 1-10:       | 1876                                  | Channel No          |                                       |
|              | Elapsed time to oper                  | 1                                     |                     |                                       |
|              | circuit or stable te                  | mp: 59 sec                            |                     |                                       |
|              | Time to ignition                      | 24 sec                                |                     |                                       |
|              | if applicable:                        | -4 acc                                |                     |                                       |
|              |                                       |                                       |                     |                                       |
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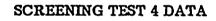
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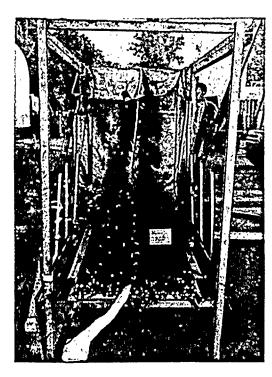
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Test Report No. 47906-02

#### SCREENING TEST #4

(4 AWG Triplex)



PHOTOGRAPH I-10

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PRETEST VIEW - OVERALL



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PHOTOGRAPH I-11 PRETEST VIEW — CLOSE-UP



PHOTOGRAPH I-12

POST-TEST VIEW -- OVERALL



PHOTOGRAPH I-13 POST-TEST VIEW — CLOSE-UP

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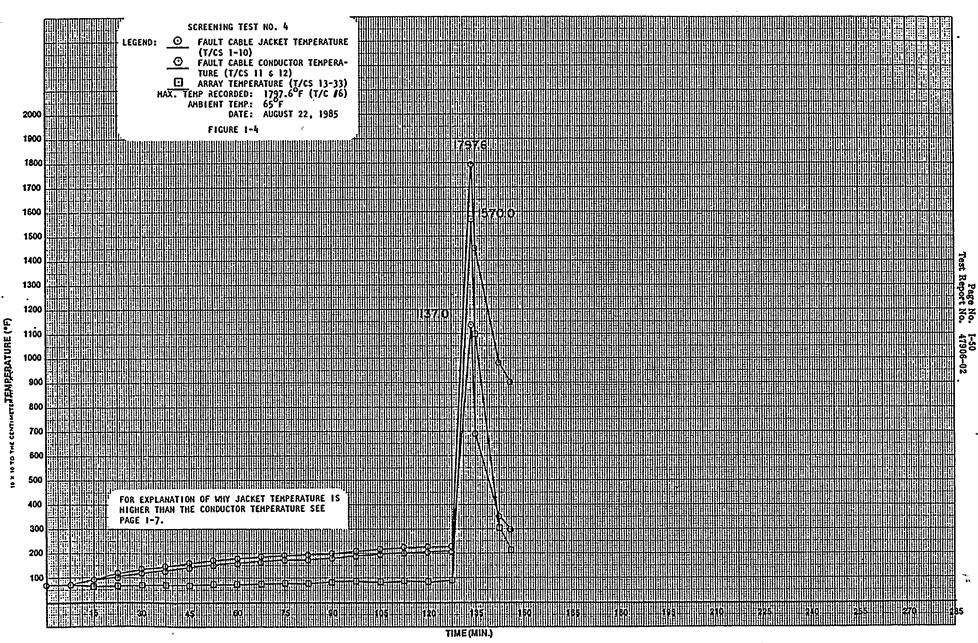
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### Test Report No. 47906-02

### SCREENING TEST #4

### (4 AWG Triplex)

| Approximate<br>Test Time | Approximate<br>Jacket Temperature | Observation                                                                     |
|--------------------------|-----------------------------------|---------------------------------------------------------------------------------|
| 0 Min                    | 730F                              | Energized cable with 20.7A                                                      |
| 10 Min                   | 720F                              | Energized cable with 130A                                                       |
| 40 Min                   | 1510F                             | Energized cable with 140A                                                       |
| 70 Min                   | 184ºF                             | Energized cable with 145A                                                       |
| 75.7 Min                 | 1890F                             | Jacket temp. at 189°F                                                           |
| 90.7 Min                 | 200°F                             | Energized cable with 156A<br>(Test current)                                     |
| 130.7 Min                | 226°F                             | Cable temperature stabilized for 15 minutes.                                    |
|                          |                                   | Energized cable with 660A<br>(Max. let-through current<br>of backup protection) |
| 132.2 Min                | 1420°F                            | Ignition                                                                        |
| 133.4 Min                | 1798°F                            | Open Circuit                                                                    |
| 133.4 Min                | 1798 <sup>0</sup> F               | Peak conductor temp. (1137 <sup>0</sup> F)                                      |
| 133.4 Min                | 1798 <sup>0</sup> F               | Peak jacket temp. (1798°F)                                                      |
| 133.4 Min                | 1798°F                            | Peak array temp. (1570°F)                                                       |
| 136.4 Min                | 1375.0°F                          | Fire Out                                                                        |



Page No. I-51 Test Report No. 47906-02

## DATA SHEET

|             | tone & Webste                         | <u>r</u>                              |                                       |                    | WYLELABO    | DRATORIES                    |
|-------------|---------------------------------------|---------------------------------------|---------------------------------------|--------------------|-------------|------------------------------|
| SpecimenC   | ables                                 |                                       |                                       |                    |             |                              |
| * Part NoV  | arious                                | ha                                    | Amb. Temp.                            | 65°F               | Job No      | 47906                        |
| SpecW       | LTP 47906-01                          |                                       | Photo                                 | Yes                | Report No   | 47906-2                      |
| Para3       | .2.3                                  |                                       | Test Med                              | AIF                | Start Date_ | 8-22-85                      |
| S/NN        | /A                                    | -                                     | Specimen Te                           | mp. <u>Ambient</u> |             |                              |
| GSIN        | 0                                     |                                       | -                                     |                    |             |                              |
| Test TitleS | creening Test                         | No. 4                                 | <del>,</del>                          |                    | <u> </u>    |                              |
| Fault Cable | Size: 4                               | AWG T                                 | riplex                                |                    |             |                              |
| No. Conduct | ors:                                  | 3                                     |                                       | ···                |             |                              |
| 3. readings | after 10 minu                         | te apolicat                           | ion of FLA:                           |                    | ·           |                              |
| Curren      | t: 2                                  | .0.7 A                                | · · · · · · · · · · · · · · · · · · · |                    |             |                              |
|             | emp. F<br>ls 1-10:                    | 72°F/3                                |                                       |                    |             |                              |
| Тето.       | Channel 11:                           | 72° F                                 |                                       | Temp. Channel      | 12: 71°F    | :                            |
|             |                                       | ·····                                 |                                       |                    |             |                              |
| 5. Readings | at beginning                          | g of 15-min                           | ute period                            | at 90°C ±3°C (     | 189°F-199°F | )                            |
| Curren      | t: l<br>emp. F                        | 45 A                                  |                                       |                    |             |                              |
|             | emp. F<br>ls 1-10:                    | 189°F/6                               |                                       | Channel No         | 6           |                              |
| Temp.       | Channel 11:                           |                                       |                                       | Temp. Channel      |             |                              |
|             |                                       |                                       |                                       | ·····              |             |                              |
|             |                                       | ¥                                     |                                       |                    |             |                              |
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|             |                                       |                                       |                                       |                    |             |                              |
|             |                                       |                                       |                                       |                    | 2-4.        | e la a las                   |
| •           |                                       |                                       |                                       | Tested By          | . // -      | Date: <u>8 / 2 2 / 8 ) _</u> |
| A           |                                       |                                       |                                       | WitnessM           | ~~          | Date:                        |
| Notice of   | None                                  |                                       |                                       | Sheet No           | 1           | of                           |
| Anomaly     | 1 cone                                | · · · · · · · · · · · · · · · · · · · | <u> </u>                              | Approved           |             | - 85                         |

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## DATA SHEET

| Customer .   |                          |                |                        | WYLE LABORATORIES                            |
|--------------|--------------------------|----------------|------------------------|----------------------------------------------|
| Specimen     |                          |                |                        |                                              |
| Part No      | Various                  | Amb. Temp.     | 65°F                   | Job No. <u>47906</u>                         |
| Spec         | WLTP 47906-01            | _ Photo        |                        | Report No <u>47906-2</u>                     |
| Para         | 3.2.3                    | _ Test Med     |                        | Start Date9-2.2-85                           |
| S/N          | <u>N/A</u>               | Specimen Te    | mp. <u>Ambient</u>     |                                              |
| GSI          | No                       | _              |                        |                                              |
| Test Title _ | Screening Test No. 4     |                |                        |                                              |
|              |                          | *              |                        |                                              |
|              |                          |                |                        | · · · · · · · · · · · · · · · · · · ·        |
| 7.           | Readings at end of 15-m  | inute period a | at 90°C <u>+</u> 3°C ( | 189°F-199°F)                                 |
|              | •                        |                |                        |                                              |
|              | Current: 14              | 5 A            |                        |                                              |
|              | Max, Temp F              | 99° F          | . Chan                 | nel No. 🎖                                    |
|              | Temp. Channel 11:        |                | Temp                   | Channel 12: /83                              |
| 9-11.        | Final readings with test |                |                        |                                              |
| ,            | 9. If open circuit occu  | Irs: N/A       |                        |                                              |
|              | Elapsed time:            |                |                        |                                              |
|              | Max. Temp. F             |                | Channel No.            |                                              |
|              | Channels 1-12:           |                |                        | ······································       |
|              | 10. If 15-minute period  | of stabilized  | temperature occ        | urs :                                        |
|              | Current: 156A            |                |                        |                                              |
|              |                          |                |                        | · · · · · · · · · · · · · · · · · · ·        |
| •            | Elapsed time to begi     | nning of 15-mi | nute period:           | 1200 Sec                                     |
|              | Max. Temp. F             | 21°F           | Channel No.            | 1                                            |
| <u> </u>     | Channels_1-122           |                | channer no.            | <u>*************************************</u> |
|              | 11. If fault cable ignit | es: N/A        |                        | · · · · · · · · · · · · · · · · · · ·        |
|              | Elapsed time to igni     | N//t           |                        |                                              |
|              |                          |                |                        |                                              |
|              |                          |                |                        |                                              |
|              |                          |                | - CATE                 | 7-1-                                         |
|              |                          |                | Tested By              | Comast Date: 8/22/                           |
|              |                          |                |                        | Mone Date:                                   |
| otice of     | 0.                       |                | Sheet No.              | of                                           |
| nomaly       | More                     |                | Approved               | Ming 8.22-85                                 |

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## DATA SHEET

| Customer   |                                              |                                         |                                  | WYLE LABO                             | RATORIES                              |
|------------|----------------------------------------------|-----------------------------------------|----------------------------------|---------------------------------------|---------------------------------------|
| Specimen _ | Cables                                       |                                         |                                  |                                       |                                       |
| art No.    | Various                                      | Amb. Temp.                              | 65° F                            | Job No                                | 47906                                 |
| Spec       | WLTP 47906-01                                | Photo                                   | Yes                              | Report No                             | 47906-2                               |
|            | 3.2.3                                        | Test Med                                | Air                              | Start Date                            | 8-22-85                               |
| S/N        | N/A                                          | Specimen Te                             | mp. Ambient                      |                                       |                                       |
| GSI        |                                              | ,                                       |                                  |                                       |                                       |
| est Title  | ·····                                        | Screening Test                          | No. 4                            |                                       |                                       |
| 12. Rea    | adings with fault curre                      |                                         | amoeres for c<br>cables 6-12)    |                                       | ) amperes                             |
|            | <u> </u>                                     |                                         |                                  |                                       |                                       |
|            | Current: G                                   |                                         | ĸ                                |                                       |                                       |
|            | May Term OF                                  |                                         |                                  | (.                                    |                                       |
| <b></b> .  | Channels 1-10:                               | <u>1798°F</u>                           | <u>Channel No</u>                |                                       |                                       |
|            | Elapsed time to oper<br>circuit or stable te |                                         |                                  |                                       |                                       |
|            |                                              |                                         |                                  |                                       |                                       |
| •          | if_applicable:                               | <u>9.3 sec</u>                          |                                  |                                       |                                       |
|            |                                              |                                         |                                  |                                       |                                       |
| ******     | · · · · · · · · · · · · · · · · · · ·        | ,                                       | 1                                | ·····                                 |                                       |
|            |                                              |                                         | <u> </u>                         |                                       |                                       |
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|            |                                              |                                         | Tested By                        | Z AA 11                               | ate: <u>8-22</u>                      |
| otice of   |                                              | •                                       | Tested By<br>Witness<br>Sheet No | Z AA 11                               | Pate: <u>8-22</u><br>ate:             |

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WYLE LABORATORIES Huntsville Facility

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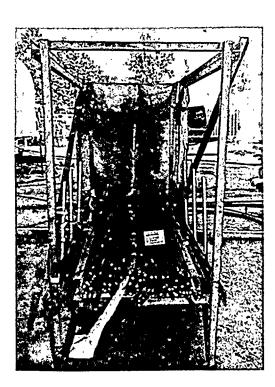
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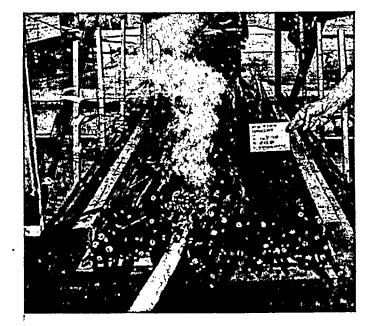
### SCREENING TEST 5 DATA

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#### SCREENING TEST #5

(2 AWG Triplex)





PHOTOGRAPH I-15 POST-TEST VIEW — OVERALL

PHOTOGRAPH I-14 PRETEST VIEW -- OVERALL



PHOTOGRAPH I-16 POST-TEST VIEW — CLOSE-UP

### Test Report No. 47906-02

### SCREENING TEST #5

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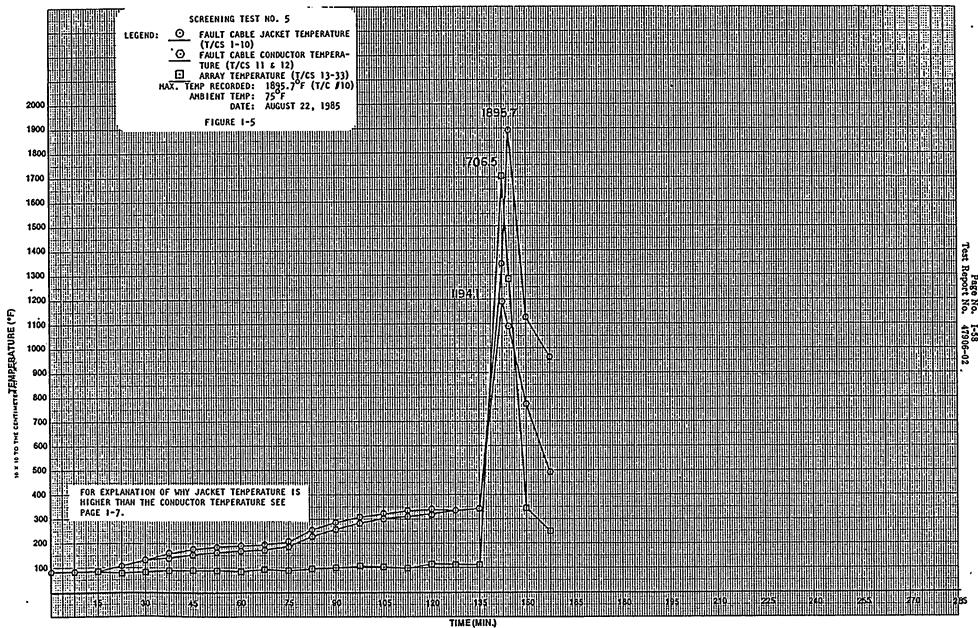
### (2 AWG Triplex)

| Approximate<br>Test Time | Approximate<br>Jacket Temperature | Observation                                                                     |
|--------------------------|-----------------------------------|---------------------------------------------------------------------------------|
| 0 Min                    | 840F                              | Energized cable with 38.5A                                                      |
| 15 Min                   | 850F                              | Energized cable with 185A                                                       |
| 56.3 Min                 | 1890F                             | Jacket temp. at 189°F                                                           |
| 71.3 Min                 | 198°F                             | Energized cable with 264A<br>(Test current)                                     |
| 134.8 Min                | 346°F                             | Cable temperature stabilized for 15 minutes.                                    |
|                          |                                   | Energized cable with 660A<br>(Max. let-through current<br>of backup protection) |
| 138.5 Min                | 800°F                             | Ignition                                                                        |
| 142.5 Min                | 1345 <sup>0</sup> F               | Open Circuit                                                                    |
| 142.5 Min                | 1345°F                            | Peak conductor temp. (1194 <sup>0</sup> F)                                      |
| 144.5 Min                | 1896°F                            | Peak jacket temp. (1896°F)                                                      |
| 142.5 Min                | 1345°F                            | Peak array temp. (1707°F)                                                       |
| 156.9 Min                | 962°F                             | Fire Out                                                                        |
|                          |                                   |                                                                                 |

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## DATA SHEET

| Customer          | Stone & Webst                         | er                                    |                                        |                                        | WYLE LAB                               | ORATORIES                      |
|-------------------|---------------------------------------|---------------------------------------|----------------------------------------|----------------------------------------|----------------------------------------|--------------------------------|
| Specimen          | Cables                                |                                       | <u> </u>                               |                                        |                                        |                                |
| Part No.          | various                               |                                       | Amb. Temp.                             | 75°F                                   | Job No                                 | 47906                          |
| Spec              | WLTP 47906-01                         |                                       | Photo                                  | Yes<br>Air<br>Ambient                  | Report No.                             | 47906-2                        |
| Para.             | 3.2.3                                 |                                       | Test Med                               |                                        | Start Date.                            | 8-22-85                        |
| S/N               | N/A                                   |                                       | Specimen Te                            | mp. <u>Ambient</u>                     |                                        |                                |
| GSI               | No                                    | ,<br>                                 |                                        |                                        |                                        |                                |
| Test Title        | Screening Tes                         | t No. 5                               |                                        |                                        | <u></u>                                |                                |
| Fault Ca          | ble Size: 2                           | AWG T                                 | riplex                                 |                                        |                                        |                                |
| No. Cond          | uctors:                               | 3                                     | •<br>                                  |                                        |                                        |                                |
|                   |                                       |                                       |                                        |                                        |                                        | •                              |
| 3. readin         | qs after 10 min                       | ute applicat                          | tion of FLA:                           |                                        |                                        |                                |
| Cur               | rent:                                 |                                       | •                                      |                                        |                                        |                                |
| Max<br>Cha        | . Temp. F<br>nnels 1-10:              | 84°F (7                               |                                        |                                        |                                        |                                |
| Tem               | p. Channel 11:                        | 81 ° F                                |                                        | Temp. Chann                            | el 12: 82°                             | F                              |
|                   |                                       |                                       |                                        |                                        |                                        |                                |
|                   | ngs at beginnin                       |                                       | nute ceriod                            | at 90°C <u>+</u> 3°C                   | (189°F-199°I                           | ;)                             |
| <u>Cur</u><br>Max | rent:<br>. Temp. F                    | 1991E                                 |                                        |                                        | 2                                      |                                |
|                   | nnels 1-10:                           |                                       |                                        |                                        |                                        | -                              |
| Tem               | p. Channel 11:                        | - 146° F                              |                                        | Temp. Chann                            | el 12: <i>169</i>                      | °F                             |
|                   |                                       |                                       |                                        |                                        |                                        |                                |
|                   |                                       |                                       |                                        |                                        |                                        | <u> </u>                       |
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| lotice of         |                                       | · · · · · · · · · · · · · · · · · · · | · · · · · · · · · · · · · · · · · · ·  | Tested By<br>Witness<br>Sheet No.      | Komaoff<br>Nore                        | Date: <u>8-22</u><br>Date:<br> |

Weie Form WH 613A, Rev. 1PR 51

Page No. I-60 Test Report No. 47906-02

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| Specimen     |            | bles                           |                                       | -                  |                                                     |
|--------------|------------|--------------------------------|---------------------------------------|--------------------|-----------------------------------------------------|
| Part No      |            | rious                          | Amb. Temp                             | 75°F               | Job No. <u>47906</u>                                |
| Spec         |            | TP 47906-01                    | Photo                                 |                    |                                                     |
| Para         | 3.:        | 2.3                            | Test Med                              | Air                | Report No. <u>47906-2</u> Start Date <i>/22/8</i> _ |
| S/N          | N//        | <u>A</u>                       | Specimen Te                           | mp. <u>Ambient</u> |                                                     |
| GSI          | No         |                                | <b></b>                               | -                  |                                                     |
| Test Title . | <u>Sci</u> | reening Test No.               |                                       |                    | ······································              |
| 7.           | Read       | dings at end of 15-n           | ninute period a                       | t 90°C ±3°C        | (189°F-199°F)                                       |
|              |            | Current: 18                    | S A                                   |                    |                                                     |
|              |            | Max. Temp. F<br>Changels 1-10: | 98                                    | Cha                | annel No. <u>2</u>                                  |
|              |            | Temp. Channel 11:              | 157                                   | Ter                | np Channel 12: /82                                  |
| 9-11.        | Fina       | Il readings with test          |                                       |                    |                                                     |
|              |            |                                |                                       |                    |                                                     |
|              | 9.         | If open circuit occ            | urs: N/A                              |                    |                                                     |
|              |            | Elapsed time:                  |                                       |                    |                                                     |
|              |            | Max. Temp. F                   |                                       | Channel No         |                                                     |
|              |            | Channels 1-12:                 | · · · · · · · · · · · · · · · · · · · |                    | · · · · · · · · · · · · · · · · · · ·               |
|              | 10.        | If 15-minuté period            | of stabilized                         | temperature o      | ccurs :                                             |
|              |            | Current: 264                   | A                                     |                    |                                                     |
|              |            |                                | ···                                   | ····               |                                                     |
|              |            | Elapsed time to beg            | inning of 15-mi                       | nute period:       | 2400 SRC                                            |
|              |            | Max. Temp. F<br>Channels 1-12: | 337                                   | Channel No.        |                                                     |
|              | 11.        | lf fault cable igni            | tes: N/A                              |                    |                                                     |
|              |            | Elapsed time to ign            | ition:                                |                    |                                                     |
|              |            |                                | ·                                     |                    |                                                     |
|              |            |                                |                                       | Tested By          | homael Date: 1/12                                   |
|              |            |                                |                                       | Witness            | 14 // 77                                            |

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## DATA SHEET

| Customer                              | Stone & Webster                         |                |              | v            | VYLE LABO                               | RATORIES  |
|---------------------------------------|-----------------------------------------|----------------|--------------|--------------|-----------------------------------------|-----------|
| Snecimen                              | Cables                                  |                |              |              |                                         |           |
| Part No.                              | Various                                 | Amh Temo       | 75°F         |              |                                         | 47906     |
| Soec.                                 | WLTP 47906-01                           | Photo          |              |              |                                         |           |
|                                       | 3.2.3                                   | Tast Mod       | Air          | ······       | Start Data                              | 8/22/8    |
| 5/N                                   |                                         | Specimen Te    | Ambie        | ent s        |                                         | <u> </u>  |
|                                       | No                                      | - Specimen re  | anp. <u></u> |              |                                         |           |
|                                       |                                         |                |              |              |                                         |           |
| est Title                             |                                         | Screening Test | : No. 5      |              |                                         |           |
|                                       |                                         | ······         |              | <u></u>      |                                         |           |
| 12. Rea                               | dings with fault curren                 | t applied (660 | amperes fo   | rcables      | 1-5, 2200                               | ) amperes |
|                                       |                                         |                | cables 6-    |              |                                         | ¥         |
|                                       |                                         |                |              |              |                                         |           |
|                                       | Current:                                | 660 A          | ``           | •            | ,                                       |           |
|                                       | Max Terra °E                            |                |              |              | • • • • • • • • • • • • • • • • • • • • | <u> </u>  |
|                                       | Channels 1-10;                          | 1896           | Channel      | No. 10       |                                         | ,<br>     |
|                                       | clapsed time to open                    |                |              |              |                                         |           |
| · · · · · · · · · · · · · · · · · · · | circuit or stable tem                   |                | e            | <del> </del> |                                         |           |
|                                       | Time to ignition                        | 225 Se         | •            |              |                                         |           |
|                                       |                                         |                |              | ·            |                                         |           |
|                                       |                                         |                |              |              |                                         |           |
|                                       |                                         |                |              |              |                                         |           |
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|                                       |                                         |                |              |              |                                         |           |
|                                       | ••••••••••••••••••••••••••••••••••••••• |                |              |              |                                         |           |
|                                       |                                         | •              |              |              |                                         |           |
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| <u> </u>                              |                                         |                |              | ·····        |                                         |           |
|                                       |                                         |                |              | $\sim$       |                                         |           |
|                                       |                                         |                |              | Bel          | all'                                    | 2/21      |
|                                       |                                         |                | Tested By_   | <u>onomi</u> | iogr c                                  | )ate:     |
|                                       |                                         |                | Witness      | - Mine       | _ <u></u> C                             | )ate:     |
|                                       |                                         |                |              |              |                                         |           |
| otice of                              | none                                    |                | Sheet No.    |              | _3                                      | of        |

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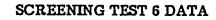
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Test Report No. 47906-02



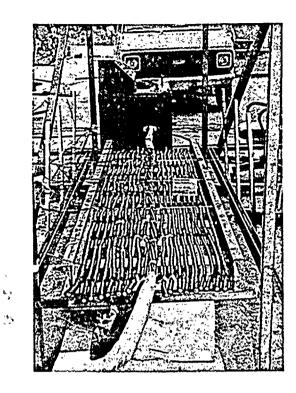
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Page No. I-64

#### SCREENING TEST #6

#### (1/0 AWG Triplex-Cu)



PHOTOGRAPH I-17

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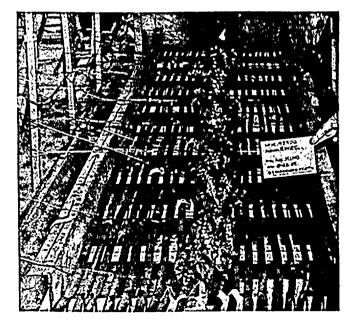
PRETEST VIEW - OVERALL



PHOTOGRAPH I–18

PRETEST VIEW - CLOSE-UP

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PHOTOGRAPH I-19 POST-TEST VIEW — OVERALL PHOTOGRAPH I-20 POST-TEST VIEW — CLOSE-UP

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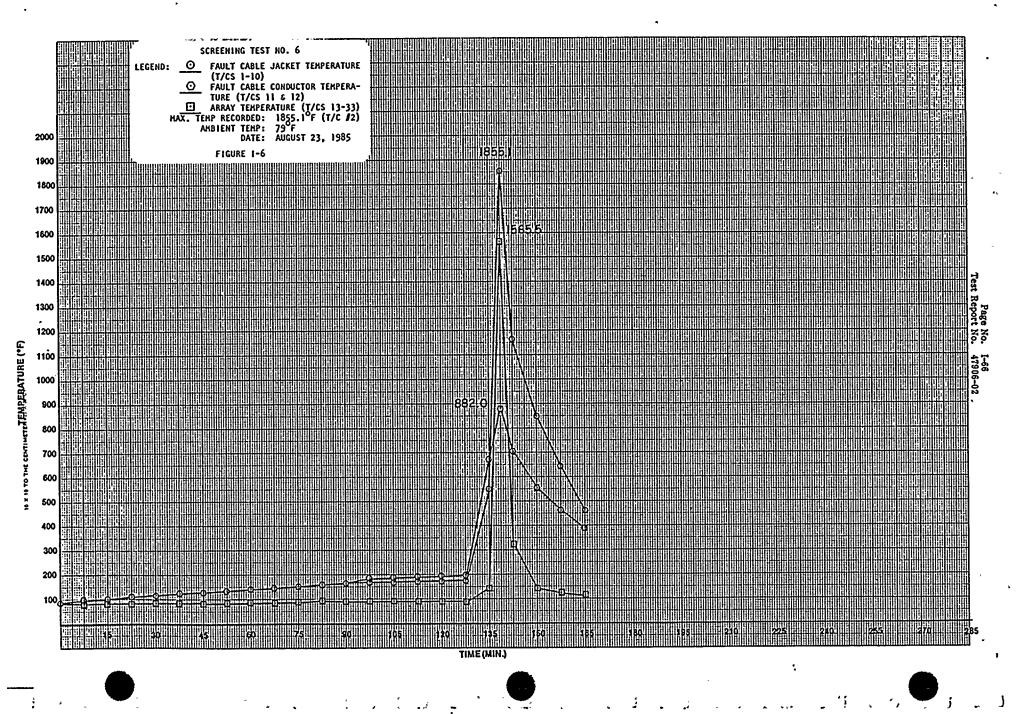
### Test Report No. 47906-02

### SCREENING TEST #6

## (1/0 AWG Triplex-Cu)

|        | ximate<br>Time | Approximate<br>Jacket Temperature | Observation                                 |
|--------|----------------|-----------------------------------|---------------------------------------------|
| 0      | Min            | 860F                              | Energized cable with 139A                   |
| 15     | Min            | 990F                              | Energized cable with 185A                   |
| 50     | Min            | 1310F                             | Energized cable with 210A                   |
| 75     | Min            | 152°F                             | Energized cable with 230A                   |
| 105.6  | Min            | 1720F ·                           | Energized cable with 235A                   |
| 113.8  | Min            | 175°F                             | Conductor at 190°F                          |
| 128.8  | Min            | 181 <sup>0</sup> F                | Energized cable with 908A<br>(Test Current) |
| 135.7  | Min            | 800°F                             | Ignition .                                  |
| 136.6  | Min            | 1050°F                            | Open Circuit                                |
| 138.75 | Min            | 1855°F                            | Peak conductor temp. (882°F)                |
| 138.75 | Min            | 1855°F                            | Peak jacket temp. (1855°F)                  |
| 138.75 | Min            | 1855°F                            | Peak array temp. (1566°F)                   |
| 139.9  | Min            | 1650°F                            | Fire Out                                    |
|        |                |                                   |                                             |

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Page No. I-67 Test Report No. 47906-02

## DATA SHEET

| Customer    | Stone & Webster                       |                  |                    | WYLE LABO                              | RATORIES           |
|-------------|---------------------------------------|------------------|--------------------|----------------------------------------|--------------------|
| Specimen _  | Cables                                |                  |                    |                                        |                    |
| Part No     | Various                               | A sale. To sale  | <u>79°F</u>        | Job No                                 | 47906              |
| Spec        | WLTP 47906-01                         | Photo            | Yes                | Report No                              | 47906-2            |
| Para        | 3.2.3                                 | Test Med.        | Yes<br>Air         | Start Date_                            | 8-23-85            |
| S/N         | N/A                                   | Specimen Te      | mp. <u>Ambient</u> |                                        |                    |
| GSI         | No                                    |                  |                    |                                        |                    |
|             | Screening Test No.                    | 6                |                    |                                        |                    |
| Fault Ca    | ble Size: 1/0                         | AWG Triplex      |                    |                                        |                    |
| No. Cond    | luctors: 3                            |                  |                    |                                        |                    |
|             |                                       |                  |                    |                                        |                    |
| · · · · · · | ngs after 10 minute ac                |                  |                    |                                        |                    |
| Max Max     | rent: 139A<br>K. Temp. F              | · F / 7          |                    |                                        |                    |
|             |                                       | 92°F             | Temp. Chann        | al 12: 97°                             | <u> </u>           |
| ren         | p. channel 11:                        | 72 F             | Temp. Grann        |                                        |                    |
| 5. Readi    | ngs at beginning of                   | 15-minute period | at 90°C +3°C       | (189°F-199°F                           | )                  |
|             | rrent: 2<br>K. Temp. F                |                  |                    |                                        |                    |
| Max<br>Cha  | k. Temp. F<br>annels 1-10:            | 175'F            | Channel No.        | <u> </u>                               |                    |
| Ten         | mp. Channel 11:                       | 190°F .          | Temp. Chann        | el 12: 181°F                           |                    |
|             |                                       |                  |                    |                                        |                    |
|             |                                       |                  |                    |                                        |                    |
|             |                                       | ····             |                    | •                                      | <u></u>            |
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|             | •                                     |                  |                    |                                        |                    |
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|             |                                       |                  |                    |                                        |                    |
| L           | · · · · · · · · · · · · · · · · · · · |                  | Transfer of        | homast.                                | 2/12/8             |
|             |                                       |                  | Tested By          | More                                   | Uate: <u>123/1</u> |
|             |                                       |                  | Witness            | 1                                      | Date:              |
| Notice of   | Mone                                  |                  | Sheet No           | AC. d.                                 | of<br>23.85        |
| Anomaly     | Tione                                 |                  | Approved           | 0-                                     | 63.03              |

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## DATA SHEET

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| Customer                               | St        | one & Webster                               |                                       |       |                                       | WY         | LE LABORATORI                         | ES              |
|----------------------------------------|-----------|---------------------------------------------|---------------------------------------|-------|---------------------------------------|------------|---------------------------------------|-----------------|
| Specimen                               |           | bles                                        |                                       |       |                                       |            |                                       |                 |
| Part No                                | Va        | rious                                       | Amb. Te                               | emo   | _79°F                                 | Job        | No. 47906                             |                 |
| Spec                                   | WL.       | TP 47906-01                                 | Photo                                 |       | Yes                                   |            | ort No                                | 2               |
| Para                                   | 3.        | 2.3                                         | Test Me                               | d     | Air                                   |            | rt Date 8 - 2 3 -                     |                 |
| S/N                                    | <u>N/</u> | 4                                           | Specim                                | en Te | mp. <u>Ambier</u>                     |            |                                       |                 |
| GSI                                    | No        | ······                                      |                                       |       |                                       |            |                                       |                 |
| Test Title .                           | Sc        | reening Test No.                            | ¢                                     | •     | ·····                                 |            |                                       |                 |
| 7.                                     | Read      | dings at end of 1                           | 5-minute peri                         | od a  | t 90°C ±3                             | °C (189°F  | -199°F)                               |                 |
|                                        |           |                                             | 235A                                  |       |                                       |            |                                       | ·               |
|                                        | •         | Max. Temp. <sup>O</sup> F<br>Channels 1-10: | 181°F                                 | •     |                                       | Channel No | o. <u>9</u>                           |                 |
| j.                                     |           | Temp. Channel 1                             | 1: 197°F                              |       | -                                     | Temp Chann | nel 12:/8)°F                          | •               |
| 9-11.                                  | Fina      | I readings with t                           | est current ap                        | plie  |                                       |            |                                       |                 |
| ······································ | 9.        | lf open circuit                             | occurs:                               |       |                                       |            |                                       |                 |
|                                        |           | Elapsed time:                               | 576 sec                               |       |                                       |            |                                       |                 |
| •                                      |           | Max. Temp. F<br>Channels 1-12:              | 1855°F                                |       | Channel                               | No. 2      |                                       |                 |
| <u> </u>                               | 10.       | lf 15-minutè per                            | iod of stabili                        | zed   | temperature                           | occurs:    | N/5 `                                 |                 |
| •<br>•                                 |           | Current:                                    |                                       |       |                                       |            |                                       | <u> </u>        |
|                                        |           | Elapsed time to                             | beginning of 1                        |       | ute period                            | :          |                                       |                 |
|                                        |           | Max. Temp. F<br>Channels 1-12:              |                                       |       | Channel                               | No         | ·····                                 |                 |
|                                        | 11.       | lf fault cable i                            | gnites:                               |       | · · · · · · · · · · · · · · · · · · · | ξ.         |                                       |                 |
|                                        |           | Elapsed time to                             | ignition: 4                           | 12 5  | ور                                    |            |                                       |                 |
|                                        | •         |                                             | · · · · · · · · · · · · · · · · · · · |       | <u> </u>                              |            | · · · · · · · · · · · · · · · · · · · |                 |
| lotice of                              |           |                                             |                                       |       | Tested By<br>Witness<br>Sheet No      | Atroma     | 04 Date: 3/                           | <u>23/</u><br>3 |
| Anomaly _                              |           | none                                        |                                       |       | Approved                              | SPIC       | 8/23/35                               | -               |

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## DATA SHEET

| Customer       | Stone & Webster                             |                                         |                                        | WYLE LABO                             | RATORIES                              |
|----------------|---------------------------------------------|-----------------------------------------|----------------------------------------|---------------------------------------|---------------------------------------|
| Specimen       | Cables                                      |                                         | 7005                                   |                                       |                                       |
| Part No        | Various                                     |                                         | <u>+ 19° F</u>                         | Job No                                | • 47906                               |
| Spec           | WLTP 47906-01                               | Photo                                   | Yes                                    | Report No                             | 47906-2                               |
|                | 3.2.3                                       |                                         | Air .                                  | Start Date                            | 8-23-85                               |
|                | N/A                                         | Specimen Te                             | mp. <u>Ambient</u>                     |                                       |                                       |
|                | No                                          | -F                                      |                                        |                                       |                                       |
|                | S                                           | creening Test                           | No. lo                                 |                                       |                                       |
|                | ······································      |                                         |                                        |                                       |                                       |
| <u></u>        |                                             |                                         |                                        |                                       |                                       |
| <u>12. Rea</u> | dings with fault current                    |                                         | <u>amperes_for_cab</u><br>cables 6-12) |                                       | 0 amperes                             |
|                |                                             |                                         |                                        | <u> </u>                              |                                       |
|                | Current:                                    |                                         |                                        | •                                     |                                       |
|                | Max. Temp. °F                               |                                         |                                        |                                       | · · · · · · · · · · · · · · · · · · · |
| <u>=</u>       | Channels 1-10:                              | <del>,</del>                            | Channel No.                            |                                       |                                       |
|                | Elapsed time to open                        | •                                       |                                        |                                       |                                       |
|                | circuit or stable temp:<br>Time to ignition |                                         |                                        |                                       |                                       |
|                | if applicable:                              |                                         |                                        |                                       |                                       |
|                |                                             |                                         |                                        | · · · · · · · · · · · · · · · · · · · |                                       |
|                |                                             |                                         |                                        |                                       |                                       |
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|                |                                             | ••••••••••••••••••••••••••••••••••••••• | · · ·                                  | <u> </u>                              | ·····                                 |
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|                |                                             |                                         |                                        | • • • • • •                           |                                       |
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|                |                                             |                                         |                                        |                                       |                                       |
|                |                                             |                                         | - The                                  | <u>)</u>                              | 01.5                                  |
|                |                                             |                                         | Tested By                              | mart 1                                | Date: <u> </u>                        |
|                |                                             |                                         |                                        | None."                                | Date:                                 |
|                |                                             |                                         | TTUIC33                                |                                       | Date:                                 |
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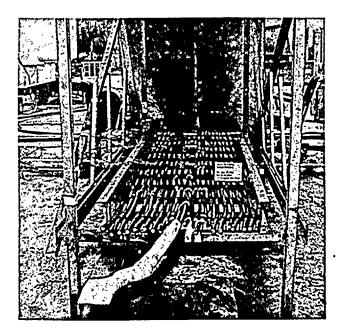
#### SCREENING TEST 7A DATA

Test Report No. 47906-02

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#### SCREENING TEST #7A

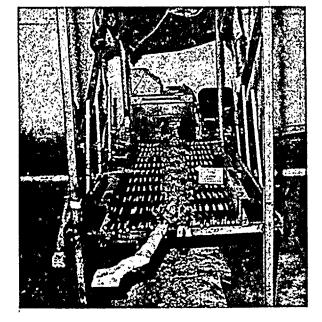
(2/0 AWG Triplex-Cu)



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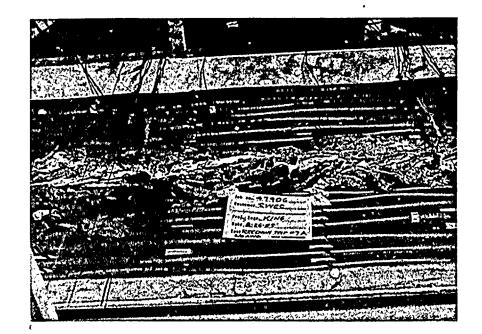
PHOTOGRAPH I-21

PRETEST VIEW - OVERALL



PHOTOGRAPH I-22

POST-TEST VIEW -- OVERALL



PHOTOGRAPH I-23 POST-TEST VIEW — CLOSE-UP

### Test Report No. 47906-02

### SCREENING TEST #7A

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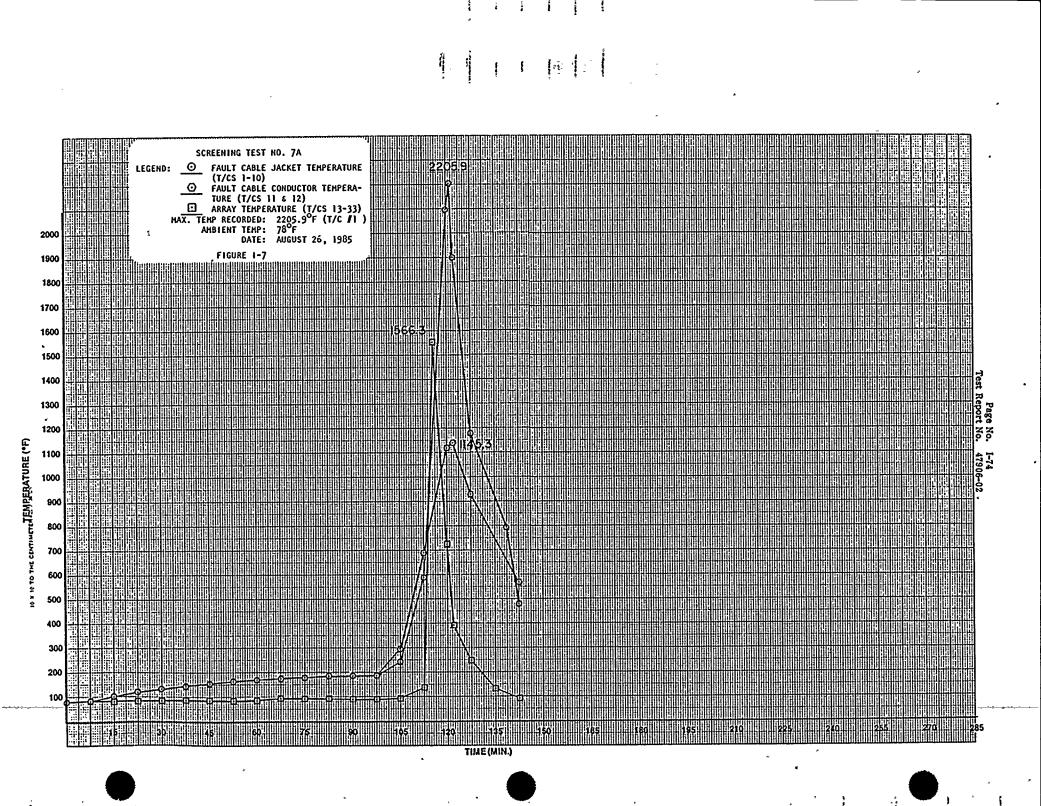
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### (2/0 AWG Triplex-Cu)

| Approximate<br>Test_Time | Approximate<br>Jacket Temperature | Observation                                 |
|--------------------------|-----------------------------------|---------------------------------------------|
| 0 Min                    | 80°F                              | Energized cable with 139A                   |
| 10.1 Min                 | 88°F                              | Energized cable with 270A                   |
| 88 Min                   | 182 <sup>0</sup> F                | Conductor at 190 <sup>0</sup> F             |
| 103.3 Min                | 184 <sup>0</sup> F                | Energized cable with 908A<br>(Test current) |
| 114.1 Min                | 900°F                             | Ignition                                    |
| 115.75 Min               | 1210°F                            | Peak array temp. (1566°F)                   |
| 121.0 Min                | 2206°F                            | Peak jacket temp. (2206°F)                  |
| 121.9 Min                | 1900°F                            | Open Circuit                                |
| 121.9 Min                | 1900°F                            | Peak conductor temp. (1145°F)               |
| 123.2 Min                | . 1750°F                          | Fire Out                                    |



Page No. I-75 Test Report No. 47906-02

# DATA SHEET

| ustomer _  |                                       | ۲                                      | <u> </u>    |                      | WYLE LABO                             | RATORIES         |
|------------|---------------------------------------|----------------------------------------|-------------|----------------------|---------------------------------------|------------------|
| pecimen _  | <u>Cables</u>                         |                                        |             |                      |                                       | 47906            |
| art No     | Various                               |                                        | Amb. Temp.  | / 0 /                | Job No                                |                  |
| oec        | WLTP 47906-01                         | <u> </u>                               | Photo       | Yes                  | Report No                             | 4/300-2          |
| ara        |                                       |                                        | Test Med    |                      | Start Date_                           | 8-26-81          |
|            | N                                     |                                        | Specimen Te | emp. <u>Ambient</u>  |                                       |                  |
| SI         |                                       |                                        |             |                      |                                       |                  |
| st Title _ | Screening Test                        | No. 7A                                 |             |                      |                                       |                  |
| Fault Ca   | able Size: 2/0                        | AWG Tri                                | plex        |                      |                                       |                  |
| No. Cond   | iuctors: 3                            |                                        |             | <u></u>              | <del></del>                           |                  |
| 3. readin  | ngs after 10 minu                     | ite applicat                           | ion of FLA: | •                    | <u></u>                               |                  |
| Cu         | rrent:                                |                                        | •           |                      |                                       |                  |
| Ma:<br>Cha | x. Temp. 7<br>annels 1-10:            | 08°F/1                                 |             |                      |                                       |                  |
| Ter        | mo. Channel II:                       | 87 ° F                                 |             | Temp. Chann          | el 12: 87 <sup>°</sup> F              |                  |
|            |                                       |                                        |             |                      |                                       |                  |
| 5. Readi   | ings at beginnin                      | g of 15-min                            | nute period | at 90°C <u>+</u> 3°C | (189°F-199°F                          | )                |
| Cui        | rrent:<br>x. Temp. F                  | 270A                                   |             |                      | · · · · · · · · · · · · · · · · · · · |                  |
| Ma:<br>Cha | x. Temp. F<br>annels 1-10:            | 182°F                                  | •           | Channel No.          | 10                                    |                  |
| Ter        | mp. Channel II:                       | 185°F                                  |             | Jemp. Chann          | el 12: 190°F                          |                  |
|            |                                       |                                        |             |                      |                                       |                  |
|            |                                       |                                        |             |                      |                                       | <u> </u>         |
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|            |                                       |                                        |             | _                    |                                       |                  |
|            | · · · · · · · · · · · · · · · · · · · |                                        |             | The second           | Tomas                                 | 8/1              |
|            |                                       |                                        |             | Tested By            |                                       | Date:            |
|            |                                       |                                        |             | Witness              |                                       | Date:            |
| tice of    | Mom                                   |                                        |             | Sheet No.            | 211. 4.                               | of               |
| omaly      | 1/Umi                                 |                                        |             | Approved             | - reing at                            | <u> (e - 7 )</u> |

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## DATA SHEET

| ustomer _                             | Stone & Webster                             |                |                                       | WYLE LABO                             | RATORIES   |
|---------------------------------------|---------------------------------------------|----------------|---------------------------------------|---------------------------------------|------------|
| Specimen .                            |                                             |                | - al -                                |                                       |            |
| Part No                               | Various<br>WLTP 47906-01                    | _ Amb. Temp    | **                                    | Job No. <u>47</u>                     |            |
| Spec                                  |                                             | _ Photo        |                                       | Report No                             |            |
| Para                                  | 3.2.3                                       |                | Air                                   |                                       | 8-26-85    |
| S/N                                   | <u>N/A</u>                                  | Specimen Te    | mp. <u>Ambient</u>                    |                                       | İ          |
| GSI                                   | No                                          | -              |                                       | •                                     |            |
| Test Title _                          | Screening Test No. 7/                       | <u>۱</u>       | · · · · · · · · · · · · · · · · · · · |                                       |            |
|                                       |                                             |                |                                       |                                       |            |
| 7.                                    | Readings at end of 15-m                     | inute period a | t 90°C <u>+</u> 3°C                   | (189°F-199°F)                         | P          |
|                                       | Currents                                    |                |                                       |                                       |            |
|                                       |                                             | 70 A           |                                       | · · · · · · · · · · · · · · · · · · · |            |
|                                       | Max. Temp. <sup>O</sup> F<br>Channels 1-10: | 186' F         | . Chai                                | nnel No. <u>Io</u>                    |            |
|                                       | Temp. Channel 11:                           | 190°F          | Tem                                   | Channel 12:                           | 193°F      |
| 9-11.                                 | Final readings with test                    | current applie |                                       |                                       |            |
| · · · · · · · · · · · · · · · · · · · | 9. If open circuit occu                     | Irs:           |                                       |                                       | й<br>1     |
|                                       |                                             | 2 4 sec        |                                       |                                       | ų          |
|                                       | Max. Temp. F                                |                |                                       |                                       |            |
|                                       | Channels 1-12: 2                            | 206°F          | Channel No.                           |                                       |            |
|                                       | 10. If 15-minute period                     | of stabilized  | temperature oc                        | curs: N/A ·                           |            |
|                                       | Current:                                    |                |                                       |                                       |            |
|                                       |                                             |                |                                       |                                       |            |
|                                       | Elapsed time to begi                        | nning of 15-mi | nute period:                          |                                       | -          |
|                                       | Max. Temp. F<br>Channels 1-12:              |                | Channel No.                           |                                       |            |
| - <u></u>                             | 11. If faul't cable ignit                   | es:            |                                       |                                       |            |
|                                       | Elapsed time to igni                        | tion: 650 3    | • •                                   |                                       |            |
|                                       |                                             | •              |                                       | · · ·                                 | 1          |
|                                       |                                             |                |                                       |                                       |            |
|                                       |                                             |                | Tested By                             | IA //                                 | Date: 8/26 |
| otice of                              |                                             |                | Witness/                              | tone                                  | )ate:      |
| nomaly                                | Mine                                        |                | Sheet No                              | King 8-                               | _of        |
|                                       |                                             |                |                                       |                                       |            |

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Page No. I-77 Test Report No. 47906-02

# DATA SHEET

| ustomer    | Stone & Webster                                 |               |                                       | WYLE LABO     | RATORIES          |
|------------|-------------------------------------------------|---------------|---------------------------------------|---------------|-------------------|
|            | Cables                                          |               | •                                     |               |                   |
|            | Various                                         | Amb. Temp.    | 78°F                                  | Job No        | 47906             |
| pec        | WLTP 47906-01                                   | Photo         | Yes<br>Air                            | Report No     | 47906-2           |
| ara        | 3.2.3                                           | Test Med      | Air                                   | - Start Date_ | 8-26-85           |
| j/N        |                                                 | Specimen Te   | emp. <u>Ambient</u>                   |               |                   |
| SI         |                                                 |               |                                       | —             |                   |
| 'est Title | S                                               | creening Test | : No. 7A                              |               | ·······           |
| 12. Rea    | adings with fault current a                     |               | amperes for cab                       |               | ) amperes         |
|            | ······································          | TOF           | cables 0-12)                          | <u> </u>      |                   |
|            | Current:                                        | ,             |                                       |               |                   |
|            | Max. Temp. °F                                   |               |                                       |               |                   |
|            | <u>Channels 1-10:</u>                           |               | Channel No.                           |               |                   |
|            | Elapsed time to open<br>circuit or stable temp: |               |                                       |               |                   |
|            | Time to ignition                                |               |                                       |               |                   |
|            | if_applicable:                                  |               |                                       |               |                   |
|            |                                                 |               |                                       |               |                   |
|            |                                                 |               |                                       |               |                   |
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|            | -                                               |               |                                       |               |                   |
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|            |                                                 |               | · · · · · · · · · · · · · · · · · · · |               | ·····             |
|            |                                                 |               |                                       |               |                   |
| ···        | ••••••                                          |               |                                       |               |                   |
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|            | **********                                      |               |                                       |               |                   |
|            |                                                 |               |                                       |               |                   |
|            |                                                 |               | ~                                     |               |                   |
|            |                                                 |               |                                       |               | _/.               |
|            |                                                 |               | Tested By                             | omaoff_ c     | )ate: <u>8/26</u> |
|            |                                                 |               |                                       | Name // r     | )ate:             |
|            |                                                 |               | Witness/                              |               | /ale.             |
| otice of   | Mone                                            |               | Sheet No.                             | 3             | _ of              |

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Test Report No. 47906-02

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Test Report No. 47906-02

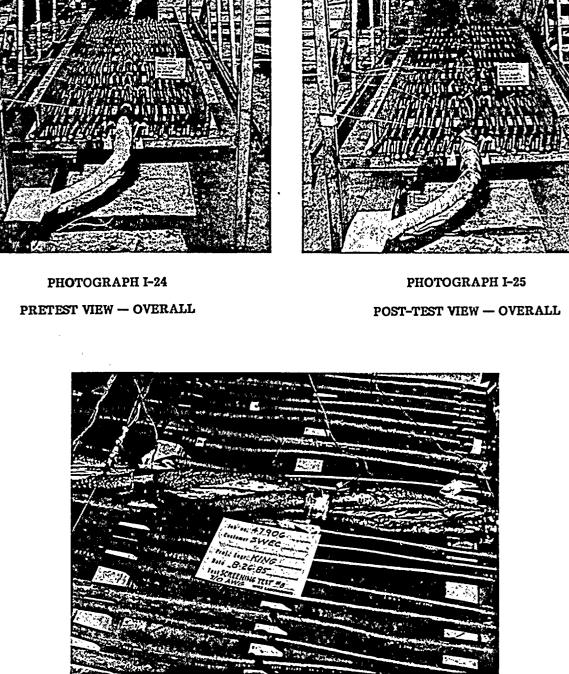


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### SCREENING TEST 8A DATA

SCREENING TEST #8A

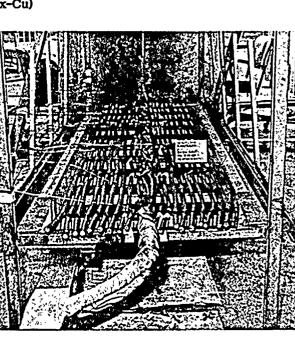
(3/0 AWG Triplex-Cu)



PHOTOGRAPH I-26

POST-TEST VIEW -- CLOSE-UP

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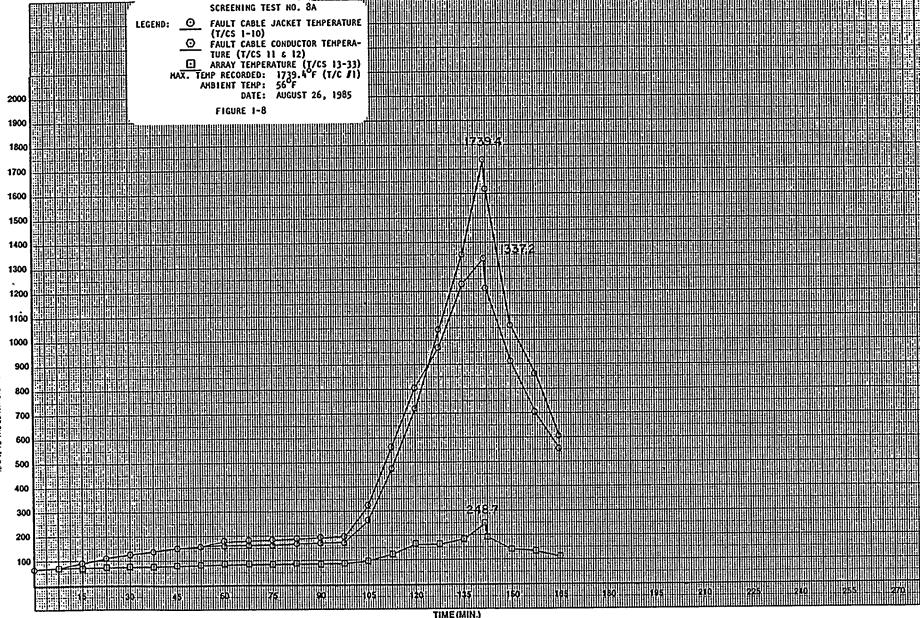
### Test Report No. 47906-02

### SCREENING TEST #8A

### (3/0 AWG Triplex-Cu)

| Approximate<br>Test Time | Approximate<br>Jacket Temperature | Observation                                 | • |
|--------------------------|-----------------------------------|---------------------------------------------|---|
| 0 Min                    | 670F                              | Energized cable with 139A                   |   |
| 10 Min                   | 740F                              | Energized cable with 330A                   |   |
| 86.2 Min                 | 1700F                             | Conductor at 189°F                          |   |
| 101.4 Min                | . 177°F .                         | Energized cable with 908A<br>(Test current) |   |
| 141.8 Min                | 1739°F                            | Open Circuit                                |   |
| 141.8 Min                | 17390F                            | Peak conductor temp. (1337ºF)               |   |
| 141.8 Min                | 1739°F                            | Peak jacket temp. (1739 <sup>0</sup> F)     |   |
| 141.8 Min                | 1739 <sup>0</sup> F               | Peak array temp. (249 <sup>0</sup> F)       |   |
|                          |                                   |                                             |   |





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# DATA SHEET

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| pec. <u>VLTP 47906-01</u><br>pec. <u>VLTP 47906-01</u><br>ara. <u>3.2.3</u><br>Test Med. <u>Air</u> Start Date <u>3-2.6-8</u> C<br>Fast Med. <u>Air</u> Start Date <u>3-2.6-8</u> C<br>Fast Med. <u>Air</u> Start Date <u>3-2.6-8</u> C<br>Specimen Temp. <u>Ambient</u><br>Specimen Temp. <u>Ambient</u><br>Screening Test No. <i>QA</i><br>Fault Cable Size: <u>3/0 AWG</u> Trip(ex<br>No. Conductors: <u>3</u><br><u>3.readings after 10 minute apolication of FLA:</u><br>Current: <u>139 A</u><br>Max. Temp. °F<br>Channels 1-10: 7 4° F /4<br>Temp. Channel 11: 74 Temp. Channel 12: 74<br><u>5. Readings at beginning of 15-minute period at 90°C ±3°C (189°F-199°F)</u><br><u>Current: 335 A</u><br>Max. Temp. °F<br>Channel 11: 190°F Channel 10: 170°F<br>Temp. Channel 11: 190°F Temp. Channel 12: 182°F<br>Temp. Channel 11: 190°F Temp. Channel 12: 182°F<br>Tested By Maxard Date: <u>Ambient</u><br>Witness Date: <u>Ambient</u> Date: <u>Ambient</u><br>Otlee of <u>Maxard Date</u> <u>100</u>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Customer   | Stone & Webst   | er        |                                       |                      | WYLE LABO                             | DRATORIES   |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|-----------------|-----------|---------------------------------------|----------------------|---------------------------------------|-------------|
| pec. <u>WLTP 47906-01</u><br>pec. <u>WLTP 47906-01</u><br>ara. <u>3.2.3</u><br>Test Med. <u>Air</u> Start Date <u>3.26-85</u><br>Test Med. <u>Air</u> Start Date <u>3.26-85</u><br>Specimen Temp. <u>Ambient</u><br>Specimen Temp. <u>Channel 11</u> : <u>74</u><br>Temp. <u>Channel 11</u> : <u>170°F</u><br><u>Channel 11</u> : <u>170°F</u><br>Channel 11: <u>170°F</u><br>Channel 11: <u>170°F</u><br>Channel 11: <u>170°F</u><br>Channel 12: <u>182°F</u><br>Date: <u>Muteus</u><br>Witness <u>Muteus</u> <u>Date</u><br><u>Speciment</u> <u>Speciment</u> | Specimen _ | Cables          |           |                                       |                      |                                       | 1700/       |
| ara.       3.47.3       Test Med.       Arr       Start Date       3.42.6-85         Sin       No       Specimen Temp.       Ambient       Start Date       3.42.6-85         Sin       No       Specimen Temp.       Ambient       Specimen Temp.       Ambient         Sin       No       Specimen Temp.       Ambient       Specimen Temp.       Ambient         Fault Cable Size:       3/0       AWG.       Trrip(ex       No         No.       Conductors:       3       3.       Specimen Temp.       Ambient         No.       Conductors:       3       3.       Specimen Temp.       Ambient         No.       Conductors:       3       3.       Specimen Temp.       Ambient         Specimen Temp.       Temp.       Channel 11:       7.4       Temp.       Channel 12:       7.4         Temp.       Channel 11:       7.4       Temp.       Channel 12:       7.4         Specimen Temp.       Granel No.       4       Specimen Temp.       4         Current:       170°F       Channel No.       4       Specimen Temp.       5         Channel 11:       190°F       Temp.       Channel 12:       182°F         Speciment Temp. </th <th>Part No.</th> <th></th> <th>· · · ·</th> <th>Amb. Temp.</th> <th>56°F</th> <th> Job No</th> <th>47906</th>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Part No.   |                 | · · · ·   | Amb. Temp.                            | 56°F                 | Job No                                | 47906       |
| ara.       3.47.3       Test Med.       Arr       Start Date       3.42.6-85         Sin       No       Specimen Temp.       Ambient       Start Date       3.42.6-85         Sin       No       Specimen Temp.       Ambient       Specimen Temp.       Ambient         Sin       No       Specimen Temp.       Ambient       Specimen Temp.       Ambient         Fault Cable Size:       3/0       AWG.       Trrip(ex       No         No.       Conductors:       3       3.       Specimen Temp.       Ambient         No.       Conductors:       3       3.       Specimen Temp.       Ambient         No.       Conductors:       3       3.       Specimen Temp.       Ambient         Specimen Temp.       Temp.       Channel 11:       7.4       Temp.       Channel 12:       7.4         Temp.       Channel 11:       7.4       Temp.       Channel 12:       7.4         Specimen Temp.       Granel No.       4       Specimen Temp.       4         Current:       170°F       Channel No.       4       Specimen Temp.       5         Channel 11:       190°F       Temp.       Channel 12:       182°F         Speciment Temp. </td <td>Spec</td> <td>WLTP 47906-01</td> <td></td> <td>Photo</td> <td>Yes</td> <td> Report No.</td> <td>47906-2</td>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Spec       | WLTP 47906-01   |           | Photo                                 | Yes                  | Report No.                            | 47906-2     |
| //N                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Para       | 3.2.3           |           | Test Med                              | AIF                  | Start Date_                           | 8-26-85     |
| sigNo                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 6/N        | <u>N/A</u>      | <u> </u>  | Specimen Te                           | emp. <u>Ambient</u>  |                                       |             |
| Fault Cable Size: $3/0 \ AwG \ Triplex$<br>No. Conductors: 3<br>3.readings after 10 minute application of FLA:<br>Current: 139 A<br>Max. Temp. (12): 74°F/4<br>Temp. Channel 11: 74 Temp. Channel 12: 74<br>5. Readings at beginning of 15-minute period at 90°C ±3°C (189°F-199°F)<br>Current: 335A<br>Max. Temp. °F<br>Channels 1-10: 170°F<br>Channel No. 4<br>Temp. Channel 11: 190°F<br>Temp. Channel 11: 190°F<br>Temp. Channel 11: 190°F<br>Tested By Max. Date: 2000<br>Witness Date: 2000<br>Witness Context Date: 2000<br>3. Feet No. 100 Date: 2000<br>Cate: 2000<br>Cate: 2000<br>Cate: 2000<br>Cate: 2000<br>Cate: 2000<br>Cate: 2000<br>Cate: 2000<br>Cate: 2000<br>Cate: 2000<br>Cate: 2000<br>Cate: 2000<br>Cate: 2000<br>Cate: 2000<br>Cate: 2000<br>Cate: 2000<br>Cate: 2000<br>Cate: 2000<br>Cate: 2000<br>Cate: 2000<br>Cate: 2000<br>Cate: 2000<br>Cate: 2000<br>Cate: 2000<br>Cate: 2000<br>Cate: 2000<br>Cate: 2000<br>Cate: 2000<br>Cate: 2000<br>Cate: 2000<br>Cate: 2000<br>Cate: 2000<br>Cate: 2000<br>Cate: 2000<br>Cate: 2000<br>Cate: 2000<br>Cate: 2000<br>Cate: 2000<br>Cate: 2000<br>Cate: 2000<br>Cate: 2000<br>Cate: 2000<br>Cate: 2000<br>Cate: 2000<br>Cate: 2000<br>Cate: 2000<br>Cate: 2000<br>Cate: 2000<br>Cate: 2000<br>Cate: 2000<br>Cate: 2000<br>Cate: 2000<br>Cate: 2000<br>Cate: 2000<br>Cate: 2000<br>Cate: 2000<br>Cate: 2000<br>Cate: 2000<br>Cate: 2000<br>Cate: 2000<br>Cate: 2000<br>Cate: 2000<br>Cate: 2000<br>Cate: 2000<br>Cate: 2000<br>Cate: 2000<br>Cate: 2000<br>Cate: 2000<br>Cate: 2000<br>Cate: 2000<br>Cate: 2000<br>Cate: 2000<br>Cate: 2000<br>Cate: 2000<br>Cate: 2000<br>Cate: 2000<br>Cate: 2000<br>Cate: 2000<br>Cate: 2000<br>Cate: 2000<br>Cate: 2000<br>Cate: 2000<br>Cate: 2000<br>Cate: 2000<br>Cate: 2000<br>Cate: 2000<br>Cate: 2000<br>Cate: 2000<br>Cate: 2000<br>Cate: 2000<br>Cate: 2000<br>Cate: 2000<br>Cate: 2000<br>Cate: 2000<br>Cate: 2000<br>Cate: 2000<br>Cate: 2000<br>Cate: 2000<br>Cate: 2000<br>Cate: 2000<br>Cate: 2000<br>Cate: 2000<br>Cate: 2000<br>Cate: 2000<br>Cate: 2000<br>Cate: 2000<br>Cate: 2000<br>Cate: 2000<br>Cate: 2000<br>Cate: 2000<br>Cate: 2000<br>Cate: 2000<br>Cate: 2000<br>Cate: 2000<br>Cate: 2000<br>Cate: 2000<br>Cate: 2000<br>Cate: 2000<br>Cate: 2000<br>Cate: 2000<br>Cate: 2000<br>Cate: 2000<br>Cate: 2000<br>Cate: 2000<br>Cate: 2000<br>Cate: 2000<br>Cate: 2000<br>Cate: 2000<br>Cate: 2000                                                                                                                                                                                                                                                                                                                                                                                                                                                            | SI         | NO              |           |                                       |                      |                                       |             |
| No. Conductors: 3<br>3. readings after 10 minute application of FLA:<br>Current: 139 A<br>Max. Temp. °F 74°F/4<br>Temp. Channels 1:: 74 Temp. Channel 12: 74<br>5. Readings at beginning of 15-minute ceriod at 90°C ±3°C (189°F-199°F)<br>Current: 335 A<br>Max. Temp. °F<br>Channels 1-10: 170°F<br>Channel No. 4<br>Temp. Channel 11: 190°F<br>Temp. Channel 11: 190°F<br>Temp. Channel 12: 182°F<br>Tested By Marman, Date: 182°<br>Vitness Date: 190°F<br>Tested By Marman, Date: 182°<br>Vitness Date: 190°F                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | est Title  | Screening Tes   | t No. 8A  |                                       |                      |                                       |             |
| 3: readings after 10 minute application of FLA:<br>Current: 139 A<br>Max. Temp. °F 74°F/4<br>Temp. Channels 1-10: 74 Temp. Channel 12: 74<br>5. Readings at beginning of 15-minute period at 90°C ±3°C (189°F-199°F)<br>Current: 335 A<br>Max. Temp. °F<br>Channels 1-10: /70°F Channel No. 4<br>Temp. Channel 11: 190°F Temp. Channel 12: /82°F<br>Temp. Channel 11: 190°F Temp. Channel 12: /82°F<br>Tested By Maran Date: 2000<br>Vitness Date: 2000<br>Vitness Date: 2000<br>Vitness Date: 2000<br>Vitness Date: 2000<br>Vitness Date: 2000<br>Vitness Date: 2000<br>Vitness Date: 2000<br>Vitness Date: 2000<br>Vitness Date: 2000<br>Vitness Date: 2000<br>Vitness Date: 2000<br>Vitness Date: 2000<br>Vitness Date: 2000<br>Vitness Date: 2000<br>Vitness Date: 2000<br>Vitness Date: 2000<br>Vitness Date: 2000<br>Vitness Date: 2000<br>Vitness Date: 2000<br>Vitness Date: 2000<br>Vitness Date: 2000<br>Vitness Date: 2000<br>Vitness Date: 2000<br>Vitness Date: 2000<br>Vitness Date: 2000<br>Vitness Date: 2000<br>Vitness Date: 2000<br>Vitness Date: 2000<br>Vitness Date: 2000<br>Vitness Date: 2000<br>Vitness Date: 2000<br>Vitness Date: 2000<br>Vitness Date: 2000<br>Vitness Date: 2000<br>Vitness Date: 2000<br>Vitness Date: 2000<br>Vitness Date: 2000<br>Vitness Date: 2000<br>Vitness Date: 2000<br>Vitness Date: 2000<br>Vitness Date: 2000<br>Vitness Date: 2000<br>Vitness Date: 2000<br>Vitness Date: 2000<br>Vitness Date: 2000<br>Vitness Date: 2000<br>Vitness Date: 2000<br>Vitness Date: 2000<br>Vitness Date: 2000<br>Vitness Date: 2000<br>Vitness Date: 2000<br>Vitness Date: 2000<br>Vitness Date: 2000<br>Vitness Date: 2000<br>Vitness Date: 2000<br>Vitness Date: 2000<br>Vitness Date: 2000<br>Vitness Date: 2000<br>Vitness Date: 2000<br>Vitness Date: 2000<br>Vitness Date: 2000<br>Vitness Date: 2000<br>Vitness Date: 2000<br>Vitness Date: 2000<br>Vitness Date: 2000<br>Vitness Date: 2000<br>Vitness Date: 2000<br>Vitness Date: 2000<br>Vitness Date: 2000<br>Vitness Date: 2000<br>Vitness Date: 2000<br>Vitness Date: 2000<br>Vitness Date: 2000<br>Vitness Date: 2000<br>Vitness Date: 2000<br>Vitness Date: 2000<br>Vitness Date: 2000<br>Vitness Date: 2000<br>Vitness Date: 2000<br>Vitness Date: 2000<br>Vitness Date: 2000<br>Vitness Date: 2000<br>Vitness                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Fault Ca   | ble Size: 3/C   | AWG T     | riplex                                |                      |                                       |             |
| 3. readings after 10 minute application of FLA:<br>Current: 139 A<br>Max. Temp. °F<br>Channels 1-10; 74° F /4<br>Temp. Channel 11: 74 Temp. Channel 12: 74<br>5. Readings at beginning of 15-minute period at 90°C ±3°C (189°F-199°F)<br>Current: 335 A<br>Max. Temp. °F<br>Channel No. 4<br>Temp. Channel 11: 190°F<br>Temp. Channel 11: 190°F<br>Temp. Channel 11: 190°F<br>Tested By Maman Date: 200<br>Witness Date: 0<br>Sheet No. 013                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | No. Cond   | luctors: 3      |           | · · · · · · · · · · · · · · · · · · · |                      |                                       | <u></u>     |
| Current:         139 A           Max. Temp. °F         74°F/4           Temp. Channel 11:         74           Temp. Channel 11:         74           S. Readings at beginning of 15-minute period at 90°C ±3°C (189°F-199°F)           Current:         335 A           Max. Temp. °F         Channels 1-10:           Channels 1-10:         170°F           Channel 11:         190°F           Temp. Channel 11:         190°F           Temp. Channel 11:         190°F           Temp. Channel 11:         190°F           Temp. Channel 11:         190°F           Temp. Channel 11:         190°F           Tested By         Mormand           Obtice of         Sheet No.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |            |                 | · · · · · | 1                                     |                      |                                       |             |
| Max. Temp. $F$<br>Channels 1-10; 74° F/4<br>Temp. Channel 11: 74<br>Temp. Channel 11: 74<br>5. Readings at beginning of 15-minute period at 90°C +3°C (189°F-199°F)<br>Current: 335A<br>Max. Temp. $F$<br>Channels 1-10: 170° F<br>Channel No. 4<br>Temp. Channel 11: 190° F<br>Temp. Channel 11: 190° F<br>Tested By Marmath. Date: 900<br>Witness Date: 200<br>Sheet No. 4<br>Sheet                                                                                                                                                                                                                                                                                                                                                                                                                                                        |            |                 |           |                                       |                      |                                       |             |
| Channels 1-10:       14* F / 4         Temp. Channel 11:       74         Temp. Channel 11:       170° F         Channels 1-10:       170° F         Channel 11:       190° F         Temp. Channel 11:       190° F         Temp. Channel 11:       190° F         Temp. Channel 11:       190° F         Temp. Channel 11:       190° F         Tested By       Maxath         Date:       944         Witness       Date:         Obtice of       Maxath                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |            |                 |           |                                       |                      |                                       |             |
| 5. Readings at beginning of 15-minute period at 90°C ±3°C (189°F-199°F)<br>Current: 335A<br>Max. Temp. °F<br>Channels 1-10: 170°F<br>Temp. Channel 11: 190°F<br>Temp. Channel 11: 190°F<br>Temp. Channel 12: 182°F<br>Tested By Momand<br>Witness Date: 9/20<br>Witness Date: 9/20<br>Witness Date: 9/20                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |            |                 | 74°F/     | 4                                     |                      |                                       |             |
| Current:         335A           Max. Temp. °F         Channels 1-10:         170°F         Channel No. 4           Temp. Channel 11:         190°F         Temp. Channel 12:         182°F                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Ten        | mp. Channel II: | 74        |                                       | Temp. Chan           | nel 12: 74                            |             |
| Current:         335A           Max. Temp. °F         Channels 1-10:         170°F         Channel No. 4           Temp. Channel 11:         190°F         Temp. Channel 12:         182°F                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |            |                 |           |                                       |                      |                                       |             |
| Max. Temp. %F     170% F     Channel No. 4       Temp. Channel 11:     190% F     Temp. Channel 12:     182% F         Temp. Channel 11:     190% F     Temp. Channel 12:     182% F         Tested By     Manual Date:     1/26       Witness     Date:     1/26       Sheet No.     01 - 2     01 - 2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |            |                 | <b>m</b>  | nute period                           | at 90°C <u>+</u> 3°( | C (189°F-199°F                        | ')          |
| Temp. Channel II:     190°F     Temp. Channel I2:     182°F       Temp. Channel I2:     182°F                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |            |                 |           |                                       | <u> </u>             | 4.                                    |             |
| Tested By Momand Date: 8/24<br>Witness Date: 01                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |            |                 |           |                                       |                      |                                       |             |
| Tested By Thomach Date: 8/26<br>Witness Date: 0010000000000000000000000000000000000                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Тел        | mp. Channel II: | . 190°F   |                                       | Temp. Chan           | nel 12: 182º                          | <u> </u>    |
| Tested By Thomach Date: 8/26<br>Witness Date: 0010000000000000000000000000000000000                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | •          |                 |           |                                       |                      |                                       |             |
| Tested By Thomach Date: 8/26<br>Witness Date: 0010000000000000000000000000000000000                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |            |                 |           |                                       |                      |                                       |             |
| Tested By Thomach Date: 8/26<br>Witness Date: 0010000000000000000000000000000000000                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |            |                 |           |                                       |                      |                                       |             |
| Tested By Thomach Date: 8/26<br>Witness Date: 0010000000000000000000000000000000000                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |            |                 | <u>.</u>  |                                       |                      |                                       | <u></u>     |
| Tested By Thomach Date: 8/26<br>Witness Date: 0010000000000000000000000000000000000                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |            |                 |           |                                       |                      |                                       |             |
| Tested By Thomach Date: 8/26<br>Witness Date: 0010000000000000000000000000000000000                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |            | ······          |           |                                       |                      |                                       |             |
| Tested By Thomach Date: 8/26<br>Witness Date: 0010000000000000000000000000000000000                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |            |                 |           |                                       |                      |                                       |             |
| Tested By Thomach Date: 8/26<br>Witness Date: 0010000000000000000000000000000000000                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |            |                 |           |                                       |                      |                                       |             |
| Tested By Thomach Date: 8/26<br>Witness Date: 0010000000000000000000000000000000000                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |            |                 |           |                                       |                      |                                       |             |
| Tested By Thomach Date: 8/26<br>Witness Date: 0010000000000000000000000000000000000                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |            | . <u></u>       | <u></u>   | . <u> </u>                            |                      |                                       |             |
| otice of Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |            |                 |           |                                       |                      | · · · · · · · · · · · · · · · · · · · |             |
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| otice of Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other Other                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |            |                 |           |                                       | Tradad Div           | Thomas H.                             | 8/2.6       |
| otice of Sheet No of                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |            |                 |           |                                       |                      | Man                                   |             |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | otion of   |                 |           |                                       |                      | 1                                     |             |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | otice of   | Mm              |           |                                       | Approved             | novin 8.                              | 01<br>26-85 |

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Page No. I-84 Test Report No. 47906-02

# DATA SHEET

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| ustomer          | Stone & W                             | lebster              |                                       |                     | WYLE LABORATORIES         |
|------------------|---------------------------------------|----------------------|---------------------------------------|---------------------|---------------------------|
| pecimen          | Cables                                |                      |                                       | A -                 | •                         |
| art No           | Various                               |                      | Amb. Temp.                            |                     | Job No. <u>47906</u>      |
| Брес             | WLTP 4790                             | 6-01                 | Photo                                 | Yes                 | Report No. <u>47906-2</u> |
| <sup>o</sup> ara | 3.2.3                                 |                      | Test Med                              | Air                 | Start Date 8-26-85        |
| 5/N              | N/A                                   |                      | Specimen To                           | emp. <u>Ambient</u> | •<br>•                    |
| isi              | No                                    |                      |                                       |                     |                           |
| est Title .      | Screening                             | Test No.             | 8A                                    |                     |                           |
| 7.               | Readings a                            | at end of 1          | 5-minute period                       | at 90°C ±3°         | C (189°F-199°F)           |
|                  | Curre                                 |                      | 335A                                  |                     | - <u></u>                 |
|                  | Max<br>Chann                          | Temp. F<br>els_1-10: | 174°F/114                             | . CI                | nannel No. <u>1</u> 4 '   |
|                  | Temp                                  | Channel 1            | 1: 198°F                              | Те                  | emp Channel 12: (?o°F     |
| 9-11.            | Final read                            | ings with t          | est current appli                     | ed: 908A            |                           |
|                  | · · · · · · · · · · · · · · · · · · · | en circuit           | occurs:                               |                     |                           |
|                  |                                       | ed time:             | 2424 sec                              |                     |                           |
|                  |                                       | Temp. F<br>els 1-12: | 1739°F                                | Channel N           | o. <u> </u>               |
|                  | 10. If 15                             | -minutè per          | iod of stabilized                     | temperature         | occurs: N/A               |
|                  | Curre                                 | nt:                  |                                       |                     |                           |
|                  | Elaps                                 | ed time to           | beginning of 15-mi                    | nute period:        |                           |
|                  |                                       | Temp. F              | ·····                                 | Channel N           | 0                         |
|                  | 11. If fa                             | ult cable i          | gnites: N/A                           |                     |                           |
|                  | Elaps                                 | ed time to           | ignition:                             |                     |                           |
|                  |                                       |                      |                                       |                     |                           |
|                  |                                       |                      | · · · · · · · · · · · · · · · · · · · | Tested By           | Monard Date: 9/26/        |
| otice of         | _                                     |                      |                                       | Sheet No.           |                           |
|                  | Mone                                  |                      |                                       |                     |                           |

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 Page No. I-85 Test Report No. 47906-02

## DATA SHEET

| Customer   | Stone & Webster                        |               |                                       | WYLE LABORATORIES        |
|------------|----------------------------------------|---------------|---------------------------------------|--------------------------|
| Specimen   | Cables                                 |               |                                       |                          |
|            | Various                                | Amb. Temp.    | <u>56°F</u>                           | Job No 47906             |
|            | WLTP 47906-01                          | Photo         | Yes                                   | Report No47906-2         |
|            | 3.2.3                                  | Test Med.     | Air                                   | Start Date8-26-85        |
| S/N        |                                        | Specimen Te   | emp. <u>Ambient</u>                   | :                        |
| ASI        |                                        | opaonnen re   |                                       |                          |
|            |                                        |               | <b>A</b> .                            |                          |
| 'est Title | S                                      | creening Test | : No. 8A                              |                          |
|            |                                        |               |                                       |                          |
| 12. Rea    | dings with fault current               |               |                                       | cables 1-5, 2200 amperes |
|            |                                        | for           | cables 6-12)                          | N/A                      |
| ••         |                                        | ······        |                                       |                          |
| •••        | Current:                               |               |                                       |                          |
|            | Max. Temp. °F<br>Channels 1-10:        |               | Channel N                             |                          |
|            | Elapsed time to open                   |               |                                       |                          |
|            | circuit or stable temp:                |               |                                       |                          |
|            | Time to ignition                       |               |                                       |                          |
|            | <u>if applicable:</u>                  |               | ·····                                 |                          |
|            |                                        |               |                                       |                          |
|            | ······································ |               |                                       |                          |
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|            | *                                      |               |                                       |                          |
|            |                                        |               | ~                                     | AT Alal                  |
|            |                                        |               | Tested By                             | Komao/_ Date: 8/26/      |
|            |                                        |               |                                       |                          |
|            |                                        |               | Witness                               | More Date:               |
| otice of   | Mone                                   |               |                                       |                          |

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Test Report No. 47906-02

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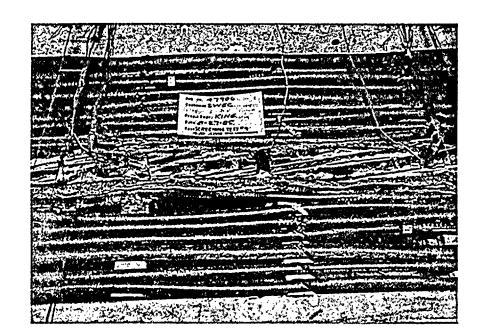
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Test Report No. 47906-02

### SCREENING TEST 9 DATA

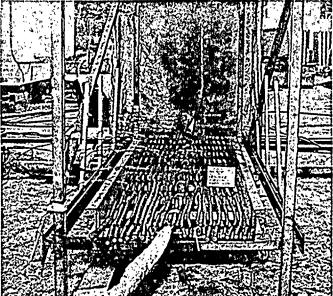
POST-TEST VIEW - CLOSE-UP

PHOTOGRAPH I-29



PRETEST VIEW - OVERALL

PHOTOGRAPH I-27



PHOTOGRAPH I-28

POST-TEST VIEW -- OVERALL

# Page No. 1-88 -

Test Report No. 47906-02

SCREENING TEST #9

(4/0 AWG Triplex-Cu)

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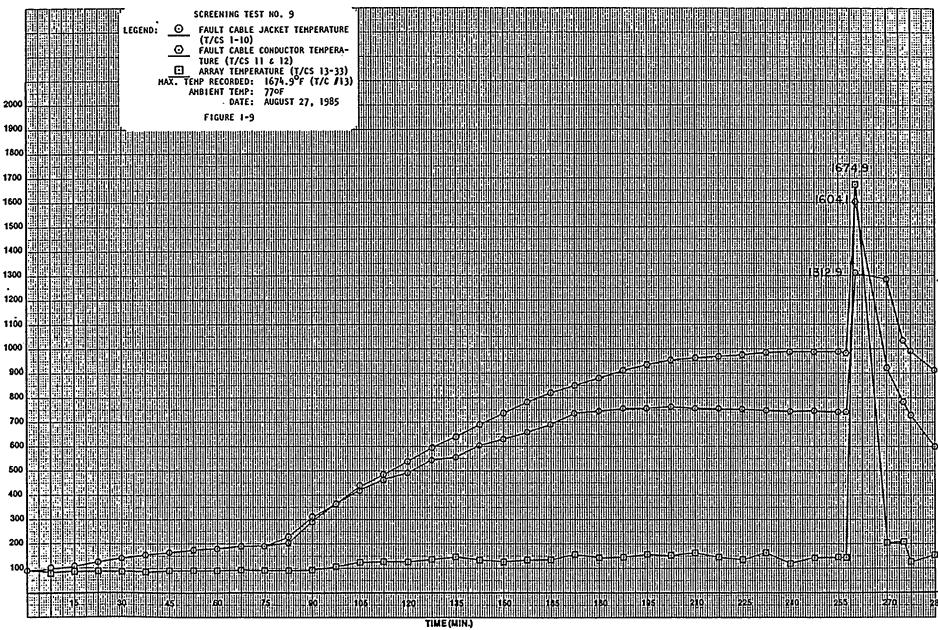
### Test Report No. 47906-02

### SCREENING TEST #9

### (4/0 AWG Triplex-Cu)

| Approximate<br>Test Time | Approximate<br>Jacket Temperature | Observation                                                                                                                                                               |
|--------------------------|-----------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 0 Min                    | 880F                              | Energized cable with 159A                                                                                                                                                 |
| 15 Min                   | 103°F                             | Energized cable with 390A                                                                                                                                                 |
| 65 Min                   | 1820F                             | Conductor at 189°F                                                                                                                                                        |
| 80 Min                   | 187°F                             | Energized cable with 908A<br>(Test current)                                                                                                                               |
| 257.8 Min                | . 744 <sup>0</sup> F              | Cable temperature stabilized<br>for 15 minutes.<br>Energized cable with 1860A<br>(Let-through current is 2200A.<br>1860A was maximum capability<br>of the current source) |
| 259.2 Min                | 1000°F                            | Ignition                                                                                                                                                                  |
| 260.7 Min                | 1313°F                            | Open Circuit — Fire Out                                                                                                                                                   |
| 260.7 Min                | 1313°F                            | Peak conductor temp. (1675°F)                                                                                                                                             |
| 260.7 Min                | 1313 <sup>0</sup> F               | Peak jacket temp. (1313°F)                                                                                                                                                |
| 260.7 Min                | 1313°F                            | Peak array temp. (1604°F)                                                                                                                                                 |

CENTIMETE JEMPERATURE (\*F) 10 TO THE Ň



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Page Report 88 **I-90** 

Page No. I-91 Test Report No. 47906-02 • .

# DATA SHEET

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| Customer                              | Stone & Webster                        |                                        |                      | WYLE LABO    | RATORIES                               |
|---------------------------------------|----------------------------------------|----------------------------------------|----------------------|--------------|----------------------------------------|
| Specimen _                            | Cables                                 |                                        |                      |              | 1                                      |
| Part No.                              | Various 🕴 '                            | Amb. Temp.                             | <u> </u>             | Job No       | 47906                                  |
| Spec                                  | WLTP 47906-01                          | Photo                                  | Yes                  | Report No    | 47906-2                                |
| <sup>2</sup> ara                      | 3.2.3                                  | Test Med                               | Air                  | Start Date_  | 8-27-85                                |
| 5/N                                   | N/A '                                  | Specimen Te                            | mp. <u>Ambient</u>   |              |                                        |
| ssi                                   | No                                     |                                        |                      |              |                                        |
| est Title                             | Screening Test No.                     | 9                                      |                      |              | ·····                                  |
| Fault Ca                              | ble Size: 4/0 AW                       | G Triplex                              |                      |              |                                        |
| No. Cond                              | luctors: 3                             |                                        |                      |              |                                        |
| 3. readin                             | lgs after 10 minute app                | lication of FLA:                       |                      |              |                                        |
|                                       | rent: 159A                             | •                                      | <u> </u>             |              |                                        |
|                                       | c. Temp. F<br>annels 1-10: 92°F        | 12                                     |                      |              |                                        |
|                                       | np. Channel II: 91°F                   | :                                      | Temp. Chann          | el 12: 92°F  |                                        |
|                                       |                                        |                                        |                      |              |                                        |
|                                       | ngs at beginning of 1<br>rrent: 390 A  |                                        | at 90°C <u>+</u> 3°C | (189°F-199°F | )                                      |
|                                       | . Temp. F                              | •                                      | Channel No.          | 2            |                                        |
| Ter                                   | mp. Channel II: _ 180                  | ?° F                                   | Temp. Chann          | el 12: 174ºF |                                        |
| •                                     | •                                      |                                        |                      |              | •                                      |
|                                       |                                        |                                        | <u> </u>             |              |                                        |
|                                       |                                        | ······································ |                      |              |                                        |
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| · · · · · · · · · · · · · · · · · · · | •                                      |                                        | Tested By            | homaol       | Date: 8/27/                            |
|                                       |                                        |                                        | Witness              | Mme          | Date: //                               |
| otice of                              |                                        |                                        | Sheet No.            | 1            | of <u></u>                             |
|                                       | Mone                                   |                                        | Approved             |              | -                                      |

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Page No. I-92 Test Report No. 47906-02

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# DATA SHEET

| Customer.                             | Stone & Webster                                     |                                       |                                   | WYLE LABORATORIES                     |
|---------------------------------------|-----------------------------------------------------|---------------------------------------|-----------------------------------|---------------------------------------|
| Specimen .                            |                                                     |                                       |                                   |                                       |
| Part No                               | Various                                             | Amb. Temp                             |                                   | Job No. <u>47906</u>                  |
| Spec                                  | WLTP 47906-01                                       | Photo                                 | Yes                               | Report No. <u>47906-2</u>             |
| Para                                  | 3.2.3                                               | Test Med                              | Air                               | Start Date8-27-85                     |
| S/N                                   | N/A                                                 | Specimen Te                           | mp. <u>Ambient</u>                | · .                                   |
| GSI                                   | <u>No</u>                                           |                                       |                                   |                                       |
| Test Title _                          | Screening Test No.                                  | 9                                     | ·····                             |                                       |
| 7.                                    | Readings at end of 15-                              | minute period a                       | et <sup>'</sup> 90°C <u>+</u> 3°C | (189°F-199°F)                         |
|                                       | Current:                                            | 355A                                  |                                   |                                       |
|                                       | Max. Temp. <sup>O</sup> F<br>Channels 1-10:         | 187° F                                | 、 Cha                             | annel No. <u>10</u>                   |
|                                       | Temp. Channel 11:                                   | 19505                                 | Ten                               | p Channel 12: 183°F                   |
| 9-11.                                 | Final readings with tes                             |                                       |                                   |                                       |
|                                       | 9. If open circuit oc                               | curs: N/A                             | •                                 |                                       |
|                                       | Elapsed time:                                       |                                       |                                   | ·····                                 |
| · · · · · · · · · · · · · · · · · · · | Max. Temp. F<br>Channels 1-12:                      |                                       | Channel No.                       | •                                     |
| •                                     | 10. If 15-minute period<br>Current:                 | d of stabilized                       | temperature o                     | curs :                                |
| · <u> </u>                            | Elapsed time to be                                  | jinning of 15-mi                      | nute period:                      | 9675 sec                              |
|                                       | Max. Temp. <sup>O</sup> F<br><u>Channels 1-12</u> : | 991°F                                 | Channel No.                       | <u> </u>                              |
|                                       | ll. If fault cable igni                             | tes: N/A                              |                                   |                                       |
| ·····                                 | Elapsed time to igr                                 | nition:                               |                                   |                                       |
|                                       |                                                     |                                       |                                   |                                       |
|                                       | T                                                   | • • • • • • • • • • • • • • • • • • • | Tested By                         | homa of Date: <u>1/2</u><br>Nov Date: |
| lotice of                             |                                                     |                                       | Sheet No                          |                                       |

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Page No. I-93 Test Report No. 47906-02

## DATA SHEET

| Customer       | Stone & Webster                              |                                       |                                             | WYLE LABORATORIES                     |
|----------------|----------------------------------------------|---------------------------------------|---------------------------------------------|---------------------------------------|
| Specimen _     | Cables                                       |                                       | _ =0 -                                      |                                       |
| art No.        | Various                                      |                                       | <u> 77'F</u>                                | Job No47906                           |
| ipec           | WLTP 47906-01                                |                                       | Yes                                         | Report No 47906-2                     |
| ara            | 3.2.3                                        | Test Med                              | Air                                         | Start Date8-27- 85                    |
| /N             |                                              | Specimen Te                           | mp. <u>Ambient</u>                          |                                       |
| SI             |                                              |                                       |                                             |                                       |
| est Title      |                                              | Screening Test                        | No. 9                                       |                                       |
| <u>12. Rea</u> | dings with fault curr                        |                                       | amoeres for ca<br>cables 6-12) <sup>-</sup> | ables 1-5, 2200 amperes               |
|                |                                              |                                       |                                             |                                       |
|                | Current:                                     | 1860                                  |                                             |                                       |
|                | Max. Temp. °F                                | 1313°F                                | Channel No.                                 | 4                                     |
|                | <u>Channels 1-10:</u><br>Elapsed time to ope | n                                     |                                             |                                       |
|                | circuit or stable t                          | emp: 190 sec t                        | o open                                      |                                       |
|                | Time to ignition                             |                                       |                                             |                                       |
|                | if_applicable:                               | 50 sec                                |                                             |                                       |
|                |                                              |                                       |                                             |                                       |
| ··· · ·· ··    |                                              |                                       |                                             | · · · · · · · · · · · · · · · · · · · |
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|                |                                              |                                       |                                             | 7,                                    |
|                |                                              |                                       | A                                           | Eman 1 020: 8/27                      |
|                |                                              |                                       | Tested by Law                               | date.                                 |
|                |                                              |                                       | Witness                                     | Lone Date:                            |
|                |                                              |                                       |                                             |                                       |
| otice of       | Monte                                        |                                       | Sheet No.                                   | 3 of 3<br>main 8.27.85                |

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Test Report No. 47906-02

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Page No. I-95 Test Report No. 47906-02

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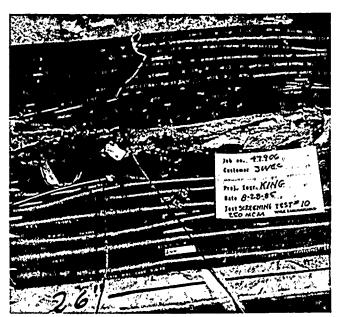
### SCREENING TEST 10 DATA

#### POST-TEST VIEW - CLOSE-UP

### PHOTOGRAPH I-33 POST-TEST VIEW -- CLOSE-UP



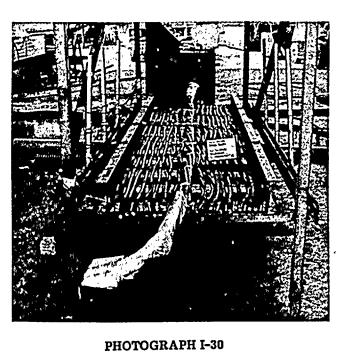




PRETEST VIEW - OVERALL

PHOTOGRAPH I-31 POST-TEST VIEW - OVERALL

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### Page No. I-96

Test Report No. 47906-02

#### SCREENING TEST #10

(250 MCM Triplex-Cu)



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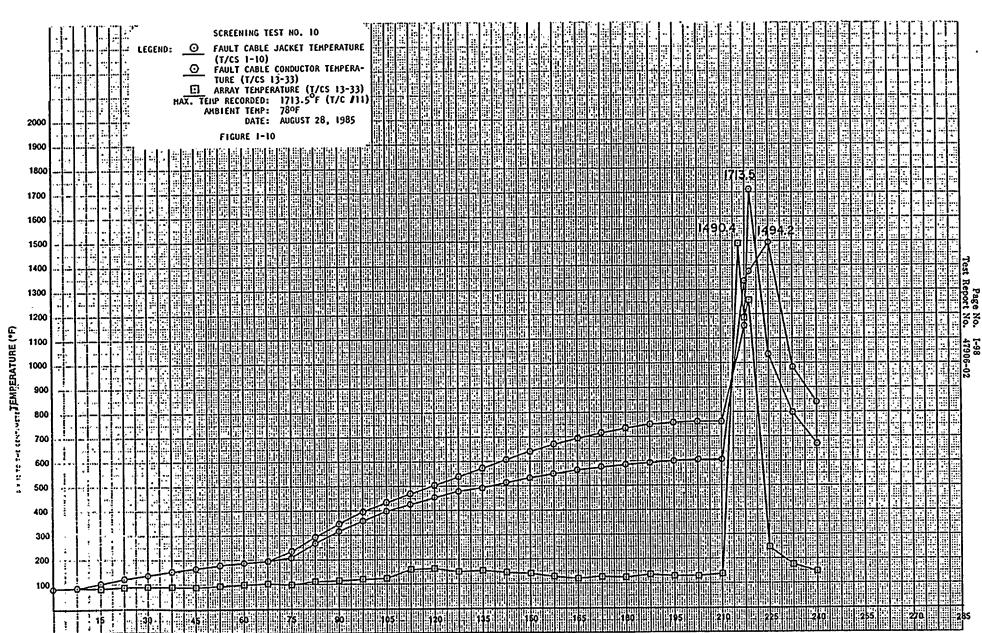
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#### Test Report No. 47906-02

### SCREENING TEST #10

### (250 MCM Triplex-Cu)

| Approximate<br>Test Time | Approximate<br>Jacket Temperature | Observation                                                                                                      |
|--------------------------|-----------------------------------|------------------------------------------------------------------------------------------------------------------|
| 0 Min                    | 830F                              | Energized cable with 159A                                                                                        |
| 10 Min                   | 860F                              | Energized cable with 440A                                                                                        |
| 46.8 Min                 | 180 <b>°</b> F                    | Conductor at 189°F                                                                                               |
| 61.8 Min                 | 190 <sup>0</sup> F.               | Energized cable with 746A<br>(Test current)                                                                      |
| 212.0 Min                | 6090F                             | Cable temperature stabilized<br>Energized cable with 2200A<br>(Max. let-through current<br>of backup protection) |
| 214.2 Min                | 9900F                             | Ignition                                                                                                         |
| 219.0 Min                | 1375°F                            | Peak array temp. (1490°F)                                                                                        |
| 219.0 Min                | 1375°F                            | Peak conductor temp. (1714°F)                                                                                    |
| 220.0 Min                | 1395 <sup>0</sup> F               | Open Circuit                                                                                                     |
| 223.0 Min                | 1455 <sup>0</sup> F               | Fire Out                                                                                                         |
| 225.0 Min                | 1494 <sup>0</sup> F               | Peak jacket temp. (1494 <sup>0</sup> F)                                                                          |
|                          |                                   |                                                                                                                  |



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TIME (MIN.)



Page No. I-99 Test Report No. 47906-02

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# DATA SHEET

| Customer   | Stone & Webster                   | r                   |                   |                                        | WYLE LABO    | RATORIES        |
|------------|-----------------------------------|---------------------|-------------------|----------------------------------------|--------------|-----------------|
| pecimen    | Cables                            |                     |                   |                                        |              |                 |
| art No.    | Various "                         |                     | Amb. Temp.        | 78°F                                   | Job No       | 47906           |
| 0ec        | WLTP 47906-01                     |                     | Photo             | Yac                                    | Report No    | 47906-2         |
| ara        | 2 2 2                             |                     | Test Med          | Air                                    | Start Date   |                 |
| /N         | N/A                               |                     | Specimen Te       | emp. <u>Ambient</u>                    |              |                 |
| SI         | No                                |                     | ·                 | •                                      |              |                 |
| est Title  | .Screening Test                   | No. 10              |                   |                                        | ,            |                 |
| Fault Ca   |                                   | OMCM 7              | <del>riplex</del> |                                        |              |                 |
| No. Cond   | uctors:                           | 3                   |                   |                                        |              |                 |
| 3. readin  | <u>qs after 10 minu</u>           | te_applicat         | ion of FLA:       |                                        |              | •               |
|            |                                   | 59 A                | •                 |                                        |              |                 |
| Max<br>Cha | . Temp. F<br>nnels 1-10:          | 86° F/1             |                   |                                        |              |                 |
| Тел        | o. Channel 11:                    | 88°F                |                   | Temp. Chann                            | el 12: 83°F  | -               |
|            |                                   |                     |                   |                                        |              |                 |
|            | ngs at beginning                  | g of 15-mir<br>430A | nute period       | at 90°C <u>+</u> 3°C                   | (189°F-199°F | )               |
|            | rent:<br>. Temp. F<br>nnels 1-10: | 180 <sup>4</sup> F  |                   | Channel No.                            |              |                 |
|            | p. Channel 11:                    | 18906               |                   |                                        | el 12: 184°F |                 |
|            | ×                                 | ·····               |                   | ······································ | •            |                 |
| ·          |                                   |                     |                   |                                        |              |                 |
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|            | <u></u>                           |                     |                   |                                        |              |                 |
|            | •                                 |                     |                   | Tostad By                              | Romanti      | 8/2.8           |
| •          |                                   |                     |                   | Tested By                              | 44           | Date: 4/20      |
|            |                                   |                     |                   |                                        |              |                 |
| otice of   |                                   |                     |                   | Sheet No.                              |              | Date: _/<br>of3 |

Wvie Form WH 614A, Rev. APR. 34

Page No. I-100 Test Report No. 47906-02

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| ustomer     |                                             |                 |                    | WYLE LABORATORIES                     |  |  |
|-------------|---------------------------------------------|-----------------|--------------------|---------------------------------------|--|--|
| ipecimen    |                                             |                 | 5 a.A -            |                                       |  |  |
| Part No     | Various                                     | Amb. Temp.      |                    | Job No. <u>47906</u>                  |  |  |
| Spec        | WLTP 47906-01                               | Photo           | Yes                | Report No. <u>47906-2</u>             |  |  |
| ara         | 3.2.3                                       |                 | <u>Air</u>         | Start Date8/2.8/8.5                   |  |  |
| 5/N         | N/A                                         | Specimen Te     | mp. <u>Ambient</u> |                                       |  |  |
| GSI         | <u>No</u>                                   |                 | -                  |                                       |  |  |
| est Title . | Screening Test No.                          | 10              |                    | · · · · · · · · · · · · · · · · · · · |  |  |
| 7.          | Readings at end of 15-                      | minute period a | t 90°C ±3°C        | (189°F-199°F)                         |  |  |
|             | Current: d                                  | 00              |                    | · · · · · · · · · · · · · · · · · · · |  |  |
|             | Max. Temp. <sup>O</sup> F<br>Channels 1-10  | 190°F           | . Cha              | nnel No/                              |  |  |
|             | Temp. Channel 11:                           | 203° E          | Теп                | p Channel 12: 196°F                   |  |  |
| 9-11.       |                                             |                 |                    |                                       |  |  |
|             | 9. If open circuit oc                       | urs: N/A        | ······             |                                       |  |  |
|             | Elapsed time:                               |                 |                    |                                       |  |  |
|             | Max. Temp. <sup>6</sup> F<br>Channels 1-12: |                 | Channel No.        | · · · · · · · · · · · · · · · · · · · |  |  |
|             |                                             |                 |                    |                                       |  |  |
|             | 10. If 15-minute period                     | f of stabilized | temperature oc     | curs:                                 |  |  |
|             | 'Current: 746/                              | ۹               |                    |                                       |  |  |
|             | Elapsed time to beg                         | inning of 15-mi | nute period:       | 72/0 500                              |  |  |
|             | Max. Temp. F<br>Channels 1-12:              | 746°F           | Channel No.        |                                       |  |  |
|             | ll. If fault cable igni                     | tes: N/A        |                    |                                       |  |  |
|             | Elapsed time to ign                         |                 |                    |                                       |  |  |
|             | · · · · · · · · · · · · · · · · · · ·       |                 |                    |                                       |  |  |
|             |                                             |                 | Tested By          | Date: 8/28/8                          |  |  |
| otice of    | Δ                                           |                 | Sheet No           | 2 of                                  |  |  |
| nomaly _    | More                                        |                 | Approved           | Min 8.28.85                           |  |  |

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Page No. I-101 Test Report No. 47906-02

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| Customer                              |                                        |                |                                       | WYLE LABORATORIES                                               |
|---------------------------------------|----------------------------------------|----------------|---------------------------------------|-----------------------------------------------------------------|
| Specimen                              |                                        |                |                                       |                                                                 |
| Part No                               |                                        |                | <u></u>                               | Job No47906                                                     |
| Spec                                  | WLTP 47906-01                          | . Photo        | Yes                                   | Report No47906-2                                                |
| Para                                  | 3.2.3                                  | . Test Med     | Air                                   | Start Date8/28/85                                               |
| S/N                                   |                                        | _ Specimen Te  | emp. <u>Ambient</u>                   |                                                                 |
| GSI                                   | No                                     | -              |                                       |                                                                 |
| Test Title                            |                                        | Screening Test | t No. /0                              | ء<br>                                                           |
| 12. Rea                               | dings with fault current               |                |                                       | les 1-5, 2200 amperes                                           |
|                                       |                                        | for            | cables 6-12)                          | •                                                               |
|                                       |                                        |                |                                       | <u> </u>                                                        |
|                                       | Current: 220                           | 00A            |                                       |                                                                 |
| ,                                     | Max. Temp. °F<br>Channels 1-10:        | 494°F          | Channel No.                           | <u>+</u>                                                        |
|                                       | Elansed time to open                   |                |                                       |                                                                 |
|                                       | circuit or stable temp                 | : 350 sec      | <u> </u>                              |                                                                 |
|                                       | Time to ignition                       | 125 sec        |                                       |                                                                 |
|                                       |                                        |                |                                       |                                                                 |
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|                                       |                                        |                |                                       | 7                                                               |
|                                       |                                        |                | Call                                  |                                                                 |
|                                       |                                        |                | Tootod Du 19786                       | OMARL - 8/1                                                     |
|                                       |                                        |                | Tested By                             | Date: 8/2                                                       |
| lotice of                             |                                        |                | Tested By Witness                     | <u></u> Date: <u>8/2</u><br><u></u> Date: <u></u><br>of <u></u> |

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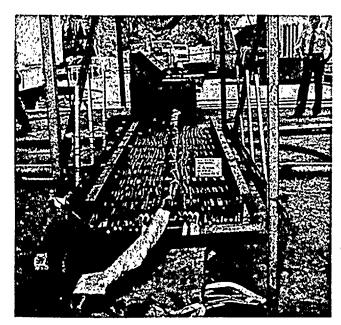
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### SCREENING TEST 11 DATA

Test Report No. 47906-02

#### SCREENING TEST #11

(350 MCM Triplex-Cu)





PHOTOGRAPH I-34 PRETEST VIEW — OVERALL PHOTOGRAPH I-35 POST-TEST VIEW -- OVERALL . .



PHOTOGRAPH I-36

POST-TEST VIEW - CLOSE-UP

### Test Report No. 47906-02

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#### SCREENING TEST #11

### (350 MCM Triplex-Cu)

| Approximate<br>Test Time | Approximate<br>Jacket Temperature | Observation                                                                                                      |  |
|--------------------------|-----------------------------------|------------------------------------------------------------------------------------------------------------------|--|
| 0 Min                    | 790F                              | Energized cable with 159A                                                                                        |  |
| 10 Min                   | 810F                              | Energized cable with 500A                                                                                        |  |
| 101.7 Min                | 1810F                             | Conductor at 1890F                                                                                               |  |
| 116.7 Min                | 187°F .                           | Energized cable with 746A<br>(Test current)                                                                      |  |
| 215.0 Min                | 329°F                             | Cable temperature stabilized<br>Energized cable with 2200A<br>(Max. let-through current<br>of backup protection) |  |
| 221.5 Min                | 940°F                             | Ignition                                                                                                         |  |
| 222.8 Min                | 1100°F                            | Peak array temp. (1561°F)                                                                                        |  |
| 226.8 Min                | 1599°F                            | Open Circuit                                                                                                     |  |
| 226.8 Min                | 1599 <sup>0</sup> F               | Peak conductor temp. (1207°F)                                                                                    |  |
| 226.8 Min                | 1494 <b>°</b> F                   | Peak jacket temp. (1599°F)                                                                                       |  |
| 231.2 Min                | 1330°F                            | Fire Out                                                                                                         |  |
|                          |                                   |                                                                                                                  |  |

----SCREENING TEST NO. 11 C FAULT CABLE JACKET TEMPERATURE (T/CS 1-10)
 G FAULT CABLE CONDUCTOR TEMPERA- TURE (T/CS 13-33)
 E ARRAY TEMPERATURE (T/CS 13-33)
 MAX. TEMP RECORDED: 1599.3°F (T/C 15)
 AMBIENT TEMP: 78°F
 DATE- AUGUST 29, 1985 LEGEND: DATE: AUGUST 29, 1985 2000 FIGURE 1-11 1900 1800 1700 5993 18 156D 1600 ø 1500 IHI linin 1400 1300 1200 1100 1000 900 800 700 Ħ 600 lin li 500 400 300 ..... 200 ÷ 1 ni hite ŕ a faile 100 З. : 20

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TIME (MIN.)

Page No. 1-106 Test Report No. 47906-02 Page No. I-107 Test Report No. 47906-02

# DATA SHEET

| Customer        | Stone & Webster                               |            |             |                                               | WYLE LABO    | RATORIES   |
|-----------------|-----------------------------------------------|------------|-------------|-----------------------------------------------|--------------|------------|
| Specimen _      | Cables                                        |            |             | <b>.</b>                                      |              |            |
| Part No.        | Various                                       |            | Amb. Temp.  | <u>_78°F</u>                                  | Job No       | 47906      |
| Spec            | WC11 4/ 00 01                                 |            | Photo       | Yes                                           | Report No    | 47906-2    |
| Para.           | 3.2.3                                         |            | Test Med.   | Yes<br>Air                                    | Start Date_  | 8/29/85    |
| S/N             |                                               |            | Soecimen Te | emp. <u>Ambient</u>                           |              | •          |
| GSI             | No                                            |            |             |                                               |              |            |
| Test Title      | Screening Test                                | No. 11     |             |                                               |              |            |
| Fault Ca        | ble Size: 350                                 | мсм        | Triplex     | ·······                                       |              |            |
| No. Cond        | uctors: 3                                     |            |             |                                               | · ,,         |            |
|                 |                                               | •          |             |                                               |              |            |
| <u>3.readin</u> | los after 10 minut                            | e_applicat | ion of FLA: |                                               | ·····        |            |
| Cur             | rent:                                         | 159A       | •           |                                               |              |            |
| Max<br>Cha      | . Temp. F                                     | 81ºF/      | <u> </u>    |                                               |              |            |
| Terr            | mp. Channel 11:                               | 81°F       |             | Temp. Chann                                   | el 12: 80°F  |            |
|                 |                                               |            |             |                                               |              |            |
| C 0             |                                               |            |             |                                               | (19085 10085 | ·····      |
| 5. Readi        | ngs at beginning                              | OT 15-mi   |             | at 90°C +3 C                                  | (109 199 -   | )          |
| Cur             | rent:<br>. Temp. F                            | 520A       |             |                                               |              |            |
|                 | innels 1-10:                                  | 181°F      |             | Channel No.                                   | _10          |            |
| ſ               | mp. Channel 11:                               |            |             |                                               | el 12: 176°  | F          |
|                 | · <u>·</u> ·································· |            |             | ·····                                         | ·····        |            |
|                 | <u></u>                                       |            |             | ··· <u>··················</u> ··············· |              |            |
|                 |                                               |            |             | <u></u>                                       |              |            |
|                 | ······································        | <u>.</u>   |             |                                               |              |            |
|                 |                                               |            |             | <u> </u>                                      |              |            |
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|                 |                                               |            |             |                                               |              | . <u> </u> |
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| L               |                                               |            | <u></u>     | A                                             | How a DII.   | olaola     |
|                 | *                                             |            |             | Tested By                                     | nomuo//_     | Date:      |
|                 |                                               |            |             | Witness                                       | "lime_"      | Date:      |
| Notice of       | м                                             |            |             | Sheet No.                                     | Mr. ~        | of <u></u> |
| Anomaly         | More                                          |            |             | Approved                                      | Flung 8.     | 29.85      |

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# DATA SHEET

|                     | A ( )                          |                   |                     | WYLE LABORATORIES                                 |
|---------------------|--------------------------------|-------------------|---------------------|---------------------------------------------------|
| Specimen            | Various                        | A 1_ ==           | 78°F                | 1.1.1.1.1.700/                                    |
| <sup>o</sup> art No | WLTP 47906-01                  | Amb. Temp.        |                     | Job No. <u>47906</u>                              |
| Spec                | 3.2.3                          | Photo             |                     | Report No. <u>47906-2</u>                         |
| <sup>5</sup> ara    | N/A                            | Test Med          |                     | Start Date8/29/85                                 |
| 5/N                 | <br>No                         | Specimen Te       | emp. <u>Ambient</u> |                                                   |
| 3SI                 |                                |                   |                     |                                                   |
| rest Title .        | Screening Test No.             | l                 | 2                   |                                                   |
|                     |                                | ·                 |                     |                                                   |
| 7.                  | Readings at end of 15          | -minute period a  | at 90°C ±3°C        | (189°F-199°F)                                     |
|                     |                                |                   |                     | ······································            |
|                     | Current:                       | 520A              |                     |                                                   |
|                     | Max. Temp. F<br>Channels 1-10: | 187°F             | . Ch                | annel No. <u>10</u>                               |
|                     | Temp. Channel 11               | : 195°F           | Те                  | mp Channel 12: 181°F                              |
| 9-11.               | Final readings with te         | st current applie | ed:                 |                                                   |
|                     | 9. If open circuit of          | ccurs: N/A        |                     |                                                   |
|                     | Elapsed time:                  |                   |                     |                                                   |
|                     | Max. Temp. F                   |                   | Channel No          | ·····                                             |
|                     | Channels 1-12:                 |                   |                     |                                                   |
|                     | 10. If 15-minute perio         | od of stabilized  | temperature o       | occurs :                                          |
|                     | Current: 746A                  | l                 |                     |                                                   |
|                     | Elapsed time to be             | ginning of 15-mi  | nute period:        | 4800 sec                                          |
|                     | Max. Temp. F                   | 353°F             |                     |                                                   |
|                     | Channels 1-12:                 | 222 L             | Channel No          | · · · · · · · · · · · · · · · · · · ·             |
|                     | 11. If fault cable igr         | nites: N/A        |                     |                                                   |
|                     | Elapsed time to ig             |                   |                     | <u> </u>                                          |
|                     |                                |                   |                     |                                                   |
|                     |                                |                   |                     | <del>, , , , , , , , , , , , , , , , , , , </del> |
|                     | ,                              |                   | Tested By           | Komaot Date: 8/2                                  |
|                     |                                |                   | Witness             | Date:                                             |
| otice of            | Mr.                            |                   | Sheet No.           | of <u></u>                                        |
|                     |                                |                   |                     | Miline 8.29-85                                    |

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# DATA SHEET

| Customer   | Stone & Webster                 |                                       |                                | WYLE LABORATORIES                     |
|------------|---------------------------------|---------------------------------------|--------------------------------|---------------------------------------|
| Specimen 🗕 | Cables                          |                                       | <u> </u>                       |                                       |
| Part No    | Various                         | Amb. Temp.                            | 18°F                           | Job No 47906                          |
| Spec       | WLTP 47906-01                   | _ Photo                               | Yes                            | Report No. <u>47906-2</u>             |
| ara        | 3.2.3                           | _ Test Med                            | Air                            | Start Date8/29/85                     |
| 5/N        | N/A                             | Specimen Te                           | mp. <u>Ambient</u>             |                                       |
| 3SI        |                                 |                                       | •                              |                                       |
| est Title  |                                 | Screening Test                        | : No. 11                       |                                       |
| 12. Rea    | dings with fault current        |                                       | amoeres for ca<br>cables 6-12) |                                       |
|            |                                 |                                       | · · · · · <u></u>              |                                       |
|            | Current:                        | 2200A                                 |                                |                                       |
|            | Max. Temp. °F<br>Channels 1-10: | 15990 5                               | Channel Ne                     | 5                                     |
|            |                                 |                                       |                                |                                       |
|            | circuit or stable temp          | 2: 710 sec                            | <u></u>                        | · · · · · · · · · · · · · · · · · · · |
|            | Time to ignition                |                                       |                                |                                       |
|            |                                 | 370 340                               | •                              | · · · · · · · · · · · · · · · · · · · |
|            |                                 |                                       |                                |                                       |
|            | · · · · ·                       | · · · · · · · · · · · · · · · · · · · | ······                         |                                       |
|            | •                               |                                       |                                |                                       |
| <u></u>    |                                 | ······                                |                                | ····                                  |
|            |                                 |                                       |                                |                                       |
|            |                                 |                                       |                                |                                       |
|            |                                 |                                       | Tested By                      | Komaoff Date: 8/29/                   |
| otice of   |                                 |                                       | Sheet No.                      | 3 of 3                                |
| nomaly     | Mme                             |                                       | Approved                       | Main 8.29.85                          |

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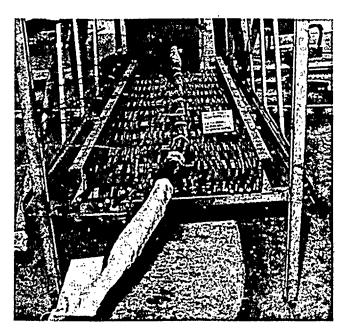
f - 54

#### SCREENING TEST 12 DATA

Test Report No. 47906-02

#### SCREENING TEST #12

(500 MCM Triplex-Cu)



PHOTOGRAPH I-37

PRETEST VIEW -- OVERALL

 PHOTOGRAPH I-38

POST-TEST VIEW - OVERALL



PHOTOGRAPH I-39 POST-TEST VIEW — CLOSE-UP

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Test Report No. 47906-02

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#### SCREENING TEST #12

## (500 MCM Triplex-Cu)

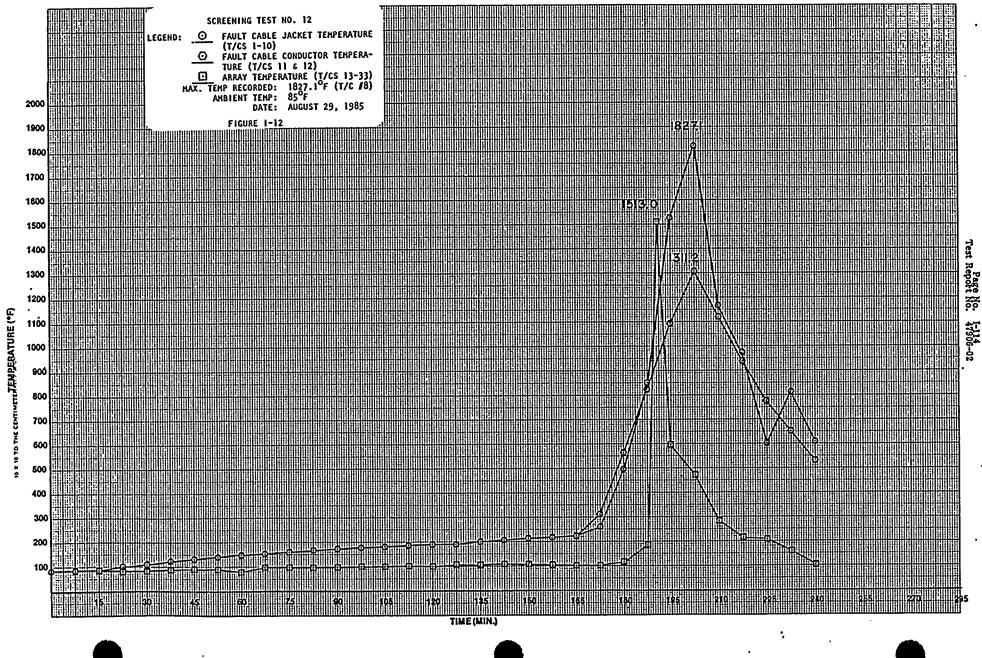
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| Approximate<br>Test Time | Approximate<br>Jacket Temperature | Observation                                                                                                      |
|--------------------------|-----------------------------------|------------------------------------------------------------------------------------------------------------------|
| 0 Min                    | 86°F                              | Energized cable with 159A                                                                                        |
| 15 Min                   | 880F                              | Energized cable with 615A                                                                                        |
| 110 Min                  | 1810F                             | Conductor at 1890 <sub>F</sub>                                                                                   |
| 125 Min                  | 187 <sup>0</sup> F ·              | Energized cable with 746A<br>(Test current)                                                                      |
| 170 Min                  | 217 <sup>0</sup> F                | Cable temperature stabilized<br>Energized cable with 2200A<br>(Max. let-through current<br>of backup protection) |
| 188 Min                  | 907°F                             | Ignition                                                                                                         |
| 190.5 Min                | 1120°F                            | Peak array temp. (1513°F)                                                                                        |
| 202.7 Min                | 1803°F                            | Open Circuit                                                                                                     |
| 208.0 Min                | 1340 <sup>0</sup> F               | Fire Out                                                                                                         |
| 202.5 Min                | 1827 <sup>0</sup> F               | Peak conductor temp. (1311 <sup>o</sup> F)                                                                       |
| 202.5 Min                | 1827 <sup>o</sup> F               | Peak jacket temp. (1827°F)                                                                                       |

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Page No. I-115 Test Report No. 47906-02

# DATA SHEET

| Customer                 | Stone & W                         | ebst    | er              |             |                                         | WYLE LABO       | RATORIES                    |
|--------------------------|-----------------------------------|---------|-----------------|-------------|-----------------------------------------|-----------------|-----------------------------|
| pecimen                  |                                   |         |                 |             |                                         |                 |                             |
| art No.                  | Various                           |         |                 | Amb. Temp.  | 85°F                                    | Job No          | 47906                       |
| pec                      |                                   | 6-01    |                 | Photo       | Yes                                     | Report No       | 47906-2                     |
| ara                      | 3.2.3                             |         |                 | Test Med    | Air                                     | Start Date      | 8/29/85                     |
| /N                       | N/A                               |         |                 | Specimen Te | emp. <u>Ambier</u>                      | 1t              |                             |
| SI                       | No                                |         |                 | -           |                                         |                 |                             |
| est Title                | Screening                         | Tes     | t No. 12        |             |                                         |                 |                             |
| Fault Ca                 | ble Size:                         | 5       | оомсм           | Triplex     |                                         |                 |                             |
| No. Cond                 | uctors:                           | 3       |                 |             |                                         |                 |                             |
| 3. readin                | qs after 10                       | <u></u> | ute applicat    | ion of FLA: |                                         |                 |                             |
| Cur                      | rent:                             |         | 159A            | •           |                                         |                 |                             |
| Max                      | . Temp. F<br>nnels 1-10:          |         | 88°F/6          |             |                                         |                 |                             |
|                          | mo. Channel                       |         | 86° F           | 4           | Temp Ch                                 | annel 12: 86°F  |                             |
| len                      | b. channel                        | 11.     | 00 1            |             | Temp: on                                |                 |                             |
| <u>Cur</u><br>Max<br>Cha | rent:<br>. Temp. F<br>nnels 1-10: |         | 650 A<br>181° F |             | Channe !                                | No              |                             |
| Tem                      | p. Channel                        | 11:     | .189°F          |             | Temp. Ch                                | annel 12: 181°F |                             |
|                          |                                   |         |                 | <u></u>     | · _ ·                                   |                 |                             |
|                          | · · ·                             |         |                 |             |                                         |                 |                             |
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|                          |                                   |         |                 |             | ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~ | Allonnoul       | ×/29                        |
|                          |                                   |         |                 |             | Tested By -                             | Romant          | Date: <u>8/29</u>           |
| otice of                 |                                   |         |                 |             | Tested By                               | Mormant         | Date: <u>8/29/</u><br>Date: |

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# DATA SHEET

| Customer .<br>Specimen . | Stone & Webster<br>Cables                   |                                   | WYLE LABORATORIES                     |
|--------------------------|---------------------------------------------|-----------------------------------|---------------------------------------|
| Part No.                 | Various                                     | Amb. Temp                         | Job No. <u>47906</u>                  |
| Spec                     | WLTP 47906-01                               | PhotoYes                          | Report No47906-2                      |
| Para                     | 3.2.3                                       | Test MedAir                       | Start Date8/2.9/8                     |
| S/N                      | N/A                                         | Specimen TempAmbien               |                                       |
| GSI                      | <u>No</u>                                   |                                   |                                       |
| Test Title _             | Screening Test No. 12                       |                                   |                                       |
| 7.                       | Readings at end of 15-m                     | ninute period at 90°C <u>+</u> 3° | °C (189°F-199°F)                      |
|                          | Current:                                    | 650A                              |                                       |
|                          | Max. Temp. <sup>O</sup> F<br>Channels 1-10: | 187°F                             | Channel No. <u>9</u>                  |
|                          | Temp. Channel 11:                           | 196°F                             | Temp Channel 12: 189°F                |
| 9-11.                    | Final readings with test                    |                                   | · · · · · · · · · · · · · · · · · · · |
|                          | 9. If open circuit occ                      | urs: N/A                          | · · · · · · · · · · · · · · · · · · · |
|                          | Elapsed time: 4                             | <del>800 sec.</del>               |                                       |
|                          | Max. Temp. <sup>0</sup> F<br>Channels 1-12: | Channel                           | No                                    |
|                          | 10. If 15-minute period                     | of stabilized temperature         | occurs :                              |
|                          | Current: 746A                               | <u>i</u>                          |                                       |
|                          |                                             | inning of 15-minute period        | : 1800 sec                            |
|                          | Max. Temp. F<br>Channels 1-12: 2            | 32°F Channel                      | No. 11                                |
|                          | 11. If fault cable igni                     | tes: N/A                          |                                       |
|                          | Elapsed time to ign                         |                                   |                                       |
|                          |                                             |                                   |                                       |
|                          |                                             | Tested By<br>Witness              | Monard Date: 8/2<br>Date:             |
|                          |                                             |                                   |                                       |

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# DATA SHEET

| Customer    | Stone & Webster                        |                |                                        | WYLE LABORATORIES        |
|-------------|----------------------------------------|----------------|----------------------------------------|--------------------------|
|             | Cables                                 |                |                                        |                          |
| Part No.    | Various                                | Amb. Temp.     | 85°F                                   | Job No. <u>47906</u>     |
| Spec        | WLTP 47906-01                          | Photo          | Yes                                    | Report No47906-2         |
| Para.       | 3.2.3                                  | Test Med       | Air                                    | Start Date8/2.9/85       |
| S/N         | N/A                                    |                | mp. <u>Ambient</u>                     |                          |
| GSI         |                                        |                |                                        |                          |
| Fest Title  | ······································ | Screening Test | : No. 12                               |                          |
| 12. Rea     | dings with fault currer                |                |                                        | ables 1-5, 2200 amoeres  |
| · · · · · · |                                        | for            | cables 6-12)                           |                          |
|             | Current:                               | 2200 A         | ······································ |                          |
|             | Max. Temp. °F                          |                |                                        | 8                        |
|             | Channels 1-10:<br>Elapsed time to open | 10617          | Channel No.                            |                          |
|             | <u>circuit or stable ten</u>           | no: 1964 sec   | •                                      |                          |
|             | Time to ignition                       |                |                                        |                          |
|             | if applicable:                         | 1085 54        | <u> </u>                               |                          |
|             |                                        |                |                                        |                          |
| ¶. 94/1≏    |                                        |                |                                        |                          |
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|             |                                        |                | Tested By                              | homaoff_ Date: 8/2       |
| - 47 4      |                                        |                | Witness                                | <u>More //</u> Date: / / |
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| nomaly      | IV made                                |                | Approved                               | Min 8.29-85              |

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Test Report No. 47906-02

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# CONFIGURATION NO. 1 TESTS (Separation of Cable in Free Air to Cable in Free Air Without Barriers)

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Test Report No. 47906-02

#### SECTION II

#### CONFIGURATION NUMBER 1 TESTS (SEPARATION OF CABLE IN FREE AIR TO CABLE IN FREE AIR WITHOUT BARRIERS)

1.0 REQUIREMENTS

1.1 Acceptance Criteria

#### 1.1.1 Insulation Resistance Test

Insulation resistance on all "target cables"\* shall be greater than 1.6 x  $10^6$  ohms with a potential of 1000 VDC (500 VDC 2/C 16 AWG cables) applied for 60 seconds.

#### 1.1.2 High Potential Test

There shall be no evidence of insulation breakdown or flashover with a potential of 2200 VAC (1600 VAC for 2/C 16 AWG cables) applied for one minute.

#### 1.1.3 Cable Continuity Test

Energized specimens in the target raceway shall conduct 100% of SWEC-rated currents (see table below) at 575 VAC (120 VAC for control cables and 50 VAC for instrument cables) before, during, and after the overcurrent test.

| Cable<br>Size | No.<br>Conductors | SWEC<br>I.D. No. | Cable<br><u>Type</u> | Voltage | Rated<br>Current |
|---------------|-------------------|------------------|----------------------|---------|------------------|
| 1/0 AWG       | Triplex           | NJM-34           | L                    | 575     | 139              |
| 2 AWG         | Triplex           | NJM-25           | K                    | 575     | 38.5             |
| 12 AWG        | 7                 | NJN-37           | С                    | 120     | 10               |
| 16 AWG        | 2/C               | NJP-05           | x                    | 50      | 1                |

#### 1.1.4 Tolerances

All target cable voltages specified in this procedure shall be maintained within a  $\pm 3\%$  tolerance. The initial setting of target cable currents (with rated current on the fault cable) shall have a tolerance of  $\pm 10\%$ , -0%. Thereafter, all target cables' currents shall be maintained within a  $\pm 10\%$  tolerance.

All fault cable currents shall be maintained within a  $\pm 3\%$  tolerance, if possible.

\*

The term "target cable" refers to energized and monitored nonfault cables used in this program.

Test Report No. 47906-02

#### 2.0 PROCEDURES

#### 2.1 Test Specimen Preparation

The test specimens were mounted to the unistrut frame assembly as shown in Figures 2, 3 and 4 of Section VIII. This apparatus was assembled to the indicated dimensions by Wyle technicians using materials supplied by the customer. The following was observed with regard to the materials and construction of the assembly:

1. The faulted cable was a Triplex 2/0 AWG cable from NMP2 stock for all three tests.

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- 2. The ends of the faulted cable from their termination at the copper bus bar to the edge of the unistrut frame were wrapped with a single layer of HAVEG SILTEMP WT-65 covered with a single layer of 3M No. 69 glass tape. This wrapping was done to ensure that any ignition that might occur was contained to the test area.
- 3. For Test No. 1:

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- The vertically separated target cable was a Triplex 2 AWG cable from NMP2 stock. This cable was loosely tied to the unistrut of Figure 2 in Section VIII, with ceramic tie cords, such that the cable was 9 inches vertically above the centerline of the faulted cable.
- The horizontally separated target cable was a 2/C 16 AWG cable from NMP2 stock. This cable was mounted such that the cable was 6 inches horizontally away from the faulted cable.
- The vertical cable was a 7/C 12 AWG cable from NMP2 stock. This cable was mounted such that the cable was 6 inches away from the fault cable.
- 4. For Test No. 2:
  - The upper horizontal target cable was a Triplex 2 AWG cable from NMP2 stock. This cable was loosely tied to the unistrut of Figure 3 in Section VIII such that the cable was located 6 inches horizontally from the perpendicular fault cable and 9 inches above the lower target cable.
  - The lower horizontal target cable was a 7/C 12 AWG cable from NMP2 stock. This cable was loosely tied to the unistrut of Figure 3 in Section VIII such that the cable was located 6 inches from the perpendicular fault cable.
- 5. For Test No. 3:
  - The horizontal cable tray was filled to its siderails with K-Type cables from NMP2 stock as shown in Figure 4, Section VIII. The bottom centerline cable was a Triplex 2 AWG cable. The cable tray was mounted parallel to the centerline of the fault cable such that it was 9 inches vertically above this cable.
- 6. Photographs were taken of the test setup prior to each test.

#### Test Report No. 47906-02

2.0 PROCEDURES (Continued)

2.2 Instrumentation Setup

2.2.1 Thermocouple Locations

#### Test No. 1

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A total of 26 Type "K" thermocouples were utilized for this test. These thermocouples were mounted as described below.

| Channel No. | Location                                                                                                                           |
|-------------|------------------------------------------------------------------------------------------------------------------------------------|
| 1-6         | Mounted to the jacket on the fault cable. These thermocouples were mounted approximately 16 inches apart.                          |
| 7 & 8       | Mounted to the conductor of the fault cables at the two series connections.                                                        |
| 9-14        | Mounted to the jacket on the vertically separated target cable.<br>These thermocouples were mounted approximately 16 inches apart. |
| 15-20       | Mounted to the jacket on the horizontally separated target cable. These thermocouples were mounted approximately 16 inches apart.  |
| 21-26       | Mounted to the jacket on the perpendicular target cable. These thermocouples were mounted approximately 10 inches apart.           |

#### Test No. 2

A total of 20 Type "K" thermocouples were utilized for this test. These thermocouples were mounted as described below.

| Channel No. | Location                                                                                                                          |
|-------------|-----------------------------------------------------------------------------------------------------------------------------------|
| 1-6         | Mounted to the jacket on the fault cable. These thermocouples were mounted approximately 16 inches apart.                         |
| 7 & 8       | Mounted to the conductor of the fault cables at the two series connections.                                                       |
| 9–14        | Mounted to the jacket on the upper horizontal target cable.<br>These thermocouples were mounted approximately 16 inches<br>apart. |
| 15-20       | Mounted to the jacket on the lower horizontal target cable.<br>These thermocouples were mounted approximately 10 inches<br>apart. |

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#### 2.0 PROCEDURES (Continued)

#### 2.2.1 Thermocouple Locations (Continued)

#### Test No. 3

A total of 14 Type "K" thermocouples were utilized for this test. These thermocouples were mounted as described below.

| Channel No. | Location                                                                                                   |  |  |  |  |  |  |
|-------------|------------------------------------------------------------------------------------------------------------|--|--|--|--|--|--|
| 1-6         | Mounted to the jacket on the fault cable. These thermocouples were mounted approximately 16 inches apart.  |  |  |  |  |  |  |
| 7 & 8       | Mounted to the conductor of the fault cables at the two series connections.                                |  |  |  |  |  |  |
| 9–14        | Mounted to the jacket on the target cable. These thermocouples were mounted approximately 16 inches apart. |  |  |  |  |  |  |

The thermocouples were monitored by a Fluke Datalogger feeding a high-speed printer. The datalogger was operated at its maximum scan rate throughout the overcurrent test.

#### 2.2.2 Electrical Monitoring

All phase-to-phase voltages and phase currents of the target cables and the fault cable current were fed into an oscillograph recorder. The oscillograph was operated at the 0.1inch per minute rate throughout the overcurrent test. The oscillograph channels were as specified in the following tables:

#### Test No. 1

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| Channel No. | Signal          | Location       |
|-------------|-----------------|----------------|
| 1           | Current-Phase A | Triplex 2 AWG  |
| 2           | Current-Phase B | Triplex 2 AWG  |
| 3           | Current-Phase C | Triplex 2 AWG  |
| 4           | Voltage A-B     | Triplex 2 AWG  |
| 5           | Voltage A-C     | Triplex 2 AWG  |
| 6           | Voltage B-C     | Triplex 2 AWG  |
| 7           | Current         | 7/C 12 AWG (V) |
| 8           | Voltage         | 7/C 12 AWG (V) |
| 9           | Current         | 2/C 16 AWG (H) |
| 10          | Voltage         | 2/C 16 AWG (H) |
| 11 '        | Current         | Fault Cable    |
| " <b>12</b> | Skipped         | N/A            |

H = Parallel Cable

V = Perpendicular Cable

#### Test Report No. 47906-02

#### 2.0 PROCEDURES (Continued)

#### 2.2.2 Electrical Monitoring (Continued)

Test No. 2

| Channel No. | Signal          | Location      |
|-------------|-----------------|---------------|
| 1           | Current-Phase A | Triplex 2 AWG |
| 2           | Current-Phase B | Triplex 2 AWG |
| 3           | Current-Phase C | Triplex 2 AWG |
| 4           | Voltage A-B     | Triplex 2 AWG |
| 5           | Voltage A-C     | Triplex 2 AWG |
| 6           | Voltage B-C     | Triplex 2 AWG |
| 7           | Current         | 7/C 12 AWG    |
| 8           | Voltage         | 7/C 12 AWG    |
| 9           | Skipped         | N/A           |
| 10          | Skipped         | N/A           |
| 11          | Current         | Fault Cable   |
| 12          | Skipped         | N/A           |

#### Test No. 3

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| Channel No. | Signal          | Location      |
|-------------|-----------------|---------------|
| 1           | Current-Phase A | Triplex 2 AWG |
| · 2         | Current-Phase B | Triplex 2 AWG |
| 3           | Current-Phase C | Triplex 2 AWG |
| 4           | Voltage A-B     | Triplex 2 AWG |
| 5           | Voltage A-C     | Triplex 2 AWG |
| 6           | Voltage B-C     | Triplex 2 AWG |
| 7           | Skipped         | N/A           |
| 8           | Skipped         | N/A           |
| 9           | Skipped         | N/A           |
| 10          | Skipped         | N/A           |
| 11          | Current         | Fault Cable   |
| 12          | Skipped         | N/A           |

A digital multimeter was utilized to measure all phase-to-phase or phase voltages and phase currents of the target cables prior to, during, and after the overcurrent test. This data was recorded to provide accurate evidence of the specimen's capability to conduct SWEC-rated current at 575 VAC (120 VAC for control cables) throughout the overcurrent test.

Test Report No. 47906-02

#### 2.0 PROCEDURES (Continued)

#### 2.3 Baseline Functional Tests

The baseline functional tests consisted of insulation resistance and high potential measurements on each of the target cables. These tests were performed as specified in the following paragraphs.

#### 2.3.1 Insulation Resistance Test

- 1. All power and instrumentation leads were disconnected from the target cables and labeled per Figures 12, 13, and 14 of Section VIII.
- 2. Using a megohmmeter, a potential of 1000 VDC (500 VDC for 2/C 16 AWG cables) was applied and the minimum insulation resistance indicated after a period of 60 seconds was recorded between the following test points:

Target Power Cable:

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| Phase-to-Phase | Phase-to-Ground |  |  |
|----------------|-----------------|--|--|
| 1 to 2         | 1 to unistrut   |  |  |
| 1 to 3         | 2 to unistrut   |  |  |
| 2 to 3         | 3 to unistrut   |  |  |

Target Control Cable:

# Phase-to-Phase

Phase-to-Ground

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1 to unistrut 4 to unistrut

Phase-to-Ground

1 to unistrut\* 2 to unistrut

Target Instrument Cable:

Phase-to-Phase 1 to 2

\* Shield tied to unistrut

For all performances of this test, the measured values were compared to the acceptance criteria, Paragraph 1.1.1.

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PROCEDURES (Continued)

#### 2.3 Baseline Functional Tests

#### 2.3.2 High Potential Test

1. Using a Hi-Pot Test Set, a potential of 2200 VAC (1600 VAC for 2/C 16 AWG cable) was applied from each conductor to ground and between conductors on multiconductor cable for a period of one minute. The test points were as specified below.

Target Power Cable:

| Phase-to-Phase   |   | Phase-to-Ground                                |  |  |
|------------------|---|------------------------------------------------|--|--|
| 1 to 2<br>1 to 3 | ł | 1 to unistrut or tray<br>2 to unistrut or tray |  |  |
| 2 to 3           | • | 3 to unistrut or tray                          |  |  |

Target Control Cable:

Phase-to-Phase 1 to 4 Phase-to-Ground

1 to unistrut 4 to unistrut

Target Instrument Cable:

Phase-to-Phase

1 to 2

Phase-to-Ground

1 to unistrut\* 2 to unistrut

\* Shield tied to unistrut

2. All power and instrumentation leads were reconnected per Figures 12, 13, and 14 of Section VIII.

For all performances of this test, the measured values were compared to the acceptance criteria, Paragraph 1.1.2.

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#### 2.0 **PROCEDURES** (Continued)

#### 2.4 Overcurrent Test

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The overcurrent test was conducted in three sequential steps with no intentional time delay. The first phase consisted of energizing the fault cable with SWEC rated current. The second phase consisted of increasing the current until fault cable temperatures were within 1890-1990F for 5 minutes. The third phase consisted of energizing the fault cable with the worst case electrical fault current until the cable open-circuited.

The target cables conducted SWEC-rated current (see Paragraph 1.1.3) at 575 VAC (power cables), 120 VAC (control cables), or 50 VAC (instrument cables) throughout the overcurrent test. The overcurrent test was conducted using the following procedure:

- 1. The Triplex 2/0 AWG fault cable was connected to the copper bus bars per Figure 11 of Section VIII (Tests No. 1, 2, and 3).
- 2. A Triplex 2 AWG target cable was installed per Figure 2 (Test 1), Figure 3 (Test 2), and Figure 4 (Test 3) of Section VIII.
- 3. A 7/C 12 AWG target cable was installed per Figure 2 (Test 1) and Figure 3 (Test 2) of Section VIII.
- 4. A 2/C 16 AWG target cable was installed per Figure 2 (Test 1) of Section VIII.
- 5. The Triplex 2 AWG target cable was connected to the instrumentation and power supplies of Figure 12 (Tests 1, 2, and 3) of Section VIII.
- 6. The 7/C 12 AWG target cable was connected to the instrumentation and power supplies of Figure 13 (Tests 1 and 2) of Section VIII.
- 7. The 2/C 16 AWG target cable was connected to the instrumentation and power supplies of Figure 14 (Test 1) of Section VIII.
- 8. The Triplex 2 AWG target cable was energized with 38.5 amperes at 575 VAC (Tests 1, 2, and 3).
- 9. The 7/C 12 AWG target cable was energized with 10 amperes at 120 VAC (Tests 1 and 2).
- 10. The 2/C 16 AWG target cable was energized with 1 ampere at 50 VAC (Test 1).
- 11. The Triplex 2/0 AWG fault cable was energized with 139 amperes per phase (rated current) from the Multi-Amp Test Set.
- 12. Target cable voltages and currents and the fault cable current were recorded.

#### 2.0 PROCEDURES (Continued)

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#### 2.4 Overcurrent Test (Continued)

- 13. The fault cable current was slowly increased until Thermocouple Channels 7 and/or 8 indicated 90 +3°C (189-199°F) conductor temperature.
- 14. The conductor temperature was maintained at 189-199°F for five minutes.
- 15. Fault cable current, conductor temperature, and the highest of thermocouple Channels 1 through 6 were recorded.
- 16. The Multi-Amp Test Set output was increased to 908A (test current).
- 17. Target cable voltages and currents and the fault cable current were recorded.
- 18. The fault cable was allowed to conduct test current until the cable opencircuited.
- 19. The elapsed time and maximum cable temperature were recorded.
- 20. The target cable voltages and currents were recorded.
- 21. The target cables and the Multi-Amp Test Set were de-energized.
- 22. Photographs were taken of the post-test condition.

For all performances of this test, the observed target cable operation was compared to the acceptance criteria, Paragraph 1.1.3.

2.5 Post-Overcurrent Test Functional Test

The functional tests of Paragraph 2.3 were repeated.

Test Report No. 47906-02

3.0 RESULTS

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#### 3.1 Results of Test No. 1

Configuration Number 1, Test No. 1, with a Triplex 2/0 AWG fault cable in free air, was conducted per Paragraph 2.0 and successfully met the requirements of Paragraph 1.0. The 908 amperes test current was applied for 1207 seconds (20.1 minutes) until the cable opencircuited. The maximum observed temperature on the fault cable was 1598°F which occurred on Thermocouple No. 2. The fault cable ignited after 660 seconds (11 minutes). The fire burned for approximately 12 minutes.

The capabilities of the target cable to conduct SWEC rated current at 575 VAC (power cable), 120 VAC (control cable), or 50 VAC (instrument cable) was not impaired during this test. The maximum observed target cable temperature was 259°F. All target cables successfully completed the Post-Overcurrent Test Functional Test.

Appendix I contains the following data from this test:

- 1. Notices of Anomaly Number 1, 2 and 3.
- 2. Photographs II-1 through II-2 which show pretest and post-test conditions.
- 3. A narrative of the test which relates test time, fault cable temperatures, and important events.
- 4. Figure II-1 which plots the temperature readings versus time.
  - 5. Data Sheets which contain Baseline Functional Test data, Overcurrent Test data, and Post-Overcurrent Test Functional Test data.

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Test Report No. 47906-02

3.0 **RESULTS** (Continued)

#### **3.2** Results of Test No. 2

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Configuration Number 1, Test No. 2, with a Triplex 2/0 AWG fault cable in free air, was conducted per Paragraph 2.0 and successfully met the requirements of Paragraph 1.0. The 908 amperes test current was applied for 1467 seconds (24.4 minutes) until the cable opencircuited. The maximum observed temperature on the fault cable was 1503°F which occurred on Thermocouple No. 3. The fault cable ignited after 690 seconds (11.5 minutes). The fire burned for approximately 16.5 minutes.

The capabilities of the target cable to conduct SWEC rated current at 575 VAC (power cable), 120 VAC (control cable), or 50 VAC (instrument cable) was not impaired during this test. The maximum observed target cable temperature was 370°F. All target cables successfully completed the Post-Overcurrent Test Functional Test.

Appendix II contains the following data from this test:

- 1. Notices of Anomaly applicable to this section are contained in Appendix I.
- 2. Photographs II-3 through II-5 which show pretest and post-test conditions.
- 3. A narrative of the test which relates test time, fault cable temperatures, and important events.
- 4. Figure II-2 which plots the temperature readings versus time.
- 5. Data Sheets which contain Baseline Functional Test data, Overcurrent Test data, and Post-Overcurrent Test Functional Test data.

Test Report No. 47906-02

3.0 **RESULTS** (Continued)

#### 3.3 Results of Test No. 3

Configuration Number 1, Test No. 3, with a Triplex 2/0 AWG fault cable in free air, was conducted per Paragraph 2.0 and successfully met the requirements of Paragraph 1.0. The 908 amperes test current was applied for 1150 seconds (19.2 minutes) until the cable opencircuited. The maximum observed temperature on the fault cable was  $1610^{\circ}$ F which occurred on Thermocouple No. 3. The fault cable ignited after 653 seconds (10.9 minutes). The fire burned for approximately 10.0 minutes.

The capabilities of the target cable to conduct SWEC rated current at 575 VAC (power cable), 120 VAC (control cable), or 50 VAC (instrument cable) was not impaired during this test. The maximum observed target cable temperature was 296°F. The target cable successfully completed the Post-Overcurrent Test Functional Test.

Appendix III contains the following data from this test:

- 1. Notices of Anomaly applicable to this section are contained in Appendix I.
  - 2. Photographs II-6 through II-10 which show pretest and post-test conditions.
  - 3. A narrative of the test which relates test time, fault cable temperatures, and important events.

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- 4. Figure II-3 which plots the temperature readings versus time.
- 5. Data Sheets which contain Baseline Functional Test data, Overcurrent Test data, and Post-Overcurrent Test Functional Test data.

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#### APPENDIX I

#### CONFIGURATION NUMBER 1, TEST NO. 1, DATA

#### Page No. II-14 Test Report No. 47906-02

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|                                                                                               | NOTICE OF ANOMALY                                                                                                                                                                                                                                                                                                                                                                                         | DATE: 9/6/85                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|-----------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| CUSTOMER:                                                                                     | _ P.O.NUMBER:NMP2-E-0907 CONTRACT NO<br>Stone & Webster<br>DETO:R. Das<br>DE BY:J. King                                                                                                                                                                                                                                                                                                                   | WYLE JOB NO:         47906           NOTIFICATION DATE:         9/6/85                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| PART NAME:                                                                                    | PECIMEN PROCEDURE TEST EQUIPMENT<br>Electrical Cable<br>Configuration 1, Test 1<br>WLTP 47906-01                                                                                                                                                                                                                                                                                                          | PART NO N/A<br>I.D. NO N/A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| 2.<br>3.3.4.2<br>1.<br>Descrip<br>The co<br>and 6<br>perform<br>Disposi<br>The lac<br>post-ov | Disconnect all power and instrumentat<br>cables and label per Figures 12, 13, and 14.<br>Using a megohmmeter, apply a potential<br>minimum insulation resistance.<br>Using a HiPot Test Set, a potential of<br>from each conductor to ground and betw<br>ductor cable for a period of one minute.<br>tion of Anomaly:<br>nductor connections (Figure 13) of 1 to<br>to 7 were not made at the time the ba | of 1000 VDC and record the<br>2200 VAC shall be applied<br>veen conductors on multicon-<br>2, 2 to 3, 4 to 5, 5 to 6,<br>aseline functional tests were<br>behave no impact because the<br>nowed acceptable values for                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| VERIFICATION:<br>TEST WITNESS<br>REPRESENTING                                                 | PROJECT                                                                                                                                                                                                                                                                                                                                                                                                   | S AND COMPLY WITH 10 CFR PART 21.<br>ENGINEER: <u>J. P. King</u> 9/9/85<br>MANAGER: <u>MANAGER: MANAGER: M</u> |

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Page No. II-15 Test Report No. 47906-02

| ABORATORIES (Eastern Operations)                                                                                                                        |                                                                                         |
|---------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|
| NOTICE OF ANOMALY                                                                                                                                       | DATE:<br>9/12/85                                                                        |
| NOTICE NO: 2_ P.O. NUMBER: NMP2-E0907 CON                                                                                                               | NTRACT NO:N/A                                                                           |
| CUSTOMER: Stone & Webster                                                                                                                               |                                                                                         |
| NOTIFICATION MADE TO: R. Das                                                                                                                            |                                                                                         |
| NOTIFICATION MADE BY:J. King                                                                                                                            |                                                                                         |
|                                                                                                                                                         | DATE OF ANOMALY: 9/5, 9/6, 9/9/85                                                       |
| PART NAME: Electrical Cables                                                                                                                            | PART NO N/A                                                                             |
| TEST: Configuration 1, Tests 1, 2, 3                                                                                                                    |                                                                                         |
| SPECIFICATION: WLTP 47906-01                                                                                                                            |                                                                                         |
| Requirements:                                                                                                                                           |                                                                                         |
| 1. The two target cables shall conduct SW 575 VAC (power cables) or 120 VAC (con throughout the overcurrent test.                                       | EC-rated current (see Paragraph 2.1.3) at<br>trol cables) or 50 VAC (instrument cables) |
| 2. All target cable currents shall be maintained                                                                                                        | within a +10%, -0% tolerance.                                                           |
| Description of Anomaly:                                                                                                                                 |                                                                                         |
| During Configuration 1, Tests 1, 2 and 3, a currents were out of tolerance after flowing to plus side was 15.3%. The maximum variation on t             | st current. The maximum variation on the                                                |
| Disposition - Comments - Recommendations:                                                                                                               |                                                                                         |
| The out of tolerance currents were judged t<br>results showed that the target cable's ability<br>the test conditions.                                   | o have no impact on the test. The test<br>y to carry current was not impaired by        |
| Maintaining the +10%, -0% tolerance is not always                                                                                                       | s possible due to the following reasons.                                                |
| 1. Unbalanced currents between phases.                                                                                                                  |                                                                                         |
| 2. Temperature changes in the conduct to change.                                                                                                        | ors causing the impedance of the cables                                                 |
| 3. Voltage fluctuations in the facility power                                                                                                           | er delivered by the local utilities.                                                    |
| Therefore, the acceptance criteria for future<br>setting of target cable currents (with rated<br>+10%, -0%. Thereafter, all target cable curre<br>ance. | current on the fault cable) to be within                                                |
| NOTE: IT IS THE CUSTOMER'S RESPONSIBILITY TO ANALYZE                                                                                                    | ANOMALIES AND COMPLY WITH 10 CFR PART 21.                                               |
| VERIFICATION:                                                                                                                                           | PROJECT ENGINEER: John D. King 9-12-85                                                  |
| TEST WITNESS:                                                                                                                                           | PROJECT MANAGER: 199-12-85 71 19/12-18                                                  |
| REPRESENTING:                                                                                                                                           | COORDINATION: KTALLOL 413-85                                                            |
| QUALITY ASSURANCE: Geld Wight 9/3/85                                                                                                                    | <i>U</i>                                                                                |

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#### Page No. II-16 Test Report No. 47906-02

| BORATORIES (Eastern Operations)                                                                                                                            |                       |        |
|------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|--------|
| NOTICE OF ANOMALY                                                                                                                                          | DATE: 9/              | 12/85  |
| NOTICE NO: P.O. NUMBER:NMP2-E-0907 CONTRACT NO                                                                                                             | D:N/A                 |        |
| CUSTOMER: Stone & Webster                                                                                                                                  | WYLE JOB NO:          | 47906  |
| IOTIFICATION MADE TO: R. Das                                                                                                                               | NOTIFICATION DATE:    | 9/6/85 |
|                                                                                                                                                            | VIA: Tele             |        |
| CATEGORY: SPECIMEN SPROCEDURE TEST EQUIPMENT                                                                                                               | DATEOF                | 9/5/85 |
| PART NAME: Electrical Cables                                                                                                                               | PART NO               | N/A    |
| rest: Configuration 1, Test 1                                                                                                                              | I.D. NO               | N/A    |
| SPECIFICATION: WLTP 47906-01                                                                                                                               | PARA. NO              | 3.3.5  |
| Requirements:<br>1. The two target cables shall conduct SWEC-rate<br>575 VAC (power cables) or 120 VAC (contro<br>cables) throughout the overcurrent test. |                       |        |
| 2. All target cable currents shall be maintained with                                                                                                      | hin a +10%, -0% toler | ance.  |
|                                                                                                                                                            |                       |        |

Initially the current on the No. 2 AWG target power cable was set to 37.9A which was 1.6% below the required 38.5A +10%, -0%. Also, the current on the No. 16 AWG instrument cable was set to 1.152A which was 4.7% above the required 1A +10%, -0%.

**Disposition - Comments - Recommendations:** 

The out of tolerance currents were judged to have no impact on the test as discussed in NOA No. 2. For future tests, initial settings will be verified by the test engineer.

NOTE: IT IS THE CUSTOMER'S RESPONSIBILITY TO ANALYZE ANOMALIES AND COMPLY WITH 10 CFR PART 21.

**PROJECT ENGINEER:** 

PROJECT MANAGER: <u>ÅM4</u> INTERDEPARTMENTAL <u>K</u>70

VERIFICATION:

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TEST WITNESS:

REPRESENTING:

QUALITY ASSURANCE: G.W. Chight 7/13/55

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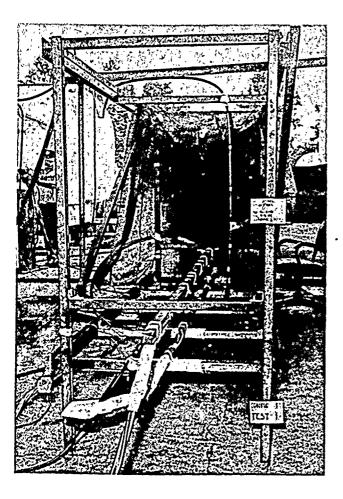
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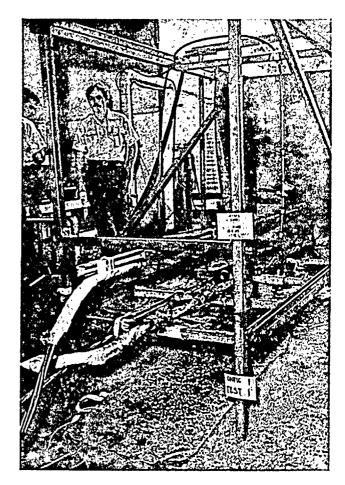
Page No. II-17 Test Report No. 47906-02

#### CONFIGURATION NUMBER 1, TEST NO. 1



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# PHOTOGRAPH II–1

PRETEST VIEW - OVERALL

PHOTOGRAPH II-2

POST-TEST VIEW - OVERALL

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Test Report No. 47906-02

## CONFIGURATION NUMBER 1, TEST NO. 1

| Approxim<br>Test Tin |   | Approximate<br>Fault Cable<br>Jacket Temperature | Observation                                              |   |
|----------------------|---|--------------------------------------------------|----------------------------------------------------------|---|
| 0 Mii                | n | 830F                                             | Energized fault cable with 139A                          |   |
| 10 Mii               | n | 890F                                             | Energized fault cable with 270A                          |   |
| 70 Mii               | n | 176°F                                            | Energized fault cable with 255A                          |   |
| 75 Mii               | n | 178 <sup>0</sup> F ·                             | Energized fault cable with 270A                          |   |
| 78.3 Mii             | n | 179 <sup>0</sup> F                               | Fault cable conductor reached 189°F                      |   |
| 86.7 Mir             | n | 182 <sup>0</sup> F                               | Energized fault cable with 908A                          |   |
| 89.9 Mir             | n | 299°F                                            | Light smoke visible                                      |   |
| 94.3 Mir             | 1 | 522 <sup>0</sup> F                               | Fault cable jacket rupturing                             |   |
| 97.7 Mir             | ı | 746°F                                            | Ignition of fault cable                                  | 1 |
| 106.8 Mir            | 1 | 1598°F                                           | Open circuit — Maximum fault<br>cable jacket temperature |   |
| 109.7 Mir            | ı | 1220 <sup>o</sup> F                              | Fire out                                                 |   |

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CONFIGURATION #1 - TEST #1 • FAULT CABLE JACKET TEMPERATURE LEGEND: (T/CS 1-6) 0 FAULT CABLE CONDUCTOR TEMPERA-TURE (T/CS 7 & 8) O UPPER HORIZONTAL TARGET CABLE (TRIPLEX 2 AWG) JACKET TEHPERA-ATURE (T/CS 9-14) 2000 ى LOWER HORIZONTAL TARGET CABLE (2/C 16 AWG) JACKET TEMPERATURE X PERPENDICULAR TARGET CABLE (7/C 12 1900 AWG) JACKET TEMPERATURE (T/CS 21-26) MAX. TEMP RECORDED: 1597.6°F (T/C /2) AMBIENT TEMP: 32°F 1800 1700 DATE: SEPTEMBER 5, 1985 FIGURE 11-1 1600 1500 Teg 1400 1300 1200 1100 1000 ŝ 900 800 700 600 500 400 300 pra 200 100 

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TIME (MIN.)

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# DATA SHEET

| Customer <u>Stone &amp; Webster</u>                 |                            |                  | WYLE LABO          |                     |
|-----------------------------------------------------|----------------------------|------------------|--------------------|---------------------|
| Specimen <u>Cables</u>                              |                            |                  |                    |                     |
| Part No Various                                     | Amb. Temp                  | 14°F             |                    | 47906               |
| Spec WLTP 47906-01                                  | Photo Yes                  |                  | Benort No          | 47906-2             |
| WLTP         47906-01           Para.         3.3.4 | Photo Yes<br>Test Med. Air |                  | Start Date         | 9-5-85              |
| /NN/A                                               | Specimen Temp              | Ambient          |                    |                     |
| SI No                                               |                            |                  |                    |                     |
|                                                     | ion <u>No. I</u> Te        | st No. 1         |                    |                     |
| Pre-Test                                            |                            | unctional T      |                    |                     |
| Insulation Resistance Test                          |                            |                  |                    |                     |
| Acceptance Criteria: Measure                        | d insulation resistanc     | e shall be       | greater tha        | n 1.6 megohms       |
| with a                                              | potential of 1000 VDC      | (500 for f       | K<br>T.P. 16 AWG   | ) anolied           |
|                                                     |                            | ()00 101 29      |                    |                     |
| TOP 60                                              | seconds.                   |                  | ·····              | <u> </u>            |
| Cable                                               | Test Points                |                  | eading             |                     |
| 2 AWG Triplex                                       | 1 to 2                     |                  | 5×1085             |                     |
| (vertically separated)                              | 1 to 3                     | 5.0              | X1082              |                     |
|                                                     | 2 to 3                     | 4.3              | ×10 <sup>8</sup> 5 | , <u> </u>          |
|                                                     | l to Unistrut              |                  | 3×10852            |                     |
|                                                     | 2 to Unistrut              |                  | X1082              |                     |
|                                                     | 3 to Unistrut              |                  | XIUSR              |                     |
|                                                     |                            |                  |                    |                     |
| 7/C - 12 AWG                                        | 1 to 4                     | 1. 2             | 2×109              |                     |
| (horizontally separated)                            | l to Unistrut              | 1.6              | X 109              |                     |
|                                                     | 4 to Unistrut              | 1.7              | X109               |                     |
| ······································              |                            |                  |                    |                     |
|                                                     |                            |                  |                    |                     |
|                                                     |                            |                  |                    |                     |
|                                                     | ·····                      | <u> </u>         |                    | ·                   |
|                                                     |                            |                  |                    |                     |
|                                                     |                            | ~                |                    |                     |
|                                                     | Teste                      | d By             | ma allo            | Date: <u>7-5-85</u> |
|                                                     |                            | ess <u>~ ^ A</u> |                    | Date:               |
| tice of mc                                          | Sheet                      | <u> </u>         |                    | - of                |
| omaly <del>No.  </del>                              | Appro                      | oved             |                    | ·s                  |

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Page No. II-21 Test Report No. 47906-02

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# DATA SHEET

| Customer Stone & Webster    | · · · · · · · · · · · · · · · · · · ·  |                             | WYLE LABORATORIES                          |
|-----------------------------|----------------------------------------|-----------------------------|--------------------------------------------|
| SpecimenCables              |                                        | <b><i>П</i></b> // <b>Р</b> |                                            |
| Part No. Various            | Amb. Temp                              | 14 F                        | Job No47906                                |
| SpecWLTP_47906-01           | Photo <u>Ye</u>                        | <u>s</u>                    | Report No                                  |
| Para. 3.3.4                 | Test MedAi                             | £                           | Start Date 9-5-85                          |
| S/NN/A                      | Specimen Temp                          | <u>Ambient</u>              |                                            |
| GSINo                       | ·                                      |                             |                                            |
| Test Title Configurat       | tion No. 1 Test                        | No. 1                       |                                            |
| Test Title <u>Configura</u> | ) -Post-Test N                         | Functional T                | est                                        |
| Insulation Resistance Test  |                                        |                             |                                            |
|                             |                                        |                             | · ·                                        |
|                             | ······································ |                             |                                            |
| Cable                       | Test_Points                            |                             | ding                                       |
| 5.T.P. 16 AWG               | 1 to 2                                 | /.2.                        | 5×109 a                                    |
| (Horizontally Separated)    | 3 to 4 NA                              | pre                         |                                            |
|                             | 5 to 6 NA G                            | mr                          | •                                          |
|                             | <u> </u>                               | 140                         |                                            |
|                             | 9 to 10 NA                             | AMAC                        |                                            |
|                             | 0<br>I to Unistrut                     | 1.5                         | x18 <sup>9</sup> 2                         |
|                             | 2 to Unistrut                          | 1.3;                        | X18 <sup>9</sup> r.<br>X18 <sup>9</sup> r. |
|                             | 3 to Unistrut /                        |                             |                                            |
|                             | 4 'to Unistrut /                       |                             |                                            |
|                             | 5 to Unistrut A                        | •                           |                                            |
|                             | 6 to Unistrut A                        | ~                           |                                            |
|                             | 7 to Unistrut /                        | 0                           |                                            |
| ۰                           | 8 to Unistrut                          | v                           |                                            |
|                             | 9 to Unistrut /                        |                             |                                            |
|                             | 10 to Unistrut                         |                             |                                            |
|                             |                                        | <i>v</i>                    |                                            |
|                             |                                        |                             |                                            |
|                             |                                        |                             | <b>A</b>                                   |
| H H H H                     | Τε                                     | sted By Janny               | Livel Date: 9-5-85                         |
|                             |                                        | itness <u>KA</u>            | Date:                                      |
| Notice of                   | St                                     | ieet No.                    | 2 of _4                                    |
| Anomaly <u>None</u>         | A                                      | proved                      | 8-9-5-85                                   |

Wyle Form WH 614A (Rev. APR 54

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# DATA SHEET

| Customer Stone & Webst     | ter                 |                     | WYLE LABORATORIES                     |
|----------------------------|---------------------|---------------------|---------------------------------------|
| Specimen <u>Cables</u>     |                     | 7/100               |                                       |
| Part No. Various           |                     |                     | Job No47906                           |
| SpecWLTP_47906-01          | Photo               | Yes                 | Report No47906-2                      |
| Para. 3.3.4                | Test Med            | Air                 | Start Date 9-5-85                     |
| S/NN/A                     | Specimen Te         | emp. <u>Ambient</u> |                                       |
| GSINo                      |                     |                     |                                       |
| Test TitleConfigurati      | on No. 1            | Test No. 1          |                                       |
| Pre-Test                   | -Post-Test-M        | Eunctional          | Test                                  |
|                            |                     |                     |                                       |
|                            |                     |                     |                                       |
| High Potential Test        | <u> </u>            | <u> </u>            | · · · · · · · · · · · · · · · · · · · |
| Acceptance Criteria: There | shall be no eviden  | ce of insulation    | n breakdown or flashover              |
|                            |                     | NAC (1(00 NAC )     |                                       |
| 1                          |                     | VAL (1600 VAL 1     | for 5 T.P. 16 AWG cables)             |
| applie                     | ed for one minute.  |                     |                                       |
|                            |                     |                     |                                       |
|                            |                     |                     |                                       |
| Cable                      | Test Points         |                     | Reading                               |
| #2 AWG Triplex             | 1 to 2              | 114                 | )5µА .                                |
| (Vertically Separated)     | <u>1 to 3</u>       | 115                 | бона                                  |
|                            | 2 to 3              | 116                 | ONA                                   |
|                            | l to Unistru        | t //7:              | 5UA                                   |
|                            | 2 to Unistru        | t /19               | 5UA                                   |
|                            | 3 to Unistru        |                     | омА                                   |
|                            |                     |                     | <u>/ M //</u>                         |
| 7/C - 12 AWG               | 1 to 4              | 64                  | 20110                                 |
|                            |                     |                     | θομΑ                                  |
| (Horizontally Separated)   | l to Unistru        |                     | OMA                                   |
|                            | <u>4 to Unistru</u> | t 49.               | 5 UA                                  |
|                            |                     |                     |                                       |
| ·····                      |                     |                     |                                       |
|                            |                     |                     |                                       |
|                            |                     |                     |                                       |
|                            |                     |                     |                                       |
|                            |                     |                     | ,                                     |
|                            |                     | · // /              | Julie arac                            |

Tested By Annu Aller Date: 9-5-85 Witness <u>NA</u> Date: . 3 4 Sheet No. \_\_\_\_ of gracing 9-5-85 Approved \_

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# DATA SHEET

| Customer             | Stone        | & Webster                             |                                     |                     | WYLE LAB          | ORATORIES                             |
|----------------------|--------------|---------------------------------------|-------------------------------------|---------------------|-------------------|---------------------------------------|
| Specimen             | Cables       |                                       |                                     |                     |                   |                                       |
| Part No.             |              | <u></u>                               | Amb. Temp.                          | 74°F                | Job No            | 47906                                 |
| Spec                 | WLTP 47906   | -01                                   |                                     | Yes                 |                   |                                       |
| Para.                | 3.3.4        |                                       | Test Med                            | Air                 | Start Date_       | 9-5-85                                |
| S/N                  | N/A          |                                       | Specimen To                         | emp. <u>Ambient</u> |                   |                                       |
| GSI                  | No           |                                       | •                                   | •                   |                   |                                       |
| Test Title           |              | Configurati<br>Pre-Test               | on No. 1<br><del>_Post</del> -      | Test No.            | l<br>Functional 1 | lest                                  |
| High Pote            | ential Test  | (Continued)                           |                                     |                     | ······            |                                       |
| Cable<br>1 Amrc      |              | T                                     | est Points                          |                     | Reading           |                                       |
| 5 T.P. 16            | S AWG        |                                       | 1 to 2                              |                     | 600 MA            |                                       |
| (Horizont            | tally Separa | ted)                                  |                                     | Am                  |                   |                                       |
|                      |              |                                       | 3 to 4 NA<br>5 to 6 NA<br>7 to 8 NA | fish                |                   |                                       |
| •                    | <u>.</u>     |                                       | 7 to 8 NA                           | Ame                 |                   | •                                     |
|                      |              |                                       | 9 to 10 NA                          | APE                 |                   |                                       |
|                      |              |                                       | l to Unistru                        | ut .                | 505 MA            | •                                     |
| <br> <br>            |              |                                       | 2 to Unistru                        |                     | 518 NA            |                                       |
|                      |              |                                       | 3 to Unistru                        | ut NA granc         |                   |                                       |
|                      |              | ·                                     | 4 to Unistru                        | ut NA Mark          |                   |                                       |
|                      |              |                                       | 5 to Unistru                        | ut NA MAC           | · · · · · ·       |                                       |
| <br>                 |              |                                       | <u>6 to Unistru</u>                 | UT NA MAC           |                   |                                       |
| !                    |              | ,<br>                                 | 7 to Unistru                        | ut NA MAC           |                   | · · · · · · · · · · · · · · · · · · · |
|                      |              |                                       |                                     | ut NA GAC           |                   |                                       |
|                      |              |                                       | <u>9 to Unistru</u>                 | ut NA MAC           |                   | · · · · · · · · · · · · · · · · · · · |
|                      |              |                                       | <u>10 to Unist</u> i                | TUE NA JAK          |                   |                                       |
|                      |              | · · · · · · · · · · · · · · · · · · · | ······                              | Tostad Bu Na        | uner Li Weld      | Date: <u> </u>                        |
| Notice of<br>Anomaly | None         |                                       |                                     |                     | rove<br>4         | Date: $$                              |

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Page No. II-24 Test Report No. 47906-02 \*

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#### DATA SHEET

| CustomerSton   | e & Webster       |                       |                   | WYLE LABORATORIES                         |
|----------------|-------------------|-----------------------|-------------------|-------------------------------------------|
| SpecimenCabl   | es                |                       | 7000              | · · · · · · · · · · · · · · · · · · ·     |
| Part No. Vari  | ous               | Amb. Temp.            | 8rF               | Job No. <u>47906</u>                      |
| SpecWLTP       |                   |                       |                   | Report No47906-2                          |
|                | <u>s</u>          | Test Med              | Air               | Start Date5-85                            |
| S/NN/A         |                   | Specimen T            | emp. <u>Ambie</u> | 1t                                        |
| GSINo          | <del>, , ,</del>  |                       |                   |                                           |
| Test Title     | Configura         | ation No. 1           | Test No. 1        | Overcurrent Test                          |
| 12. Readings   | with rated curren | nt on fault cab       | le                |                                           |
| Target Cable   |                   | Voltage (V<br>A-B B-C |                   | Current (amps)<br>Phase A Phase B Phase ( |
| 2 AWG Triplex  |                   |                       |                   |                                           |
| (Vertically Se | anatad)           | 577 576               | 572               | 39, 1 39. 1 (39.9)                        |
|                |                   |                       | •••••             |                                           |
| 7/C - 12 AWG   | ······            | 12.0.                 | 9 1/20            | 10.11 Amps                                |
| (Horizontally  | Separated)        | 7,007                 | //                | · · · · · · · · · · · · · · · · · · ·     |
| (norrzoncarry  |                   |                       |                   | <u></u>                                   |
| -5 T.P. 16 AWG |                   | 50.21 1               | lac               | 1.152 AMOS                                |
| (Horizontally  | Separated)        | <u></u>               | ·····             | /                                         |
|                | •                 |                       |                   |                                           |
| Fault Cable:   | #2/0 TR           | IPLEX                 |                   |                                           |
| Rated Current: | 139 A             |                       |                   |                                           |
| Measured Curre | nt: : 40A         | <u></u>               | <u></u>           |                                           |
|                |                   |                       |                   | <u> </u>                                  |
|                |                   |                       |                   |                                           |
| ·              | <u> </u>          |                       |                   |                                           |
|                |                   |                       |                   |                                           |
|                |                   | <u> </u>              |                   |                                           |
| L              |                   |                       | Tested By 🟒       | Churry File Date: 25-65                   |
|                |                   |                       | Witness           | None. Date:                               |
| Notice of      |                   |                       | Sheet No          | of                                        |
| AnomalyNo      | . 3               |                       | Approved          | Wellin 9-5-85                             |

Wyle Form WH 512A, Rev. APR '51

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# DATA SHEET

| ustomer Stone & Webster                         |                        | -                  | WYLE LABO                             | ORATORIES                             |
|-------------------------------------------------|------------------------|--------------------|---------------------------------------|---------------------------------------|
| Cobles                                          |                        | -                  |                                       |                                       |
| art No. Various                                 | Amb. Tem               | p. <u>83°F</u>     | Job No                                | 47906                                 |
| Dec. WLTP 47906-01                              | Photo                  | Yes                | Report No.                            | 47906-2                               |
| ara. <u>3.3.5</u>                               | Test Med.              | Air                | Start Date_                           | 9-5-85                                |
| NN/A                                            |                        | Temp. <u>Ambie</u> |                                       |                                       |
| SINo                                            | ·                      | ·                  |                                       |                                       |
| est TitleConfiguratio                           | NoI.                   | lest Nol.          | Overcurr                              | ent Test                              |
| 13. Increasing current to                       | raise fault cable      | temperature        | to 189°F-199°F                        |                                       |
| FAULT_CABLE_CURRENT                             | FLAPSED TIM            | IF Stra            | CABLE                                 | /CHANNEI                              |
|                                                 |                        |                    |                                       |                                       |
| 2-10A                                           |                        |                    | •                                     | -                                     |
| 255A                                            | 300                    |                    | <u>/ 87°F/</u>                        | 8                                     |
| 270A                                            | 700                    |                    | 195°F                                 | 18                                    |
|                                                 |                        |                    |                                       |                                       |
| 15. Readings after fault c                      | able warmup to 18      | 9°F-199°F          |                                       | · · · · · · · · · · · · · · · · · · · |
| 15. Readings after fault c<br>Fault Cable Curre |                        | 9°F-199°F          | · · · · · · · · · · · · · · · · · · · | · · · · · · · · · · · · · · · · · · · |
| Fault Cable Curre<br>Conductor tempera          | ent: 270<br>ature: 193 |                    | Channel No.                           | 8                                     |
| Fault Cable Curre                               | ent: 270<br>ature: 193 |                    | Channel No.                           | 8                                     |
| Fault Cable Curre<br>Conductor tempera          | ent: 270<br>ature: 193 |                    | Channel No.                           | 8                                     |
| Fault Cable Curre<br>Conductor tempera          | ent: 270<br>ature: 193 |                    | Channel No.                           | 8                                     |
| Fault Cable Curre<br>Conductor tempera          | ent: 270<br>ature: 193 |                    | Channel No.                           | 8                                     |
| Fault Cable Curre<br>Conductor tempera          | ent: 270<br>ature: 193 |                    |                                       | 8                                     |
| Fault Cable Curre<br>Conductor tempera          | ent: 270<br>ature: 193 |                    | Channel No.                           | 8<br>Date:                            |
| Fault Cable Curre<br>Conductor tempera          | ent: 270<br>ature: 193 |                    |                                       | 8<br>Date:                            |
| Fault Cable Curre<br>Conductor tempera          | ent: 270<br>ature: 193 | Tested By          | Summer V. Lo dites"                   | Date:                                 |

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#### DATA SHEET

| ustomer Stone & Webster    | r                               | WYLE LABORATORIES                         |
|----------------------------|---------------------------------|-------------------------------------------|
| pecimen <u>Cables</u>      |                                 |                                           |
| art No. <u>Various</u>     |                                 | <u>3° デ</u> Job No. <u>47906</u>          |
| pecWLTP_47906-01           | Photo <u>Yes</u>                | Report No47906-2                          |
| ara. <u> </u>              | Test MedAir                     | Start Date 9-5-85                         |
| NN/A                       | Specimen Temp                   | Ambient                                   |
| SINo                       |                                 |                                           |
| est Title Cor              | nfiguration No. 1 T             | est No. 1 Overcurrent Test                |
| 17. Initial readings wit   | th test current on fault cab    | le:                                       |
| Target Cable               | Voltage (VAC)<br>A-B B-C A-C    | Current (amps)<br>Phase A Phase B Phase C |
| 2 AWG Triplex              | 518 575 570                     | (42.6) (34.9A) (27.54                     |
| (Vertically Separated)     |                                 |                                           |
| 7/C - 12 AWG               | 50.4 Yoc                        | ( J. J. ) , '                             |
|                            |                                 |                                           |
| (Horizontally Separated)   |                                 |                                           |
| 1 grat                     |                                 |                                           |
| T.P. 16 AWG                | ** 51 yrs                       | (1,14) A                                  |
| (Horizontally Separated)   |                                 | ,<br>,                                    |
| Fault Cable 77             | LO TRIPLEX                      |                                           |
| PMC Test<br>Bated Current: | 2/0 TRIPLEX<br>908 MAX<br>H39 A |                                           |
| Measured Current:          | <u>702 A</u>                    | · · · · · · · · · · · · · · · · · · ·     |
|                            | ·····                           |                                           |
|                            |                                 |                                           |
|                            |                                 |                                           |
|                            |                                 | · · ·                                     |
|                            |                                 | By Date:                                  |
|                            | Witne                           |                                           |
| otice of No. 2             | Sheet                           |                                           |
| nomaly <u>No. C</u>        | Appro                           | ved (2.100 4.5-3)                         |

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# DATA SHEET

| Customer.    | Stone & Webster              | •           |                     | WYLE LABORATORIES                      |
|--------------|------------------------------|-------------|---------------------|----------------------------------------|
| Specimen .   | Cables                       |             |                     |                                        |
| Part No.     | Various                      | Amb. Temp.  | <u>83°F</u>         | Job No47906                            |
| Spec         | WLTP 47906-01                | Photo       | Yes                 | Beport No. 47906-02                    |
| Para         |                              | Test Med.   | Air                 | Start Date7-5-85                       |
| S/N          |                              | Soecimen T  | emp. <u>Ambient</u> |                                        |
| GSI          |                              |             |                     |                                        |
| Test Title _ | Configuration No. 1          | Test No.    | 1                   |                                        |
| 19. 0        | pen circuit on fault cable:  |             | 4                   |                                        |
|              | Elapsed time:                |             | 1207 sec            |                                        |
|              | Maximum fault cable temp     | erature:    | 1598                | Channel No. 2                          |
|              |                              | •           |                     |                                        |
| 20. 5        | tabilized temperature on fau | ilt cable:  |                     |                                        |
|              | Elapsed time (beginning      | of 15-minut | e period): N/A      |                                        |
|              | Maximum fault cable temp     | erature:    | NA                  | Channel No. N/A                        |
|              | Fault cable current:         | N/A         |                     |                                        |
| 21. 1        | gnition of fault cable:      | ·           |                     |                                        |
|              | Elapsed time:                | 660 Sec     | ð                   |                                        |
| [            | Maximum fault cable temp     |             | 1                   | Channel No. 2                          |
|              | Fault cable current:         |             | 1598-908A           |                                        |
|              |                              |             |                     |                                        |
|              |                              |             |                     | •                                      |
|              |                              |             |                     |                                        |
|              |                              |             |                     |                                        |
|              |                              |             |                     |                                        |
|              |                              |             |                     | ······································ |
|              |                              |             |                     |                                        |
|              |                              |             |                     | · ·                                    |
|              |                              |             | Tested By Aronn     | 4 7 112 Date: 9-5-8                    |
|              |                              |             | Witness No          | Date:                                  |
| Notice of    | None                         |             | Sheet No            | 4 of                                   |
| Anomaly      |                              |             | Approved            | mor 4-6-86                             |

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# DATA SHEET

| Customer Stone & Webster               | · · · · · · · · · · · · · · · · · · · | WYLE LABORATORIES                         |
|----------------------------------------|---------------------------------------|-------------------------------------------|
| Specimen <u>Cables</u>                 |                                       | 1                                         |
| Part No. Various<br>Spec WLTP 47906-01 | Amb. Temp83°7                         |                                           |
|                                        | Photo Yes                             | Report No. 47906-02                       |
|                                        |                                       |                                           |
| S/NN/A<br>GSINo                        | Specimen Temp <u>Amb</u> i            |                                           |
| Test Title <u>Configuration No. 1</u>  | Test No. 1                            | Overcurrent Test                          |
| 23. Readings after let-throug          | h-current applied until fau           | lt cable open circuits:                   |
| Target Cable                           | Voltage (VAC)<br>A-B B-C A-C          | Current (amps)<br>Phase A Phase B Phase C |
| 2 AWG Triplex                          | 57.8 579 573                          |                                           |
| (Vertically Separated)                 | <u></u>                               | (37.3) (37.9) (36.1.)                     |
|                                        |                                       |                                           |
| 7/C - 12 AWG                           | 120.71/2C                             | (9,97)A                                   |
| (Horizontally Separated)               | ·                                     |                                           |
|                                        | 49.65 Var                             | 1.15 3 A                                  |
| (Horizontally Separated)               | ······                                |                                           |
| · · · · · · · · · · · · · · · · · · ·  |                                       |                                           |
|                                        |                                       |                                           |
|                                        |                                       |                                           |
|                                        |                                       |                                           |
|                                        |                                       |                                           |
|                                        |                                       |                                           |
|                                        | · · · · · · · · · · · · · · · · · · · |                                           |
|                                        |                                       | · · · · · · · · · · · · · · · · · · ·     |
|                                        | Tested By 🟒<br>Witness                | Noke Date:                                |
| Notice of                              | Sheet No                              | 5 of _5                                   |
| Anomaly <u>No. 2</u>                   | Approved                              | 9 King 9.5-85                             |

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# DATA SHEET

| Customer <u>Stone &amp; Webster</u>    |                                       | <b>WYLE LABORATORIES</b>                       |
|----------------------------------------|---------------------------------------|------------------------------------------------|
| Specimen <u>Cables</u>                 |                                       | 1 a PT                                         |
| Part No Various                        | Amb. Temp                             | 3 7 Job No47906                                |
| Spec. WLTP 47906-01                    | PhotoYes                              | Report No. <u>47906-2</u><br>Start Date 9-5-85 |
| Para3.3.6                              | Test MedAir                           | Start Date585                                  |
| 5/NN/A                                 | Specimen TempA                        | Ambient                                        |
| 3SI <u>No</u>                          | ·····                                 |                                                |
| Test TitleConfigura                    |                                       | No. 1                                          |
| Insulation Resistance Test             |                                       |                                                |
|                                        | ed insulation resistance              | shall be greater than 1.6 megohms              |
| witha                                  | potential of 1000 VDC (5              | 500 for \$ T.P. 16 AWG) applied                |
|                                        | seconds.                              |                                                |
|                                        | seconds.                              |                                                |
| Cable                                  | Test Points                           | Reading                                        |
| 2 AWG Triplex                          | 1 to 2                                | 8.0×10 52                                      |
| (vertically separated)                 | 1 to 3                                | 8.0×10 m                                       |
|                                        | 2 to 3                                | 8.0×10 <sup>9</sup> L                          |
|                                        | l to Unistrut                         | 1.8×1081                                       |
|                                        | 2 to Unistrut                         | 2.6×1085                                       |
| ,<br>                                  | 3 to Unistrut                         | 2.1×108 n                                      |
| 7/C - 12 AWG                           | 1 to 4                                | 8.0 × 1092                                     |
| (horizontally separated)               | l to Unistrut                         | <u>8.0×109</u> 2<br>8.0×10952                  |
| · · · · · · · · · · · · · · · · · · ·  | 4 to Unistrut                         | 7.5×10 52                                      |
|                                        |                                       |                                                |
| <u></u>                                |                                       |                                                |
|                                        |                                       |                                                |
|                                        | · · · · · · · · · · · · · · · · · · · |                                                |
| ······································ | Tested                                | By Manues To Web Date: 9-5-84                  |
|                                        | Witnes                                | s Date:                                        |
| otice of                               | Sheet M                               | vo of                                          |
| nomaly <u>None</u>                     | Approv                                | ed 1.Km 9.5.85                                 |

Wyle Form WH 614A, Rev. APR '54

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Page No. II-30 Test Report No. 47906-02 \*\*

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# DATA SHEET

| Customer Stone & Webster              |                                                          | WYLE LABORATORIES                      |
|---------------------------------------|----------------------------------------------------------|----------------------------------------|
| Specimen <u>Cables</u>                |                                                          |                                        |
| Part No. Various                      |                                                          | Job No 47906                           |
| SpecWLTP_47906-01                     | PhotoYes                                                 | Report No                              |
| Para. 3.3.6                           | Test MedAir                                              | Start Date                             |
| S/NN/A                                | Specimen Temp                                            | Ambient                                |
| GSI <u>^ No</u>                       |                                                          |                                        |
| Test Title Configura                  | tion No. 1 Test No.                                      | 0.1                                    |
| Pre-Tost-                             | N (Post-Test)                                            | Functional Test                        |
| Insulation Resistance Tes             | t (Continued)                                            | ······································ |
| Cabla                                 | Test Points                                              | Reading                                |
| Cable                                 |                                                          | 4.0 × 10 4 A                           |
| \$.T.P. 16 AWG                        | 1 to 2                                                   | TOXICIL                                |
| (Horizontally Separated)              | 3 to 4 NA Joy                                            |                                        |
| 4                                     | 5 to 6 NA MM                                             | ٢                                      |
|                                       | 5 to 6 NA JMA<br>7 to 8 NA JMA                           | ٢                                      |
|                                       | 9 to 10 NA AM                                            |                                        |
| ~                                     | l to Unistrut                                            | 2.1 × 10.8 2                           |
|                                       | 2 to Unistrut                                            | 2.1 ×10.8 2<br>2.12 ×108 2             |
|                                       | 3 to Unistrut NA                                         | June                                   |
| · · · · · · · · · · · · · · · · · · · |                                                          |                                        |
|                                       | 4 to Unistrut NA<br>5 to Unistrut NA<br>6 to Unistrut NA | JPK                                    |
|                                       | 6 to Unistrut <sub>N</sub> A                             | gmc                                    |
|                                       | 7 to Unistrut NA                                         | JAK                                    |
| ····                                  | 8 to Unistrut N/                                         |                                        |
|                                       | 9 to Unistrut NA                                         | 4 MMK                                  |
|                                       | 10 to Unistrut N                                         | A JPAC                                 |
|                                       |                                                          | <i>u</i>                               |
|                                       |                                                          |                                        |
|                                       |                                                          |                                        |
| <u></u>                               | Test                                                     | ed By Maring - Habe Date: 65-9:        |
|                                       | Witn                                                     |                                        |
| Notice of                             | Shee                                                     | et No of                               |
| Anomaly <u>None</u>                   | Арр                                                      | roved 9-5-85                           |

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Page No. II-31 Test Report No. 47906-02

# DATA SHEET

| ecimen     | Stone & Webste         | <u>er</u>               | WYLE LABORATORI               | ES   |
|------------|------------------------|-------------------------|-------------------------------|------|
|            | Cables                 |                         | 120:-                         |      |
| art No     | Various                | Amb. Temp               | 637 Job No. 47906             |      |
| pec        | WLTP 47906-01<br>3.3.6 | Photo Yes               | Report No47906<br>Start Date  | -2   |
| ara        | 3,3,6                  | Test MedAir             | Start Date 2 - 3 -            | 82   |
|            | N/A                    | Specimen Temp           | Ambient                       |      |
| ISI        | No                     |                         |                               |      |
| est Title  | Configuratio           |                         | st No. 1                      |      |
|            | -pre-Test- d           | Post-Test F             | unctional Test                |      |
|            |                        |                         |                               |      |
| High Poten | tial Test              |                         |                               |      |
|            |                        | shall be no evidence of | insulation breakdown or flas  | hove |
|            |                        |                         |                               |      |
|            |                        |                         | 1600 VAC for 5 T.P. 16 AWG_c. | able |
|            | applied                | d for one minute.       |                               |      |
|            | <u></u>                |                         |                               |      |
| Cable      |                        | Test Points             | Reading                       |      |
| #2 AWG Tri | plex                   | 1.to 2                  | THOMA                         |      |
| (Vertical) | y Separated)           | 1 to 3                  | TROLLA                        |      |
|            |                        | 2 to 3                  | TASHA                         |      |
|            |                        | l to Unistrut           | 1005 MA                       |      |
|            |                        | 2 to Unistrut           | 1015 MA                       |      |
|            |                        | 3 to Unistrut           | ICISNA                        |      |
|            |                        |                         |                               |      |
| 7/C - 12 A | WG                     | 1 to 4                  | 1540 BA                       |      |
|            | lly Separated)         | l to Unistrut           | 1000.LIA                      |      |
| (Horizonta |                        |                         | 1200LIA                       |      |

Wyle Form WH 514A, Rev. APR '84

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Page No. II-32 Test Report No. 47906-02

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| Customer Stone & Webste               | <u>r</u>                | WYLE LABORATORIES                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|---------------------------------------|-------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Specimen <u>Cables</u>                |                         | 1 2 4 -                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Part No. Various                      | Amb. Temp               | <u>\$37</u> Job No. 47906                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Spec. WLTP 47906-01                   | Photo Yes               | Report No47906-2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Para. 3.3.6                           | Test MedAir             | Start Date                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| S/NN/A                                |                         | Ambient                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| GSINo                                 |                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                                       | uration No. 1 Te        | est No. 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|                                       | st-N Post-Test          | Functional Test                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                                       |                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| High Potential Test (Contin           | ued)                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Cable                                 |                         | Reading                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| 1 9002<br>3 T.P. 16 AWG               | 1 to 2                  | 5.50 LIA                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| (Horizontally Separated)              | 3 to 4 NA grac          | 1150HA DW                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|                                       | 5 to 6 NA Apric         | H951 DW                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|                                       | 7 to 8 NA MAR           | *                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <u></u>                               | 9 to 10 NA MAL          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                                       | l to Unistrut           | 1150MA                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|                                       | 2 to Unistrut           | 1195MA .                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| · · · · · · · · · · · · · · · · · · · | 3 to Unistrut NA        | gmc                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|                                       | 4 to Unistrut NA        | Marc                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|                                       | 5 to Unistrut NA        | groce                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|                                       | <u>6 to Unistrut NA</u> | for the second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second s |
| ·                                     | 7 to Unistrut NA        | AME                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|                                       | 8 to Unistrut NA        | APT .                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|                                       | 9 to Unistrut NA        | Opk                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <u></u>                               | 10 to Unistrut NA       | gpt                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|                                       |                         | f: zili:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|                                       | Tested                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| lation of                             | Witnes                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| lotice of None                        | Sheet N                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| nomalyNone                            | Approv                  | eu                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |

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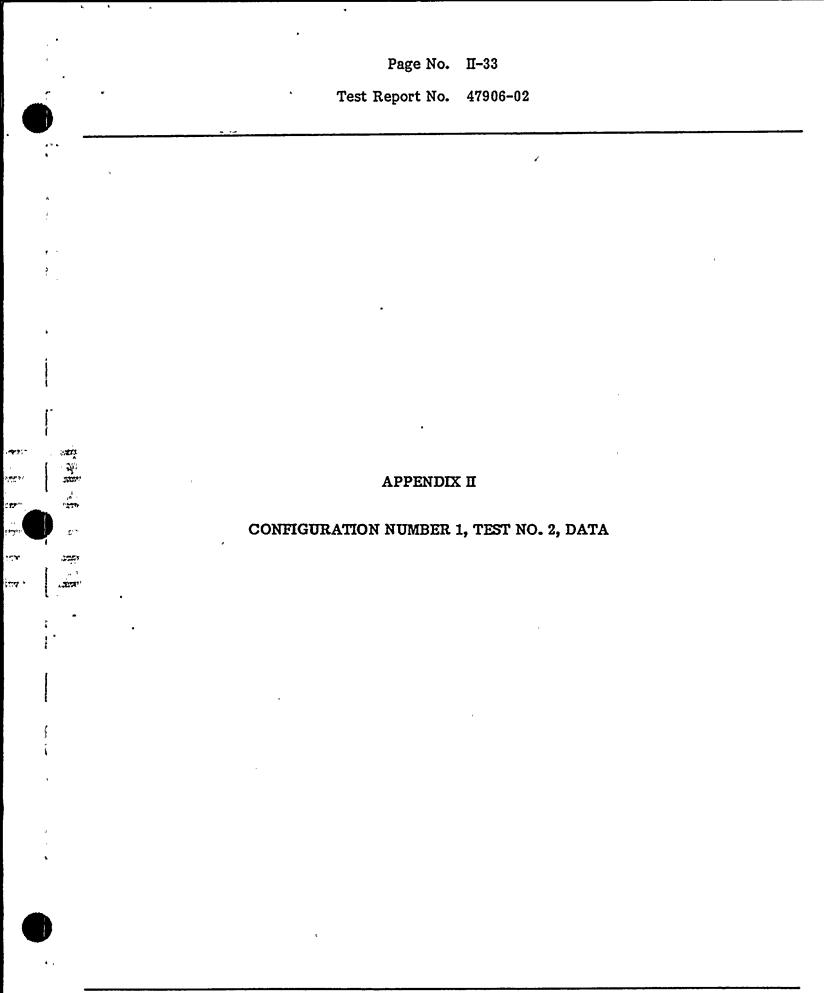
47 440

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N Anomaly \_\_\_\_

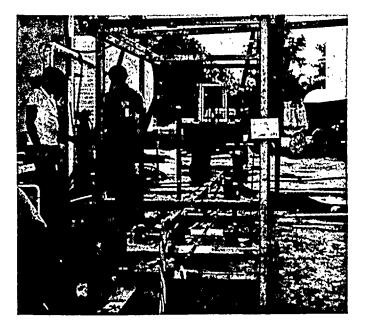
None

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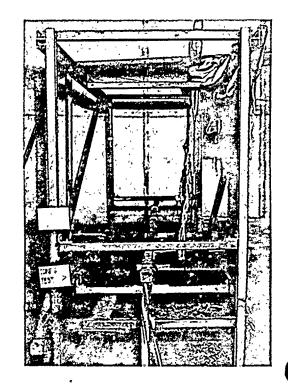
Page No. II-34
 Test Report No. 47906-02

#### CONFIGURATION NUMBER 1, TEST NO. 2

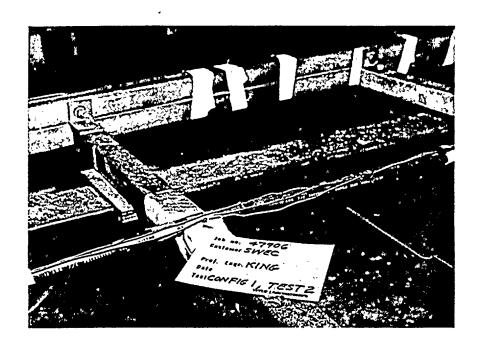


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PHOTOGRAPH II-3 PRETEST VIEW — OVERALL



PHOTOGRAPH II-4 POST-TEST VIEW — OVERALL



PHOTOGRAPH II-5

POST-TEST VIEW — CLOSE-UP TARGET CABLE AT CLOSEST POINT TO FAULT CABLE Page No. II-35

Test Report No. 47906-02

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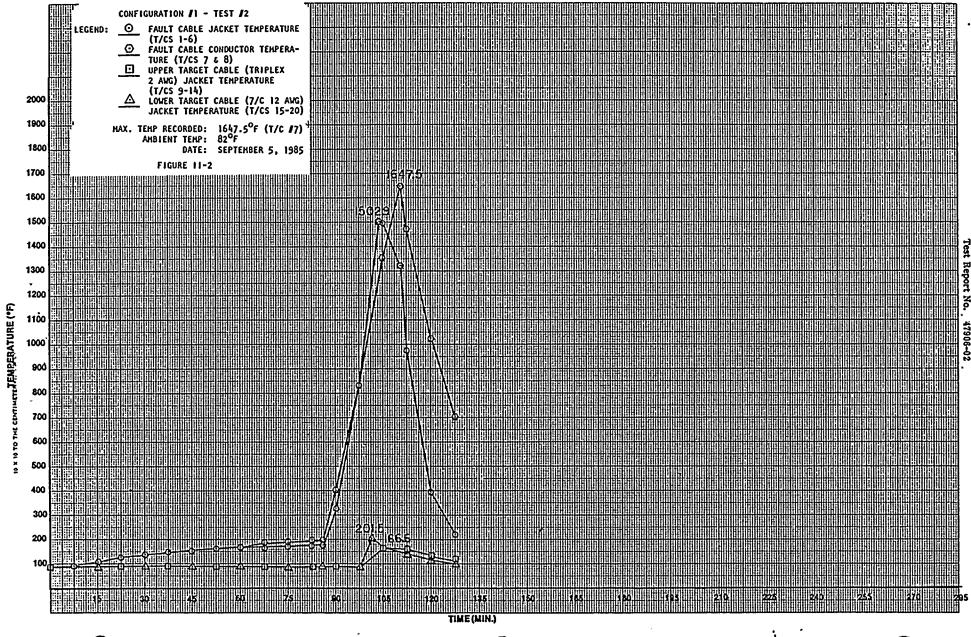
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#### CONFIGURATION NUMBER 1, TEST NO. 2

| Approximate<br>Test Time | Approximate<br>Fault Cable<br>Jacket Temperature | Observation                         |
|--------------------------|--------------------------------------------------|-------------------------------------|
| 0 Min                    | 82°F                                             | Energized fault cable with 139A     |
| 10 Min                   | 890F                                             | Energized fault cable with 270A     |
| 65 Min                   | 169°F                                            | Energized fault cable with 275A     |
| 70 Min                   | 172°F .                                          | Energized fault cable with 280A     |
| 75 Min                   | 175°F                                            | Energized fault cable with 285A     |
| 80 Min                   | 176 <sup>0</sup> F                               | Fault cable conductor reached 190°F |
| 86.3 Min                 | 178°F                                            | Energized fault cable with 908A     |
| 91.3 Min                 | 3920F                                            | Light smoke visible                 |
| 94.2 Min                 | 515°F                                            | Fault cable jacket rupturing        |
| 97.8 Min                 | 856°F                                            | Ignition of fault cable             |
| 110.7 Min                | 1648 <sup>0</sup> F                              | Open circuit                        |
| 113.3 Min                | 1420 <sup>o</sup> F                              | Fire out                            |

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# DATA SHEET

| ustomer <u>Stone &amp; Webster</u>                                                                         |                                                                        | WYLE LABORATORIES            |
|------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------|------------------------------|
| 0-1-1-6                                                                                                    |                                                                        |                              |
| art No. Various                                                                                            | Amb. Temp. 5.2                                                         | Job No. 47906                |
| WLTP 47906-01                                                                                              | Photo Yes                                                              | Benort No. 47906-02          |
| Lables           art No.         Various           pec.         WLTP 47906-01           ara.         3.3.4 | Tost Mod Air                                                           | Start Date 7-5-85            |
| /NN/A                                                                                                      | Specimen TempAr                                                        | mient                        |
| SI <u>No</u>                                                                                               | Specimen Temp                                                          |                              |
| 51                                                                                                         |                                                                        |                              |
| est Title <u>Configuration No.</u><br>Pre-Test <u>Pool</u>                                                 | 1 <u>Test No. 2</u><br><del>st-Test <sup>QCD</sup></del> Functional Te | st                           |
| INSULATION RESISTANCE TEST                                                                                 |                                                                        |                              |
| ACCEPTANCE CRITERIA: Measure                                                                               |                                                                        |                              |
| with a                                                                                                     | potential of 1000 VDC (500                                             | for T.P. 16 AWG) applied for |
| 60 seco                                                                                                    | nds.                                                                   |                              |
| ······                                                                                                     |                                                                        |                              |
| CABLE                                                                                                      | TEST POINTS                                                            | READING                      |
| 2 AWG Triplex                                                                                              | 1 to 2                                                                 | 6.0×109-22<br>8.6×109-22     |
| (Vertically Separated)                                                                                     | 1 to 3                                                                 |                              |
|                                                                                                            | 2 to 3                                                                 | 3.4X108 n                    |
| <del></del>                                                                                                | l to Unistrut                                                          | 7.2 ×109 2                   |
| ······                                                                                                     | <u>2 to Unistrut</u>                                                   | 5.0×1092                     |
| · · · · · · · · · · · · · · · · · · ·                                                                      | 3 to Unistrut                                                          | 4.5×109 r                    |
| 7/C - 12 AWG                                                                                               | 1 to 4                                                                 | 8.0×109 2                    |
| (Horizontally Separated)                                                                                   | l to Unistrut                                                          | 8.0×1095                     |
|                                                                                                            | 4 to Unistrut                                                          | 7.5×10°.a                    |
|                                                                                                            |                                                                        |                              |
|                                                                                                            |                                                                        |                              |
|                                                                                                            |                                                                        | ······                       |
| ,                                                                                                          | 4                                                                      | the second of the second     |
|                                                                                                            | -                                                                      | Anternal State Date:         |
|                                                                                                            | Witness _                                                              |                              |
| tice of                                                                                                    | Sheet No.                                                              |                              |
| cmaly <u>None</u>                                                                                          | 4ccroved                                                               | Mr. 9-5-85                   |

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Page No. II-38 Test Report No. 47906-02

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| Customer Stone & Webster           |                                       | WYLE LABORATORIES                       |
|------------------------------------|---------------------------------------|-----------------------------------------|
| pecimen <u>Cables</u>              | 000                                   | -                                       |
| art No. Various                    | Amb. Temp 3.4 /-                      | Job No47906                             |
| pecWLTP 47906-01                   | PhotoYes                              | Report No 47906-02<br>Start Date 5 - 85 |
| ara3.3.4                           | Test MedAir                           | Start Date5 - 85                        |
| /NN/A                              | Specimen TempAmbie                    | <u>nt</u>                               |
| iSINo                              |                                       |                                         |
| est Title <u>Configuration</u> No. | 1Test No. 2                           |                                         |
| Pre-test Post-T                    | Cot Structional Test                  |                                         |
| HIGH POTENTIAL TEST                |                                       |                                         |
| ACCEPTANCE CRITERIA: There sha     |                                       |                                         |
| with a po                          | otential of 2200 VAC (1600 VAC        | for & T.P. 16 AVG cables)               |
|                                    |                                       | tor 9 million and Cables/               |
| applied                            | for one minute:                       |                                         |
|                                    |                                       |                                         |
| CABLE                              | TEST POINTS                           | READING                                 |
| 2 AWG Triplex                      | 1 to 2                                | 930 UA                                  |
| (Vertically Separated)             | 1 to 3                                | 980MA                                   |
|                                    | 2 to 3                                | 92011A                                  |
|                                    | l to Unistrut                         | 905MA                                   |
|                                    | 2 to Unistrut                         | <u> X80 LIA</u>                         |
|                                    | 3 to Unistrut                         | 8.90NA                                  |
| 7/C - 12 AWG                       | 1 to 4                                | 1540 NA                                 |
| (Horizontally Separated)           | l to Unistrut                         | IDDO MA                                 |
|                                    | 4 to Unistrut                         | 12.00 LA                                |
|                                    |                                       |                                         |
| ******                             |                                       |                                         |
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|                                    | · · · · · · · · · · · · · · · · · · · |                                         |
|                                    |                                       |                                         |
|                                    | Tested By                             | 2nour Millie Date: 9-5-85               |
|                                    | Witness                               | Mone Date:                              |
| tice of                            | Sheet No.                             | 2 date:                                 |
| nomalyNave                         |                                       | Mellin Pris 85                          |

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| ustomer Stone & Webster              |                                       |                      | WYLE LABOR       | ATORIES                               |
|--------------------------------------|---------------------------------------|----------------------|------------------|---------------------------------------|
| pecimenCables                        |                                       | 9:00                 |                  | 1                                     |
| art No. Various                      | Amb. Temp                             | 837                  | Job No           | 47906                                 |
| pecWLTP 47906-01<br>ara3.3.5         | Photo <u>Yes</u>                      |                      | Report No.       | 47906-02                              |
| ara3.3.5                             | Test MedAir                           |                      | Start Date2      | -5-85                                 |
| /NN/A                                | Specimen Temp                         | Ambient              |                  |                                       |
| SI <u>No</u>                         |                                       |                      | æ                |                                       |
| est Title <u>Configuration No. 1</u> | Test No. 2                            | 0vercur              | rent Test        |                                       |
| 12. Readings with rated current o    | n fault cable:                        |                      |                  |                                       |
| V                                    | oltage (VAC)                          | Cur                  | rent (AMPS)      |                                       |
| TARGET CABLE A-B                     |                                       | Phase A              | Phase 8          | Phase C                               |
| 2 AWG Triplex 578                    | 577 571                               | 400 A                | 41.0 A           | 39.91                                 |
| (Vertically Separated)               |                                       |                      |                  |                                       |
|                                      | innell                                | <u> </u>             | (9.99 A          | 7) <sup>*</sup>                       |
| 7/C - 12 AWG                         | INDID Val                             |                      | (1.17 A          | /                                     |
| (Horizontally Separated)             | · · · · · · · · · · · · · · · · · · · | <u> </u>             |                  |                                       |
|                                      |                                       |                      |                  |                                       |
|                                      | Pi                                    |                      |                  |                                       |
| FAULT CABLE: 26 AINC                 | TRIPLER                               |                      | <u></u>          |                                       |
| RATED CURRENT: 139 A                 | / NI/ 44 A                            |                      | ·····            | · · · · · · · · · · · · · · · · · · · |
| MEASURED CURRENT: 139A               |                                       |                      |                  |                                       |
|                                      |                                       |                      |                  | <del></del>                           |
|                                      |                                       | <u> </u>             |                  |                                       |
|                                      |                                       |                      |                  |                                       |
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|                                      |                                       |                      |                  |                                       |
|                                      |                                       |                      |                  |                                       |
|                                      |                                       |                      | <u> </u>         |                                       |
|                                      | Teste<br>Witne                        | d By <u>K. Lever</u> | <u></u> Da<br>Dá | te: <u>7-5-</u><br>te:                |
| ilce of NOA Z                        | Shee                                  | t No1                | /                | of <u>5</u>                           |
| omaly <u></u>                        | Appro                                 | oved////             | ung 9-5          | -82-                                  |

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Page No. II-40 Test Report No. 47906-02

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| istomer <u>Stone &amp; Webster</u>             |                           | WYLE LABORATORIES                  |
|------------------------------------------------|---------------------------|------------------------------------|
| ecimen <u>Cables</u>                           | Amb. Temp. <u>83</u>      |                                    |
| art No. Various                                | Amb. Temp                 | Job No 47906                       |
| pec. WLTP 47906-01                             | Photo                     | Report No47506-02                  |
| ara. 3.3.5                                     | Test MedAir_              |                                    |
| /NN/A                                          | Specimen Temp             | Ambient                            |
| SI <u>No</u>                                   |                           |                                    |
| est Title <u>Configuration No</u>              | . 1 Test No. 2            | Overcurrent Test                   |
| 13. Increasing current to                      | raise fault cable tempera | ture to 189°F - 199°F:             |
| FAULT CABLE CURRENT                            | ELAPSED TIME              | HCABLE<br>CONDUCTOR- TEMP./CHANNEL |
| 2 70 A                                         | 3 300 Sec                 | 1780 - 7                           |
| 275A                                           | 300 Sec                   | 182°=/7                            |
| 2 60 A                                         | 300 Sec                   | 185°F/7                            |
| 285A                                           | 300 sec                   | 190°F/7                            |
| FAULT CABLE CURRENT:<br>CONDUCTOR TEMPERATURE: | 285A<br>192°F             | CHANNEL NO. 7                      |
| Max. Temp, °F<br>Channels 1-6                  |                           | CHANNEL NO. 7                      |
| Channels 1-6                                   | 173°F                     |                                    |
|                                                |                           |                                    |
|                                                |                           |                                    |
|                                                |                           |                                    |
|                                                |                           |                                    |
|                                                | Teste                     | od By 1 Sinsy 5 alsobate: 7-5-4    |
| nomaly <u>None</u>                             | With<br>Shee<br>Appr      | t No of _5                         |

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| Specimen       Cables       Amb. Temp.       3%       Job No.       47905         Part No.       WLTP 47906-01       Photo       Yes       Report No.       47906-02         Para.       3.3.5       Test Med.       Alr       Start Date       7.57-7.55         SIN       N/A       Specimen Temp.       Ambient       Start Date       7.57-7.55         SIN       N/A       Specimen Temp.       Ambient       Start Date       7.57-7.55         SIN       NA       Specimen Temp.       Ambient       Start Date       7.57-7.55         SIN       No       Test No.       2       Overcurrent Test         Total readings with test current on fault cable:       Initial readings with test current on fault cable:       Initial readings with test current on fault cable:         TARGET CABLE       Amb Andrea       STA       Start Date       Thase A       Phase B       Phase         2 AWG Triplex       STA       Start Date       Start Date       Thase B       Phase       Phase B       Phase         7/C - 12 AWG       ///9.3 bac       Start Date       Start Date       The Start Date       The Start Date       The Start Date       The Start Date       Start Date       Start Date       Start Date       Start Date | Customer   | Stone & Webster        |                       | WY                                    | LE LABORATORIES                        |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|------------------------|-----------------------|---------------------------------------|----------------------------------------|
| SIN                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | •          | 11 1                   |                       | 83°C                                  | 17001                                  |
| SIN                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Part No.   |                        | Amb. Temp             | Job                                   | No4/906                                |
| SIN                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |            |                        | PhotoYes              | Rep                                   | ort No                                 |
| SIN                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |            |                        | Test Med. <u>Air</u>  | Sta                                   | rt Date 9-5-85                         |
| Test Title <u>Configuration No. 1</u> Test No. 2 Overcurrent Test<br>17. Initial readings with test current on fault cable:<br>TARGET CABLE <u>Voltage (VAC)</u><br>TARGET CABLE <u>Voltage (VAC)</u><br>TARGET CABLE <u>Voltage (VAC)</u><br>TARGET CABLE <u>S73 568 570</u> 39.9 A 41.0 A 39.4<br>(Vertically Separated<br>7/C - 12 AWG <u>//9.3 Va.c</u> <u>9.89</u> Amps<br>(Horizontally Separated)<br>FAULT CABLE <u>2/0 AW &amp; TRIPLEX</u><br>Measured Current: <u>H34 A 908A gave</u><br>Measured Current: <u>908A</u><br>Tested Ey <u>Current</u> <u>Withbate: 9.5-</u><br>Witness <u>Mac</u> Date: <u>555</u>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | S/N        | N/A                    | Specimen Temp.        | Ambient                               |                                        |
| 17. Initial readings with test current on fault cable:<br>TARGET CABLE Voltage (VAC) Current (AMPS)<br>ARGET CABLE ST3 568 570 39.9 A 41.0 A 39.4<br>(Vertically Separated<br>7/C - 12 AMG //9.3 Vac 9.89) Amps<br>(Horizontally Separated)<br>FAULT CABLE 2/0 AW& TRIPLEX<br>FAULT CABLE 2/0 AW& TRIPLEX<br>Measured Current: -32A 908A perc<br>Measured Current: 908A<br>Tested By Current: 908A<br>Tested By Current: 9.5-<br>Witness Made Date: 5.5-                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | GSI        | No                     |                       |                                       |                                        |
| TARGET CABLE       Voitage (VAC)<br>A=B       Current (AMPS)<br>Phase B         2 AWG Triplex       573:568       570       39.94       41.0 A       39.4         (Vertically Separated       119.3 Vac       9.9       41.0 A       39.4         7/C - 12 AWG       119.3 Vac       9.8       41.0 A       39.4         (Vertically Separated       119.3 Vac       9.8       41.0 A       39.4         FAULT CABLE       119.3 Vac       9.8       41.0 A       39.4         FAULT CABLE       2/0 AW 6- TR-IPLE K       41.0 A       41.0 A       41.0 A         FAULT CABLE       2/0 AW 6- TR-IPLE K       41.0 A       41.0 A       41.0 A         Fault Cable       2/0 AW 6- TR-IPLE K       41.0 A       41.0 A       41.0 A         Fault Cable       2/0 AW 6- TR-IPLE K       41.0 A       41.0 A       41.0 A         Fault Cable       2/0 AW 6- TR-IPLE K       41.0 A       41.0 A       41.0 A       41.0 A         Fault Cable       2/0 AW 6- TR-IPLE K       41.0 A       41.0 A       41.0 A       41.0 A         Fault Cable       2/0 AW 6- TR-IPLE K       41.0 A       41.0 A       41.0 A       41.0 A         Fault Cable       2/0 AW 6- TR-IPLE K       41.0 A       41.0 A                                            | Test Title | Configuration No.      | 1 Test No. 2          | Over                                  | current Test                           |
| 2 AWG Triplex 573 568 570 39.9A 41.0A 39.4<br>(Vertically Separated<br>7/C - 12 AWG 1/9.3 Vac 9.89 Amps<br>(Horizontally Separated)<br>FAULT CABLE 2/0 AW 6 TRIPLEX<br>Mer Test Current: 134 A 908A proc<br>Measured Current: 908 A<br>Tested By Channe X MM Date: F.5-<br>Wilness Made Date: -                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 17. Init   | tial readings with tes | t current on fault ca | ble:                                  |                                        |
| 2 AWG Triplex 573 568 570 39.9.4 41.0 A 39.4<br>(Vertically Separated<br>7/C - 12 AWG //9.3 Vac 9.89 Amps<br>(Horizontally Separated)<br>FAULT CABLE 2/0 AW 6 TRIPLEX<br>Measured Current: 134 A 908 Amc<br>Measured Current: 908 A<br>Tested By Channe X Millionte: F.5-<br>Wilness Mai Date: 55                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | T          | RGET CABLE             | Voltage (VAC)         | Ci<br>Rhace A                         | irrent (AMPS)                          |
| (Vertically Separated<br>7/C - 12 AWG //9.3 Va.c. 9.89 Amps<br>(Horizontally Separated)<br>FAULT CABLE 2/0 AW 6- TRIPLEX<br>MMC Test<br>Measured Current: +3&A 908A from<br>Measured Current: 908A<br>Measured Current: 908A<br>Tested By Came & Withbate: F.5-<br>Witness Mark Date:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |            |                        |                       |                                       |                                        |
| 7/C - 12 AWG     1/9.3 Va.c     9.89 Amps       (Horizontally Separated)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |            |                        | 313 568 5             | <u>10 39,94</u>                       | 41.0A 39.4A                            |
| (Horizontally Separated)<br>FAULT CABLE 2/0 AW 6- TRIPLEX<br>Measured Current: -13&A-908A genc<br>Measured Current: 908A<br>Tested By Mann & MM Date: 5.5-<br>Witness Mark Date: -                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | (Vertical  | ly Separated           |                       |                                       |                                        |
| (Horizontally Separated)<br>FAULT CABLE 2/0 AW 6- TRIPLEX<br>MAK Testod Current: 1-3& A 90BA from<br>Measured Current: 908A<br>Measured Current: 908A<br>Tested By Mann K MM Date: 9.5-<br>Witness Mark Date: 908                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 7/C - 12   | AWG                    | 119.3 Vac             | (9                                    | (89) Amps                              |
| FAULT CABLE 2/0 AW& TRIPLEX<br>MK Test<br>Measured Current: -134 A 908 A<br>Measured Current: 908 A<br>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | (Horizont  | tally Separated)       |                       |                                       |                                        |
| Measured Current:     408/4                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |            |                        | ······                |                                       |                                        |
| Measured Current:     408/4                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |            |                        |                       | · · · · · · · · · · · · · · · · · · · |                                        |
| Measured Current:     408/4                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |            |                        |                       |                                       |                                        |
| Measured Current:     408/4                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |            |                        |                       |                                       |                                        |
| Measured Current:     408/4                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |            |                        |                       |                                       |                                        |
| Measured Current:     408/4                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |            |                        |                       |                                       |                                        |
| Measured Current:     408/4                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |            |                        |                       |                                       | ·····                                  |
| Measured Current:     408/4                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |            | ILE 2/0 A              | WG TRIPLEX            |                                       |                                        |
| Measured Current:     408/4                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Opr Test   | t                      |                       |                                       | ······································ |
| Measured Current:     408/4                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 10 70 7000 | A current: 75          | TOBA MAR              | <u> </u>                              |                                        |
| Tested By <u>Carmy XWH</u> Date: <u>7.5-</u><br>Witness <u>Mark</u> Date:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Meas       |                        | 708A ·                |                                       |                                        |
| Witness Date:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |            |                        |                       |                                       |                                        |
| Witness Date:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | ·····      |                        |                       |                                       |                                        |
| Witness Date:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |            |                        |                       |                                       | •                                      |
| Witness Date:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |            |                        |                       |                                       |                                        |
| Witness Date:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | ·····      | -                      |                       |                                       |                                        |
| Witness Date:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |            |                        |                       |                                       |                                        |
| Witness Date:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |            |                        |                       |                                       |                                        |
| Witness Date:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |            |                        |                       |                                       |                                        |
| Witness Date:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |            |                        |                       | -                                     |                                        |
| Witness Date:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |            |                        |                       | (!                                    | 41111 9.5-X                            |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |            |                        |                       |                                       | Date: / . J - //                       |
| IOUICE OT Sheet No. 5 of 5                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | *          |                        |                       | _                                     |                                        |
| NO 2 AMI : ALCON                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |            | 10 2                   |                       | AMI .                                 |                                        |
| Anomaly NO. 2 Approved Marine 9-19-85                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Anomaly    | NU. L                  | Арр                   | roved                                 | 9-19-85                                |

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|-------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Cables                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | -                                                                      |                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Various A                     | Amb. Tem                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 5. <u>83°</u> F                                                        | Job No                                                                                                                                                                                         | 47906                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| WLTP 47906-01 F               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Yes                                                                    | Report No                                                                                                                                                                                      | 47906-02                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <u> </u>                      | est Med.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                        |                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <u>N/A</u> S                  | Specimen                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Temp. <u>Ambient</u>                                                   |                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| No                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                        |                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Configuration No. 1           | fest No.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 2                                                                      | Overcurr                                                                                                                                                                                       | ent Test                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| en_circuit on fault cable:    | 4                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 467 20 Bb                                                              |                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Elapsed time:                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 467 sec                                                                |                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Maximum fault.cable temper    | ature:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 1503°F                                                                 | Channel                                                                                                                                                                                        | No. 3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                        | •                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| abilized temperature on fault | cable:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                        |                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Elapsed time (beginning of    | 15-minu                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | te period): N/A                                                        |                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Maximum fault cable temper    | ature:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | N/A                                                                    | Channel                                                                                                                                                                                        | NO. N/A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Fault cable current:          | N/A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                        |                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                        |                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| nition of fault cable:        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                        |                                                                                                                                                                                                | ¢                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Elapsed time:                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 690 sec                                                                | <u> </u>                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Maximum fault cable temper    | ature:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 1503°F                                                                 | Channel I                                                                                                                                                                                      | 10. 3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Fault cable current:          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 908 A                                                                  |                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| •                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                        |                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                        |                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                        |                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|                               | _                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                        |                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                        |                                                                                                                                                                                                | •                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                        |                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                        | <br>ז                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Tested By                                                              | omad! o                                                                                                                                                                                        | ate: <u>9/5</u> /                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| *                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Witness                                                                |                                                                                                                                                                                                | ate:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Sheet No.                                                              | 4                                                                                                                                                                                              | _ of5                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|                               | Cables       Various       //         WLTP 47906-01       F         3.3.5       1         N/A       S         No       S         Configuration No. 1       1         en circuit on fault cable:       S         Elapsed time:       Maximum fault cable temper         abilized temperature on fault       Elapsed time (beginning of         Maximum fault cable temper       Fault cable current:         nition of fault cable:       Elapsed time:         Maximum fault cable       Maximum fault cable | Cables       Various       Amb. Temp         WLTP 47906-01       Photo | Cables       Various       Amb. Temp.       J3°F         WLTP 47906-01       Photo       Yes         3.3.5       Test Med.       Air         N/A       Specimen Temp.       Ambient         No | Cables       WILLELABO         Various       Amb. Temp. $33^{\circ}F$ Job No.         WLTP 47906-01       Photo       Yes       Report No.         3.3.5       Test Med.       Air       Start Date         NA       Specimen Temp.       Ambient       Start Date         No       Specimen Temp.       Ambient       Multer         No       Confiduration No. 1       Test Mo. 2       Overcurre         en circuit on fault cable: $1467 220^{\text{BD}}$ Elapsed time:       If 467 320         Elapsed time:       If 467 320       Channel if         maximum fault cable temperature: $1503^{\circ}$ F       Channel if         abilized temperature on fault cable:       Elapsed time (beginning of 15-minute period):       N/A         Maximum fault cable temperature:       N/A       Channel if         Fault cable current:       N/A       Channel if         Fault cable current:       N/A       Channel if         Fault cable current:       70% A       Mumad/       D         Witness       Maximum fault cable temperature:       100% A       Mumad/       D |

Page No. II-43 Test Report No. 47906-02

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| Spec.         WLTP         47906-01         Pl           Para.         3.3.5         Te           S/N         N/A         Si           GSI         No         Si | mh Temn          | Air              | Job /<br>Repo<br>Start        | No                | 47906-02                               |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|------------------|-------------------------------|-------------------|----------------------------------------|
| Spec.         WLTP         47906-01         Pl           Para.         3.3.5         Te           S/N         N/A         Si           GSI         No         Si | hoto<br>est Med  | Yes<br>Air       | Repo<br>Start                 | rt No             | 47906-02                               |
| Spec.         WLTP         47906-01         PI           Para.         3.3.5         Te           S/N         N/A         Si           GSI         No         Si | hoto<br>est Med  | Yes<br>Air       | Repo<br>Start                 | rt No             | 47906-02                               |
| Para 7.5.5 Te<br>S/N N/A Si<br>GSI No                                                                                                                            | est Med          | Air              | Start                         | Date              | 9-5-89                                 |
| S/NN/AS<br>GSINo                                                                                                                                                 | pecimen T        | amn Amhi         |                               |                   |                                        |
| GSI No                                                                                                                                                           |                  |                  | ent                           |                   |                                        |
|                                                                                                                                                                  |                  |                  |                               |                   |                                        |
| Test Title <u>Configuration No. 1</u>                                                                                                                            |                  |                  |                               |                   |                                        |
| 23. Readings after <del>let-through</del> curren                                                                                                                 | it applie        | d until faul     | t cable ope                   | n circu           | its:                                   |
| TARGET CABLE A-B                                                                                                                                                 | oltage ()<br>8-C | VAC)             | Phase A                       | Current<br>Phase  | (AMPS)<br>B Phase                      |
| 2 AWG Triplex 576                                                                                                                                                | , .577           | 1 512            | 39.7                          |                   |                                        |
| (Vertically Separated)                                                                                                                                           |                  |                  |                               |                   |                                        |
|                                                                                                                                                                  |                  |                  |                               |                   |                                        |
| 7/C - 12 AWG                                                                                                                                                     | 2.001/2          | 210<br>120.0 VAC |                               | 9.99              | Amos                                   |
|                                                                                                                                                                  | 100 140          |                  | <u>-</u>                      | $\tilde{}$        | 111111111                              |
| (Horizontally Separated)                                                                                                                                         |                  |                  |                               |                   |                                        |
|                                                                                                                                                                  |                  |                  |                               |                   |                                        |
|                                                                                                                                                                  |                  |                  |                               |                   |                                        |
|                                                                                                                                                                  |                  |                  |                               |                   |                                        |
| · •                                                                                                                                                              |                  |                  |                               |                   |                                        |
|                                                                                                                                                                  |                  |                  |                               |                   |                                        |
|                                                                                                                                                                  |                  |                  |                               |                   |                                        |
|                                                                                                                                                                  |                  |                  |                               |                   |                                        |
|                                                                                                                                                                  |                  |                  |                               |                   |                                        |
|                                                                                                                                                                  |                  |                  |                               |                   |                                        |
|                                                                                                                                                                  |                  |                  |                               |                   |                                        |
| · · · · · · · · · · · · · · · · · · ·                                                                                                                            |                  |                  |                               |                   |                                        |
|                                                                                                                                                                  |                  |                  |                               |                   |                                        |
|                                                                                                                                                                  |                  |                  | <u> </u>                      | <u></u>           |                                        |
|                                                                                                                                                                  |                  | ····             |                               | <u>.</u>          |                                        |
|                                                                                                                                                                  |                  | -                |                               |                   |                                        |
|                                                                                                                                                                  |                  |                  |                               | ·····             |                                        |
|                                                                                                                                                                  |                  |                  |                               |                   |                                        |
|                                                                                                                                                                  |                  |                  | _                             |                   |                                        |
|                                                                                                                                                                  |                  |                  | . <b>.</b> .                  |                   |                                        |
| <u> </u>                                                                                                                                                         | ******           |                  | 1                             | · luce            | 9-5-1                                  |
|                                                                                                                                                                  |                  | Tested By        | Kenning 1                     | 116 Dal           | te: <u>9-5-</u> 8                      |
|                                                                                                                                                                  |                  | Witness          | Mac                           | <u>////</u> 0 Dal | te:                                    |
| otice of <i>No</i> . 2_                                                                                                                                          |                  | •                | Marchan<br>Marchan<br>Marchan | Dai               | te: <u>9-5-5</u><br>te:<br>of <u>5</u> |

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# DATA SHEET

| Customer Stone & Webster                                |                                       | WYLE LABORATORIES                                                               |
|---------------------------------------------------------|---------------------------------------|---------------------------------------------------------------------------------|
| Specimen <u>Cables</u>                                  |                                       | <b>-</b>                                                                        |
| Part NoVarious                                          | Amb. Temp77 /                         | Job No47906                                                                     |
| pecWLTP 47906-01                                        | Photo <u>Yes</u>                      | Job No. <u>47906</u><br>Report No. <u>47906-02</u><br>Start Date <u>9-6-8-5</u> |
| ara 3.3. 6                                              | Test MedAir                           | Start Date <u>9-6-85</u>                                                        |
| 6/NN/A                                                  |                                       | ient                                                                            |
| 651 <u>No</u>                                           |                                       |                                                                                 |
| est Title <u>Configuration No. 1</u><br>Pre-Test Ba Pos |                                       |                                                                                 |
| INSULATION RESISTANCE TEST                              | · · · · · · · · · · · · · · · · · · · |                                                                                 |
| ACCEPTANCE CRITERIA: Measured                           |                                       |                                                                                 |
| with a p                                                | otential of 1000 VDC (500 fo          | or 5 T.P. 16 AWG) applied for                                                   |
| 60 secon                                                | ds.                                   | ·····                                                                           |
|                                                         |                                       |                                                                                 |
| CABLE                                                   | TEST POINTS                           | READING                                                                         |
| 2 AWG Triplex                                           | 1 to 2                                | 3.7 × 10 5 2                                                                    |
| (Vertically Separated)                                  | 1 to 3                                | 2.0 × 108 r                                                                     |
|                                                         | 2 to 3                                | 3.2×1085                                                                        |
|                                                         | l to Unistrut                         | 2.2×1085                                                                        |
|                                                         | 2 to Unistrut                         | 2.7×108-2                                                                       |
|                                                         | 3 to Unistrut                         | 7.1 y108 2                                                                      |
| 7/C - 12 AWG                                            | 1 to 4                                | 3.7×10 35                                                                       |
| (Horizontally Separated)                                | l to Unistrut                         | 1.0 × 10 8 -2<br>2.7 × 108.2                                                    |
|                                                         | 4 to Unistrut                         | 2.77×108.2                                                                      |
|                                                         |                                       | ····                                                                            |
| ······································                  |                                       |                                                                                 |
|                                                         | · · · · · · · · · · · · · · · · · · · |                                                                                 |
|                                                         |                                       |                                                                                 |
|                                                         |                                       | AL FULL DIM                                                                     |
|                                                         | Tested By                             | M                                                                               |
| otice of                                                | Witness                               | Date:                                                                           |
| ALCE OF                                                 | Sheet No                              | of                                                                              |

Page No. II-45 Test Report No. 47906-02

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# DATA SHEET

| Customer           | Stone & Webster                           |                                                         | WYLE LABORATORIES                                                     |
|--------------------|-------------------------------------------|---------------------------------------------------------|-----------------------------------------------------------------------|
| Specimen           | Cables                                    |                                                         | -                                                                     |
| Part No.           | Various                                   | Amb. Temp/ / /                                          | Job No. <u>47906</u>                                                  |
| Spec               | WLTP 47906-01                             | PhotoYes                                                | Report No 47906-02                                                    |
| Para               | 3.3.6                                     |                                                         | Start Date <u>7-6-85</u>                                              |
| 5/N                | N/A                                       | Specimen TempAmbie                                      | ent                                                                   |
| ìSI                | No                                        | _                                                       |                                                                       |
| est Title          | Configuration No. 1<br>Pre test (Post-Tes | Test No. 2<br>Functional Test                           |                                                                       |
| HIGH POTE          | NTIAL TEST                                | ····                                                    |                                                                       |
| ACCEPTANC          |                                           | l be no evidence of insulat                             |                                                                       |
|                    | with a pote                               | ential of 2200 VAC (1600 VA                             | for 8 T.P. 16 AWG cables)                                             |
|                    | applied for                               | r one minute.                                           |                                                                       |
|                    |                                           | *                                                       |                                                                       |
| САВ                | LE                                        | TEST POINTS                                             | READING                                                               |
| 2 AWG Tr           | iplex                                     | l to 2                                                  | 950LIA                                                                |
| (Vertical          | ly Separated)                             | 1 to 3                                                  | MOCLIA                                                                |
|                    |                                           | 2 to 3                                                  | 9175MA                                                                |
|                    |                                           | l to Unistrut                                           | ID90LIA                                                               |
|                    |                                           | 2 to Unistrut                                           | 1025.UA                                                               |
|                    |                                           | 3 to Unistrut                                           | IOR.5LIA                                                              |
| 7/C - 12 /         | AWG                                       | 1 to 4                                                  | 1500.UA                                                               |
| (Horizonta         | ally Separated)                           | l to Unistrut                                           | 1030 NA                                                               |
|                    | · · · · · · · · · · · · · · · · · · ·     | 4 to Unistrut                                           | 126511A                                                               |
| ······             |                                           |                                                         | <u> </u>                                                              |
| otice of<br>nomaly | None                                      | Tested By <u>/ /</u><br>Witness<br>Sheet No<br>Approved | <u>Marie Date: 7-/,</u><br>Marie Date:<br>Quere Of 2<br>MrKing 9-6-85 |

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#### APPENDIX III

#### CONFIGURATION NUMBER 1, TEST NO. 3, DATA

#### CONFIGURATION NUMBER 1, TEST NO. 3

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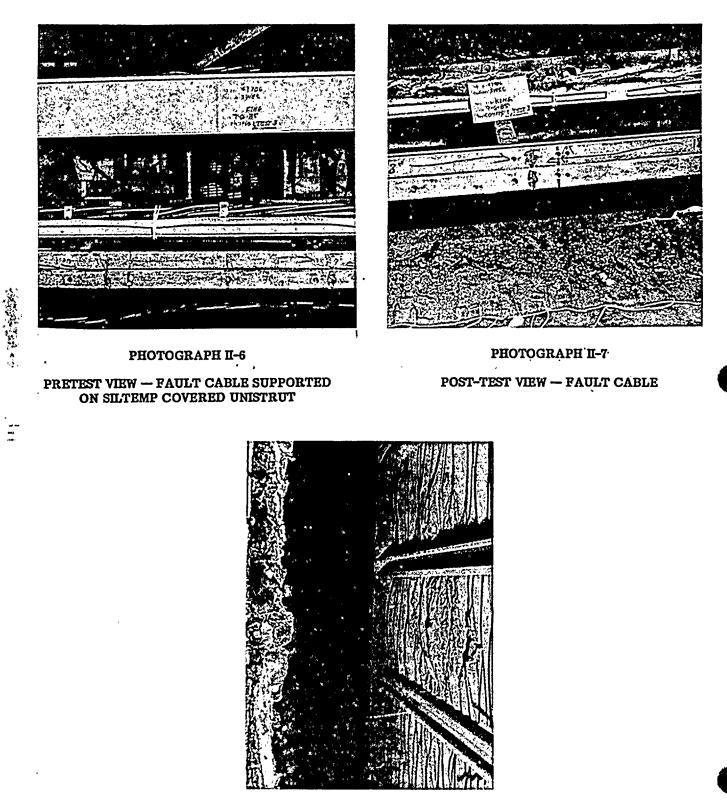
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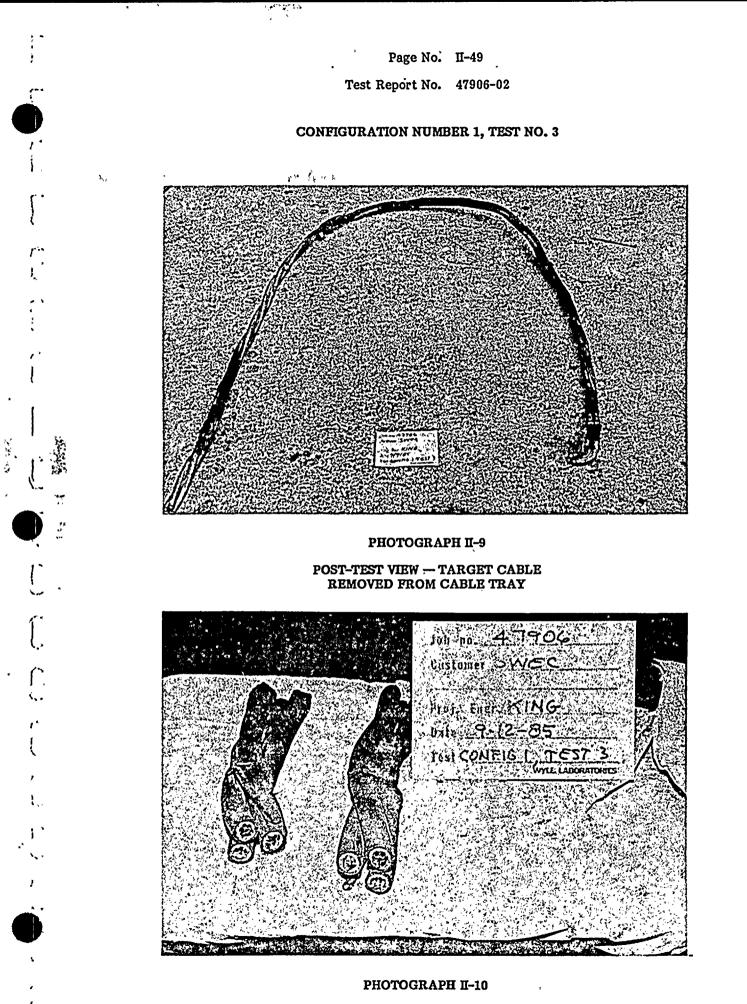
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РНОТОGRAPH II-8

POST-TEST VIEW — CLOSE-UP BOTTOM VIEW OF TARGET CABLE IN TRAY



POST-TEST VIEW — CROSS SECTION OF TARGET CABLE AT POINT WHERE MAXIMUM DAMAGE OCCURRED TO THE JACKET Page No. II-50

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Test Report No. 47906-02

#### CONFIGURATION NUMBER 1, TEST NO. 3

| Approximate<br>Test Time | Approximate<br>Fault Cable<br>Jacket Temperature | Observation                         |
|--------------------------|--------------------------------------------------|-------------------------------------|
| 0 Min                    | 92 <b>°</b> F                                    | Energized fault cable with 139A     |
| 10 Min                   | 970F                                             | Energized fault cable with 270A     |
| 75 Min                   | 1780F                                            | Energized fault cable with 275A     |
| 78.2 Min                 | 179°F                                            | Fault cable conductor reached 189°F |
| 83.2 Min                 | 181 <sup>0</sup> F                               | Energized fault cable with 908A     |
| 86.5 Min                 | 3550F                                            | Light smoke visible                 |
| 90.8 Min                 | 575°F                                            | Fault cable jacket rupturing        |
| 94.0 Min                 | 925 <sup>0</sup> F                               | Ignition of fault cable             |
| 102.4 Min                | 1610 <sup>0</sup> F                              | Open circuit                        |
| 104.0 Min                | 1280 <sup>o</sup> F                              | Fire out                            |

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CONFIGURATION #1 - TEST #3 0\_ FAULT CABLE JACKET TEMPERATURE LEGEND: (T/CS 1-6) 0 FAULT CABLE CONDUCTOR TEMPERA-TURE (T/CS 7 € 8) △ TARGET CABLE (TRIPLEX 2 AWG) JACKET TEHPERATURE (T/CS 9-14) HAX. TEHP RECORDED: 1610.3°F (T/C #3) AHBIENT TEHP: 74°F DATE: SEPTEHBER 6, 1985 卿 2000 FIGURE 11-3 1900 il li 1800 1700 16103 1600 1500 1 1400 EL C Ħ 1111 1300 e e e 3 1200 connucreTEMPERATURE (\*F) 10. HII 1100 - 12 1000 A CHANNELLIN 900 800 ÷ 700 600 2 HITH. 2 500 2 400 2964 S, III 300 200 100, ŀ

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Page No. Test Report No. П-51 47906-02 Page No. II-52 Test Report No. 47906-02 . ....

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#### DATA SHEET

| CustomerStone & Webster                          |                                              | WYLE LABORATORIES                        |
|--------------------------------------------------|----------------------------------------------|------------------------------------------|
| pecimen <u>Cablas</u>                            | Amb. Temp. 74%                               |                                          |
| art No Various                                   | Amb. Temp / / /                              | Job No 47906                             |
| pec. WLTP 47906-01                               | Photo Yes                                    | Report No. 47906-02<br>Start Date 9-6-85 |
| ara3.3.4                                         | Test MedAir                                  | Start Date9685                           |
| /NN/A                                            | Specimen Temp. <u>Ambie</u>                  | <u>nç</u>                                |
| SINo                                             |                                              | •                                        |
| est Title <u>Configuration No.</u><br>Pre-Test 4 | 1 Test No. 3<br>Post-Tast PD Functional Test |                                          |
| INSULATION RESISTANCE TEST                       | ·····                                        | ·                                        |
| ACCEPTANCE CRITERIA: Measur                      | red insulation resistance shall              | be greater than 1.6 Megohms              |
| with a                                           | a potential of 1000 VDC (500 for             | ST.P. 16 AWG) applied for                |
| . 60 sec                                         | conds.                                       |                                          |
| CABLE                                            | TEST POINTS                                  |                                          |
| <u></u>                                          |                                              | READING                                  |
| 2 AWG Triplex                                    | 1 to 2                                       | 3.7×10×50.<br>201×10×50.                 |
| (Vertically Separated)                           | 1 to 3                                       | 32×10 <sup>8</sup> N                     |
|                                                  | 2 to 3                                       | 2.2 × 10 × 2                             |
|                                                  | <u> </u>                                     | 2011080                                  |
| · · ·                                            | 3 to Unistrut                                | 2.1×10× 0-                               |
|                                                  |                                              | A.1 1.14 SI-                             |
| <u> </u>                                         | ·                                            |                                          |
|                                                  |                                              |                                          |
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|                                                  |                                              |                                          |
|                                                  |                                              |                                          |
|                                                  | Tasted By                                    | Unen Arthers Date: 9-15-9                |
|                                                  | Witness                                      | Date:                                    |
| otice of                                         | Sheet No                                     |                                          |
| nomalyNone                                       | Approved                                     | Withing 9/6/85                           |

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# DATA SHEET

| Customer Stone & Webster           |                                     | WYLE LABORATORIES                       |
|------------------------------------|-------------------------------------|-----------------------------------------|
| Specimen <u>Cables</u>             | Ать. Тетр 74                        | F                                       |
|                                    |                                     |                                         |
| Spec                               |                                     | Report No 47906-02                      |
| Para3.3.4                          |                                     | Start Date9-6-85                        |
| 5/NN/A                             | Specimen TempAmb i                  | ent                                     |
| 3SINo                              |                                     |                                         |
| est Title <u>Configuration No.</u> | Test_No3<br>ost=Test Functional Tes |                                         |
| HIGH POTENTIAL TEST                |                                     |                                         |
| ACCEPTANCE CRITERIA: There         | shall be no evidence of insula      | tion_breakdown_or_flashover             |
| with a                             | potential of 2200 VAC (1600 VA      | AC for 5 T.P. 16 AWG cables)            |
| · •                                | for one minute.                     | ······································  |
|                                    |                                     |                                         |
| CABLE                              | TEST POINTS                         | READING                                 |
| 2 AWG Triplex                      | 1 to 2                              | 980 MA                                  |
| (Vertically Separated)             | 1 to 3                              | 1000 MA                                 |
|                                    | 2 to 3                              | 975 KA                                  |
| ·····                              | l to Unistrut                       | 1090MA                                  |
|                                    | 2 to Unistrut                       | 1025 MA                                 |
|                                    | 3 to Unistrut                       | 1025 UA                                 |
|                                    |                                     |                                         |
|                                    |                                     |                                         |
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|                                    |                                     |                                         |
|                                    | /                                   | O. Fullet O.I. C                        |
|                                    | Tested By <u>//</u><br>Witness      | <u>Manue (740- 8</u><br>Mar Date:       |
| otice of                           | Sheet No.                           | of                                      |
| nomaly <u>None</u>                 | Acproved                            | war 9/1/2.2                             |

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## DATA SHEET

| Customer <u>Stone &amp; Webster</u><br>Specimen <u>Cables</u>                                                    |                       |                                       | WYLE LABORATORIE                                  |
|------------------------------------------------------------------------------------------------------------------|-----------------------|---------------------------------------|---------------------------------------------------|
| Specimen       Cables         Part No.       Various         Spec.       WLTP 47906-01         Para.       3.3.5 | Amb. Temp.<br>Photo   | Yes                                   | Job No. <u>47906</u><br>Report No. <u>47906-0</u> |
| S/NN/A<br>GSINo                                                                                                  |                       | emp. <u>Amb</u>                       | ient Start Date <u>9-6-85</u>                     |
| Test Title <u>Configuration No. 1</u>                                                                            | Test No.              | 3                                     | Overcurrent Test                                  |
| 12. Readings with rated current                                                                                  | on fault cable        | :                                     |                                                   |
| TARGET CABLE                                                                                                     | Voltage (\<br>A-8 B-C | A-C                                   | Current (AMPS)<br>Phase A Phase B P               |
| 2 AWG Triplex                                                                                                    | 578 570               |                                       | 41.7 41.3                                         |
| (Vertically Separated)                                                                                           |                       |                                       |                                                   |
|                                                                                                                  |                       |                                       |                                                   |
|                                                                                                                  |                       |                                       |                                                   |
|                                                                                                                  |                       |                                       |                                                   |
|                                                                                                                  |                       | ٩                                     | ·····                                             |
| FAULT CABLE: 2/0 AWG                                                                                             | TRIPLEX               |                                       |                                                   |
| RATED CURRENT: 139 A                                                                                             | ·····                 |                                       |                                                   |
| MEASURED CURRENT:                                                                                                |                       |                                       |                                                   |
|                                                                                                                  |                       |                                       |                                                   |
|                                                                                                                  |                       | · · · · · · · · · · · · · · · · · · · |                                                   |
|                                                                                                                  |                       |                                       |                                                   |
| · · · · · · · · · · · · · · · · · · ·                                                                            |                       |                                       |                                                   |
| Notice of                                                                                                        |                       | Tested By<br>Witness<br>Sheet No      | <u></u> Date: <u></u><br>Date:<br>of <u></u>      |
| Anomaly <u>None</u>                                                                                              |                       |                                       | moline 9-6-85                                     |

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## DATA SHEET

| Customer <u>Stone &amp; Webster</u>                    |                                              |               | WYLE LAB                          | ORATORIES                             |
|--------------------------------------------------------|----------------------------------------------|---------------|-----------------------------------|---------------------------------------|
| SpecimenCables                                         |                                              |               |                                   |                                       |
| Part No. Various                                       |                                              | 74°F          | Job No                            | 47906                                 |
| WLTP 47906-01                                          | PhotoY                                       | es            | Report No.                        | 47906-02                              |
| ara. 3.3.5                                             |                                              | <u>ir</u>     | Start Date.                       | 9-6-85                                |
| N/AN/A                                                 |                                              |               |                                   |                                       |
| SINo                                                   |                                              |               |                                   |                                       |
| est Title <u>Configuration No.</u> 1                   | Test No. 3                                   |               | Overcurren                        | <u>t Test</u>                         |
| 13. Increasing current to rai                          | ise fault cable temp                         | erature to 18 | 89°F - 199°F:                     |                                       |
| FAULT CABLE CURRENT                                    | ELAPSED TIME                                 | AAA. O AZ/ A  | DR TEMP./CHAN                     |                                       |
| 2704                                                   | 3900 Sec                                     |               | 88°F/7                            |                                       |
| 275 A                                                  | 192                                          |               | 89°F(7                            |                                       |
|                                                        | •                                            |               | ·                                 |                                       |
| 15. Readings after fault cable<br>FAULT CABLE CURRENT: | e warmup to 189°F -<br><del>-908-</del> 275A | 199°F:        |                                   | · · · · · · · · · · · · · · · · · · · |
| FAULT CABLE CURRENT:                                   |                                              |               | CHANNEL_NO.:                      | 7                                     |
| FAULT CABLE CURRENT:                                   | -908-275A                                    |               | CHANNEL_NO.:                      | 7                                     |
| FAULT CABLE CURRENT:                                   | <del>908-</del> 275A<br>192'F                |               | CHANNEL_NO.:                      | 7                                     |
| FAULT CABLE CURRENT:                                   | <del>908-</del> 275A<br>192'F                |               | CHANNEL_NO.:                      | 7                                     |
| FAULT CABLE CURRENT:                                   | <del>908-</del> 275A<br>192'F                |               | CHANNEL_NO.:                      | 7                                     |
| FAULT CABLE CURRENT:                                   | <del>908-</del> 275A<br>192'F                |               | CHANNEL_NO.:                      | 7                                     |
| FAULT CABLE CURRENT:<br>CONDUCTOR TEMPERATURE:         | <del>908-</del> 275A<br>192'F                |               | CHANNEL_NO.:                      | 7                                     |
| FAULT CABLE CURRENT:<br>CONDUCTOR TEMPERATURE:         | -908-275A<br>192'F<br>181                    | ested By      | CHANNEL NO .:                     | 7<br>7<br>Date: _ 7/6/                |
| FAULT CABLE CURRENT:<br>CONDUCTOR TEMPERATURE:         | -908-275A<br>192"F<br>181<br>                | · ·           | CHANNEL NO .:<br>Romadf<br>Mone J |                                       |

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| ustomer <u>Stone &amp; Webs</u>          |               |                                       |                           | ·                                     | VYLE LABO             | RATORIES         |
|------------------------------------------|---------------|---------------------------------------|---------------------------|---------------------------------------|-----------------------|------------------|
| pecimen <u>Cables</u><br>art No. Various |               | Amb. Temp.                            | <u>7</u> <del>¢</del> ° F | 、                                     | Job No                | 47906            |
| pec                                      |               | Photo                                 | Yes                       | F                                     | Report No             | 47906-02         |
| ara. <u></u>                             | ,             | Test Med                              | Air                       | (                                     | Start Date            | 9-6-85           |
|                                          |               | Specimen T                            | 'emp. <u>Ar</u>           | <u>mbient</u>                         |                       | ı                |
| SI No                                    |               |                                       |                           |                                       |                       |                  |
| est Title <u>Configuratic</u>            | on No. 1      | Test No.                              | 3                         | 0ve                                   | rcurrent 1            | <u>est</u>       |
| 17. Initial readings v                   | with test cur | rent on fau                           | lt cable:                 |                                       |                       | <u> </u>         |
| TARGET CABLE                             | Vo<br>A-B     | ltage (VAC)<br>B-C                    | A-C                       | C<br>Phase A                          | urrent (AM<br>Phase B | IPS)<br>Phase C  |
| 2 AWG Triplex                            |               | 578.5                                 |                           | (44,4                                 | ) 38.7                |                  |
| (Vertically Separated)                   |               |                                       |                           |                                       |                       |                  |
|                                          |               |                                       |                           |                                       |                       |                  |
|                                          |               |                                       |                           |                                       |                       |                  |
|                                          |               |                                       |                           |                                       |                       |                  |
|                                          |               |                                       |                           | · · · · · · · · · · · · · · · · · · · |                       |                  |
|                                          |               |                                       |                           |                                       |                       |                  |
|                                          |               | · · · · · · · · · · · · · · · · · · · |                           |                                       |                       |                  |
| FAULT CABLE: 2-/                         | 6 AWG         | TRIPLE                                | Χ                         |                                       |                       |                  |
| TEST MAG                                 | 708A          |                                       |                           |                                       |                       |                  |
| MEASURED CURRENT:                        |               |                                       |                           |                                       |                       |                  |
|                                          | , . <u> </u>  |                                       |                           |                                       |                       |                  |
|                                          |               |                                       |                           |                                       |                       |                  |
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|                                          |               |                                       |                           |                                       |                       | ·······          |
|                                          |               |                                       |                           |                                       | <u> </u>              |                  |
| · · · · · · · · · · · · · · · · · · ·    |               | ··· · · · · · · · · · · · · · · · · · | Tented P                  | Atta                                  |                       | 9/6/2            |
|                                          |               |                                       | Tested By                 | (10)                                  | <u> </u>              | ate: <u>10/0</u> |
| tics of                                  |               |                                       | Witness_                  |                                       | <u> </u>              | ate:             |
| otice of No. 2                           |               |                                       | Sheet No.                 |                                       | 9-6-85                | _ of             |
| icmaly <u>No.</u>                        |               | <u> </u>                              | Approved                  | yr king                               | 1-0.82                |                  |

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| Yes<br>Air<br>Temp. <u>Ambien</u><br>3<br>50 S&C                                                                                          | Overcurrent Test<br>Channel No. 3                                                                              |
|-------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------|
| Yes<br>Air<br>Temp. <u>Ambien</u><br>3<br>50 32C<br>1610 ° F<br>e period): <u>N/</u><br><u>N/A</u>                                        | Report No. <u>47906-02</u><br>Start Date <u>9-6-85</u><br>t<br><u>Overcurrent Test</u><br>Channel No. <u>3</u> |
| Yes<br><u>Air</u><br>emp. <u>Ambien</u><br><u>3</u><br><u>50 3.2c</u><br><i>1610 <sup>d</sup> F</i><br>e period): <u>K/</u><br><u>N/A</u> | Report No. <u>47906-02</u><br>Start Date <u>9-6-85</u><br>t<br><u>Overcurrent Test</u><br>Channel No. <u>3</u> |
| Air<br>emp. <u>Ambien</u><br>3<br><u>50 34c</u><br>1610 <sup>e</sup> F<br>e period): <u>M</u>                                             | Start Date9-6-85<br>t<br>Overcurrent Test<br><br>Channel No. 3                                                 |
| 3<br>50 32c<br>1610°F<br>e period): N/<br>N/A                                                                                             | Overcurrent Test<br>Channel No. 3                                                                              |
| 3<br>50 32c<br>1610°F<br>e period): N/<br>N/A                                                                                             | Overcurrent Test<br>Channel No. 3                                                                              |
| 50 32c<br>1410 ° F<br>e period): <i>K</i> /<br><i>N/A</i>                                                                                 | Channel No. 3                                                                                                  |
| 1410 ° F<br>e period): <i>N</i> /<br><i>N/A</i>                                                                                           | (A                                                                                                             |
| 1410 ° F<br>e period): <i>N</i> /<br><i>N/A</i>                                                                                           | (A                                                                                                             |
| e period): <i>K</i> /<br>N/A                                                                                                              | (A                                                                                                             |
| N/A                                                                                                                                       |                                                                                                                |
| N/A                                                                                                                                       |                                                                                                                |
| ,                                                                                                                                         | Channel No. M(A-                                                                                               |
| N/A                                                                                                                                       |                                                                                                                |
|                                                                                                                                           |                                                                                                                |
| <del>65</del>                                                                                                                             | · · · · · · · · · · · · · · · · · · ·                                                                          |
| 653                                                                                                                                       |                                                                                                                |
| 1610° F                                                                                                                                   | Channel No. 3                                                                                                  |
| 908                                                                                                                                       |                                                                                                                |
|                                                                                                                                           |                                                                                                                |
|                                                                                                                                           |                                                                                                                |
|                                                                                                                                           | x                                                                                                              |
|                                                                                                                                           |                                                                                                                |
| Tested By                                                                                                                                 | 18maelf Date: 9/6,<br>1.m. Date:                                                                               |
|                                                                                                                                           | of                                                                                                             |
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| Customer _   |                                                |                                       | WYLE L'ABORATORIES                     |
|--------------|------------------------------------------------|---------------------------------------|----------------------------------------|
|              | <u>Cables</u><br>Various                       |                                       |                                        |
| Part No      |                                                | Amb. Temp.                            | Job No47906                            |
| Spec         |                                                |                                       | Report No47906-02                      |
| Para         | 3.3,5                                          | _ Test MedAir                         | Start Date9-6-81                       |
| S/N          | N/A                                            | . Specimen Temp. <u>Ar</u>            | nbient                                 |
| GSI          | No                                             | •                                     |                                        |
| Test Title _ | Configuration No. 1                            | Test No, 3                            | Overcurrent Test                       |
| 23. R        | test /<br>eadings after <del>let-through</del> | rx<br>current applied until 1         | fault cable open circuits:             |
|              | ۹<br>                                          | Voltage (VAC)                         | Current (amps)                         |
| Ţ            | arget Cable                                    | A-B B-C A-C                           | Phase A Phase B Phase C                |
| 2            | AWG Triplex                                    | 577 576 578                           | (37.8) 38.7 (37.9                      |
| (            | Vertically Separated)                          |                                       | <u>`</u>                               |
|              | ······································         |                                       |                                        |
|              |                                                |                                       |                                        |
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|              | - <u></u>                                      |                                       |                                        |
|              |                                                |                                       |                                        |
| L            |                                                |                                       | All in state                           |
|              |                                                | Tested By                             |                                        |
|              |                                                | Witness_                              | Date:                                  |
| Notice of    |                                                | Sheet No.                             |                                        |

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## DATA SHEET

| Customer    | Stone & Webster                  |                                        | WYLE LABORATORIES                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|-------------|----------------------------------|----------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Specimen    | Cables                           |                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Part No     | Various                          | Amb. Temp                              | Job No 47906                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Spec        | WLTP 47906-01                    | Photo Yes                              | Report No47906-02                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|             | 3.3.(n                           | Test MedAir                            | Start Date9/7 ///                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| S/N         | <u>N/A</u>                       | Specimen TempAmb                       | ient                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| GSI         | No                               | ······                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Test Title  | Configuration No.<br>Pre-Tost Da | Test No, 3<br>Post-Test Functional Tes | ;t;t;t;t;t;t;t;t;t;t;t;t;t;t;t;t;t;t;t;t;t;t;t;t;t;t;t;t;t;t;t;t;t;t;t;t;t;t;t;t;t;t;t;t;t];t;t;t];t;t];t;t];t];t];t];t];t];t];t];t];t];t];t];t];t];t];t];t];t];t];t];t];t];t];t];t];t];t];t];t];t];t];t];t];t];t];t];t];t];t];t];t];t];t];t];t];t];t];t];t];t];t];t];t];t];t];t];t];t];t];t];t];t];t];t];t];t];t];t];t];t];t];t];t];t];t];t];t];t];t];t];t];t];t];t];t];t];t];t];t];t];t];t];t];t];t];t];t];t];t];t];t];t];t];t];t];t];t];t];t];t];t];t];t];t];t];t];t];t];t];t];t];t];t];t];t];t];t];t];t];t];t];t];t];t];t];t];t];t];t];t];t];t];t];t];t];t];t];t];t];t_[];t_]];t_[];t_]];t_[];t_]];t_[];t_[ |
| HIGH POTEN  | TIAL TEST                        |                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| ACCEPTANCE  | CRITERIA: There                  | shall be no evidence of insula         | tion breakdown or flashover                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|             | with a                           | potential of 2200 VAC (1600 V          | AC for 5 T.P. 16 AWG cables)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|             |                                  | d for one minute.                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|             |                                  |                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| CABLE       |                                  | TEST POINTS                            | READING                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| 2 AWG Trip  | lex                              | 1 to 2                                 | 76011A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| (Vertically | y Separated)                     | 1 to 3                                 | 760MA                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|             |                                  | 2 to 3                                 | 760NA                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|             |                                  | l to Unistrut                          | 2000 u A.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|             |                                  | 2 to Unistrut                          | 1900 U A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|             |                                  | 3 to Unistrut                          | 2020UA                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|             |                                  |                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|             |                                  |                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <u></u>     |                                  |                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|             |                                  |                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| •           |                                  | ······································ |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|             |                                  | · · · · · · · · · · · · · · · · · · ·  | · · · · · · · · · · · · · · · · · · ·                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
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|             |                                  |                                        | · · · · · · · · · · · · · · · · · · ·                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|             |                                  |                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|             |                                  | Tested By≤                             | 75.8 on alf Date: 9/7/2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|             |                                  | Witness                                | Date:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| lotice of   | Na                               | Sheet No                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Anomaly     | Noue                             | Approved                               | Joking 9/9/85                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |

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## DATA SHEET

| Customer <u>Stone &amp; Webster</u> |                                  | WYLE LABORATORIES           |
|-------------------------------------|----------------------------------|-----------------------------|
| Specimen <u>Cables</u>              |                                  |                             |
| Part No. Various                    | Amb. Temp                        |                             |
|                                     | Photo Yes                        | Report No 47906-02          |
| Para3.3.10                          |                                  | Start Date // / / / /       |
|                                     | Specimen TempAmbi.               | ent                         |
| 3SI No                              |                                  |                             |
| est Title <u>Configuration No.</u>  |                                  |                             |
| INSULATION RESISTANCE TEST          | Post-Test Functional Test        |                             |
|                                     |                                  |                             |
| ACCEPTANCE CRITERIA: Measu          | red insulation resistance shall  | be greater than 1.6 Megohms |
| - with a                            | a potential of 1000 VDC (500 for | ST.P. 16 AWG) applied for   |
| 60 se                               | conds.                           |                             |
|                                     |                                  | ·····                       |
| CABLE                               | TEST POINTS                      | READING                     |
| 2 AWG Triplex                       | l to 2                           | 7.2 × 102 2                 |
| (Vertically Separated)              | 1 to 3                           | 1.0 × 109 2                 |
|                                     | 2 to 3                           | 7.0 × 108 2                 |
|                                     | 1 to Unistrut                    | 1.2 × 1072                  |
|                                     | 2 to Unistrut                    | 2.0 × 103 n                 |
|                                     | 3 to Unistrut                    | (·3 × 10 <sup>8</sup> sr    |
|                                     |                                  |                             |
|                                     |                                  |                             |
|                                     |                                  |                             |
|                                     |                                  |                             |
|                                     |                                  |                             |
|                                     |                                  |                             |
|                                     |                                  |                             |
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|                                     |                                  |                             |
|                                     |                                  | $\overline{D}$ .            |
|                                     | Tested By                        | Mamari Date: 9/7/21         |
|                                     | Vitness                          | Oate:                       |
| otice of                            | Sheet No.                        | of                          |
| nomaly None                         | Approved                         | William 9/9/85              |

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# CONFIGURATION NO. 2 TESTS (Separation of Cable in Free Air to Cable in Free Air With Siltemp 188 CH Barriers)

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Test Report No. 47906-02

#### SECTION III

#### CONFIGURATION NUMBER 2 TESTS (SEPARATION OF CABLE IN FREE AIR TO CABLE IN FREE AIR WITH SILTEMP BARRIERS)

1.0 **REQUIREMENTS** 

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1.1 Acceptance Criteria

#### 1.1.1 Insulation Resistance Test

Insulation resistance on all "target cables"\* shall be greater than 1.6 x  $10^6$  ohms with a potential of 1000 VDC (500 VDC 2/C 16 AWG cables) applied for 60 seconds.

#### 1.1.2 High Potential Test

There shall be no evidence of insulation breakdown or flashover with a potential of 2200 VAC (1600 VAC for 2/C 16 AWG cables) applied for one minute.

#### 1.1.3 Cable Continuity Test

Energized specimens in the target raceway shall conduct 100% of SWEC-rated currents (see table below) at 575 VAC (120 VAC for control cables and 50 VAC for instrument cables) before, during, and after the overcurrent test.

| Cable<br>Size | No.<br>Conductors | SWEC<br>LD. No. | Cable<br>Type | Voltage | Rated<br>Current |
|---------------|-------------------|-----------------|---------------|---------|------------------|
| 1/0 AWG       | Triplex           | NJM-34          | $\mathbf{L}$  | 575     | 139              |
| 2 AWG         | Triplex           | NJM-25          | K             | 575     | 38.5             |
| 12 AWG        | 7                 | NJN-37          | С             | 120     | 10               |
| 16 AWG        | 2/C               | NJP-05          | х             | 50      | 1                |

#### 1.1.4 Tolerances

All target cable voltages specified in this procedure shall be maintained within a  $\pm 3\%$  tolerance. The initial setting of target cable currents (with rated current on the fault cable) shall have a tolerance of  $\pm 10\%$ , -0%. Thereafter, all target cables' currents shall be maintained within a  $\pm 10\%$  tolerance.

All fault cable currents shall be maintained within a +3% tolerance, if possible.

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The term "target cable" refers to energized and monitored nonfault cables used in this program.

#### Test Report No. 47906-02

#### 2.0 PROCEDURES

#### 2.1 Test Specimen Preparation

The test specimen was mounted to the unistrut frame assembly per Figure 5 (Test No. 1) and Figure 6 (Test No. 2) of Section VIII. This apparatus was assembled to the indicated dimensions by Wyle technicians using materials supplied from NMP2. The following guidelines were observed with regard to the materials and construction of the assembly:

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- 1. The faulted cable was a Triplex 2/0 AWG cable from NMP2 stock.
- 2. For Test No. 1, the faulted cable was wrapped using four layers of SWEC protective wrap. For Test No. 2, the ends of the faulted cable from their termination at the copper bus bar to the edge of the unistrut frame were wrapped with a single layer of HAVEG SILTEMP WT-65 covered with a single layer of 3M No. 69 glass tape. This wrapping was done to ensure that any ignition that might occur was contained to the test area.
- 3. The target cable was a Triplex 1/0 AWG cable from NMP2 stock.
- 4. For Test No. 1, the target cable was an unwrapped cable. For Test No. 2, the target cable was wrapped for the length inside the unistrut test fixture and extending approximately two feet on either side as shown in Figure 6 of Section VIII. This wrapping was done using four layers of the SWEC protective wrap.
  - 5. Photographs were taken of the test setup prior to each test.

#### 2.2 Instrumentation Setup

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#### 2.2.1 Thermocouple Locations

A total of 14 Type "K" thermocouples were utilized for these tests. The thermocouples were mounted as described below.

| Channel No. | Location<br>Mounted to the jacket on the fault cable. These thermocouples<br>were mounted approximately 12 inches apart. For Test No. 1,<br>the thermocouples were underneath the SWEC protective wrap.<br>Mounted to the conductor of the fault cables at the two series<br>connections. |  |  |
|-------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--|
| 1-6         |                                                                                                                                                                                                                                                                                           |  |  |
| 7 & 8       |                                                                                                                                                                                                                                                                                           |  |  |
| 9-14        | Mounted to the jacket on the target cable. These<br>thermocouples were mounted approximately 12 inches apart and<br>close to the location of Channels 1-6. For Test No. 2, the<br>thermocouples were inside the SWEC protective wrap.                                                     |  |  |

The thermocouples were monitored by a Fluke Datalogger feeding a high-speed printer. The datalogger was operated at its maximum scan rate throughout the overcurrent test.

#### Test Report No. 47906-02

#### 2.0 PROCEDURES (Continued)

#### 2.2 Instrumentation Setup (Continued)

#### 2.2.2 Electrical Monitoring

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All phase-to-phase voltages and phase currents of the target cables and the fault cable current were fed into an oscillograph recorder. The oscillograph was operated at the 0.1-inch per minute rate throughout the overcurrent test. The oscillograph channels were as specified in the following table:

| Channel No. | Signal          | Cable            |
|-------------|-----------------|------------------|
| 1           | Current-Phase A | Triplex 1/0 AWG. |
| 2           | Current-Phase B | Triplex 1/0 AWG  |
| 3           | Current-Phase C | Triplex 1/0 AWG  |
| 4           | Voltage A-B     | Triplex 1/0 AWG  |
| 5           | Voltage A-C     | Triplex 1/0 AWG  |
| 6           | Voltage B-C     | Triplex 1/0 AWG  |
| 7-9         | Skipped         | N/A              |
| 10          | Current         | Fault Cable      |
| 11 & 12     | Skipped         | N/A              |

A digital multimeter was utilized to measure all phase-to-phase or phase voltages and phase currents of the target cables prior to, during, and after the overcurrent test. This data was recorded to provide accurate evidence of the specimen's capability to conduct SWEC-rated current at 575 VAC throughout the overcurrent test.

#### 2.3 Baseline Functional Tests

The baseline functional tests consisted of insulation resistance and high potential measurements on each of the target cables.

#### 2.3.1 Insulation Resistance Test

- 1. All power and instrumentation leads were disconnected from the target cable and labeled per Figure 12 of Section VIII.
- 2. Using a megohmmeter, a potential of 1000 VDC was applied and the minimum insulation resistance indicated after a period of 60 seconds was recorded between the following test points:

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#### Test Report No. 47906-02

**PROCEDURES** (Continued) 2.0

2.3 Baseline Functional Tests (Continued)

2.3.1 Insulation Resistance Test (Continued)

#### Target Power Cable:

| Phase-to-Phase   | Phase-to-Ground                |
|------------------|--------------------------------|
| 1 to 2<br>1 to 3 | 1 to unistrut<br>2 to unistrut |
| 2 to 3           | 3 to unistrut                  |

For all performances of this test, the measured values were compared to the acceptance criteria, Paragraph 1.1.1.

2.3.2 High Potential Test

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Using a Hi-Pot Test Set, a potential of 2200 VAC was applied from each 1. conductor to ground and between conductors on multiconductor cable for a period of one minute.

**Target Power Cable:** 

| Phase-to-Phase | Phase-to-Ground |
|----------------|-----------------|
| 1 to 2         | 1 to unistrut   |
| 1 to 3         | 2 to unistrut   |
| 2 to 3         | 3 to unistrut   |

2. All power and instrumentation leads were reconnected per Figure 12 of Section VIII.

For all performances of this test, the measured values were compared to the acceptance criteria, Paragraph 1.1.2.

Test Report No. 47906-02

#### 2.0 PROCEDURES (Continued)

#### 2.4 Overcurrent Test

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The overcurrent test was conducted in three sequential steps with no intentional time delay. The first phase consisted of energizing the fault cable with SWEC rated current. The second phase consisted of increasing the current until fault cable temperatures were within 1890-1990F for 5 minutes. The third phase consisted of energizing the fault cable with the worst case electrical fault current until the cable open-circuited.

The target cables conducted SWEC rated current (see Paragraph 1.1.3) at 575 VAC throughout the overcurrent test. The overcurrent test was conducted using the following procedure:

1. The Triplex 2/0 AWG fault cable was connected to the copper bus bars per Figure 11 of Section VIII.

For Test No. 1, this cable was wrapped. For Test No. 2, this cable was unwrapped.

2. A Triplex 1/0 AWG target cable was installed per Figure 5 or 6 of Section VIII.

For Test No. 1, this cable was unwrapped. For Test No. 2, this cable was wrapped.

- 3. The Triplex 1/0 AWG target cable was connected to the instrumentation and power supplies per Figure 12 of Section VIII.
- 4. The Triplex 1/0 AWG target cable was energized with 124 amperes\* at 575 VAC.
- 5. The Triplex 2/0 AWG fault cable was energized with 139 amperes per phase (rated current) from the Multi-Amp Test Set.
- 6. Target cable voltages and currents and the fault cable current were recorded.
- 7. The fault cable current was slowly increased until Thermocouple Channels 7 and/or 8 indicated  $90 \pm 3^{\circ}C$  (189-199°F) conductor temperature.
- 8. The conductor temperature was maintained at 189–199°F for five minutes.

\* Although the procedure called for 124 amperes, the rated current for the 1/0 AWG cable is 139 amperes. The exact currents measured on the 1/0 AWG cable during the test ranged from 129.6 amperes to 141.3 amperes and are accounted for in NOA No. 2.

Test Report No. 47906-02

#### 2.0 **PROCEDURES** (Continued)

#### 2.4 Overcurrent Test (Continued)

9. The fault cable current, conductor temperature, and the highest of thermocouple Channels 1 through 6 were recorded.

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- 10. The Multi-Amp Test Set output was increased to 908 amperes (test current).
- 11. Target cable voltages and currents and the fault cable current were recorded.
- 12. The fault cable was allowed to conduct test current until the cable opencircuited.
- 13. The elapsed time and maximum cable temperature were recorded.
- 14. The target cable voltages and currents were recorded.
- 15. The target cables and the Multi-Amp Test Set were de-energized.
- 16. Photographs were taken of the post-test condition.

For all performances of this test, the observed target cable operation was compared to the acceptance criteria, Paragraph 1.1.3

2.5 Post-Overcurrent Test Functional Test

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The functional tests of Paragraph 2.3 were repeated.

Test Report No. 47906-02

3.0 RESULTS

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#### 3.1 Results of Test No. 1

Configuration Number 2, Test No. 1, with a Triplex 2/0 AWG fault cable inside four layers of SWEC protective wrap, was conducted per Paragraph 2.0 and successfully met the requirements of Paragraph 1.0. The 908 amperes test current was applied for 1296 seconds (21.6 minutes) until the cable open-circuited. The maximum observed temperature on the fault cable was 1836°F which occurred on Thermocouple No. 4. The fault cable did not ignite.

The capability of the target cable to conduct SWEC rated current at 575 VAC (power cable) was not impaired during this test. The maximum observed target cable temperature was  $225^{\circ}F$ . The target cable successfully completed the Post-Overcurrent Test Functional Test.

Appendix I contains the following data from this test:

- 1. Notices of Anomaly Number 2 and 5.
- 2. Photographs III-1 through III-2 which show pretest and post-test conditions.
- 3. A narrative of the test which relates test time, fault cable temperatures, and important events.
- 4. Figure III-1 which plots the temperature readings versus time.
- 5. Data Sheets which contain Baseline Functional Test data, Overcurrent Test data, and Post-Overcurrent Test Functional Test data.

Test Report No. 47906-02

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3.0 RESULTS (Continued)

**3.2** Results of Test No. 2

Configuration Number 2, Test No. 2; with an unwrapped Triplex 2/0 AWG fault cable in free air, was conducted per Paragraph 2.0 and successfully met the requirements of Paragraph 1.0. The 908 amperes test current was applied for 1267 seconds (21.1 minutes) until the cable open-circuited. The maximum observed temperature on the fault cable was 1783°F which occurred on Thermocouple No. 6. The fault cable ignited after 640 seconds (10.7 minutes). The fire burned for approximately 12.5 minutes.

The capabilities of the target cable to conduct SWEC rated current at 575 VAC (power cable), 120 VAC (control cable), or 50 VAC (instrument cable) was not impaired during this test. The maximum observed target cable temperature was 370°F. All target cables successfully completed the Post-Overcurrent Test Functional Test.

Appendix II contains the following data from this test:

- 1. Photographs III-3 through III-4 which show pretest and post-test conditions.
- 2. A narrative of the test which relates test time, fault cable temperatures, and important events.
- 3. Figure III-2 which plots the temperature readings versus time.
- 4. Data Sheets which contain Baseline Functional Test data, Overcurrent Test data, and Post-Overcurrent Test Functional Test data.

Page No. III-9 Test Report No. 47906-02

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### APPENDIX I

### CONFIGURATION NUMBER 2, TEST NO. 1, DATA

WYLE LABORATORIES Huntsville Facility

### Page No. III-10 Test Report No. 47906-02

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| ABORATORIES (Eastern Operations)                                                                                                   |                    |              |                                |
|------------------------------------------------------------------------------------------------------------------------------------|--------------------|--------------|--------------------------------|
| NOTICE OF ANC                                                                                                                      | MALY               | 0            | ATE:<br>9/12/85                |
| NOTICE NO: P.O. NUMBER:                                                                                                            | CONTRACT NO        | :            | N/A                            |
| CUSTOMER: Stone & Webster                                                                                                          |                    | WYLEJ        | ов NO:47906                    |
| NOTIFICATION MADE TO:R. Das                                                                                                        | I                  | NOTIFICATION | I DATE: 9/6.9/7.9/10/85        |
| NOTIFICATION MADE BY:J. King                                                                                                       |                    | VIA:         | Telephone                      |
|                                                                                                                                    |                    | , DAT<br>ANC | EOF<br>DMALY: 9/5, 9/6, 9/9/85 |
| PART NAME: Electrical Cables                                                                                                       |                    | PART NO.     | N/A                            |
| TEST: Configuration 1, Tests 1, 2,                                                                                                 | 3                  | I.D. NO      | N/A                            |
| SPECIFICATION:WLTP_47906-01                                                                                                        |                    | PARA. NO.    | 2.1.4, 3.3.5, 3.4.5            |
| Requirements:                                                                                                                      |                    |              |                                |
| 1. The two target cables shall cond<br>575 VAC (power cables) or 120 V<br>throughout the overcurrent test.                         |                    |              |                                |
| 2. All target cable currents shall be main                                                                                         | ntained within a   | +10%, -0%    | tolerance.                     |
| Description of Anomaly:                                                                                                            |                    |              |                                |
| During Configuration 1, Tests 1, 2 a currents were out of tolerance after flo plus side was 15.3%. The maximum varia               | owing test curren  | nt. The n    | naximum variation on the       |
| Disposition - Comments - Recommendation                                                                                            | as:                |              |                                |
| The out of tolerance currents were j<br>results showed that the target cable's<br>the test conditions.                             |                    |              |                                |
| Maintaining the +10%, -0% tolerance is no                                                                                          | t always possible  | due to the   | following reasons.             |
| 1. Unbalanced currents between ph                                                                                                  | ases.              |              |                                |
| 2. Temperature changes in the to change.                                                                                           | conductors caus    | ing the i    | mpedance of the cables         |
| 3. Voltage fluctuations in the facil                                                                                               | lity power deliver | red by the   | local utilities.               |
| Therefore, the acceptance criteria for<br>setting of target cable currents (with<br>+10%, -0%. Thereafter, all target cab<br>ance. | rated current      | on the fa    | ault cable) to be within       |
| NOTE: IT IS THE CUSTOMER'S RESPONSIBILITY TO                                                                                       | ANALYZE ANOMALIES  |              | Y WITH 10 CFR PART 21.         |
| VERIFICATION:                                                                                                                      | PROJECT            |              | Jahn D King 9-12-85            |
| TEST WITNESS:                                                                                                                      |                    | ANAGER: 2    | M9-12-85 71 19/1 9/124         |
| REPRESENTING:                                                                                                                      |                    | ARTMENTAL    | KTaylar 9+13-85                |
| QUALITY ASSURANCE: Geld belight                                                                                                    | 1385               |              | <i>U</i>                       |
| Wyle Form WH 1088, Rev. JAN '85                                                                                                    |                    |              | Page of                        |

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### Page No. III-11 Test Report No. 47906-02

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| NOTICE OF ANOMALY                                                                                           | DATE: 9/26/85                                                                          |
|-------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------|
| NOTICE NO: 5 P.O. NUMBER: NMP2-E-0907 CO                                                                    | DNTRACT NO: N/A                                                                        |
| CUSTOMER:Stone & Webster                                                                                    | WYLE JOB NO: 47906                                                                     |
| NOTIFICATION MADE TO: R. Das                                                                                | NOTIFICATION DATE: 9/27/85                                                             |
| NOTIFICATION MADE BY:J. King                                                                                | VIA: Telephone                                                                         |
| CATEGORY: SPECIMEN SPROCEDURE TESTE                                                                         | EQUIPMENT DATE OF<br>ANOMALY: <u>9/9, 9/12, 9/17/8</u><br>PART NO. N/A                 |
| TEST. Config. 2. Test 1: Config. 3. Test 2:                                                                 | : Config N/A                                                                           |
| SPECIFICATION:                                                                                              | PARA. NO. 3.4.5. 3.5.5. 3.7.5                                                          |
| REQUIREMENTS:                                                                                               |                                                                                        |
| <ol> <li>Slowly increase fault cable current until<br/>90 ±3°C (189°F-199°F) conductor temperatu</li> </ol> | thermocouple channels 7 and/or 8 indicate<br>are.                                      |
| 2. Maintain the conductor temperature at 189                                                                | 9°F-199°F for five minutes.                                                            |
|                                                                                                             | •                                                                                      |
| DESCRIPTION OF ANOMALY:                                                                                     | ,                                                                                      |
| The thermocouple channels 1-6 on the cable and/or 8.                                                        | e jacket were used instead of channels 7                                               |
|                                                                                                             |                                                                                        |
|                                                                                                             |                                                                                        |
| -                                                                                                           |                                                                                        |
| DISPOSITION · COMMENTS · RECOMMENDATIONS:                                                                   |                                                                                        |
| The anomaly was judged to have no impact on the                                                             | he test for the following reasons.                                                     |
| 1. During warmup of the cable, the conducto the temperature of the adjacent jacket.                         | -                                                                                      |
| 2. The conductor thermocouple can indicate thermocouples because of differences in mo                       | ate a lower temperature than the jacket ounting and location.                          |
| 3. The heat transferred from the fault cab                                                                  | ole to the target cables during warmup to,<br>y small compared to the heat transferred |
| NOTE: IT IS THE CUSTOMER'S RESPONSIBILITY TO ANALYZE A                                                      | ANOMALIES AND COMPLY WITH 10 CFR PART 21.                                              |
| VERIFICATION:                                                                                               | PROJECT ENGINEER: J. P. King. 9/27/85                                                  |
|                                                                                                             | PROJECT MANAGER:                                                                       |
| REPRESENTING:                                                                                               |                                                                                        |
| QUALITY ASSURANCE: G. UV. Hight 1/8 5                                                                       |                                                                                        |

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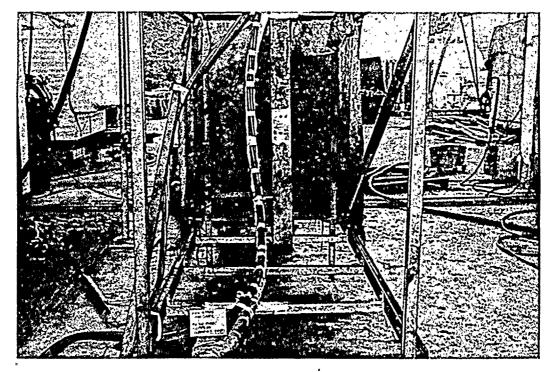
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Test Report No. 47906-02

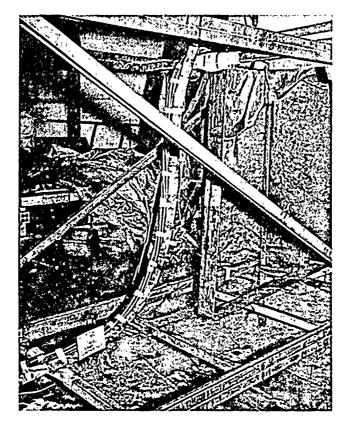
### CONFIGURATION NUMBER 2, TEST NO. 1



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рнотоgraph III-1

PRETEST VIEW - OVERALL



РНОТОGRAPH Ш-2

POST-TEST VIEW - OVERALL

Test Report No. 47906-02

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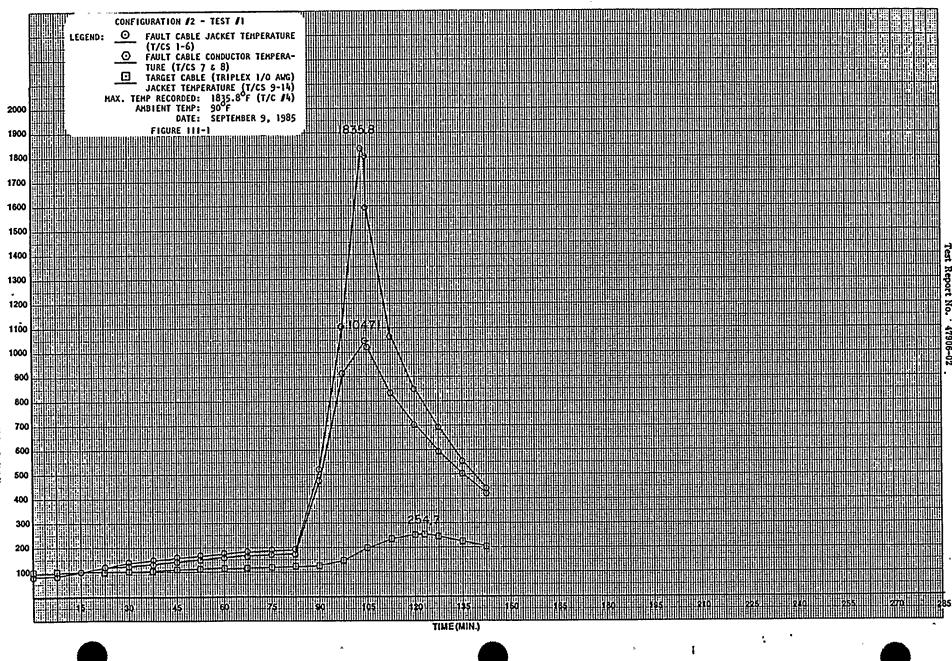
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### CONFIGURATION NUMBER 2, TEST NO. 1

| Approximate<br>Test Time | Approximate<br>Fault Cable<br>Jacket Temperature | Observation                                             |
|--------------------------|--------------------------------------------------|---------------------------------------------------------|
| 0 Min                    | 80o£                                             | Energized fault cable with 139A                         |
| 10 Min                   | 880F                                             | Energized fault cable with 270A                         |
| 77.7 Min                 | 189°F                                            | Fault cable conductor reached 189 <sup>0</sup> F        |
| 82.7 Min                 | 192 <sup>0</sup> F.                              | Energized fault cable with 908A                         |
| 90.6 Min                 | 500 <sup>0</sup> F                               | Light smoke visible and fault<br>cable jacket rupturing |
| 104.3 Min                | 1807 <sup>0</sup> F                              | Open circuit                                            |

10 × 10 TO THE CENTIMETETEMPERATURE (\*F)



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Page No. 111-14 Report No. · 47906-02 Page No. III-15 Test Report No. 47906-02

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## DATA SHEET

| Customer   | Stone & Webster                       |                                        | WYLE LABORATORIES                        |
|------------|---------------------------------------|----------------------------------------|------------------------------------------|
| Specimen   | Cables + + + + +                      | ·                                      |                                          |
| Part No.   | Various                               | Amb, Temp 9                            | 0°F Job No. 47906                        |
| Spec       | WLTP 47906-01                         | Photo Yes                              | 0°F Job No. 47906<br>Report No. 47906-02 |
| Para       | 3,4.4                                 | Test Med. Air                          | Start Date9/8/85-                        |
| S/N        |                                       |                                        |                                          |
| GSI        | No                                    |                                        |                                          |
| Test Title |                                       | 2 Test No. 1                           | •                                        |
|            | Pre-Test                              | Post-Test- 65                          | Functional Test                          |
| Insulati   | on Resistance Test                    |                                        |                                          |
| Acceptan   | ice Criteria: Measure                 | d insulation resistance                | shall be greater than 1.6 megohms        |
|            | with a                                | potential of 1000 VDC a                | pplied for 60 seconds.                   |
|            |                                       |                                        |                                          |
| Ca         | ble                                   | Test Points                            | Reading                                  |
| 1/         | O AWG Triplex                         | 1 to 2 <sup>,</sup>                    | U.R 700 7.8× 10°2                        |
| <u> </u>   | w <u>ww</u>                           | 1 to 3                                 | 9.0×109 s                                |
| •          |                                       | 2 to 3                                 | 7.2 × 109 52                             |
|            |                                       | l to Unistrut                          | 9.0 X 109 2                              |
| ·····      | ,                                     | 2 to Unistrut                          | 1.0 × 1010 2                             |
|            |                                       | 3 to Unistrut                          | 6.0 × 109 52                             |
|            |                                       |                                        |                                          |
|            |                                       |                                        |                                          |
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Page No. III-16 Test Report No. 47906-02

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### DATA SHEET

| Customer3          | ables            | ······································ | WYLE LABORATORIES             |
|--------------------|------------------|----------------------------------------|-------------------------------|
|                    | arious           | Amb. Temp90°P                          | Job No47906                   |
|                    | LTP 47906-01     | Photo Yes                              | Report No47906-02             |
|                    | 2.4.4            |                                        | Start Date9/2/25              |
|                    | I/A              |                                        | bient                         |
|                    | lo               |                                        |                               |
|                    | onfiguration No. | . 2 Test No. 1                         |                               |
|                    | Pre-Test         | . 2 Test No. 1<br>~Post Test De        | Functional Test               |
| High Potent        |                  | <u>,</u>                               |                               |
| Acceptance         | Criteria: Ther   | re shall be no evidence of ins         | ulation breakdown or flashove |
|                    | with             | a potential of 2200 VAC (160           | 0 VAC for S.T.P. 16 AWG cable |
|                    | appl             | lied for one minute.                   | · ····                        |
|                    |                  |                                        |                               |
| Cable              |                  | Test Points                            | Reading                       |
| 1/0 <sub>.</sub> A | WG Triplex       | 1 to 2                                 | 800 11 A                      |
|                    |                  | 1 to 3                                 | 800 11 A                      |
|                    |                  | 2 to 3                                 | 700 11 A                      |
|                    |                  | l to Unistrut                          | 980 UA                        |
|                    |                  | 2 to Unistrut                          | 920 MA                        |
|                    |                  | 3 to Unistrut                          | 950 MA                        |
|                    |                  |                                        |                               |
|                    |                  |                                        |                               |
|                    |                  |                                        |                               |
|                    | .                |                                        |                               |
|                    |                  |                                        |                               |
|                    | <u> </u>         |                                        |                               |
| *                  |                  |                                        |                               |
|                    | -                |                                        |                               |
|                    |                  |                                        | -11                           |
|                    |                  | Tested By                              | Etitmant Date: 9/71           |
|                    |                  | Witness _                              | More Date:                    |
| lotice of          |                  | Sheet No.                              |                               |

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Page No. III-17 Test Report No. 47906-02

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## DATA SHEET

| Customer  | Stone & Webste                 | er                                      |                                       |                      | ١            | NYLELABO       | RATORIES               |
|-----------|--------------------------------|-----------------------------------------|---------------------------------------|----------------------|--------------|----------------|------------------------|
| specimen  |                                |                                         |                                       | ~ ^ -                |              |                |                        |
| Part No   | Various                        | ······································  | Amb. Temp.                            | 90°F                 |              | Job No         | 47906                  |
| ipec      |                                |                                         | Photo                                 | Yes                  |              | Report No      | 47906-02               |
| Para      |                                |                                         | Test Med                              |                      |              | Start Date_    | 9/9/85                 |
| 5/N       |                                |                                         | Specimen Te                           | emp. <u>Amb</u>      | ient         |                |                        |
| isi       | No                             | ,                                       |                                       |                      |              |                | 3                      |
| est Title | Configuration                  | <u>No. 2</u>                            | <u>Test No.</u>                       | 1                    |              | Overcurr       | ent Test               |
| 6         | Readings with rate             | d current on                            | fault cabl                            | le:                  |              |                |                        |
|           | Target Cable                   | Ve<br>A-B                               | Ditage (VAC<br>B-C A-                 | c)                   |              |                | (amps)<br>se 8 Phase C |
|           | 1/0 01/0 7-1-1-1               |                                         |                                       |                      |              | ~ ~            | 71210                  |
|           | 1/0 AWG Triplex                | 513                                     | 573 50                                | 64                   | (13          | <u>3,9) (1</u> | 36.7) (+3.97           |
|           |                                |                                         |                                       |                      |              |                | $\sim$                 |
|           |                                |                                         |                                       |                      |              |                |                        |
|           |                                |                                         |                                       |                      |              |                |                        |
|           |                                |                                         | · · · · · · · · · · · · · · · · · · · | •                    |              |                |                        |
|           |                                | ••••••••••••••••••••••••••••••••••••••• |                                       |                      |              |                |                        |
|           |                                |                                         |                                       |                      |              |                |                        |
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|           |                                |                                         |                                       |                      |              |                |                        |
|           |                                |                                         |                                       |                      |              |                |                        |
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|           |                                |                                         |                                       |                      |              |                |                        |
|           |                                |                                         |                                       |                      |              |                |                        |
|           |                                |                                         |                                       |                      |              |                |                        |
|           |                                |                                         |                                       |                      |              |                |                        |
| ···       |                                |                                         |                                       |                      |              |                |                        |
|           |                                |                                         |                                       |                      |              |                |                        |
| _         | Fault Cable:                   | 2/0 AWG                                 | TRIPLEX                               |                      |              |                |                        |
|           |                                | 2/0 AWG                                 | TRIPLEX                               |                      |              | <u> </u>       |                        |
|           | Fault_Cable:<br>Rated Current: | <u>2/0 AWG</u><br>139A                  | TRIPLEX                               |                      |              |                |                        |
|           |                                | 139A                                    | TRIPLEX                               |                      |              |                |                        |
|           | Rated Current:                 | +                                       | TRIPLEX                               |                      |              |                |                        |
|           | Rated Current:                 | 139A                                    | TRIPLEX                               |                      |              |                |                        |
|           | Rated Current:                 | 139A                                    | TRIPLEX                               |                      |              |                |                        |
|           | Rated Current:                 | 139A                                    | TRIPLEX                               |                      |              |                |                        |
|           | Rated Current:                 | 139A                                    | TRIPLEX                               |                      |              |                |                        |
|           | Rated Current:                 | 139A                                    | TRIPLEX                               |                      |              |                |                        |
|           | Rated Current:                 | 139A                                    | TRIPLEX                               |                      |              |                |                        |
|           | Rated Current:                 | 139A                                    | TRIPLEX                               |                      |              |                |                        |
|           | Rated Current:                 | 139A                                    | TRIPLEX                               |                      |              |                | 9/0/9                  |
|           | Rated Current:                 | 139A                                    | TRIPLEX                               | Tested By_           |              |                | Date: <u>9/9/85</u>    |
|           | Rated Current:                 | 139A                                    | TRIPLEX                               | Tested By<br>Witness | 17 Mone      |                | Date: <u>9/9/85</u>    |
|           | Rated Current:                 | 139A                                    | TRIPLEX                               | Tested By_           | in 7<br>Come |                |                        |

Page No. III-18 Test Report No. 47906-02

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## DATA SHEET

| Customer.    | Stone & Webster                                           |                                                           | WYLE LABORATORIES                                                          |
|--------------|-----------------------------------------------------------|-----------------------------------------------------------|----------------------------------------------------------------------------|
| Specimen     | Cables                                                    |                                                           |                                                                            |
| Part No.     | Various                                                   | Amb. Temp ?                                               | 0° F Job No. 47906                                                         |
| Spec.        | WLTP 47906-01                                             | Photo Yes                                                 | Report No47906-0                                                           |
| Para         | 3.4.5                                                     | Test MedAir                                               | Start Date9-9-85                                                           |
| S/N          | N/A                                                       | Specimen Temp                                             |                                                                            |
| GSI          | No                                                        |                                                           |                                                                            |
| Test Title _ | Configuration No. 2                                       | 2 Test No. 1                                              | Overcurrent Test                                                           |
| 7.           | Increasing current to ra                                  | aise fault cable temper                                   | ature to 189°F - 199°F                                                     |
| F            | FAULT CABLE CURRENT                                       | ELAPSED TIME                                              | SPE CABLE<br>CONDUCTOR TEMP/CHANNEL                                        |
|              |                                                           | 4060                                                      |                                                                            |
|              | 270A                                                      | -3900 Sec                                                 | 189°F ((4)                                                                 |
|              |                                                           |                                                           | <u> </u>                                                                   |
|              |                                                           |                                                           |                                                                            |
|              |                                                           |                                                           |                                                                            |
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|              |                                                           |                                                           |                                                                            |
|              |                                                           |                                                           |                                                                            |
|              |                                                           |                                                           |                                                                            |
| 9. F         | Readings after fault cab                                  | ple warmup to 189°F - 1                                   | 99°F                                                                       |
| 9. F         | Readings after fault cab<br>Fault cable current           | <u></u>                                                   | 99°F                                                                       |
| 9. 8         | Fault cable current                                       | t: <del>908</del> 270A                                    |                                                                            |
| 9. F         | Fault cable current<br>Conductor temperatu<br>Max temp of | t: <u>908</u> 270A<br>ure: 178°F                          | 99°F<br>Channel No. 8                                                      |
| 9. F         | Fault cable current<br>Conductor temperatu                | t: <del>908</del> 270A                                    |                                                                            |
| 9. F         | Fault cable current<br>Conductor temperatu<br>Max temp of | t: <u>908</u> 270A<br>ure: 178°F                          |                                                                            |
| 9. F         | Fault cable current<br>Conductor temperatu<br>Max temp of | t: <u>908</u> 270A<br>ure: 178°F                          |                                                                            |
| 9. 8         | Fault cable current<br>Conductor temperatu<br>Max temp of | t: <u>908</u> 270A<br>ure: 178°F                          |                                                                            |
| 9. F         | Fault cable current<br>Conductor temperatu<br>Max temp of | t: <u>908</u> 270A<br>ure: 178°F                          |                                                                            |
| 9. F         | Fault cable current<br>Conductor temperatu<br>Max temp of | t: <u>908</u> 270A<br>ure: 178°F                          |                                                                            |
| 9. F         | Fault cable current<br>Conductor temperatu<br>Max temp of | t: <u>908</u> 270A<br>ure: 178°F                          |                                                                            |
| 9. 6         | Fault cable current<br>Conductor temperatu<br>Max temp of | t: <u>908</u> 270A<br>ure: <u>178°F</u><br>192°F<br>Teste | Channel No. 8<br>d By Whomas Date: 7/9                                     |
| 9. F         | Fault cable current<br>Conductor temperatu<br>Max temp of | t: <u>908</u> 270A<br>ure: 178°F<br>192°F                 | channel No. 8<br>Channel No. 8<br>d By Attomated Date: 7/9<br>Pass Date: 1 |

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Page No. III-19 Test Report No. 47906-02

## DATA SHEET

|               | Stone & Webster          |          |                  | -                  | WYLE LAB       | ORATORI                               | ES              |
|---------------|--------------------------|----------|------------------|--------------------|----------------|---------------------------------------|-----------------|
| -             | Cables                   | ·····    |                  | -                  |                | 1                                     |                 |
| Part No.      | Various                  |          | Amb. Tem         | o. <u>−90°</u> F   | Job No         | 47906                                 | _               |
|               | WLTP 47906-01            |          | Photo            | res                | Report No.     | 47906                                 |                 |
| Para          |                          |          | Test Med.        | AL#                | Start Date.    | -47/4                                 | <u></u>         |
| S/N<br>GSI    |                          | ·        | Specimen         | Temp. <u>Ambie</u> | ent            | /                                     |                 |
|               |                          |          |                  |                    |                |                                       |                 |
| Fest Title    | Configuration No.        | 2        | <u>Test No,</u>  | 1                  | Overcurrent    | Test                                  |                 |
| <u>11. In</u> | itial readings with      | test cur | rent on f        | ault cable:        |                |                                       |                 |
| Ta            | rget Cable               |          | oltage (V<br>B-C | AC)<br>A-C         |                | t (amps)                              |                 |
|               |                          |          |                  |                    |                |                                       | Phase           |
| 1/            | 0 AWG Triplex            | 517      | 573 (            | 571                | <u>(134,5)</u> | <u>41.3 (</u>                         | [33.            |
|               |                          |          |                  |                    |                |                                       |                 |
|               |                          |          |                  |                    |                |                                       |                 |
|               |                          |          |                  |                    |                |                                       |                 |
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|               |                          |          |                  |                    |                |                                       |                 |
| <u> </u>      |                          | ···· -   |                  |                    |                | <u></u>                               | _               |
|               |                          | <u> </u> |                  |                    |                | <u> </u>                              |                 |
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|               | ·····                    |          |                  |                    |                |                                       |                 |
|               | ······                   |          |                  |                    |                |                                       |                 |
|               |                          |          |                  |                    |                | · · · · · · · · · · · · · · · · · · · |                 |
| Fa            | ult Cable 24             | lo AW    | C TRIPO          | .ex                |                |                                       |                 |
| Fa            | Test &                   |          |                  | .ex                |                |                                       |                 |
| Fa            | Test &<br>Rated Current: | 9081     | 4                | . <i>c</i> ×       |                |                                       |                 |
| Fa            | Test &                   | 9081     | 4                | . <i>c</i> X       |                |                                       |                 |
| Fa            | Test &<br>Rated Current: | 9081     | 4                | . <i>c</i> X       |                |                                       |                 |
| Fa            | Test &<br>Rated Current: | 9081     | 4                | . <i>EX</i>        |                |                                       |                 |
| Fa            | Test &<br>Rated Current: | 9081     | 4                | . <i>c</i> X       |                |                                       |                 |
| Fa            | Test &<br>Rated Current: | 9081     | 4                | . <i>c</i> X       |                |                                       |                 |
| Fa            | Test &<br>Rated Current: | 9081     | 4                | .EX                |                |                                       |                 |
| Fa            | Test &<br>Rated Current: | 9081     | 4                | . <i>EX</i>        |                |                                       |                 |
| Fa            | Test &<br>Rated Current: | 9081     | 4                | . <i>E</i> X       |                |                                       |                 |
| Fa            | Test &<br>Rated Current: | 9081     | 4                | . <i>c</i> ×       |                |                                       |                 |
| Fa            | Test &<br>Rated Current: | 9081     | 4                | . <i>c</i> X       |                |                                       |                 |
| Fa            | Test &<br>Rated Current: | 9081     | 4                |                    | Romao//:       | Date: 9                               |                 |
| Fa            | Test &<br>Rated Current: | 9081     | 4                | Tested By          | m              | Date:                                 | <br><br>/ 9 / 8 |
| Fa            | Test &<br>Rated Current: | 9081     | 4                |                    | m              | Date:                                 | /9/0            |

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| Customer.    | Stone & Webster                       |                             | WYLE LABORATORIES                         |
|--------------|---------------------------------------|-----------------------------|-------------------------------------------|
| Specimen     |                                       |                             |                                           |
| Part No.     | 14 <b>•</b>                           | Amb. Temp                   | Job No47906                               |
| Spec         | WLTP 47906-01                         | Photo Yes                   | Report No. 47906-02                       |
| Para.        | <b>A</b>                              | Test MedAir                 | Start Date 9/ 9 /8)                       |
| S/N          | N/A                                   | Specimen TempA              |                                           |
| GSI          | <u>No</u> ,                           | • • • •                     |                                           |
| Test Title _ | Configuration No. 2                   | Test No. 1                  | Overcurrent Test                          |
| 13. (        | Open Circuit on fault cable:          |                             |                                           |
|              | Elapsed time:                         | 1296 · sec                  | <u> </u>                                  |
|              | Maximum fault cable temp              | perature: 1836°F            | Channel No. در                            |
|              |                                       |                             |                                           |
| 14.          | Stabilized temperature on fa          | ult cable:                  |                                           |
|              | Elapsed time (beginning               | of 15-minute period)        | : N/A                                     |
|              | Maximum fault cable tem               | perature: N/A               | Channel No. N/A                           |
|              | Fault cable current:                  |                             |                                           |
|              |                                       |                             |                                           |
| 15.          | Ignition of fault cable:              | -                           |                                           |
|              | Elasped time:                         | NA                          |                                           |
|              | Maximum fault cable tem               | perature: N/A               | Channel No. N/A                           |
|              | Fault cable current:                  | N/A                         |                                           |
| 17. 1        | Readings after lot-through c          | urrent applied until        | fault cable open circuits:                |
|              | ····· · · · · · · · · · · · · · · · · |                             |                                           |
| · · · · · ·  | Target Cable A                        | Voltage (VAC)<br>-B B-C A-C | Currenc (amps)<br>Phase A Phase B Phase C |
|              |                                       |                             |                                           |
|              | 1/0 AWG Triplex 57                    | 8 573 570                   | (133.6) (137.0) (129.6)                   |
| [            |                                       |                             |                                           |
|              |                                       |                             |                                           |
|              |                                       |                             |                                           |
| Į            |                                       |                             | My III alala                              |
| L            |                                       | Tested By                   |                                           |
|              |                                       | Witness_                    | Mone Date:                                |
| Notice of    | No. 2                                 | -                           | <u>Mone</u> Date: <u>4</u>                |

Page No. III-21 Test Report No. 47906-02

## DATA SHEET

| Customer  | Stone & Webster                        |                                        |                                   | WYLE LABO                | RATORIES                          |
|-----------|----------------------------------------|----------------------------------------|-----------------------------------|--------------------------|-----------------------------------|
| Specimen  | Cables                                 |                                        | ч                                 |                          |                                   |
| Part No.  | Various                                | Amb, Temp,                             | 90° F                             | Job No                   | 47906                             |
| Spec      | WLTP 47906-01                          | Photo                                  | Yes `                             | Report No                | 47906-02                          |
| ara       |                                        | Test Med                               | Air                               | Start Date_              | 9/9/85                            |
| /N        |                                        | Specimen T                             | emp. <u>Ambie</u>                 | nt                       |                                   |
| isi       | No                                     | Opecimente                             | <u>.</u>                          |                          |                                   |
|           |                                        |                                        |                                   |                          |                                   |
| est Title | Configuration No.                      | 2 Test No.                             |                                   |                          |                                   |
| ······    | Pre-Test                               | Post-Test                              | F                                 | unctional Test.          |                                   |
| Insulatio | n Resistance Test                      |                                        |                                   |                          |                                   |
| Acceptanc | <u>e Criteria: Measur</u>              | red insulation resig                   | stance shall                      | be greater than          | 1.6 megohms                       |
|           | with a                                 | potential of 1000                      | VDC applied                       | for 60 seconds.          |                                   |
|           |                                        |                                        | roo apprica                       |                          |                                   |
| Cab       | le                                     | Test Points                            |                                   | Reading                  |                                   |
| 1/0       | AWG Triplex                            | 1 to 2                                 |                                   | 3.0 × 10105              | 2                                 |
|           |                                        | 1 to 3                                 |                                   | 3.0 × 10'05              |                                   |
|           |                                        | 2 to 3                                 |                                   | 5.0 × 1010-              |                                   |
| <u> </u>  |                                        | l to Unistrut                          | <del>.</del>                      | 3.5 × 1010               | <u> </u>                          |
|           |                                        | 2 to Unistrut                          | U.\$                              | · <del>2 0 ×</del> 3.7 ) | (10 2                             |
|           |                                        | <u>3 to Unistrut</u>                   |                                   | 7.0 × 10105              | r                                 |
|           |                                        |                                        |                                   |                          |                                   |
|           |                                        |                                        |                                   |                          |                                   |
|           | · · · · · · · · · · · · · · · · · · ·  | ······································ |                                   |                          |                                   |
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|           |                                        |                                        |                                   |                          |                                   |
|           | <del></del>                            | <u> </u>                               | Tested By                         | Romaoff                  | Date: 9/9/8                       |
|           |                                        |                                        | Tested By                         | 101 11                   | Date: <u>9/9/8</u>                |
| tice of   |                                        | <u> </u>                               | Tested By<br>Witness<br>Sheet No. | 101 11                   | Date: <u>9/9/8</u><br>Date:<br>of |

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## DATA SHEET

| stomer <u>Stone &amp; Webster</u>     |                                       | WYLE LABORATORIES               |
|---------------------------------------|---------------------------------------|---------------------------------|
| ecimen <u>Cables</u>                  |                                       | -                               |
| Irt No. Various                       | Amb. Temp. <u>90° č</u>               |                                 |
| WLTP 47906-01                         | Photo Yes                             | Report No                       |
| ira. <u> </u>                         | Test MedAir                           | Start Date7/9/85                |
| NN/A                                  | Specimen TempAr                       | nbient                          |
| 51 <u>No</u>                          |                                       |                                 |
| st TitleConfiguration_No              | . 2 Test No. 1                        | -                               |
| Pre-Test C                            | Post-Test                             | Functional Test                 |
| High Potential Test                   |                                       |                                 |
| Acceptance Criteria: Ther             | e shall be no evidence of ins         | sulation breakdown or flashover |
| with                                  | a potential of 2200 VAC (160          | 00 VAC for S.T.P. 16 AWG cables |
| appi                                  | ied for one minute.                   |                                 |
| · · · · · · · · · · · · · · · · · · · |                                       |                                 |
| Cable                                 | Test Points                           | Reading                         |
| 1/0 AWG Triplex                       | 1 to 2                                | 820 yA                          |
|                                       | 1 to 3                                | 820 MA                          |
|                                       | 2 to 3                                | 800 MA                          |
|                                       | 1 to Unistrut                         | 830 MA                          |
|                                       | 2 to Unistrut                         | 820 y A                         |
|                                       | 3 to Unistrut                         | 835 u A                         |
|                                       |                                       |                                 |
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|                                       |                                       | Alloman alalo                   |
|                                       | Tested By                             |                                 |
|                                       | Witness -                             | Date:                           |
| tice of 👘 👘                           | Sheet No.                             | Qof                             |

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Test Report No. 47906-02



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### CONFIGURATION NUMBER 2, TEST NO. 2, DATA

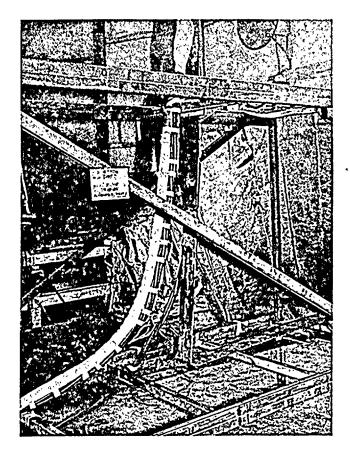
Test Report No. 47906-02

### CONFIGURATION NUMBER 2, TEST NO. 2

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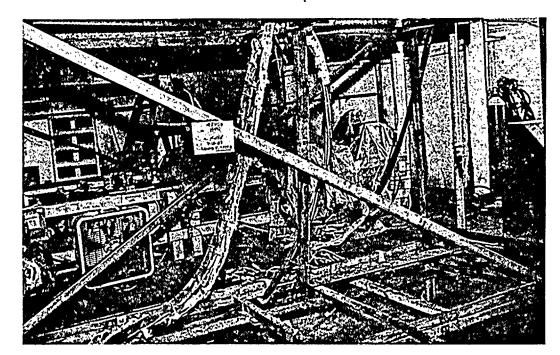
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рнотоgraph III-3

PRETEST VIEW - OVERALL



PHOTOGRAPH III-4 . POST-TEST VIEW — OVERALL

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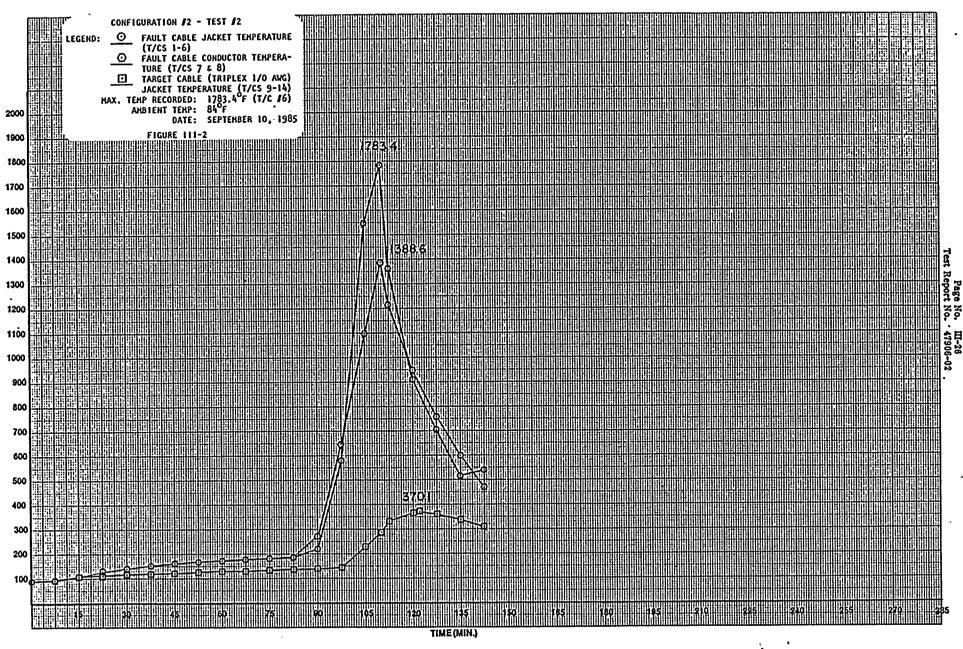
Test Report No. 47906-02

### CONFIGURATION NUMBER 2, TEST NO. 2

| Approximate<br>Test_Time | Approximate<br>Fault Cable<br>Jacket Temperature | Observation                         |
|--------------------------|--------------------------------------------------|-------------------------------------|
| 0 Min                    | 84°F                                             | Energized fault cable with 139A     |
| 10 Min                   | 930F                                             | Energized fault cable with 270A     |
| 65 Min                   | 174°F                                            | Energized fault cable with 275A     |
| 83.7 Min                 | 184°F,                                           | Fault cable conductor reached 189°F |
| 88.7 Min                 | 186 <b>0</b> F                                   | Energized fault cable with 908A     |
| 93.3 Min                 | 380°F                                            | Light smoke visible                 |
| 96.1 Min                 | 515 <sup>0</sup> F                               | Fault cable jacket rupturing        |
| 99.2 Min                 | 800°F                                            | Ignition of fault cable             |
| 109.8 Min                | 1783°F                                           | Open circuit                        |
| 111.8 Min                | 1470°F                                           | Fire out                            |

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## DATA SHEET

| ,                                                                                         | Customer<br>Specimen<br>Part No<br>Spec<br>Para<br>GSI<br>Test Title | Stone & Webster<br>Cables **<br>Various<br>WLTP 47906-01<br>3.4.4<br>N/A<br>No<br>Configuration No. 2 |                            | WYLE LABORATORIES<br>Job No. <u>47906</u><br>Report No. <u>47906-02</u><br>Start Date <u>9/10/85</u><br> |
|-------------------------------------------------------------------------------------------|----------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------|----------------------------|----------------------------------------------------------------------------------------------------------|
|                                                                                           |                                                                      | Pre-Test                                                                                              | -Post-Tost 85              | Functional Test                                                                                          |
|                                                                                           |                                                                      | on Resistance Test                                                                                    |                            |                                                                                                          |
|                                                                                           | Acceptan                                                             |                                                                                                       |                            | 1 be greater than 1.6 megohms                                                                            |
|                                                                                           |                                                                      | with a p                                                                                              | otential of 1000 VDC appli | ed for 60 seconds.                                                                                       |
| ۲.<br>۲.                                                                                  |                                                                      |                                                                                                       | •<br>                      |                                                                                                          |
|                                                                                           |                                                                      | ble                                                                                                   | Test Points                | Reading                                                                                                  |
| 929 M<br>818 M<br>4 M<br>1 M<br>1 M<br>1 M<br>1 M<br>1 M<br>1 M<br>1 M<br>1 M<br>1 M<br>1 | 1/                                                                   | 0 AWG Triplex                                                                                         | i to 2                     | 1.0 × 109 s                                                                                              |
|                                                                                           |                                                                      |                                                                                                       | <u>1 to 3</u><br>2 to 3    | 6.4 × 108 m                                                                                              |
| 19                                                                                        | []                                                                   |                                                                                                       | 1 to Unistrut              | 9.0 × 1082<br>1.1 × 1092                                                                                 |
|                                                                                           |                                                                      |                                                                                                       | 2 to Unistrut              | 1.6 × 10 %                                                                                               |
|                                                                                           |                                                                      |                                                                                                       | 3 to Unistrut              | 1.3 × 10 52                                                                                              |
|                                                                                           |                                                                      |                                                                                                       |                            |                                                                                                          |
|                                                                                           |                                                                      |                                                                                                       |                            |                                                                                                          |
|                                                                                           |                                                                      |                                                                                                       |                            |                                                                                                          |
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|                                                                                           |                                                                      |                                                                                                       |                            |                                                                                                          |
|                                                                                           |                                                                      |                                                                                                       | •                          |                                                                                                          |
|                                                                                           |                                                                      |                                                                                                       |                            |                                                                                                          |
|                                                                                           |                                                                      |                                                                                                       |                            |                                                                                                          |
|                                                                                           |                                                                      |                                                                                                       |                            |                                                                                                          |
| į                                                                                         | i                                                                    | ********                                                                                              | Tested By 4                | Date: <u>9/10/85</u><br>Mine Date:                                                                       |
| *                                                                                         | Notice of<br>Anomaly<br>A + Fire A-444-4                             | None                                                                                                  | Sheet No Approved          | J. P. King 9/10/85                                                                                       |

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## DATA SHEET

| Customer                              | Stone & Webster                       |                                       | WYLE LABORATORIES                                  |
|---------------------------------------|---------------------------------------|---------------------------------------|----------------------------------------------------|
| Specimen                              | <u>Cables</u><br>Various              | 84                                    | ۲ آمریک کو میں میں میں میں میں میں میں میں میں میں |
| Part No                               | WLTP 47906-01                         |                                       |                                                    |
| Spec                                  |                                       |                                       |                                                    |
| Para                                  |                                       |                                       |                                                    |
| S/N                                   | N/A<br>No                             | Specimen Temp                         | Ambient                                            |
| GSI                                   | <u></u>                               |                                       |                                                    |
| Test Title                            | Configuration No.                     |                                       |                                                    |
|                                       | (Pre-test)                            | -Post-Test- BQ                        | Functional Test                                    |
| High Pote                             | ntial Test                            |                                       |                                                    |
| Acceptanc                             | e Criteria: Ther                      | e shall be no evidence of i           | insulation breakdown or flashove                   |
|                                       | with                                  | a potential of 2200 VAC (1            | 1600 VAC for 5 T.P. 16 AWG cable                   |
| · · ·                                 |                                       |                                       |                                                    |
|                                       | аррі                                  | ied for one minute.                   |                                                    |
| <u></u>                               |                                       |                                       |                                                    |
| Cab                                   | le                                    | Test Points                           | Reading                                            |
| 1/0                                   | AWG Triplex                           | 1 to 2                                | 750 JA                                             |
|                                       |                                       | 1 to 3                                | 720 MA                                             |
|                                       |                                       | 2 to 3                                | 800MA                                              |
|                                       |                                       | l to Unistrut                         | 1920 и А                                           |
|                                       |                                       | 2 to Unistrut                         | 1830 u.A                                           |
| ·····                                 | <u> </u>                              |                                       |                                                    |
|                                       |                                       | 3 to Unistrut                         | 1820MA                                             |
|                                       |                                       |                                       |                                                    |
|                                       |                                       |                                       |                                                    |
|                                       |                                       |                                       |                                                    |
| <u> </u>                              |                                       |                                       |                                                    |
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|                                       |                                       | · · · · · · · · · · · · · · · · · · · | ····                                               |
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|                                       |                                       | •                                     |                                                    |
| · · · · · · · · · · · · · · · · · · · |                                       |                                       |                                                    |
|                                       |                                       | Tested 8                              | By Manuthmanting 9/10                              |
|                                       |                                       | Witness                               |                                                    |
| otice of                              |                                       | Sheet N                               |                                                    |
| nomaly                                | None                                  | Acprove                               |                                                    |

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## DATA SHEET

|            | Stone & Webster          |             | ······································ |          | •                   | WYLE LABO                             | RATORIES                              |
|------------|--------------------------|-------------|----------------------------------------|----------|---------------------|---------------------------------------|---------------------------------------|
|            | <u>Cables</u><br>Various |             |                                        | 9 10     | e                   |                                       | 47906                                 |
| Part No    | 10 70 1700/ 01           |             | Amb. Temp.                             | Yes      | F                   | . Job No                              |                                       |
| Spec       | · · · ·                  |             | Photo                                  |          |                     | Report No                             | C 1 1 12                              |
| Para       |                          |             | Test Med                               | ALF      |                     | . Start Date                          | 1/ 10/0                               |
| S/N        |                          |             | Specimen Te                            | mp       | Ambient             | •                                     |                                       |
| GSI        | No                       |             |                                        |          |                     | •                                     |                                       |
| Test Title | Configuration No.        | 2           | Test No. 2                             |          | <u>    0v</u>       | ercurrent Te                          | st                                    |
| 6. Re      | adings with rated cu     | urrent on   | fault cabl                             | e        |                     |                                       |                                       |
| <br>Ta     | roet Cable               |             | oltage (VAC<br>B-C A-                  |          | Phase               | Current (amp<br>A Phase B             | s)<br>Phase C                         |
|            |                          |             |                                        |          |                     | ,                                     |                                       |
| 1/         | 0 AWG Triplex            | 5 80        | 51251                                  | <u> </u> | 14                  | 4 147                                 | 141                                   |
|            | •                        |             | *                                      |          | <u></u>             |                                       | ·····                                 |
|            |                          |             | <u></u>                                | <u>_</u> |                     |                                       |                                       |
|            |                          |             |                                        | ····     |                     | · · · · · · · · · · · · · · · · · · · |                                       |
| ·          |                          |             |                                        |          |                     | ·····                                 |                                       |
|            |                          |             |                                        |          |                     |                                       |                                       |
|            |                          | ,           |                                        |          | · · · · · ·         |                                       |                                       |
|            |                          | AWG         | TRIPLE                                 |          |                     |                                       |                                       |
| Ra         |                          |             | TRIPLE                                 |          | ·····               |                                       |                                       |
| Ra         | ted Current:             | AWG<br>39 A | TRIPLE                                 |          |                     |                                       | · · · · · · · · · · · · · · · · · · · |
| Ra         | ted Current:             | AWG<br>39 A | TRIPLE                                 |          |                     |                                       |                                       |
| Ra         | ted Current:             | AWG<br>39 A | TRIPLE                                 |          |                     |                                       | •                                     |
| Ra         | ted Current:             | AWG<br>39 A | TRIPLE                                 |          |                     |                                       | •                                     |
| Ra         | ted Current:             | AWG<br>39 A | TRIPLE                                 |          |                     |                                       | · · · · · · · · · · · · · · · · · · · |
| Ra         | ted Current:             | AWG<br>39 A | TRIPLE                                 | Tested   | ву Жат              | - //                                  |                                       |
| Ra         | ted Current:             | AWG<br>39 A | TRIPLE                                 | ×        | By Alton<br>s_ More | - //                                  | Pate: <u>9/10/</u><br>ate: <u>-</u>   |

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| Customer _   | Stone & Webster                                             | الاين عباقات بالمسالية ا              | WYLE LABORATORIES                                                                                                                           |
|--------------|-------------------------------------------------------------|---------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------|
| Specimen .   | Cables                                                      | · ·                                   |                                                                                                                                             |
| Part No.     | Various                                                     | Amb. Temp84                           | +°F Job No47906                                                                                                                             |
| Spec         | WLTP 47906-01                                               | Photo Yes                             | Report No47906-0                                                                                                                            |
| Para         | 3.4.5                                                       | Test MedAir                           | Start Date9 -/0- 85                                                                                                                         |
| S/N          | <u>N/A</u>                                                  |                                       | Ambient                                                                                                                                     |
| GSI          |                                                             |                                       |                                                                                                                                             |
| Test Title _ | Configuration No. 2                                         | Test No. 2                            | Overcurrent Test                                                                                                                            |
| 7. 1         | Increasing current to rai                                   | se fault cable temper                 | ature to 189°F - 199°F                                                                                                                      |
|              | FAULT CABLE CURRENT                                         | ELAPSED TIME                          | GABLE<br>CONDUCTOR- TEMP/CHANNEL                                                                                                            |
|              | 2.70 A                                                      | 3300.                                 |                                                                                                                                             |
|              |                                                             |                                       | //7//                                                                                                                                       |
|              | 275A                                                        | 900                                   | <u> </u>                                                                                                                                    |
| <u>.</u>     | 280 A                                                       | 220                                   | 189/7                                                                                                                                       |
|              |                                                             |                                       | · · · · · · · · · · · · · · · · · · ·                                                                                                       |
| ······       |                                                             | ķ                                     |                                                                                                                                             |
|              |                                                             | · · · · · · · · · · · · · · · · · · · |                                                                                                                                             |
| 9. F         | Readings after fault cabl                                   | e warmup to 189°F - 1                 | 99°F                                                                                                                                        |
| 9. F         | Readings after fault cabl<br>Fault cable current:           |                                       | 99°F                                                                                                                                        |
| 9. F         | Fault cable current:                                        | 2801                                  |                                                                                                                                             |
| 9, F         | Fault cable current:<br>Conductor temperatur<br>Max temp of | 280A<br>e: 191                        | 99°F<br>Channel No. 7                                                                                                                       |
| <u>9.</u> f  | Fault cable current:                                        | 2801                                  |                                                                                                                                             |
| <u>9.</u> F  | Fault cable current:<br>Conductor temperatur<br>Max temp of | 280A<br>e: 191                        |                                                                                                                                             |
| 9. F         | Fault cable current:<br>Conductor temperatur<br>Max temp of | 280A<br>e: 191                        |                                                                                                                                             |
| 9. F         | Fault cable current:<br>Conductor temperatur<br>Max temp of | 280A<br>e: 191                        |                                                                                                                                             |
| 9. F         | Fault cable current:<br>Conductor temperatur<br>Max temp of | 280A<br>e: 191                        |                                                                                                                                             |
| 9. F         | Fault cable current:<br>Conductor temperatur<br>Max temp of | 280A<br>e: 191                        |                                                                                                                                             |
| <u>9.</u> f  | Fault cable current:<br>Conductor temperatur<br>Max temp of | 280A<br>e: 191                        |                                                                                                                                             |
| 9. F         | Fault cable current:<br>Conductor temperatur<br>Max temp of | 280A<br>e: 191                        | Channel No. 7                                                                                                                               |
| 9. F         | Fault cable current:<br>Conductor temperatur<br>Max temp of | 280A<br>re: 19/<br>/86                | d By Mamaio// Date: 9-1                                                                                                                     |
|              | Fault cable current:<br>Conductor temperatur<br>Max temp of | 280 A<br>re: 19/<br>/86               | d By Mane Date: 9-1<br>Date:                                                                                                                |
| 9. F         | Fault cable current:<br>Conductor temperatur<br>Max temp of | 280A<br>re: 19/<br>/86                | d By Mancoll Date: 9-1<br>Date: 9-1<br>Date: 9-1<br>Date: 9-1<br>Date: 9-1<br>Date: 9-1<br>Date: 9-1<br>Date: 9-1<br>Date: 9-1<br>Date: 9-1 |

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| ustome            |                                        |                              | _                                      | WYLE LABOR                             | ATORIES                               |
|-------------------|----------------------------------------|------------------------------|----------------------------------------|----------------------------------------|---------------------------------------|
| pecime<br>art No. |                                        | Amb. Temp                    | 84°F                                   | tab N-                                 | 47906                                 |
|                   | 14 70 1700/ 01                         | Amb. lemp                    | Yes                                    | _ JOD NO                               | 47906-02                              |
| pec               |                                        |                              | At - ``                                | _ Report No                            | 47500 02                              |
| ara               |                                        |                              |                                        | _ Start Date                           | ·····                                 |
| N                 |                                        |                              | np. <u>Ambient</u>                     | -                                      |                                       |
| SI                |                                        |                              |                                        |                                        |                                       |
| est Title         | e <u>Configuration No</u>              | 0. 2 Test No. 2              | 0                                      | vercurrent Te                          | sţ                                    |
| 11.               | Initial readings wit                   | h test current on faul       | t cable:                               | <u></u>                                |                                       |
|                   |                                        | <u> </u>                     |                                        |                                        |                                       |
|                   | Target Cable                           | Voltage (VAC)<br>A-B B-C A-C |                                        | Current (amp<br>A Phase B              | s)<br>Phase C                         |
|                   | 1/0 AWG Triplex                        | 582 578 57                   |                                        |                                        | 144                                   |
|                   |                                        |                              | <u> </u>                               |                                        | · / /                                 |
|                   |                                        |                              |                                        |                                        |                                       |
|                   |                                        |                              |                                        |                                        |                                       |
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|                   | ······································ |                              |                                        |                                        |                                       |
|                   |                                        |                              | *                                      |                                        |                                       |
|                   | Fault Cable: 2                         | O AWG TRIPLEX                |                                        |                                        | <u>م</u> رد میروند.<br>بر             |
|                   | Test Mrc<br>Rated Current:             | 900 A                        | ······································ |                                        |                                       |
|                   |                                        |                              |                                        |                                        | <u> </u>                              |
|                   | Measured Current:                      | 908A                         |                                        |                                        |                                       |
|                   |                                        |                              |                                        |                                        |                                       |
|                   |                                        |                              |                                        |                                        | · · · · · · · · · · · · · · · · · · · |
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|                   | ······································ |                              |                                        |                                        |                                       |
|                   | ······                                 |                              | Fested By Mar                          | nast o                                 | ate: <u>9/10</u>                      |
|                   | ······································ |                              | Fested By                              |                                        |                                       |
| ice of            | ······································ | N                            | · /                                    |                                        | ate: $\frac{9/10}{10}$                |

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## DATA SHEET

| Customer   | Stone & Webster             | f2                            | WYLE LABORATORIES                         |
|------------|-----------------------------|-------------------------------|-------------------------------------------|
| Specimen 🗕 | Cables                      |                               |                                           |
| Part No    | Various                     | Amb. Temp                     | Job No 47906                              |
| Spec       | WLTP 47906-01               | Photores                      |                                           |
| Para       | 3.4.5                       |                               | Start Date                                |
| S/N        |                             | Specimen Temp. <u>Amb i</u>   | ent                                       |
| GSI        | No                          |                               |                                           |
| Test Title | Configuration_No. 2         | Test No. 2                    | Overcurrent Test                          |
| 13. Op     | en circuit on fault cable:  |                               |                                           |
|            | Elapsed time:               | 87x1267<br>1177 Sec           |                                           |
|            | Maximum fault cable temp    | erature: 1783°F               | Channel No. 6                             |
|            | ۰                           |                               |                                           |
| 14. St     | abilized temperature on fau | ilt cable:                    |                                           |
| <u> </u>   | Elapsed time (beginning     | of 15-minute period):         | N/A                                       |
|            | Maximum fault cable temp    | perature: N/A                 | Channel No. N/A                           |
|            | Fault cable current:        | N/A                           |                                           |
|            |                             |                               |                                           |
| 15. lg     | nition of fault cable:      | MAK6 40                       |                                           |
| .= ,,      | Elapsed time:               |                               | ·····                                     |
|            | Maximum fault cable temp    | perature: 1783°F              | Channel No. 6                             |
|            | Fault cable current:        | 908 A                         |                                           |
| 17. Re     | adings after lest for       | ;<br>screet applied until fau | lt cable open circuits:                   |
|            |                             | intene appried unerrinda      |                                           |
| Та         | rget Cable A-               | Voltage (VAC)<br>-B B-C A-C   | Current (amps)<br>Phase A Phase B Phase C |
| 1/         | 0 AWG Triplex 584           | 2 578 574                     | 141 145 139                               |
|            | 0 AWG Triplex 5多く           | <u>2 578 574</u>              | 141 145 139                               |
|            |                             |                               |                                           |
|            |                             | Tested By                     | Mone Date: 9/10/                          |
|            |                             | 14/14                         |                                           |
| lotice of  | •                           | Witness<br>Sheet No           | <u></u> Date:<br>Of4                      |

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## DATA SHEET

| Customer  | Stone & Webster                         |                           | WYLE LABORATORIES                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|-----------|-----------------------------------------|---------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|           | Cables                                  |                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| art No.   | Various                                 | Amb. Temp                 | Job No 47906                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| pec       | WLTP 47906-01                           | Photo Yes                 | Report No 47906-02                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| ara.      | 3,46                                    | Test Med. Air             | Start Date_ 9-10-85                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| /N        |                                         | Specimen TempAmb          | ient                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| ISI       |                                         |                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|           |                                         | <b>-</b> 11 - 0           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| est Title | Configuration No. 2<br>-Pre-Test        | Post-Test Po              | Functional Test                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Insulati  | on Resistance Test                      |                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Acceptan  | nce Criteria: Measured                  | insulation resistance sha | 11 be greater than 1.6 megoh                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|           | with a r                                | otential of 1000 VDC appl | ied for 60 seconds                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
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| Ca        | able                                    | Test Points               | Reading                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| 1/        | O_AWG_Triplex                           | 1 to 2                    | 1,3 x 10'0                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|           |                                         | , 1 to 3                  | 1.0 × 1010                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|           |                                         | 2 to 3                    | 1,2×1010                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|           |                                         | l to Unistrut             | 1.3 × 1010                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|           |                                         | 2 to Unistrut             | 1.7 × 1010                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <u></u>   |                                         | 3 to Unistrut             | 1,9 × 10'°                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
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|           |                                         | Tested By                 | Philomao Date: 9-10-1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|           |                                         | Witness                   | Date:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| otice of  | XI                                      | Sheet No                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| nomaly    | None                                    | Approved                  | 4. P. King 9-10-85                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |

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## DATA SHEET

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| Customer   | Stone & Webster                       | ·                                     | WYLE LABORATORIES                      |
|------------|---------------------------------------|---------------------------------------|----------------------------------------|
| Specimen _ | Cables                                |                                       |                                        |
| Part No.   | Various                               | Amb. Temp                             | Job No 47906                           |
| Spec       | WLTP 47906-01                         | Photo Yes                             | Report No. <u>47906-02</u>             |
| ara        | <b>—</b> • • •                        |                                       | Start Date9-10-85                      |
| /N         | <u>N/A</u>                            | Specimen TempAn                       |                                        |
| SI         | No                                    | · · · · · ·                           |                                        |
| act Titla  | Configuration No.                     | 2 Test No. 2                          |                                        |
|            | -Pro-test-02                          | Post-Test                             | Functional Test                        |
| High Pot   | tential Test                          |                                       |                                        |
| Acceptar   | nce Criteria: Ther                    | e shall be no evidence of ins         | sulation breakdown or flashover        |
|            | with                                  | a potential of 2200 VAC (160          | 00 VAC for 5 T.P. 16 AWG cables)       |
|            | appl                                  | ied for one minute.                   |                                        |
|            |                                       |                                       |                                        |
| Ca         | able                                  | Test Points                           | Reading                                |
|            | 0 AWG Triplex                         | 1 to 2                                | 820 y A                                |
|            |                                       | 1 to 3                                | 800MA                                  |
|            |                                       | 2 to 3                                | 810 y A                                |
|            | ·                                     | l to Unistrut                         | 1210 yA                                |
|            |                                       | 2 to Unistrut                         | 1180 MA                                |
|            |                                       | 3 to Unistrut                         | 1180 y A                               |
|            |                                       |                                       | 1100 <i>µ</i> A                        |
|            | · · · · · · · · · · · · · · · · · · · |                                       | ·····                                  |
|            |                                       |                                       |                                        |
|            |                                       |                                       |                                        |
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|            |                                       |                                       | All All                                |
|            |                                       | Tested By                             | Hamant Date: 9-10.8                    |
|            |                                       | Witness _                             | C Mre Date:                            |
| otice of   | *1                                    | Sheet No.                             | 10 10                                  |
| nomaly     | None                                  | Approved                              | 1. D. King 9-10-85                     |

11 - Free Area (11 - Sec. 198 - 31

# CONFIGURATION NO. 3 TESTS (Horizontal Tray to Parallel Conduit Separation)

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Test Report No. 47906-02

## SECTION IV

## CONFIGURATION NUMBER 3 TESTS (HORIZONTAL TRAY TO PARALLEL CONDUIT SEPARATION)

## 1.0 REQUIREMENTS

**1.1** Acceptance Criteria

## 1.1.1 Insulation Resistance Test

Insulation resistance on all "target cables"\* shall be greater than 1.6 x  $10^6$  ohms with a potential of 1000 VDC (500 VDC 2/C 16 AWG cables) applied for 60 seconds.

## 1.1.2 High Potential Test

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There shall be no evidence of insulation breakdown or flashover with a potential of 2200 VAC (1600 VAC for 2/C 16 AWG cables) applied for one minute.

## 1.1.3 Cable Continuity Test

Energized specimens in the target raceway shall conduct 100% of SWEC-rated currents (see table below) at 575 VAC (120 VAC for control cables and 50 VAC for instrument cables) before, during, and after the overcurrent test.

| Cable<br><u>Size</u> | No.<br>Conductors | SWEC<br>LD. No. | Cable<br><u>Type</u> | Voltage | Rated<br>Current |
|----------------------|-------------------|-----------------|----------------------|---------|------------------|
| 1/0 AWG              | Triplex           | NJM-34          | L                    | 575     | 139              |
| 2 AWG                | Triplex           | NJM-25          | К                    | 575     | 38.5             |
| 12 AWG               | 7                 | NJN-37          | С                    | 120     | 10               |
| 16 AWG               | 2/C               | NJP-05          | х                    | • 50    | 1                |

## 1.1.4 Tolerances

All target cable voltages specified in this procedure shall be maintained within a  $\pm 3\%$  tolerance. The initial setting of target cable currents (with rated current on the fault cable) shall have a tolerance of  $\pm 10\%$ , 0%. Thereafter, all target cables' currents shall be maintained within a  $\pm 10\%$  tolerance.

All fault cable currents shall be maintained within a  $\pm 3\%$  tolerance, if possible.

\* The term "target cable" refers to energized and monitored nonfault cables used in this program.

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### 2.0 PROCEDURES

### 2.1 Test Specimen Preparation

The test specimens were mounted to the unistrut frame assembly of Figure 7 (Test No. 1) and Figure 8 (Test No. 2) of Section VIII. This apparatus was assembled to the indicated dimensions by Wyle technicians using materials supplied by NMP2. The following guidelines were observed with regard to the materials and construction of the assembly:

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- 1. The faulted cable was a Triplex 2/0 AWG cable from NMP2 stock.
- 2. For Test 1, the faulted cable was contained inside the cable tray at the centerline of the tray as shown in Figure 7 in Section VIII. The cable tray was mounted one inch below the conduit. For Test 2, the faulted cable was contained inside the conduit below the cable tray as shown in Figure 8 of Section VIII.
- 3. The ends of the faulted cable from their termination at the copper bus bar to the edge of the cable tray or conduit were wrapped with a single layer of HAVEG SILTEMP WT-65 covered with a single layer of 3M No. 69 glass tape. This wrapping was done to ensure that any ignition that might occur was contained to the test area.
- 4. For Test 1, the conduit was 1-inch rigid steel. For Test 2, the conduit was 4-inch rigid steel.
- 5. Photographs were taken of the test setup prior to each test.
- <sup>2.2</sup> Instrumentation Setup

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#### 2.2.1 Thermocouple Locations

A total of 17 Type "K" thermocouples were utilized for this test. These thermocouples were mounted as described below for both Test 1 and Test 2.

| Channel No. | Location                                                                                                                                    |  |
|-------------|---------------------------------------------------------------------------------------------------------------------------------------------|--|
| 1-6         | Mounted to the jacket on the fault cable. These thermocouples were mounted approximately 16 inches apart.                                   |  |
| 7 & 8       | Mounted to the conductor of the fault cables at the two series connections.                                                                 |  |
| 9-11        | Mounted to the outside of the conduit. These thermocouples<br>were mounted approximately 16 inches apart and above<br>Channels 3, 4, and 5. |  |
| 12-17       | Mounted to the jacket of the target cable. These thermocouples were mounted approximately 16 inches apart and above Channels 1–6.           |  |

The thermocouples were monitored by a Fluke Datalogger feeding a high-speed printer. The datalogger was operated at its maximum scan rate throughout the overcurrent test.

### 2.0 PROCEDURES (Continued)

### 2.2 Instrumentation Setup (Continued)

### 2.2.2 Electrical Monitoring

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All phase-to-phase voltages and phase currents of the target cables and the fault cable current were fed into oscillograph recorders. The oscillograph was operated at the 0.1-inch per minute rate throughout the overcurrent test. The oscillograph channels were as specified in the following table:

| Channel No.               | Signal  | Cable/Location* |
|---------------------------|---------|-----------------|
| 1                         | Current | 7/C 12 AWG/C    |
| 2                         | Voltage | 7/C 12 AWG/C    |
| 3-7                       | Skipped | N/A             |
| 8                         | Current | Fault Cable/T   |
| 9-12                      | Skipped | N/A             |
| * C = Conduit<br>T = Tray |         |                 |

For Test 2, in addition to the above, the below listed thermocouples were added:

| Channel No. | Location                                |
|-------------|-----------------------------------------|
| 18 & 19     | Mounted to the rungs of the cable tray. |

A digital multimeter was utilized to measure all phase-to-phase or phase voltages and phase currents of the target cables prior to, during, and after the overcurrent test. This data was recorded to provide accurate evidence of the specimen's capability to conduct SWEC-rated current at 120 VAC for the control cables throughout the overcurrent test.

### 2.3 Baseline Functional Tests

The baseline functional tests consisted of insulation resistance and high potential measurementrs on each of the target cables.

### 2.3.1 Insulation Resistance Test

1. All power and instrumentation leads were disconnected from the target cables and labeled per Figures 12 and 13 of Section VIII.

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- 2.0 PROCEDURES (Continued)
- 2.3 Baseline Functional Tests (Continued)
- 2.3.1 Insulation Resistance Test (Continued)
  - 2. Using a megohmmeter, a potential of 1000 VDC was applied and the minimum insulation resistance indicated after a period of 60 seconds was recorded between the following test points.

**Target Control Cables:** 

| Phase-to-Phase | Phase-to-Ground |
|----------------|-----------------|
| 1 to 4         | 1 to conduit    |
|                | 4 to conduit    |

- For all performances of this test, the measured values were compared to the acceptance  $\frac{1}{4}$  criteria, Paragraph 1.1.1.
  - 😤 2.3.2 High Potential Test

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3**44** 81. 1 81. 1 1. Using a Hi-Pot Test Set, a potential of 2200 VAC was applied from each conductor to ground and between conductors on multiconductor cable for a period of one minute.

**Target Control Cables:** 

| Phase-to-Phase | Phase-to-Ground |
|----------------|-----------------|
| 1 to 4         | 1 to conduit    |
|                | 4 to conduit    |

2. All power and instrumentation leads were reconnected per Figures 12 and 13 of Section VIII.

For all performances of this test, the measured values were compared to the acceptance criteria, Paragraph 1.1.2.

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### 2.0 **PROCEDURES** (Continued)

#### 2.4 Overcurrent Test

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The overcurrent test was conducted in three sequential steps with no intentional time delay. The first phase consisted of energizing the fault cable with SWEC rated current. The second phase consisted of increasing the current until fault cable temperatures were within  $189^{\circ}$ - $199^{\circ}$ F for 5 minutes. The third phase consisted of energizing the fault cable with the worst case electrical fault current until the cable open-circuited.

The target control cable conducted SWEC-rated current (see Paragraph 1.1.3) at 120 VAC throughout the overcurrent test. The overcurrent test was conducted using the following procedure.

- 1. The Triplex 2/0 AWG fault cable was connected to the copper bus bars per Figure 11 of Section VIII.
- 2. A 7/C 12 AWG target cable was installed into the conduit (Test 1) per Figure 7 of Section VIII or into the cable tray per Figure 8 (Test 2) of Section VIII.
- 3. The 7/C 12 AWG target cable was connected to the instrumentation and power supplies of Figure 13 of Section VIII.
- 4. The 7/C 12 AWG target cable was energized with 10 amperes at 120 VAC.
- 5. The Triplex 2/0 AWG fault cable was energized with 139 amperes per phase (rated current) from the Multi-Amp Test Set.
- 6. Target cable voltages and currents and the fault cables current were recorded.
- 7. The fault cable current was slowly increased until Thermocouple Channels 7 and/or 8 indicated 90 +3°C (189-199°F) conductor temperature.
- 8. The conductor temperature was maintained at 189–199°F for five minutes.
- 9. Fault cable current, conductor temperature, and the highest of Thermocouple Channels 1 through 6 were recorded.
- 10. The Multi-Amp Test Set output was increased to 908 amperes (test current).
- 11. Target cable voltages, currents and the fault cable current were recorded.
- 12. The fault cable was allowed to conduct test current until the cable opencircuited.

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- 2.0 PROCEDURES (Continued)
- 2.4 Overcurrent Test (Continued)
  - 13. The elapsed time and maximum cable temperature were recorded.
  - 14. Target cable voltages and currents were recorded.
  - 15. The target cables and the Multi-Amp Test Set were de-energized.
  - 16. Photographs were taken of the post-test condition.

For all performances of this test, the observed target cable operation was compared to the acceptance criteria, Paragraph 1.1.3

2.5 Post-Overcurrent Test Functional Test

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The functional tests of Paragraph 2.3 were repeated.

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3.0 RESULTS

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### 3.1 Results of Test No. 1

Configuration Number 3, Test No. 1, with a Triplex 2/0 AWG fault cable inside a 4-inch rigid steel conduit, was conducted per Paragraph 2.0 and successfully met the requirements of Paragraph 1.0. The 908 amperes test current was applied for 1240 seconds (20.7 minutes) until the cable open-circuited. The maximum observed temperature on the fault cable was 1836°F which occurred on Thermocouple No. 6. The fault cable ignited after 630 seconds (10.5 minutes). The fire burned for approximately 13.0 minutes.

The capabilities of the target cables to conduct SWEC rated current at 120 VAC were not impaired during this test. The maximum observed target cable temperature was 788°F. The target cable successfully completed the Post-Overcurrent Test Functional Test.

Appendix I contains the following data from this test:

- 1. Photographs IV-1 through IV-5 which show pretest and post-test conditions.
- 2. A narrative of the test which relates test time, fault cable temperatures, and important events.
- 3. Figure IV-1 which plots the temperature readings versus time.
- 4. Data Sheets which contain Baseline Functional Test data, Overcurrent Test data, and Post-Overcurrent Test Functional Test data.

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3.0 **RESULTS (Continued)** 

### **3.2** Results of Test No. 2

Configuration Number 3, Test No. 2, with a Triplex 2/0 AWG fault cable inside the cable tray, was conducted per Paragraph 2.0 and successfully met the requirements of Paragraph 1.0. The 908 amperes test current was applied for 1317 seconds (22.0 minutes) until the cable open-circuited. The maximum observed temperature on the fault cable was  $1212^{\text{OF}}$  which occurred on Thermocouple No. 4. The fault cable ignited at the mouth of the conduit after 1317 seconds (22.0 minutes). The fire burned out the end of the conduit and did not impinge upon the length of target cable under test.

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The capabilities of the target cables to conduct SWEC rated current 120 VAC were not impaired during this test. The maximum observed target cable temperature was 245°F. The target cable successfully completed the Post-Overcurrent Test Functional Test.

Appendix II contains the following data from this test:

- 1. Notices of Anomaly Number 5 and 6.
- 2. Photographs IV-6 through IV-7 which show pretest and post-test conditions.
- 3. A narrative of the test which relates test time, fault cable temperatures, and important events.
- 4. Figure IV-2 which plots the temperature readings versus time.
- 5. Data Sheets which contain Baseline Functional Test data, Overcurrent Test data, and Post-Overcurrent Test Functional Test data.

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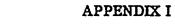
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## CONFIGURATION NUMBER 3, TEST NO. 1, DATA

Page No. IV-10 Test Report No. 47906-02

| NOTICE OF ANOMALY                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | DATE: 9/                                                                                                                                                                                                        | 26/85                                                             |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------|
| NOTICE NO: 5_ P.O. NUMBER: NMP2-E-0907 CON                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | TRACT NO: N/A                                                                                                                                                                                                   |                                                                   |
| CUSTOMER: Stone & Webster                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | WYLE JOB NO: 47                                                                                                                                                                                                 | 906                                                               |
| NOTIFICATION MADE TO: R. Das                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | NOTIFICATION DATE: 9/                                                                                                                                                                                           | 27/85                                                             |
| NOTIFICATION MADE BY:J. King                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                 |                                                                   |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | DATE OF<br>UIPMENT ANOMALY: 9/9, 9                                                                                                                                                                              | /12, 9/17/85                                                      |
| PART NAME:Electrical Cable                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                 | /A                                                                |
| TEST:Config. 2, Test 1; Config. 3; Test 2;                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                 | /A                                                                |
| 5, Tests 2 and 3<br>SPECIFICATION:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | PARA. NO. 3.4.5, 3.                                                                                                                                                                                             | 5.5, 3.7.5                                                        |
| REQUIREMENTS:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                 |                                                                   |
| 1. Slowly increase fault cable current until<br>90 $\pm 3^{\circ}$ C (189°F-199°F) conductor temperatur                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | thermocouple channels 7 and/o<br>c.                                                                                                                                                                             | r 8 indicate                                                      |
| 2. Maintain the conductor temperature at 189°                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | F-199°F for five minutes.                                                                                                                                                                                       |                                                                   |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                 |                                                                   |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                 |                                                                   |
| DESCRIPTION OF ANOLANY                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                 | 1                                                                 |
| DESCRIPTION OF ANOMALY:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | include ware word include of                                                                                                                                                                                    |                                                                   |
| DESCRIPTION OF ANOMALY:<br>The thermocouple channels 1-6 on the cable<br>and/or 8.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | jacket were used instead of                                                                                                                                                                                     | channels 7                                                        |
| The thermocouple channels 1-6 on the cable                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | jacket were used instead of                                                                                                                                                                                     | channels 7                                                        |
| The thermocouple channels 1-6 on the cable                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | jacket were used instead of                                                                                                                                                                                     | channels 7                                                        |
| The thermocouple channels 1-6 on the cable                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | jacket were used instead of                                                                                                                                                                                     | channels 7                                                        |
| The thermocouple channels 1-6 on the cable and/or 8.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | jacket were used instead of                                                                                                                                                                                     | channels 7                                                        |
| The thermocouple channels 1-6 on the cable and/or 8.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                 |                                                                   |
| The thermocouple channels 1-6 on the cable and/or 8.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                 |                                                                   |
| The thermocouple channels 1-6 on the cable and/or 8.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | e test for the following reasons.                                                                                                                                                                               |                                                                   |
| The thermocouple channels 1-6 on the cable<br>and/or 8.<br>DISPOSITION · COMMENTS · RECOMMENDATIONS:<br>The anomaly was judged to have no impact on th<br>1. During warmup of the cable, the conductor                                                                                                                                                                                                                                                                                                                                                                                                       | e test for the following reasons.<br>temperature would have to be<br>te a lower temperature than                                                                                                                | higher than                                                       |
| The thermocouple channels 1-6 on the cable<br>and/or 8.<br>DISPOSITION · COMMENTS · RECOMMENDATIONS:<br>The anomaly was judged to have no impact on th<br>1. During warmup of the cable, the conductor<br>the temperature of the adjacent jacket.<br>2. The conductor thermocouple can indicat                                                                                                                                                                                                                                                                                                               | e test for the following reasons.<br>temperature would have to be<br>te a lower temperature than<br>unting and location.<br>to the target cables during<br>small compared to the heat                           | higher than<br>the jacket                                         |
| <ul> <li>The thermocouple channels 1-6 on the cable and/or 8.</li> <li>DISPOSITION · COMMENTS · RECOMMENDATIONS:</li> <li>The anomaly was judged to have no impact on th</li> <li>1. During warmup of the cable, the conductor the temperature of the adjacent jacket.</li> <li>2. The conductor thermocouple can indicat thermocouples because of differences in more than the table and maintenance at, 189°F-199°F is very</li> </ul>                                                                                                                                                                     | e test for the following reasons.<br>temperature would have to be<br>te a lower temperature than<br>inting and location.<br>to the target cables during<br>small compared to the heat<br>curred in every test.  | higher than<br>the jacket<br>warmup to,<br>transferred            |
| <ul> <li>The thermocouple channels 1-6 on the cable and/or 8.</li> <li>DISPOSITION - COMMENTS - RECOMMENDATIONS:</li> <li>The anomaly was judged to have no impact on th</li> <li>1. During warmup of the cable, the conductor the temperature of the adjacent jacket.</li> <li>2. The conductor thermocouple can indicat thermocouples because of differences in mod</li> <li>3. The heat transferred from the fault cable and maintenance at, 189°F-199°F is very during burning of the fault cable, which occurs</li> <li>NOTE: IT IS THE CUSTOMER'S RESPONSIBILITY TO ANALYZE A</li> </ul>               | e test for the following reasons.<br>temperature would have to be<br>te a lower temperature than<br>inting and location.<br>to the target cables during<br>small compared to the heat<br>curred in every test.  | higher than<br>the jacket<br>warmup to,<br>transferred            |
| <ul> <li>The thermocouple channels 1-6 on the cable and/or 8.</li> <li>DISPOSITION · COMMENTS · RECOMMENDATIONS:</li> <li>The anomaly was judged to have no impact on th</li> <li>1. During warmup of the cable, the conductor the temperature of the adjacent jacket.</li> <li>2. The conductor thermocouple can indicat thermocouples because of differences in mot</li> <li>3. The heat transferred from the fault cabl and maintenance at, 189°F-199°F is very during burning of the fault cable, which occurs</li> <li>NOTE: IT IS THE CUSTOMER'S RESPONSIBILITY TO ANALYZE AN VERIFICATION:</li> </ul> | e test for the following reasons.<br>temperature would have to be<br>the a lower temperature than<br>unting and location.<br>to the target cables during<br>small compared to the heat<br>curred in every test. | higher than<br>the jacket<br>warmup to,<br>transferred            |
| <ul> <li>The thermocouple channels 1-6 on the cable and/or 8.</li> <li>DISPOSITION · COMMENTS · RECOMMENDATIONS:</li> <li>The anomaly was judged to have no impact on th</li> <li>1. During warmup of the cable, the conductor the temperature of the adjacent jacket.</li> <li>2. The conductor thermocouple can indicat thermocouples because of differences in mot</li> <li>3. The heat transferred from the fault cabl and maintenance at, 189°F-199°F is very during burning of the fault cable, which occurs</li> <li>NOTE: IT IS THE CUSTOMER'S RESPONSIBILITY TO ANALYZE AN VERIFICATION:</li> </ul> | e test for the following reasons.<br>temperature would have to be<br>the a lower temperature than<br>unting and location.<br>to the target cables during<br>small compared to the heat<br>curred in every test. | higher than<br>the jacket<br>warmup to,<br>transferred<br>ART 21. |

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## Page No. IV-11 Test Report No. 47906-02.

| NOTICE OF ANOMALY                                                                                                                                                                                                                                                                                                                                                                       | DATE:                                                                                                              | 0/26/85                                                  |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------|
| NOTICE NO: 6 P.O. NUMBER: NMP2-E-0907 CONTRACT N                                                                                                                                                                                                                                                                                                                                        | 0:N/A                                                                                                              |                                                          |
| CUSTOMER: Stone & Webster                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                    | 47906                                                    |
| NOTIFICATION MADE TO: R. Das                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                    |                                                          |
| NOTIFICATION MADE BY:J. King                                                                                                                                                                                                                                                                                                                                                            | VIA: Telepho                                                                                                       | one                                                      |
|                                                                                                                                                                                                                                                                                                                                                                                         | DATE OF<br>ANOMALY:                                                                                                | 9/12/85                                                  |
| PART NAME: Electrical Cables                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                    |                                                          |
| TEST: Configuration 3, Test 2                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                    |                                                          |
| SPECIFICATION: WLTP 47906-01                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                    |                                                          |
| REQUIREMENTS:                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                    |                                                          |
| For Test 2, add thermocouple channels 18 and 19 to the r                                                                                                                                                                                                                                                                                                                                | rungs of the cable                                                                                                 | trav.                                                    |
| ,                                                                                                                                                                                                                                                                                                                                                                                       | •                                                                                                                  |                                                          |
|                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                    |                                                          |
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| *                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                    |                                                          |
| DESCRIPTION OF ANOMALY                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                    |                                                          |
| DESCRIPTION OF ANOMALY:                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                    |                                                          |
| DESCRIPTION OF ANOMALY:<br>Installation of thermocouples 18 and 19 was omitted.                                                                                                                                                                                                                                                                                                         |                                                                                                                    |                                                          |
|                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                    |                                                          |
|                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                    |                                                          |
|                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                    |                                                          |
|                                                                                                                                                                                                                                                                                                                                                                                         | •                                                                                                                  |                                                          |
| Installation of thermocouples 18 and 19 was omitted.                                                                                                                                                                                                                                                                                                                                    | •                                                                                                                  |                                                          |
| Installation of thermocouples 18 and 19 was omitted.                                                                                                                                                                                                                                                                                                                                    |                                                                                                                    |                                                          |
|                                                                                                                                                                                                                                                                                                                                                                                         | or the following re                                                                                                | eason.                                                   |
| Installation of thermocouples 18 and 19 was omitted.<br>DISPOSITION · COMMENTS · RECOMMENDATIONS:<br>This anomaly was judged to have no impact on the test f                                                                                                                                                                                                                            |                                                                                                                    |                                                          |
| Installation of thermocouples 18 and 19 was omitted.<br>DISPOSITION · COMMENTS · RECOMMENDATIONS:<br>This anomaly was judged to have no impact on the test f<br>1. Temperature of target cable, fault cable, and                                                                                                                                                                        | the conduit en                                                                                                     | closing the fault                                        |
| Installation of thermocouples 18 and 19 was omitted.<br>DISPOSITION · COMMENTS · RECOMMENDATIONS:<br>This anomaly was judged to have no impact on the test f                                                                                                                                                                                                                            | the conduit en                                                                                                     | closing the fault                                        |
| Installation of thermocouples 18 and 19 was omitted.<br>DISPOSITION · COMMENTS · RECOMMENDATIONS:<br>This anomaly was judged to have no impact on the test f<br>1. Temperature of target cable, fault cable, and<br>cable were measured; therefore, the temperatures                                                                                                                    | the conduit en                                                                                                     | closing the fault                                        |
| Installation of thermocouples 18 and 19 was omitted.<br>DISPOSITION · COMMENTS · RECOMMENDATIONS:<br>This anomaly was judged to have no impact on the test f<br>1. Temperature of target cable, fault cable, and<br>cable were measured; therefore, the temperature                                                                                                                     | the conduit en                                                                                                     | closing the fault                                        |
| Installation of thermocouples 18 and 19 was omitted.<br>DISPOSITION · COMMENTS · RECOMMENDATIONS:<br>This anomaly was judged to have no impact on the test f<br>1. Temperature of target cable, fault cable, and<br>cable were measured; therefore, the temperature                                                                                                                     | the conduit en                                                                                                     | closing the fault                                        |
| Installation of thermocouples 18 and 19 was omitted.<br>DISPOSITION · COMMENTS · RECOMMENDATIONS:<br>This anomaly was judged to have no impact on the test f<br>1. Temperature of target cable, fault cable, and<br>cable were measured; therefore, the temperatures                                                                                                                    | the conduit en                                                                                                     | closing the fault                                        |
| Installation of thermocouples 18 and 19 was omitted.<br>DISPOSITION · COMMENTS · RECOMMENDATIONS:<br>This anomaly was judged to have no impact on the test f<br>1. Temperature of target cable, fault cable, and<br>cable were measured; therefore, the temperatures                                                                                                                    | the conduit en<br>s of the cable tr                                                                                | closing the fault<br>ray at two points                   |
| Installation of thermocouples 18 and 19 was omitted.<br>DISPOSITION · COMMENTS · RECOMMENDATIONS:<br>This anomaly was judged to have no impact on the test f<br>1. Temperature of target cable, fault cable, and<br>cable were measured; therefore, the temperatures<br>are unnecessary data.<br>NOTE: IT IS THE CUSTOMER'S RESPONSIBILITY TO ANALYZE ANOMALIES                         | the conduit en<br>s of the cable tr<br>S AND COMPLY WITH 10                                                        | closing the fault<br>ray at two points                   |
| Installation of thermocouples 18 and 19 was omitted. DISPOSITION - COMMENTS - RECOMMENDATIONS: This anomaly was judged to have no impact on the test f 1. Temperature of target cable, fault cable, and cable were measured; therefore, the temperatures are unnecessary data. NOTE: IT IS THE CUSTOMER'S RESPONSIBILITY TO ANALYZE ANOMALIES VERIFICATION: PROJECT I                   | the conduit en<br>s of the cable tr<br>S AND COMPLY WITH 10<br>ENGINEER: <u>J. P. 1</u>                            | oclosing the fault<br>ray at two points<br>OCFR PART 21. |
| Installation of thermocouples 18 and 19 was omitted.  DISPOSITION - COMMENTS - RECOMMENDATIONS:  This anomaly was judged to have no impact on the test f  1. Temperature of target cable, fault cable, and cable were measured; therefore, the temperature: are unnecessary data.  NOTE: IT IS THE CUSTOMER'S RESPONSIBILITY TO ANALYZE ANOMALIES VERIFICATION: PROJECT I TEST WITNESS: | the conduit en<br>s of the cable tr<br>S AND COMPLY WITH 10<br>ENGINEER: <u>J. P. 1</u><br>MANAGER: <u>J. P. 1</u> | oclosing the fault<br>ray at two points<br>OCFR PART 21. |

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#### Test Report No. 47906-02

## CONFIGURATION NUMBER 3, TEST NO. 1

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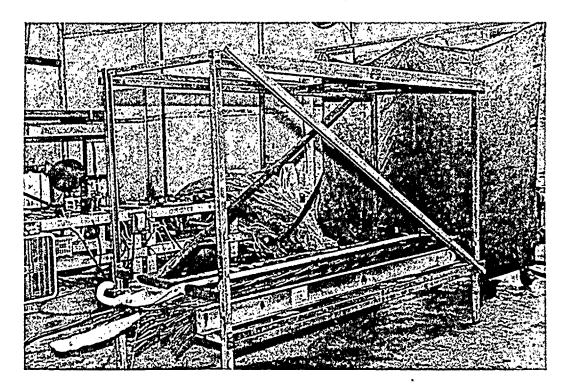
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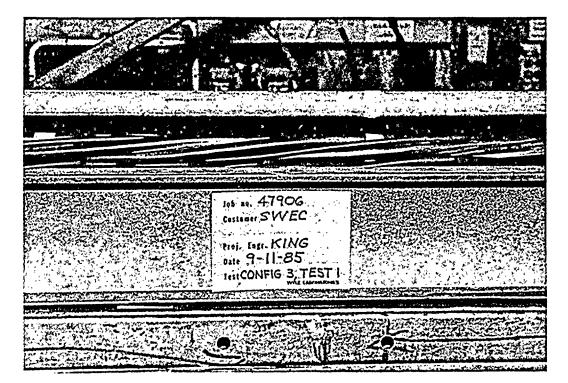
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PHOTOGRAPH IV-1

PRETEST VIEW - OVERALL



PHOTOGRAPH IV-2

POST-TEST VIEW — SHOWING TARGET CABLE CONDUIT ONE INCH ABOVE FAULT CABLE

### Test Report No. 47906-02

#### CONFIGURATION NUMBER 3, TEST NO. 1



PHOTOGRAPH IV-3

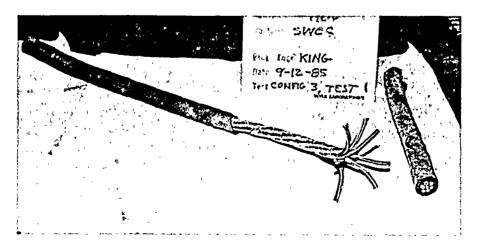
PRETEST VIEW - OVERALL

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PHOTOGRAPH IV-4

POST-TEST VIEW -- CLOSE-UP



**PHOTOGRAPH IV-5** 

POST-TEST VIEW — CLOSE-UP SHOWING CONDITION OF TARGET CABLE AFTER REMOVAL FROM CONDUIT

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Test Report No. 47906-02

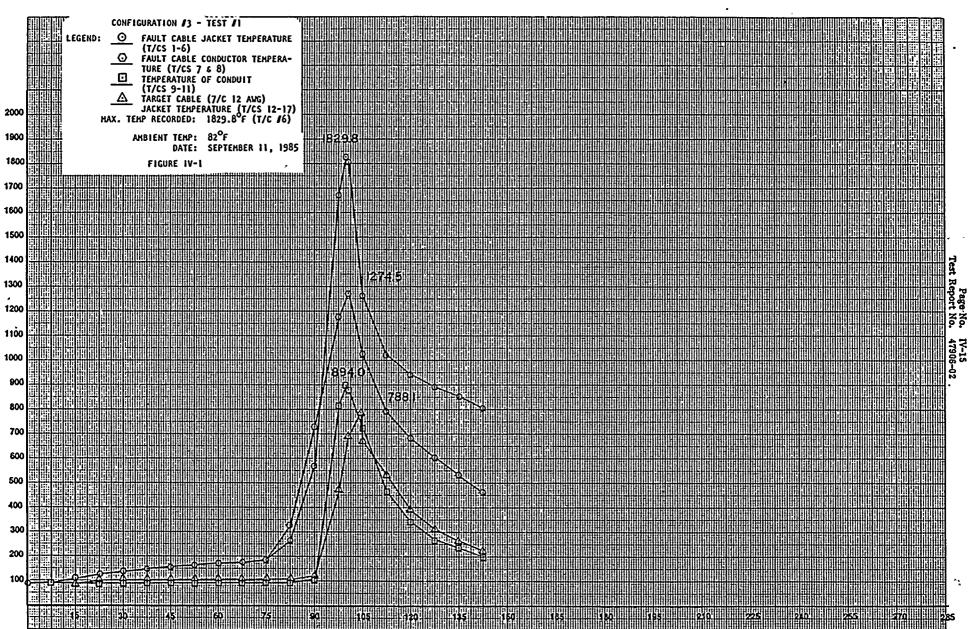
## CONFIGURATION NUMBER 3, TEST NO. 1

| Approximate<br>Test Time | Approximate<br>Fault Cable<br>Jacket Tempe <del>r</del> ature | Observation                         |
|--------------------------|---------------------------------------------------------------|-------------------------------------|
| 0 Min                    | 84°F                                                          | Energized fault cable with 139A     |
| 10 Min                   | 900F                                                          | Energized fault cable with 270A     |
| 65 Min                   | . 166°F                                                       | Energized fault cable with 280A     |
| 75 Min                   | 182 <sup>o</sup> F                                            | Fault cable conductor reached 189°F |
| 80 Min                   | 184°F                                                         | Energized fault cable with 908A     |
| 83.2 Min                 | 2950F                                                         | Light smoke visible                 |
| 87.8 Min                 | 480 <sup>0</sup> F                                            | Fault cable jacket rupturing        |
| 90.5 Min                 | 630°F                                                         | Ignition of fault cable             |
| 100.7 Min                | 1790 <sup>0</sup> F                                           | Open circuit                        |
| 103.5 Min                | 1450°F                                                        | Fire out                            |

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## DATA SHEET

| Customer Stone & Webster               |                        | WYLE LABORATORIES                      |
|----------------------------------------|------------------------|----------------------------------------|
| SpecimenCables                         |                        |                                        |
| Part No. Various                       | Amb. Temp8             | <u>2°F</u> Job No. <u>47906</u>        |
| SpecWLTP_47906-01                      | Photo Yes              | Beport No. 47906-02                    |
| Para. 3.5.4                            | Test Med               | Start Date 9-11- 85                    |
| 5/NN/A                                 | Specimen Temp.         | Ambient                                |
| SI No                                  |                        |                                        |
| est Title Configuration No.            | 3 Test No. 1           |                                        |
| (Pre-test)                             | Post-test Du           | Functional Test                        |
| Insulation Resistance Test             |                        |                                        |
| Acceptance Criteria: Measure           | ed insulation resistan | ice shall be greater than 1.6 megohm   |
|                                        |                        |                                        |
| with a                                 | potential of 1000 VDL  | applied for 60 seconds.                |
|                                        |                        |                                        |
| Cable                                  | Test Points            | Reading                                |
| 7/C 12 AWG                             | 1 to 4                 | 6.0 × 1010                             |
| par (Horizontally Separated)           | - l to Conduit         | 7.0 × 1010                             |
|                                        | 4 to Conduit           | 3.8 × 1010                             |
|                                        |                        | 3.8 × 10                               |
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|                                        | Test                   | ed By Danny & Well Date: 9-11-1        |
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Page No. IV-17 Test Report No. 47906-02

## DATA SHEET

| Customer Stone & Webs                        | ster                                   | WYLE LABORATORIES                     |
|----------------------------------------------|----------------------------------------|---------------------------------------|
| Specimen <u>Cables</u>                       |                                        |                                       |
| Part No. Various                             | Amb. Temp. <u>82</u>                   | <u>6</u> Job No. <u>47906</u>         |
| Spec. WLTP 47906-0                           | )1 PhotoYes                            | Report No47906-02                     |
| Para. 3.5.4                                  | Test MedAir                            | Start Date9-1/-85                     |
| S/NN/A                                       | Specimen Temp                          |                                       |
| GSINo                                        | · · ·                                  |                                       |
|                                              |                                        | •                                     |
| Test Title <u>Configuratio</u><br>(Pre-test) | n No. 3 Test No. 1<br>-Post-test &     | Functional Test                       |
| High Potential Test                          |                                        | · · ·                                 |
| •                                            | There shall be no evidence of          | insulation breakdown or flashover     |
| •                                            | with a potential of 2200 VAC ag        |                                       |
|                                              | · · · · · · · · · · · · · · · · · · ·  | · · · · · · · · · · · · · · · · · · · |
| Cable                                        | Test Points                            | Reading                               |
| 7/C 12 AWG                                   | 1 to 4                                 | 1770MA                                |
| fmg-(Horizoncally Se                         | parated) I to Conduit                  | 920 ut                                |
|                                              | 4 to Conduit                           | 825 yA                                |
|                                              |                                        |                                       |
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|                                              |                                        |                                       |
|                                              |                                        | By Danry Millet Date: 9-11-           |
|                                              | Tested<br>Witness                      |                                       |
| otice of Al                                  |                                        |                                       |
| nomaly Non                                   | e Access                               |                                       |
| iomaly                                       | C Approv                               | ed 4. F. 12 7-11-85                   |

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Page No. IV-18 Test Report No. 47906-02

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## DATA SHEET

| Customer                                | Stone & Webste                        |                |                        | WYLEL                                  | ABORATORIES                           |
|-----------------------------------------|---------------------------------------|----------------|------------------------|----------------------------------------|---------------------------------------|
|                                         | NA                                    |                | mb. Temp82_°F          |                                        | 47906                                 |
| Part No<br>Spec                         |                                       | A              | hoto <u>Yes</u>        | JOD NO.                                | 47906-02                              |
| Spec<br>Seco                            | 3, 5, 5                               |                | est Med. <u>Air</u>    | Report I                               | NO7505 0.                             |
| Para<br>S/N                             |                                       |                |                        |                                        | $te - \frac{7 - 7 - 83}{2}$           |
| GSI                                     |                                       | S              | pecimen Temp. <u> </u> | brenç                                  |                                       |
|                                         |                                       | ,              | •                      |                                        |                                       |
| Test Title .                            | Configuration N                       | <u>No.3</u> T  | est No. 1              | Overcurre                              | nt Test                               |
| 6.                                      | Readings with rated                   | i current on f | fault cable            | · · · · · · · · · · · · · · · · · · ·  |                                       |
|                                         | Target Cable                          | Vol            | tage (VAC)<br>B-C A-C  | Cur<br>Shace A                         | rent (amps)<br>Phase B Ph             |
|                                         |                                       |                |                        |                                        | Phase o Ph                            |
|                                         | 7/C - 12 AWG                          | 120,8          |                        | 10.5                                   |                                       |
|                                         |                                       |                |                        |                                        |                                       |
|                                         | · · · · · · · · · · · · · · · · · · · |                |                        |                                        |                                       |
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|                                         |                                       |                |                        |                                        |                                       |
|                                         | Fault Cable: 2                        | O AWG          | TRIPLEX                |                                        |                                       |
|                                         | Rated Current:                        | 908A           | Tizo 1                 | · · · · · · · · · · · · · · · · · · ·  |                                       |
|                                         | · · · · · · · · · · · · · · · · · · · | 4084           | 137 /4                 |                                        | ·                                     |
|                                         | Measured Current:                     | <u>_</u>       |                        |                                        |                                       |
|                                         |                                       |                |                        |                                        |                                       |
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|                                         |                                       |                |                        | all in                                 |                                       |
|                                         |                                       |                | Tested By.             | whomaeff-                              | Date:                                 |
|                                         |                                       |                |                        | // محدالته //                          | · · ·                                 |
| otice of                                |                                       |                | Witness<br>Sheet No.   |                                        | _ Date:                               |

Page No. IV-19 Test Report No. 47906-02

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## DATA SHEET

| Customer   | Stone & Webster                                     |                                 | WYLE LABORATORIES                                                              |
|------------|-----------------------------------------------------|---------------------------------|--------------------------------------------------------------------------------|
| Specimen 🕳 | Cables                                              |                                 |                                                                                |
| Part No.   | Various .                                           | Amb. Temp82°F                   | Job No 47906                                                                   |
| Spec       | WLTP 47906-01                                       | Photo Yes                       | Report No. 47906-02                                                            |
| ara        | 3, 5, 5                                             | Test Med. Air                   | Start Date7-//-85                                                              |
|            | N/A                                                 | Specimen TempA                  | mbient                                                                         |
| ISI        |                                                     |                                 |                                                                                |
|            |                                                     |                                 | •                                                                              |
| est Title  | Configuration No. 3                                 | Test No. 1                      | Overcurrent Test                                                               |
| 7. In      | creasing current to raise f                         | fault cable temperatu           | re to 189°F - 199°F                                                            |
|            | FAULT CABLE CURRENT                                 | 677                             | CONDUCTOR TEMP/CHANNEL                                                         |
|            | 27021 COULE COMILINI                                | 2 75 60 100                     |                                                                                |
|            | 270A<br>280A                                        | 2700 322                        |                                                                                |
|            | 280A                                                | 1300 502                        | 774/8                                                                          |
|            |                                                     |                                 | · · · · · · · · · · · · · · · · · · ·                                          |
|            |                                                     |                                 |                                                                                |
|            |                                                     |                                 |                                                                                |
|            |                                                     | -<br>                           |                                                                                |
|            |                                                     | ······                          |                                                                                |
|            |                                                     | ·<br>·                          | · · · · · · · · · · · · · · · · · · ·                                          |
| 9. Re      | adings after fault cable wa                         |                                 | F                                                                              |
| 9. Re      | adings after fault cable wa<br>Fault cable current: |                                 | F                                                                              |
| 9. Re      | Fault cable current:                                | 280A<br>194° F                  | Channel No. 8                                                                  |
| 9. Re      | Fault cable current:                                | 280A<br>194° F                  | Channel No. 8                                                                  |
| 9. Re      | Fault cable current:                                | 280A<br>194° F                  | Channel No. 8                                                                  |
| 9. Re      | Fault cable current:                                | 280A<br>194° F                  | Channel No. 8                                                                  |
| 9. Re      | Fault cable current:                                | 280A<br>194° F                  | Channel No. 8                                                                  |
| 9. Re      | Fault cable current:                                | 280A<br>194° F                  | Channel No. 8                                                                  |
| 9. Re      | Fault cable current:                                | 280A<br>194° F                  | Channel No. 8                                                                  |
| 9. Re      | Fault cable current:                                | 280A<br>194° F                  | Channel No. 8                                                                  |
| 9. Re      | Fault cable current:                                | 280A<br>194° F                  | Channel No. 8                                                                  |
| 9. Re      | Fault cable current:                                | 280A<br>194° F                  | Channel No. 8                                                                  |
| 9. Re      | Fault cable current:                                | 280A<br>194°F<br>184 Channel    | Channel No. 3                                                                  |
| 9. Re      | Fault cable current:                                | 2.80 A<br>194° F<br>184 Channel | Channel No. 8<br>6<br>                                                         |
| 9. Re      | Fault cable current:                                | 280A<br>194°F<br>184 Channel    | Channel No. 3<br>C<br>C<br>C<br>C<br>C<br>C<br>C<br>C<br>C<br>C<br>C<br>C<br>C |

Page No. IV-20 Test Report No. 47906-02

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| Customer                      | Stone & Webster          |                                       |                                        | WYLEI          | ABORATOR                         | RIES                   |
|-------------------------------|--------------------------|---------------------------------------|----------------------------------------|----------------|----------------------------------|------------------------|
| Specimen                      | <u>Cables</u><br>Various |                                       | 80 °C                                  |                | 1.700                            |                        |
| Part No.                      | WLTP 47906-01            | Amb. Temp                             | 82°F                                   | Job No         | 4/90                             | <u> </u>               |
| Spec                          | 7 ~ ~                    | Photo                                 | res                                    | Report         | No4790                           | 5-02                   |
|                               |                          |                                       |                                        | Start D        | ate <u>9-1/-</u>                 | 87                     |
| S/N                           |                          | Specimen Te                           | mp. <u>Ambient</u>                     |                |                                  |                        |
| GSI                           |                          |                                       |                                        |                |                                  |                        |
| Test Title                    | Configuration No. 3      | 3 Test No. 1                          |                                        | Overcurre      | ent Test                         |                        |
| <u> 11. Ini</u>               | tial readings with tes   | st current on fau                     | lt cable:                              |                |                                  |                        |
| Tar                           | get Cable                | Vortage (VAC<br>A-B B-C A-            |                                        | Phase A        | <del>rent (amps</del><br>Phase B | <del>.)</del><br>Phase |
| got-2-A                       | WG_Triplex               |                                       |                                        |                | <u></u>                          |                        |
|                               | rtically Separated)      |                                       |                                        |                |                                  |                        |
| 7/0                           | - 12 AWG                 | 120.9                                 |                                        | 10.7           |                                  |                        |
| and lun                       | rizontally-Separated)    |                                       |                                        |                | <u></u>                          |                        |
|                               |                          |                                       |                                        |                |                                  |                        |
|                               | Ilt cable: $2/0 AV$      | NG TRIPLE                             | X                                      |                |                                  |                        |
|                               | of current: 908 A        | 4                                     | ···· · · · · · · · · · · · · · · · · · |                |                                  |                        |
| Mea                           | sured current:           |                                       |                                        |                |                                  |                        |
|                               |                          | · · · · · · · · · · · · · · · · · · · |                                        | •              |                                  |                        |
|                               |                          |                                       |                                        |                |                                  |                        |
|                               |                          |                                       |                                        |                |                                  |                        |
|                               |                          |                                       | Withess                                | omaoff<br>Nore | Date:                            | 111/85                 |
|                               |                          |                                       | <b>A</b> L                             | <b>.</b>       |                                  | 21                     |
| lotice of<br>Anomaly <u> </u> | None                     |                                       | Sheet No                               |                | of                               | <u> </u>               |

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## DATA SHEET

| Customer       | Stone & Webster                   | · · · · · · · · · · · · · · · · · · · | •                                              | WYLE LABO                      | RATORIES                                  |
|----------------|-----------------------------------|---------------------------------------|------------------------------------------------|--------------------------------|-------------------------------------------|
| Specimen       | Cables                            |                                       | 0.5                                            |                                |                                           |
| Part No.       | Various                           | Amb. Temp                             | 82°F                                           | Job No                         | 47906                                     |
| Spec           | WLTP 47906-01                     | Photo                                 | Yes                                            | Report No                      | 47906-02                                  |
| Para           | 3.5.5                             | Test Med                              | Air                                            | Start Date_                    |                                           |
| S/N            | <u>N/A</u>                        | Specimen '                            | TempAmt                                        | <u>vient</u>                   |                                           |
| 3SI            | No                                |                                       | ·                                              |                                |                                           |
| est Title      | Configuration No. 3               | Test No.                              | 1                                              | Overcurrent To                 | est                                       |
| 13. Ope        | n circuit on fault cable:         |                                       |                                                |                                |                                           |
|                | Elapsed time:                     | 12                                    | 40 sec                                         |                                |                                           |
|                | Maximum fault cable temp          | erature:                              | 1830'F                                         | Channel No. 6                  | *                                         |
|                |                                   | •                                     |                                                |                                |                                           |
| 14. Stal       | bilized temperature on fau        | lt cable:                             |                                                |                                |                                           |
|                | Elapsed time (beginning           | of 15-minut                           | e period):                                     | NIA                            |                                           |
|                | Maximum fault cable temp          | erature:                              | NIA                                            |                                |                                           |
|                | Fault cable current:              |                                       | NIA                                            | Channel No.                    | NA                                        |
| <u>15. Ign</u> | <u>Elapsed time:</u>              |                                       | 630 Sec                                        |                                | · · · · · · · · · · · · · · · · · · ·     |
|                | <u>Maximum fault cable temp</u>   | erature:                              | 1830° F                                        | Channel No. 6                  | · · ·                                     |
|                | Fault cable current:              |                                       | 908 A                                          |                                | <u> </u>                                  |
| 17. Rea        | dings after let-through cu        | rrent appli                           | ed until fa                                    | ult cable open cire            | cuits:                                    |
| Tar            | get Cable A-                      | Voltage (VA<br>B B-C A                | c)<br>-C                                       | Current (am<br>Phase A Phase B | os)<br>Phase C                            |
| mc -2-A        | WG-Triplex                        |                                       |                                                |                                |                                           |
| ·              | tically Separated)                |                                       |                                                |                                |                                           |
| 7/0            | - 12 AWG 12                       | 1.4                                   |                                                | 10,5                           |                                           |
| mc(110         | <del>rizontally-Separated).</del> |                                       |                                                |                                |                                           |
| otice of       | Noue                              |                                       | Tested By<br>Witness<br>Sheet No<br>Approved _ | - Morre // [                   | Date: <u>9/11/81</u><br>Date:<br>of<br>PS |

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| Customer _          | Stone & Web              | 5(61                 |                                         |                                 | WYLE.LAB        | DRATORIES               |
|---------------------|--------------------------|----------------------|-----------------------------------------|---------------------------------|-----------------|-------------------------|
| Specimen _          | <u>Cables</u><br>Various |                      |                                         | 82°F                            | 28-665 Mil 8    | 47906                   |
| Part No.            |                          | 01                   | Amb. Temp.                              | Yes                             | Job No          |                         |
| Spec                | 3.5.6                    |                      | Photo                                   | 165                             | Report No.      | 9-11-85                 |
|                     | <u> </u>                 |                      |                                         |                                 | Start Date_     | <u></u>                 |
| S/N                 |                          |                      | Specimen To                             | emp. <u>Ambiei</u>              | <u>nt</u>       | سو و م                  |
| GSI                 |                          |                      |                                         |                                 | - 40            | - 8-45 Augus            |
| Test Title _        | Configurati              |                      | Test No.                                |                                 | <u> </u>        |                         |
|                     | Pre-test &               | 2                    | (Post-test)                             | Ft                              | unctional Test  |                         |
| Insulat             | ion Resistance           | Test                 |                                         |                                 |                 |                         |
| Accepta             | nce Criteria:            | Measured             | insulation res                          | istance shall                   | be greater that | n 1.6 megohms           |
|                     |                          | with a pr            | ptential of 100                         | O VDC applied                   | for 60 seconds  |                         |
|                     |                          |                      |                                         |                                 | 101 00 500000   | •                       |
| C:                  | able                     |                      | Test Points                             | <u></u>                         | Reading         |                         |
| 7.                  | /C 12 AWG                |                      | 1 to 4                                  | <u>-</u>                        | 2.8×106         |                         |
|                     | Horizontally Se          | <del>:paratod)</del> | l to Conduit                            |                                 |                 |                         |
|                     |                          | •                    |                                         |                                 | 5,0 x 107       |                         |
|                     |                          |                      | 4 to Conduit                            |                                 | 6.0 × 107       |                         |
|                     | · · <u>-</u> ·           |                      |                                         |                                 |                 |                         |
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|                     |                          |                      |                                         | <u> </u>                        | - Perte         | <u></u>                 |
|                     |                          |                      |                                         | Tested By                       | my of Walt      | Date: 2-11-8            |
|                     |                          |                      |                                         |                                 | WY .            |                         |
|                     |                          |                      |                                         | Witness                         | "cone           | nator                   |
| 0100 04             |                          |                      |                                         |                                 | Moni            | Date:                   |
| otice of<br>incmaly | None                     |                      |                                         | Witness<br>Sheet No<br>Approved |                 | Date:<br>of<br>-//~ 8 S |

Page No. IV-23 Test Report No. 47906-02

## DATA SHEET

| Customer         | Stone & Webster                        |                                       |                   | WYLE LABC       | RATORIES                              |
|------------------|----------------------------------------|---------------------------------------|-------------------|-----------------|---------------------------------------|
| Specimen         | Cables                                 | >                                     | <b>A</b> -        |                 |                                       |
| Part No.         | Vanious                                | Amb. Temp.                            | 82°F              | Job No          | 47906                                 |
| Spec             | 14 TO 17006 01                         | Photo                                 | Yes               | Report No       | 47906-02                              |
| <sup>2</sup> ara | ·                                      |                                       | Air               | Start Date      | 9-11-85                               |
| 5/N              |                                        |                                       | mp. <u>Ambien</u> |                 |                                       |
| 3SI              |                                        | Speciment re                          | mp                | <u> </u>        |                                       |
|                  |                                        |                                       |                   |                 |                                       |
| est Title        | Configuration No.                      |                                       | C                 | nctional Test   |                                       |
|                  | 748-(85)                               | Post-test                             | <i>r</i> u        |                 |                                       |
| -                | ential Test                            |                                       |                   |                 | ·······                               |
| Acceptan         | nce Criteria: There                    | shall be no eviden                    | ce of insulat     | ion breakdown o | or flashover                          |
|                  | with a                                 | potential of 2200                     | VAC applied       | for one minute. | · · · · · · · · · · · · · · · · · · · |
|                  |                                        |                                       |                   |                 |                                       |
|                  |                                        |                                       |                   |                 |                                       |
| Ca               | able                                   | Test Points                           |                   | Reading         | · · · · · · · · · · · · · · · · · · · |
| 7/               | /C 12 AWG                              | 1 to 4                                |                   | 2220,           | чA                                    |
| 8P01< -++        | lorizontally Separated                 | )   to Conduit                        |                   | 1100            | u A                                   |
| ,                |                                        | 4 to Conduit                          |                   | 12 30           | . A                                   |
| <u> </u>         | 'n                                     |                                       | ······            |                 | 4/F                                   |
| <u> </u>         | ···· ·····                             |                                       |                   |                 |                                       |
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|                  |                                        |                                       | Tested By         | wy Hillelf      | Date: 9-1/- 8                         |
|                  |                                        |                                       | Witness           |                 | Date:                                 |
| otice of         |                                        |                                       | Sheet No          | (               | -                                     |
| nomaly           | None                                   |                                       | <b>A</b> -        | K- 7-11         | - 85                                  |
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Test Report No. 47906-02

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Test Report No. 47906-02

## APPENDIX II

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## CONFIGURATION NUMBER 3, TEST NO. 2, DATA

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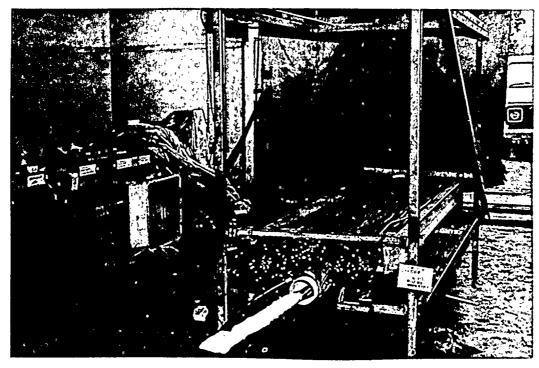
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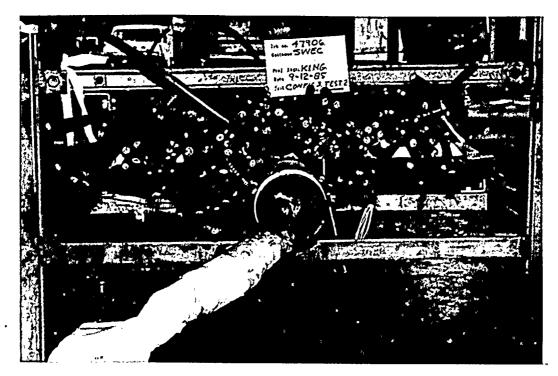
Test Report No. 47906-02

## CONFIGURATION NUMBER 3, TEST NO. 2



PHOTOGRAPH IV-6

PRETEST VIEW - OVERALL



PHOTOGRAPH IV-7

POST-TEST VIEW -- CLOSE-UP

Test Report No. 47906-02

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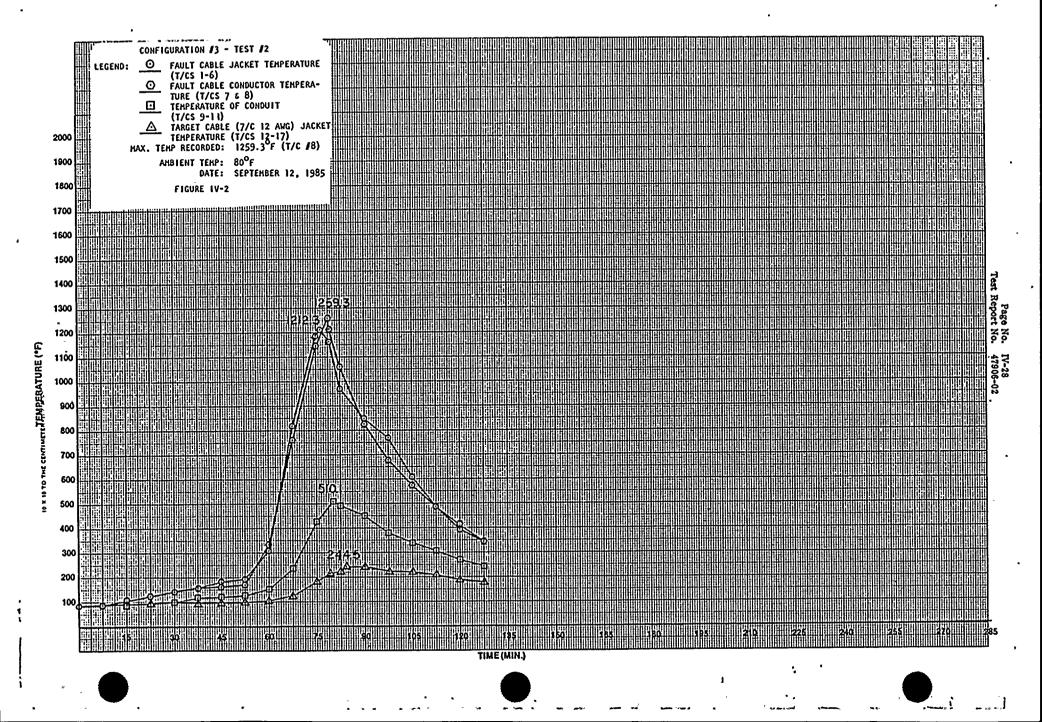
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## CONFIGURATION NUMBER 3, TEST NO. 2

| Approximate<br>Test Time | Approximate<br>Fault Cable<br>Jacket Temperature | Observation                                                                                                                   |
|--------------------------|--------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------|
| 0 Min                    | 81°F                                             | Energized fault cable with 139A                                                                                               |
| 10 Min                   | 890F                                             | Energized fault cable with 270A                                                                                               |
| 45 Min ·                 | 181°F                                            | Energized fault cable with 255A                                                                                               |
| 50 Min                   | 189 <sup>0</sup> F                               | Fault cable conductor reached 189 <sup>0</sup> F                                                                              |
| 57 Min                   | 198 <sup>0</sup> F                               | Energized fault cable with 908A                                                                                               |
| 60 Min                   | 309 <sup>0</sup> F                               | Smoke visible                                                                                                                 |
| 64.1 Min                 | 590°F                                            | Fault cable jacket rupturing                                                                                                  |
| 79 Min                   | 1165°F                                           | Ignition and Open circuit.<br>Fire was very small and burned only<br>on current source end immediately<br>within the conduit. |



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## DATA SHEET

| Customer   | Stone & Webster            |                                       |                                       | WYLE LABORATORIES                     |
|------------|----------------------------|---------------------------------------|---------------------------------------|---------------------------------------|
| Specimen   | Cables                     |                                       |                                       |                                       |
| Part No.   | Various 25 5 5             | Amb. Temp.                            | <u> 80° F</u>                         | Job No. 47906                         |
| Spec       | WLTP 47906-01              |                                       |                                       |                                       |
| Para       | 3.5.4                      |                                       |                                       | _ Start Date 7-/2 - %5                |
| 6/N        |                            |                                       | Ambient                               |                                       |
| SI         |                            | Specimen i emp                        | ). <u></u>                            |                                       |
|            |                            |                                       |                                       |                                       |
| 'est Title | <u>Configuration No. 3</u> | Test No. 2                            |                                       |                                       |
|            | (Pre-test)                 | Post-test-                            | Funct                                 | ional Test                            |
| Insulati   | on Resistance Test         | <u> </u>                              |                                       | ·····                                 |
| Acceptan   | ce Criteria: Measured      | insulation resista                    | nce shall be g                        | reater than 1.6 megohms               |
|            | with a po                  | otential of 1000 VD                   | C applied for                         | 60 seconds.                           |
|            |                            |                                       |                                       |                                       |
|            | · · · ·                    | •                                     |                                       |                                       |
| Ca         | ble                        | Test Points                           |                                       | Reading                               |
| 7/         | 'C - 12 AWG                | 1 to 4                                |                                       | 80× 109 ~~                            |
| JAT - ++   | orizontally_Separated)     | l to Conduit                          |                                       | 5.0× 1010 22                          |
|            |                            | 4 to Conduit                          |                                       | 70× 1010 cm                           |
|            |                            |                                       | · · · · · · · · · · · · · · · · · · · | <u></u>                               |
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|            |                            |                                       |                                       |                                       |
|            |                            | · w                                   | itness                                | Date:                                 |
| otice of   | None                       | · W<br>St                             |                                       |                                       |

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| Specimen <u>Cables</u>                |                                       |                  |                                        |
|---------------------------------------|---------------------------------------|------------------|----------------------------------------|
| Part No. Various                      | Amb. Temp                             | 80° F            | Job No 47906                           |
| Spec                                  | Photo                                 | Yes              | Report No 47906-0                      |
| Para3.5.4                             | Test Med.                             | Air              | Start Date9-12-9                       |
| S/NN/A                                |                                       | p. <u>Ambien</u> | <u>t</u>                               |
| GSI <u>No</u>                         |                                       |                  |                                        |
| Test Title <u>Configuration No.</u>   | <u>Post-test</u>                      |                  | ctional Test                           |
| High Potential Test                   |                                       |                  |                                        |
|                                       |                                       |                  |                                        |
|                                       |                                       |                  | on breakdown or flashow                |
| with a                                | potential of 2200 \                   | AC (1600 VAC     | for ST.P. 15 AWG cabl                  |
| applied                               | d for one minute.                     |                  |                                        |
|                                       |                                       |                  |                                        |
| Cable                                 | Test Points                           |                  | Reading                                |
| 7/C - 12 AWG                          | 1 to 4                                |                  |                                        |
| fm (Horizontally-Separated)           |                                       |                  | 1825 MA                                |
|                                       |                                       |                  | 700 <u>и А</u><br>780 <u>и А</u>       |
|                                       | 4 to Conduit                          | <u> </u>         | <u> 780 MA</u>                         |
|                                       |                                       |                  | •                                      |
|                                       |                                       |                  |                                        |
| · · · · · · · · · · · · · · · · · · · |                                       |                  |                                        |
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|                                       |                                       |                  | 141111 12                              |
|                                       |                                       | ested By         | 1111. 1. K. M. L. Date:                |
|                                       |                                       | Vitness          | Date:                                  |
| otice of                              |                                       | Sheet No         |                                        |
| nomaly None                           | 2                                     | meet NO          | King 9-12-85                           |

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## DATA SHEET

| Customer _    | Stone & Webs                          |                | ······           | •                                              | -                                             | WYLE LAB                               | ORATORIES |
|---------------|---------------------------------------|----------------|------------------|------------------------------------------------|-----------------------------------------------|----------------------------------------|-----------|
| -             | <u>Cables</u><br>Various              |                |                  |                                                | °-                                            |                                        | 1.7006    |
| Part No       | 14 70 1700/ 0                         | 1              | Ать. Тетр        | . <u>- 80</u>                                  | °F                                            | Job No                                 | 4/906     |
| Spec          |                                       |                | Photo            | res                                            |                                               | Report No.                             | 47906-0   |
| Para          |                                       |                | Test Med         | Air                                            |                                               | Start Date-                            | 6-12-8    |
|               | <u>N/A</u>                            |                | Specimen 1       | ſempA                                          | <u>mbient</u>                                 |                                        |           |
| * GSI         | NO                                    |                |                  |                                                |                                               |                                        |           |
| Test Title    | Configuratio                          | <u>n No. 3</u> | Test No.         | 2                                              | ·····                                         | Overcur                                | rent Test |
| . <u>6.</u> R | eadings with rat                      | ted current o  | on fault cal     | ole                                            | · · · · · · · · · · · · · · · · · · ·         | · · · · · · · · · · · · · · · · · · ·  |           |
|               |                                       |                | voitage (V/      |                                                |                                               | urrenc (a                              |           |
| T             | arget Cable                           | A-             | - <u>B B-C /</u> | <u>\-C</u>                                     | Phase A                                       | A Phase                                | B Phase   |
| 7             | /C - 12 AWG                           | 120            | •                |                                                | 10.6                                          |                                        |           |
|               |                                       |                |                  |                                                |                                               |                                        |           |
|               |                                       |                |                  |                                                |                                               |                                        |           |
|               |                                       |                |                  |                                                |                                               |                                        |           |
|               |                                       |                |                  |                                                |                                               |                                        |           |
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|               |                                       |                |                  |                                                |                                               | ·······                                |           |
|               |                                       |                |                  |                                                |                                               |                                        |           |
|               |                                       |                |                  | 4                                              |                                               |                                        |           |
|               |                                       |                |                  | 4                                              |                                               | · · · · · · · · · · · · · · · · · · ·  |           |
|               |                                       |                |                  | 4                                              |                                               | ·····                                  |           |
|               |                                       |                |                  | ۵<br>                                          |                                               |                                        |           |
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|               | · · · · · · · · · · · · · · · · · · · |                |                  |                                                |                                               |                                        |           |
|               |                                       | 26.44          |                  | 4                                              |                                               |                                        |           |
| F             | ault Cable:                           | 2/0 AW         | G- TRIP          | LEX                                            |                                               |                                        |           |
|               | ault Cable:<br>ated Current:          | 2/0 AW<br>1391 |                  | LEX                                            |                                               |                                        |           |
| R             | ated Current:                         | 1391           | <del>1</del>     | LEX                                            |                                               |                                        |           |
| R             |                                       | 1391           | <del>1</del>     | LEX                                            | <u> </u>                                      |                                        |           |
| R             | ated Current:                         | 1391           | <del>1</del>     | LEX                                            |                                               |                                        |           |
| R             | ated Current:                         | 1391           | <del>1</del>     | -<br><u>LEX</u>                                | · · · · · · · · · · · · · · · · · · ·         |                                        |           |
| R             | ated Current:                         | 1391           | <del>1</del>     | ۔<br><u>د کر ج</u>                             |                                               |                                        |           |
| R             | ated Current:                         | 1391           | <del>1</del>     | ۔<br>در کر کر کر کر کر کر کر کر کر کر کر کر کر | · · · · · · · · · · · · · · · · · · ·         |                                        |           |
| R             | ated Current:                         | 1391           | <del>1</del>     | -<br><u>LEX</u>                                |                                               |                                        |           |
| R             | ated Current:                         | 1391           | <del>1</del>     | ۔<br>در کر کر کر کر کر کر کر کر کر کر کر کر کر |                                               |                                        |           |
| R             | ated Current:                         | 1391           | <del>1</del>     |                                                | ······                                        |                                        |           |
| R             | ated Current:                         | 1391           | <del>1</del>     | Tested By                                      | <u>, , , , , , , , , , , , , , , , , , , </u> | - Wer                                  | Date:     |
| R             | ated Current:                         | 1391           | <del>1</del>     |                                                | p <u>i ('</u><br>More                         | - Wer                                  |           |

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| Custome         |                                                         | · · · · · · · · · · · · · · · · · · ·               | WYLE LABORATORIES                                                 |
|-----------------|---------------------------------------------------------|-----------------------------------------------------|-------------------------------------------------------------------|
| •               | n <u>Cables</u><br>Various                              |                                                     | F Job No. 47906                                                   |
| Part No.        | 14 TO 1700/ 01                                          |                                                     |                                                                   |
| Spec            |                                                         |                                                     |                                                                   |
| Para            | -                                                       |                                                     | Start Date7-/2-8.                                                 |
| S/N             |                                                         | Specimen Temp                                       | Amblent                                                           |
| GSI             | NO                                                      |                                                     |                                                                   |
| Test Title      | Configuration No.                                       | 3 Test No. 2                                        | Overcurrent Test                                                  |
| 7.              | Increasing current to r                                 | aise fault cable temperat                           | ure to 189°F - 199°F                                              |
|                 | FAULT CABLE CURRENT                                     | ELAPSED TIME CARL                                   | S CONDUCTOR- TEMP/CHANNEL                                         |
|                 | 270 A                                                   | 2100 sec                                            | 181°F/3                                                           |
|                 | 255A                                                    | 300 sec                                             | 189°F/ (3)                                                        |
|                 |                                                         |                                                     |                                                                   |
| 9.              | Fault cable curren                                      |                                                     |                                                                   |
| 9.              | Fault cable curren<br>Conductor temperat                | it: 255A                                            | °F<br>Channel No. හි                                              |
| 9.              | Fault cable curren                                      | it: 255A<br>:ure: <del>196<sup>04</sup></del> 173'F |                                                                   |
| 9.              | Fault cable curren<br>Conductor temperat<br>Max temp of | it: 255A<br>:ure: <del>196<sup>04</sup></del> 173'F | Channel No. 8                                                     |
| 9.              | Fault cable curren<br>Conductor temperat<br>Max temp of | it: 255A<br>:ure: <del>196<sup>04</sup></del> 173'F | Channel No. 8                                                     |
| 9.<br>Jotice of | Fault cable curren<br>Conductor temperat<br>Max temp of | it: 255A<br>:ure: <del>196<sup>04</sup></del> 173'F | Channel No. 8<br>1 annel 3<br>By Miomaol Date: 7/1<br>SMore Date: |

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| Customer   | Stone & Webster                          |                                       | WYLE                                  | LABORATORIES                |
|------------|------------------------------------------|---------------------------------------|---------------------------------------|-----------------------------|
| Specimen 🔔 | Cables                                   |                                       |                                       |                             |
| Part No    | Various<br>WLTP 47906-01                 | Amb. Temp                             | 80° F Job N                           | 047906                      |
| Spec       | Various<br>WLTP 47906-01<br>3.5.5<br>N/A | PhotoYes                              | Repor                                 | t No. <u>47906-02</u>       |
| Para       | 3.5.5                                    | Test MedAir                           | Start                                 | Date <u>9-12-85</u>         |
| S/N        | N/A                                      | Specimen Temp                         | Ambient                               |                             |
| GSI        | No                                       | •                                     |                                       |                             |
| Test Title | Configuration No. 3                      | Test No. 2                            | Overcuri                              | ent Test                    |
| 11. In     | itial readings with te                   | st current on fault ca                | ble:                                  |                             |
| <br>Ta     | rget Cable                               | Voltage (VAC)<br>A-B B-C A-C          |                                       | it (amps)<br>Jase 8 Phase C |
|            |                                          |                                       |                                       |                             |
| for -(4    | AWG-Triplex<br>ertically_Separated)      |                                       | ·····                                 |                             |
| 7/9        | C - 12 AWG                               | 12_0.1                                | 10.6                                  |                             |
| Joy tit    | prizoncally Separated)                   |                                       |                                       | ··· ··· ··· ··              |
|            |                                          |                                       | · · · · · · · · · · · · · · · · · · · |                             |
|            |                                          |                                       |                                       |                             |
|            |                                          |                                       |                                       | ······                      |
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|            | · · · · · · · · · · · · · · · · · · ·    |                                       |                                       |                             |
|            |                                          |                                       |                                       |                             |
|            |                                          |                                       |                                       |                             |
|            | · · · · · · · · · · · · · · · · · · ·    | · · · · · · · · · · · · · · · · · · · |                                       |                             |
|            |                                          |                                       |                                       |                             |
|            |                                          |                                       |                                       |                             |
|            |                                          |                                       |                                       |                             |
| 5-         | ult Cable: 2/0 Au                        |                                       | ······                                |                             |
| Test       | ult Cable: <u>2/0 Ac</u>                 | Sore                                  |                                       |                             |
| yok -na    | ted current. <u>139</u>                  | A- 908A                               |                                       |                             |
| Me         | asured Current:                          | 908A                                  |                                       | ·                           |
|            |                                          |                                       |                                       |                             |
|            |                                          |                                       | /*                                    | -                           |
|            |                                          | Toet                                  | d By Canada All.                      | Date: -12-                  |
| •          |                                          | Witn                                  | su by                                 | Date:                       |
| otice of   |                                          | Shee                                  | -                                     | Uale;                       |
| ncmaly     | Home No.5 N                              | <u>Appr</u>                           | mari ·                                | OT                          |
|            |                                          | ACDI                                  |                                       |                             |

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| Customer   | Stone & Webster               |             |                                       | v                       | VYLE LAB                                         | ORATORIES   |
|------------|-------------------------------|-------------|---------------------------------------|-------------------------|--------------------------------------------------|-------------|
| Specimen   |                               |             |                                       |                         |                                                  |             |
| Part No    |                               | Amb. Temp   | •                                     |                         | lob No. 🗕                                        | 47906       |
| Spec       | WLTP 47906-01                 | Photo       |                                       | R                       |                                                  |             |
| Para       | 3.5.5                         |             | Air                                   |                         |                                                  |             |
| S/N        | N/A                           |             | emp. <u>Amb</u>                       |                         |                                                  |             |
| GSI        | No                            |             | •                                     |                         |                                                  |             |
| Test Title | Confiduration No. 3           | Test No.    | 2                                     | 0ver                    | current                                          | test        |
| 13.        | Open circuit on fault cable:  | -+          | 215                                   |                         |                                                  |             |
|            | Elapsed time:                 |             | 317 sec                               |                         |                                                  |             |
|            | Maximum fault cable temp      | erature:    | 1212°F                                | Chan                    | nel No.                                          | 4.          |
|            |                               |             |                                       |                         | *                                                |             |
| 14.        | Stabilized temperature on fau | it cable:   |                                       |                         |                                                  |             |
|            | Elapsed time (beginning       | of 15-minut | e period):                            | N/A                     |                                                  |             |
|            | Maximum fault cable temp      | erature:    | NIA                                   | Chan                    | nel No.                                          | NIA         |
|            | Fault cable current:          | N/          | · · · · · · · · · · · · · · · · · · · |                         |                                                  |             |
|            |                               |             | //                                    |                         |                                                  |             |
| 15.        | Ignition of fault cable:      |             |                                       | -                       |                                                  |             |
|            | Elapsed time:                 |             | 317 sec                               |                         |                                                  |             |
|            | . Maximum fault cable temp    | erature:    | 1212°F                                | Chan                    | nel No.                                          | Ч           |
| <u></u>    | Fault cable current:          |             | 908A                                  |                         |                                                  |             |
| 17.        | Readings after let-through cu | rrent appli | ed until fa                           | ult cable               | open ci                                          | rcuits:     |
|            |                               | Voltage (VP |                                       |                         | rrent (a                                         |             |
| 4          | Target Cable A-               | B B-C A     | N-C                                   | Phase A                 | Phase                                            | B Phase C   |
| AMC.       | 2 AWG Triplex                 |             |                                       | · · · · · · · · · · · · |                                                  |             |
| Jone .     | -(Vertically-Separated)       |             |                                       |                         |                                                  |             |
| v          | ·····                         |             |                                       |                         |                                                  |             |
|            | 7/C - 12 AWG                  | 121.1       | V                                     |                         | 10.4                                             | 66 A        |
| Space      | (Horizontally_Separated)      |             |                                       |                         |                                                  |             |
|            |                               |             | Tested By_                            | 1 June 1                | Subject.                                         | Date: 9-17- |
|            |                               |             | Witness                               | Mon                     |                                                  |             |
| lotice of  |                               |             | Sheet No                              | <u></u>                 |                                                  | Date:       |
| nomaly     | Home No. 5. No. 1             |             |                                       | mr.                     | · 0/1                                            | of<br>12/85 |
| •          | 4 30 360 14                   |             | Approved _                            |                         | <del>~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~</del> |             |

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| Customer             | Stone & Webster          |                     |                   | WYLE LABORATORI                       |
|----------------------|--------------------------|---------------------|-------------------|---------------------------------------|
| _ Specimen           | <u>Cables</u><br>Various |                     | SOF               | 47906                                 |
| ` Part No            |                          |                     |                   |                                       |
| Spec                 | WLTP 47906-01            |                     |                   |                                       |
| Para                 | 3.5.6                    | Test MedAi          |                   | Start Date <u>4-17</u>                |
| S/N                  | N/A                      | Specimen Temp.      | Ambient           | -                                     |
| GSI                  | No                       | <del></del>         |                   |                                       |
| Test Title           |                          | Test No. 2          |                   |                                       |
| [                    | Pre-test &               | Post-test           | Funct             | ional Test                            |
|                      | on Resistance Test       |                     |                   |                                       |
| Acceptan             | ice Criteria: Measured   |                     |                   |                                       |
|                      | with a po                | tential of 1000 VDC | applied for (     | 60 seconds.                           |
|                      |                          |                     |                   |                                       |
| - Ca                 | able                     | Test Points         |                   | Reading                               |
| 7/                   | /C - 12 AWG              | 1 to 4              |                   | 2.4×101°52<br>1.1×10°52.              |
| Bar ++               | lorizontally Separated)  | l to Conduit        |                   | 1.1×10°52.                            |
|                      |                          | h an Conduita       |                   | .0X1010-n.                            |
|                      | <u></u>                  | 4 to Conduit        |                   | .0/10 20.                             |
|                      | łı                       |                     |                   |                                       |
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| L                    |                          | ·•                  | 14                | Z11-11 0                              |
|                      |                          |                     |                   | man St Be Date: 4-                    |
|                      |                          |                     | tness <u> </u>    |                                       |
| Notice of<br>Anomaly | None                     |                     | eet No/<br>proved | of                                    |
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| Customer                | Stone & Web                           | ster       |                        |                                       | WYLE LABO       | RATORIES             |
|-------------------------|---------------------------------------|------------|------------------------|---------------------------------------|-----------------|----------------------|
| Specimen                |                                       |            |                        | 1-0-                                  |                 |                      |
| Part No.                | Various                               |            | _ Amb. Temp.           | XOF                                   | Job No          | 47906                |
| Spec                    | WLTP 47906-                           | 01         | _ Photo                | Yes                                   | Report No       | 47906-02             |
| Para.                   | 3.5.6                                 |            | _ Test Med             | Air                                   | Start Date      | 7-12-85              |
|                         | N/A                                   |            |                        | mpAmbier                              | <u>nt</u>       |                      |
| GSI                     | No                                    |            | -                      |                                       |                 |                      |
| Test Title              | Configurati<br>Pro-toct B             | on No. 3   | Test No.<br>Post-test) | 2<br>Fu                               | nctional Test   |                      |
| High Poten              | tial Test                             |            |                        |                                       |                 |                      |
| Acceptance              | criteria:                             | There shal | l be no eviden         | ce of insulat                         | ion breakdown o | r flashøver          |
|                         |                                       | with a pot | ential of 2200         | VAC (1600 VA                          | C'for 5 T.P. 15 | AWG cables)          |
|                         |                                       | applied fo | r one minute.          |                                       |                 |                      |
| Cab I                   | ۵                                     |            | Test Points            |                                       | Reading         |                      |
| [                       | - 12 AWG                              |            |                        |                                       | 1880,           | 11                   |
|                         |                                       |            | l to Conduit           |                                       |                 |                      |
|                         | · · · · ·                             |            | 4 to Conduit           |                                       | 700 LI          | 4                    |
|                         |                                       |            |                        |                                       | . / 0 / 0 /     | <u>.</u>             |
| }                       |                                       |            |                        |                                       |                 |                      |
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|                         |                                       |            |                        | · · · · · · · · · · · · · · · · · · · | <u> </u>        |                      |
|                         |                                       |            |                        | Tested By                             | M. Holan (      | Date: <u>9-12-85</u> |
|                         |                                       |            |                        | Witness                               | <u> </u>        | Date:                |
| Notice of<br>Anomaly    | None                                  |            | -1                     | Sheet No<br>Approved                  | Poline 9-       | _ of2                |
| 21.19 Form San 3122, Pe | 4 155 jt                              |            |                        |                                       | 0               |                      |

# CONFIGURATION NO. 4 TEST (Vertical Separation of Horizontal Cable Trays in a Vertical Stack)

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Test Report No. 47906-02

### SECTION V

### CONFIGURATION NUMBER 4 TESTS (3-TRAY HORIZONTAL STACK WITH VERTICAL SEPARATION)

1.0 REQUIREMENTS

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- 1.1 Acceptance Criteria
- **1.1.1** Insulation Resistance Test

Insulation resistance on all "target cables"\* shall be greater than 1.6 x  $10^6$  ohms with a potential of 1000 VDC (500 VDC 2/C 16 AWG cables) applied for 60 seconds.

### 1.1.2 High Potential Test

There shall be no evidence of insulation breakdown or flashover with a potential of 2200 VAC (1600 VAC for 2/C 16 AWG cables) applied for one minute.

### **1.1.3** Cable Continuity Test

Energized specimens in the target raceway shall conduct 100% of SWEC-rated currents (see table below) at 575 VAC (120 VAC for control cables and 50 VAC for instrument cables) before, during, and after the overcurrent test.

| Cable<br><u>Size</u> | No.<br>Conductors | SWEC<br>L.D. No. | Cable<br>Type | Voltage | Rated<br>Current |
|----------------------|-------------------|------------------|---------------|---------|------------------|
| 1/0 AWG              | Triplex           | NJM-34           | $\mathbf{L}$  | 575     | 139              |
| 2 AWG                | Triplex           | NJM-25           | K             | 575     | . 38.5           |
| 12 AWG               | 7                 | NJN-37           | С             | 120     | 10               |
| 16 AWG               | 2/C               | NJP-05           | x             | 50      | 1                |

### 1.1.4 Tolerances

All target cable voltages specified in this procedure shall be maintained within a  $\pm 3\%$  tolerance. The initial setting of target cable currents (with rated current on the fault cable) shall have a tolerance of  $\pm 10\%$ , 0%. Thereafter, all target cables' currents shall be maintained within a  $\pm 10\%$  tolerance.

All fault cable currents shall be maintained within a +3% tolerance, if possible.

\*

The term "target cable" refers to energized and monitored nonfault cables used in this program.

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Test Report No. 47906-02

### 2.0 PROCEDURES

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### 2.1 Test Specimen Preparation

The test specimens were mounted into the test assembly of Figure 9 of Section VIII. This apparatus was manufactured to the indicated dimensions by Wyle technicians using materials supplied by NMP2. The following guidelines were observed with regard to the materials and construction of the assembly:

- 1. The fault cable was a Triplex 2/0 AWG cable from NMP2 stock.
- 2. The faulted cable was located at the centerline of Tray T2 as shown in Figure 9 of Section VIII.
- 3. The ends of the fault cable were wrapped from their termination on the copper bus bar to the edge of their cable tray. This wrap consisted of a single layer of HAVEG SILTEMP WT-65 covered with a single layer of 3M No. 69 glass tape. This wrapping was done to ensure that any ignition that might occur was contained to the cable tray test area.
- 4. The horizontal cable trays were mounted such that there are nine inches between the top of the siderail of one tray to the bottom of the siderail to the next higher cable tray.
- 5. The cable trays contained the following cables from NMP2 stock:

| Raceway No. | Raceway Cable Fill                                                                                                          |  |  |
|-------------|-----------------------------------------------------------------------------------------------------------------------------|--|--|
| Tl          | Mixture of K-Type cables with one Triplex 2 AWG target cable in the bottom layer at the centerline of the tray.             |  |  |
| Τ2          | Mixture of K-Type cables with one Triplex 2/0 AWG fault cable at the top centerline of the tray.                            |  |  |
| Т3          | Mixture of C- and X-Type cables with one $7/C$ 12 AWG and one $2/C$ 16 AWG target cables at the top centerline of the tray. |  |  |

6. Photographs were taken of the test setup prior to the test.

### Test Report No. 47906-02

### 2.0 PROCEDURES (Continued)

2.2 Instrumentation Setup

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### 2.2.1 Thermocouple Locations

A total of 20 Type "K" thermocouples were utilized for this test. These thermocouples were mounted as described below.

| Channel No. | Location                                                                                                               |
|-------------|------------------------------------------------------------------------------------------------------------------------|
| 1-6         | Mounted to the jacket on the fault cable. These thermocouples were mounted approximately 16 inches apart.              |
| 7 & 8       | Mounted to the conductor of the fault cables at the two series connections.                                            |
| 9-14        | Mounted to the jacket of the target cable in Tray T1. These thermocouples were mounted approximately 16 inches apart.  |
| 15-20       | Mounted to the jacket of the target cables in Tray T3. These thermocouples were mounted approximately 16 inches apart. |

The thermocouples were monitored by a Fluke Datalogger feeding a high-speed printer. The datalogger was operated at its maximum scan rate throughout the overcurrent test.

### 2.2.2 Electrical Monitoring

All phase-to-phase voltages and phase currents of the target cables and the fault cable current were fed into oscillograph recorders. The oscillograph was operated at the 0.1-inch per minute rate throughout the overcurrent test. The oscillograph channels were as specified in the following table:

| Channel No. | Signal          | Cable/Location   |
|-------------|-----------------|------------------|
| 1           | Current-Phase A | Triplex 2 AWG/T1 |
| 2           | Current-Phase B | Triplex 2 AWG/T1 |
| 3           | Current-Phase C | Triplex 2 AWG/T1 |
| 4           | Voltage A-B     | Triplex 2 AWG/T1 |
| 5           | Voltage A-C     | Triplex 2 AWG/T1 |
| 6           | Voltage B-C     | Triplex 2 AWG/T1 |
| 7           | Current         | 7/C 12 AWG/T3    |
| 8           | Voltage         | 7/C 12 AWG/T3    |
| 9           | Current         | 2/C 16 AWG/T3    |
| 10          | Voltage         | 2/C 16 AWG/T3    |
| 11          | Skipped         | · N/A            |
| 12          | Current         | Fault Cable/T2   |
|             |                 | v                |

WYLE LABORATORIES Huntsville Facility

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Test Report No. 47906-02

### 2.0 PROCEDURES (Continued)

### 2.2 Instrumentation Setup (Continued)

### 2.2.2 Electrical Monitoring (Continued)

A digital multimeter was utilized to measure all phase-to-phase or phase voltages and phase currents of the target cables prior to, during, and after the overcurrent test. This data was recorded to provide accurate evidence of the specimen's capability to conduct SWEC-rated current at 575 VAC (120 VAC for control cables and 50 VAC for instrument cables) throughout the overcurrent test.

### 2.3 Baseline Functional Tests

The baseline functional tests consisted of insulation resistance and high potential measurements on each of the target cables. These tests were performed as described in the following paragraphs.

### 2.3.1 Insulation Resistance Test

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- 1. All power and instrumentation leads were disconnected from the target cables and labeled per Figures 12, 13, or 14 of Section VIII.
- 2. Using a megohmmeter, a potential of 1000 VDC (500 VDC for 2/C 16 AWG cable) was applied and the minimum insulation resistance indicated after a period of 60 seconds was recorded between the following test points:

| Target | Power | Cables: |
|--------|-------|---------|
|        |       |         |

| Phase-to-Phase | Phase-to-Ground       |  |  |
|----------------|-----------------------|--|--|
| 1 to 2         | 1 to unistrut or tray |  |  |
| . 1 to 3       | 2 to unistrut or tray |  |  |
| 2 to 3         | 3 to unistrut or tray |  |  |

Target Control Cables:

## Phase-to-Phase

1 to 4

Phase-to-Ground 1 to tray or conduit 4 to tray or conduit

Target Instrument Cables:

Phase-to-Phase 1 to 2 Phase-to-Ground

1 to shield\* 2 to shield\*

\*One end of shield tied to unistrut, tray or conduit.

For all performances of this test, the measured values were compared to the acceptance criteria, Paragraph 1.1.1.

| WYLE | LABO     | RAT    | OR | ES |
|------|----------|--------|----|----|
| Hu   | ntsville | Facili | ty |    |

Test Report No. 47906-02

2.0 PROCEDURES (Continued)

### 2.3 Baseline Functional Tests (Continued)

### 2.3.2 High Potential Test

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{ \ 1. Using a Hi-Pot Test Set, a potential of 2200 VAC (1600 VAC for 2/C 16 AWG cable) was applied from each conductor to ground and between conductors on multiconductor cable for a period of one minute.

Target Power Cables:

| Phase-to-Phase | Phase-to-Ground |
|----------------|-----------------|
| 1 to 2         | 1 to tray       |
| 1 to 3         | 2 to tray       |
| 2 to 3         | 3 to tray       |
|                |                 |

Target Control Cables:

Phase-to-Phase 1 to 4 Phase-to-Ground 1 to conduit or tray

4 to conduit or tray

Target Instrument Cables:

| Phase-to-Phase | Phase-to-Ground |
|----------------|-----------------|
| 1 to 2         | 1 to shield*    |
|                | 2 to shield*    |

\*One end of shield tied to conduit or tray.

2. All power and instrumentation leads were connected per Figure 12, 13, or 14 of Section VIII.

For all performances of this test, the measured values were compared to the acceptance criteria, Paragraph 1.1.2.

### 2.4 Overcurrent Test

The overcurrent test was conducted in three sequential steps with no intentional time delay. The first phase consisted of energizing the fault cable with SWEC rated current. The second phase consisted of increasing the current until fault cable temperatures were within  $189^{\circ}$ - $199^{\circ}$ F for 5 minutes. The third phase consisted of energizing the fault cable with the worst case electrical fault current until the cable open-circuited.

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### 2.0 **PROCEDURES** (Continued)

### 2.4 Overcurrent Test (Continued)

The target control cables conducted SWEC-rated current (see Paragraph 1.1.3) at 575 VAC (power cables), 120 VAC (control cables), or 50 VAC (instrument cables) throughout the overcurrent test. The overcurrent test was conducted using the following procedure:

- 1. The Triplex 2/0 AWG fault cable was connected to the copper bus bars per Figure 11 of Section VIII.
- 2. A 7/C 12 AWG and a 2/C 16 AWG target cable were installed into Tray T3 per Figure 9 of Section VIII.
- 3. A Triplex 2 AWG target cable was installed into Tray T1 per Figure 9 of Section VIII.
- 4. The Triplex 2 AWG target cable was connected to the instrumentation and power supplies of Figure 12 of Section VIII.
- 5. The 7/C 12 AWG target cable was connected to the instrumentation and power supplies of Figure 13 of Section VIII.
- 6. The 2/C 16 AWG target cable was connected to the instrumentation and power supplies of Figure 14 of Section VIII.
- 7. The Triplex 2 AWG target cable was energized with 38.5 amperes at 575 VAC.
- 8. The 7/C 12 AWG target cable was energized with 10 amperes at 120 VAC.
- 9. The 2/C 16 AWG target cable was energized with one ampere at 50 VAC.
- 10. The Triplex 2/0 AWG fault cable was energized with 908 amperes per phase (rated current) from the Multi-Amp Test Set.
- 11. Target cable voltages and currents and the fault cables current were recorded.
- 12. The fault cable current was slowly increased until Thermocouple Channels 7 and/or 8 indicates 90 +3°C (189-199°F) conductor temperature.
- 13 The conductor temperature was maintained at 189–199<sup>o</sup>F for five minutes.
- 14. Fault cable current, conductor temperature, and the highest of thermocouple Channels 1 through 6 were recorded.

Test Report No. 47906-02

2.0 PROCEDURES (Continued)

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2.4 Overcurrent Test (Continued)

- 15. The Multi-Amp Test Set output was increased to 908 amperes (test current).
- 16. Target cable voltages, currents and the fault cable current were recorded.
- 17. The fault cable was allowed to conduct test current until the cable open-circuited.
- 18. The elapsed time and maximum cable temperature were recorded.
- 19. Target cable voltages and currents were recorded.
- 20. The target cables and the Multi-Amp Test Set were de-energized.
- 21. Photographs were taken of the post-test condition.

For all performances of this test, the observed target cable operation were compared to the acceptance criteria, Paragraph 1.1.3

2.5 Post-Overcurrent Test Functional Test

The functional tests of Paragraph 2.3 were repeated.

Test Report No. 47906-02

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3.0 RESULTS

### 3.1 Results of Test No. 1

Configuration Number 4, Test No. 1, with a Triplex 2/0 AWG fault cable inside a horizontal cable tray, was conducted per Paragraph 2.0 and successfully met the requirements of Paragraph 1.0. The 908 amperes test current was applied for 1322 seconds (22.0 minutes) until the cable open-circuited. The maximum observed temperature on the fault cable was  $1820^{\circ}$ F which occurred on Thermocouple No. 5. The fault cable ignited after 650 seconds (10.8 minutes). The fire burned for approximately 13.5 minutes.

The capabilities of the target cable to conduct SWEC rated current at 575 VAC (power cable), 120 VAC (control cable), or 50 VAC (instrument cable) was not impaired during this test. The maximum observed target cable temperature was 343°F. All target cables successfully completed the Post-Overcurrent Test Functional Test.

Appendix I contains the following data from this test:

- 1. Notice of Anomaly Number 4.
- 2. Photographs V-1 through V-4 which show pretest and post-test conditions.
- 3. A narrative of the test which relates test time, fault cable temperatures, and important events.
- 4. Figure V-1 which plots the temperature readings versus time.
- 5. Data Sheets which contain Baseline Functional Test data, Overcurrent Test data, and Post-Overcurrent Test Functional Test data.

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### CONFIGURATION NUMBER 4, TEST NO. 1, DATA

### Page No. V-10 Test Report No. 47906-02

| LABORATORIES (Eastern Operations)                                                  |                             |
|------------------------------------------------------------------------------------|-----------------------------|
| NOTICE OF ANOMALY                                                                  | DATE: September 16, 1985    |
|                                                                                    |                             |
| CATEGORY: SPECIMEN PROCEDURE ITEST EQUIPMENT                                       | DATE OF 9/13/85<br>ANOMALY: |
| PART NAME:Electrical Power Cable<br>TEST:Config. 4, Test 1; Config. 5, Tests 1,2,3 | I.D. NO N/A                 |
| SPECIFICATION: WLTP 47906-01                                                       | PARA. NO <u>3.6.5.</u>      |

### Requirements:

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- 1. The target cables shall conduct SWEC rated current (see Paragraph 2.1.3) at 575 VAC (power cables) throughout the overcurrent test.
- 2. All target cable currents shall be maintained within a  $\pm 10\%$  tolerance (per NOA2).

### **Description of Anomaly:**

During Configuration 4, Test 1 and Configuration 5, Tests 1, 2 and 3, some of the phase currents on the No. 2 AWG cable were above the +10% tolerance by as much as 8.4 amperes, while test current was flowing in the worst case cable. During Configuration 5, Test 3, one of the phase currents was below the -10% tolerance by 12.3 amperes while the other two phase currents were above the +10% tolerance by 8.4 amperes and 6.7 amperes, respectively.

### Disposition - Comments - Recommendations:

The out of tolerance currents were judged to have no impact on the test for the following reasons.

- 1. Current above the tolerance results in additional conductor heating and therefore higher cable temperatures which is a more severe condition than required.
- 2. In the case where one of the phase currents was below the -10% tolerance the resulting lower conductor heating is compensated for by the additional heating in the other two phases.
- 3. Heating due to rated current of 38.5 amperes is very low. Screening Test No. 5 of the No. 2 AWG cable showed no change in temperature of the cable conductor or jacket after 10 minutes of rated current.

| NOTE: IT IS THE CUSTOMER'S RESPONSIBILITY TO ANALYZE | ANOMALIES AND COMPLY WITH 10 CFR PART 21. |
|------------------------------------------------------|-------------------------------------------|
| VERIFICATION:                                        | PROJECT ENGINEER: John D. Ring 9/19/85    |
| TEST WITNESS:                                        | PROJECT MANAGER: 11/1 10 Tom 9/20/85      |
| REPRESENTING:                                        | COORDINATION: KTULION 9-20-35             |
| QUALITY ASSURANCE: G.W. Klight 9/20/85               |                                           |

Wyle Form WH 1066, Rev. JAN '85

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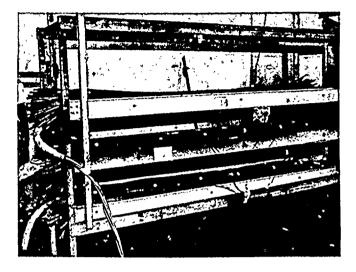
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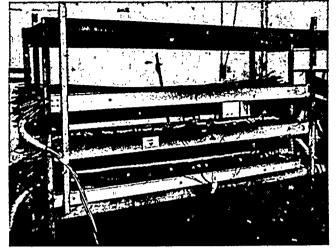
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Test Report No. 47906-02

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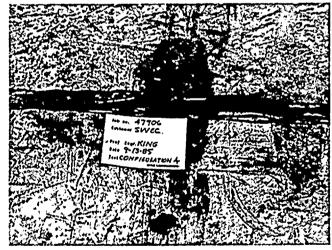
### CONFIGURATION NUMBER 4, TEST NO. 1





PHOTOGRAPH V-1 PRETEST VIEW — OVERALL PHOTOGRAPH V-2 POST-TEST VIEW — OVERALL





### PHOTOGRAPH V-3

POST-TEST VIEW — CLOSE-UP BOTTOM VIEW OF TARGET CABLE IN UPPER TRAY

### PHOTOGRAPH V-4

### POST-TEST VIEW — TARGET CABLE AFTER REMOVAL FROM UPPER TRAY

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Test Report No. 47906-02

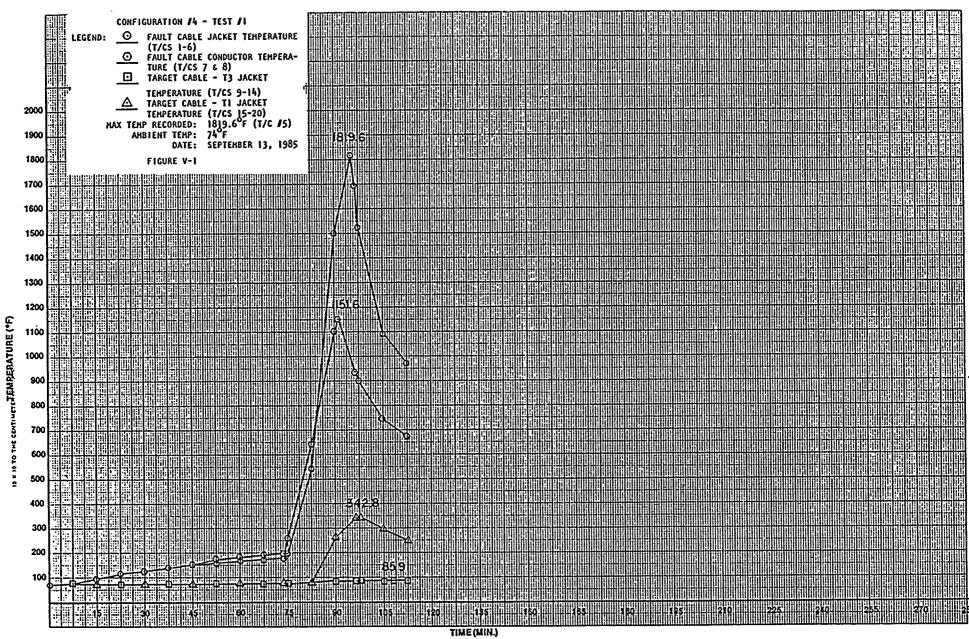
CONFIGURATION NUMBER 4, TEST NO. 1

| Approximate
Test Time | Approximate
Fault Cable
Jacket Temperature | Observation | |
|--------------------------|--|-------------------------------------|--|
| 0 Min | 690F | Energized fault cable with 139A | |
| 10 Min | 73°F | Energized fault cable with 280A | |
| 68.7 Min | 171°F | Fault cable conductor reached 190°F | |
| 74 Min | 176°F | Energized fault cable with 908A | |
| 80.3 Min | 430°F | Fault cable jacket rupturing | |
| 84.8 Min | 810 ⁰ F | Ignition of fault cable | |
| 96.0 Min | 1697°F | Open circuit | |
| 98.3 Min | 1460°F | Fire out | |
| | | | |

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Test V-13 47906-02

Page Report No Page No. V-14 Test Report No. 47906-02

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DATA SHEET

| Specimen <u>Cables</u> | (00 | |
|---------------------------------|----------------------------------|-------------------------------|
| Part No. Various | Amb. Temp6 7 | F Job No 47906 |
| Spec WLTP 47906-01 | Photo Yes | Report No47906-02 |
| Para3.5.4 | | Start Date_9- 13- 85 |
| S/NN/A | Specimen TempAr | nbient |
| GSINo | | |
| Test Title <u>Configuration</u> | No. 4 Test No. 1 | |
| (Pre-test) | -Post-Test Bp | Functional Test |
| Insulation Resistance Te | st | |
| Acceptance Criteria: Me | easured insulation resistance sh | all be greater than 1.6 megol |
| wi | ith a potential of 1000 VDC (500 | for US T.P. 16 AWG) applied |
| fo | or 60 seconds. | |
| Cable | Test Points | Reading |
| 2 AWG Triplex | 1 to 2 | |
| 2 And Triplex | 1 to 3 | 2.0 × 1010 m |
| | 1 10 5 | 1,8 x 10% m |
| | 2 to 3 | 1.9 × 1010 sc |
| | l to Unistrut or Tray | 2.4 x 10'0 ~ |
| | 2 to Unistrut or Tray | 2.9 × 1010 ~- |
| | 3 to Unistrut or Tray | 3.5 × 1000 ~- |
| 7/C - 12 AWG | l to 4 | . 4,0 × 10 ¹⁰ |
| | l to Tray or Conduit | 4,5 × 1010 - |
| | 4 to Tray or Conduit | 1.0 ×10" ~ |
| | | |
| | Testec By
Witness | Monia Date: 9/13 |
| Notice of
Anomaly None | Sheet No. | |

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Page No. V-15 Test Report No. 47906-02

DATA SHEET

| Customer | Stone & Webster | | | WYLE LABO | DRATORIES |
|------------|--|---|--------------------|---------------------------------------|-------------------|
| Specimen | Cables | | | | |
| Part No. | Various | Amb. Temp. | 69°F | Job No | 47906 |
| Spec | WLTP 47906-01 | Photo | 69° F
Yes | Report No | 47906-02 |
| Para | | Test Med | Air | Start Date | 9-13-85 |
| S/N | N/A | Specimen Te | mp. <u>Ambient</u> | | |
| GSI | No | _ | F | | |
| - | | - | , | | |
| Test Title | Configuration No. 4 | Post=tost BQ | I
Eunci | tional Test | |
| Insulatio | on Resistance Test (Con | | | | |
| | | | | | |
| Cab | ole | Test Points | | Reading | ···· |
| 1.81 | . P. 16 AWG | 1 tò 2. 🚒 | | 2.6×10 | ¹⁰ -r- |
| | | 3 to 4 NA | Ame | | |
| | | | - | | |
| | | 5 to 6 NA
7 to 8 NA | groc | | |
| | | | <u>ymc</u> | | |
| | | l to Shield | ·
 | 5,6x1010 | · ~ |
| | ······································ | 2 to Shield | | 5.6×10"
2.4×10" | °./. |
| | | 3 to Shield A | • | | |
| | ······ | 4 to Shield A | IA AMAC | · | |
| | · · · · · · · · · · · · · · · · · · · | $\frac{4 \text{ to Shield } \Lambda}{5 \text{ to Shield } \Lambda}$ | IA MAR | - <u> </u> | |
| | | 6 to Shield _N | A AMC | | |
| | | 7 to Shield N | IA gross | <u> </u> | |
| | | 8 to Shield N | A hose | ····· | |
| | | 9 to Shield _N | A APPIC | · · · · · · · · · · · · · · · · · · · | |
| | | 10 to Shield y | IA APPX | | |
| | | · · · · · · · · · · · · · · · · · · · | <i>v</i> | | |
| | · · · · · · · · · · · · · · · · · · · | | | | |
| <u> </u> | | | | 2 | |
| | | | Tested By | mast | Date: 9/13/95 |
| | | | Witness | | Date: |
| Notice of | | | Sheet No. | _2 | of |
| Anomaly | None | | Approved | 14mg 9/13 | 185 |
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I Page No. V-16 Test Report No. 47906-02 **ار** ..

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| Customer _ | Stone & Web | ster | | WYLE LABORATORIES |
|------------------------------------|--------------|---------------------------------------|---|------------------------------|
| Specimen _ | Cables | | | |
| art No | | Amb. Temp. | <u> 69°F </u> | Job No 47906 |
| pec | WLTP 47906- | 01 Photo | Yes | Report No. <u>47906-02</u> |
| ara | | | Air | Start Date_9-13-85 |
| /N | | | emp. <u>Ambie</u> | nt |
| SI | | · · · · · · · · · · · · · · · · · · · | · | |
| est Title | Configurati | on No. 4 Test No.
Post-test-Ba | | unctional Test |
| High Po | tential Test | | | |
| | | There shall be no evide | nce of insula | tion breakdown or flashover |
| ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~ | · · | with a potential of 220 | 0 VAC (1600 V | AC for & T.P. 16 AWG cables) |
| | | applied for one minute. | | |
| ;, | | · · · · · · · · · · · · · · · · · · · | | |
| C | able | Test Points | | Reading |
| 2 | AWG Triplex | 1 to 2 | | 600 MA |
| | | 1 to 3 | | 410 MA |
| 1 | ۰. | 2 to 3 | | 620 MA |
| ;
 | | l to Tray | | 580 MA |
| | <u> </u> | 2 to Tray | | 580 MA |
| | | '3 to Tray | | 580 MA
580 MA |
| 7 | /C - 12 AWG | 1 to 4 | <u></u> | 1080 MA . |
| , | | l to Conduit | or Tray | 540 MA |
| | | 4 to Conduit | or Tray | 590 MA |
| | | | | |
| | | | | |
| | <u> </u> | | | |
| | | | Tested By | Komaol Date: 9/13/8 |
| | | | Witness | More // Date: |
| tice of | -1 | | Sheet No | 3 of 4 |
| nomaly | None | | Approved | 11º/ung 9/13/85 |

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DATA SHEET

| Customer | Stone & Webster | | WYLE LABORATORIES |
|------------|----------------------|--|--|
| | Cables | | |
| Part No. | Various | Amb. Temp. 67°F | Job No. 47906 |
| Spec | WLTP 47906-01 | Photo Yes | Job No. <u>47906</u>
Report No. <u>47906-02</u> |
| Para | 3.5.4 | Test Med Air | Start Date_ 9-13-85 |
| S/N | | | |
| GSI | No | | |
| Tact Titla | Configuration No. 4 | Test No. 1 | |
| | (Pre-test) | _Post_test_B | Functional Test |
| High Pot | ential Test (Continu | | |
| Ca | ble | Test Points | Reading |
| rall | T.P. 16 AWG | 1 to 2. | |
| 10 | · · · · · · | | 700 дА |
| <u></u> , | | 3 to 4 NA MAC | ······ |
| | | 5 to 6 NA MARC | P |
| | - <u></u> | 7 to 8 NA MM | |
| | | 9 to 10 NA APPZ | |
| | | | 330 MA |
| | | 2 to shield | 335 MA |
| | | 3 to Shield NA gook | - |
| | | 3 to Shield NA grock
4 to Shield NA grock | |
| | | 5 to Shield NA Ame | |
| | | 6 to Shield NA AMK | |
| | | 7 to Shield NA AM | |
| | | 8 to Shield NA GPIC | |
| | | 9 to Shield NA GAIC | |
| | | 10 to Shield NA MMK | |
| | <u></u> | | |
| | | ······································ | |
| | * * *** | | |
| <u></u> | · | | Standin alia |
| | | Tested By_ | Afromal Date: 1/3 |
| otice of | | Witness | U Date: |
| | None | Sheet No | of |

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Page No. V-18 Test Report No. 47906-02

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DATA SHEET

| Customer
Specimen | Stone & Webster
Cables | | · · · · · · · · · · · · · · · · · · · | → | | YLE LABO | RATORIES |
|----------------------|--|------------------------|--|---------------------------------------|-------------|---------------|------------------|
| Part No. | Various | | Amb. Ten | 10. 69°F | = | ob No | 47906 |
| Spec | WLTP 47906-01 | | Photo | • • • • | | eport No | 47906-02 |
| Para | 3.5.5 | | Test Med. | | N | | 9/13/85 |
| S/N | N/A | | | 1 TempAn | | | |
| GSI | No | | opconner | | | | |
| | Configuration N | • · | Toot No. | . 1 | 0 | current_To | |
| Test Title | | | Test NO. | · · · | UVero | | <u>.</u> |
| 11. Rea | dings with rated | current on | fault c | able | <u>.</u> | | |
| | | | Oltage (| | Cu | rrent (am | |
| iar | get Cable | A-8 | 8-C | A-C | Phase A | Phase B | Phase C |
| 2 A | WG Triplex | 575 | 576 | 569 | 40.7 | 41.1 | 40.4 |
| 7/0 | : - 12 AWG | 120 | .0 | | 10.5 | | |
| | | | | | | | • |
| 181 | .P. 16 AWG | 50 | 1 | · · | 1.08 | | |
| | | | <u>. </u> | · · · · · · · · · · · · · · · · · · · | 1.00 | | |
| | ······································ | | | | - | | |
| · · · · · · | | | | | | | |
| | | | | | | | |
| Ē. | ult Cable: 2 | 1 | | | | <u> </u> | |
| | ed Current: | <u>/o AWG</u>
139 A | TRIPLE | <u>×</u> | | | |
| | | | | | | | |
| Mea | asured Current: | 139A | | | | | |
| | | | | | | | |
| | | | | | | | |
| <u> </u> | <u> </u> | | | · . · | | | |
| | | | | | - AP | _/ | <u>,</u> |
| | | | | Tested By | | <i>₽</i> ∰ 0 | ate: <u>9/13</u> |
| | | | | Witness | (More | <u> </u> | ate: _/ / |
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|---------------|---|----------------------|-----------------------|
| Specimen _ | Cables | | |
| Part No | Various | Amb. Temp69° | F Job No 47906 |
| Spec | WLTP 47906-01 | Photo Yes | Report No47906-02 |
| | | Test MedAir | Start Date |
| S/N | <u>N/A</u> | Specimen Temp | |
| GSI | No | | |
| Fest Title | Configuration No. 4 | Test No.1 | Overcurrent Test |
| 12. lr | ncreasing current to raise | fault cable temperat | ure to 189°F - 199°F |
| <u>F4</u> | AULT CABLE CURRENT | ELAPSED TIME | MA CASCE TEMP/CHANNEL |
| , | 2-80 A | 3520 | 190° F / 8 |
| | | | |
| | | | |
| 14. Re | adings after fault cable wa | armup to 189°F - 199 |)°F |
| 14. Re | adings after fault cable wa
Fault Cable Current: | |)°F |
| 14. Re | Fault Cable Current:
Conductor temperature: | 280A | °F
Channel No. & |
| 14. Re | Fault Cable Current: | 280A | Channel No. & |
| <u>14.</u> Re | Fault Cable Current:
Conductor temperature:
Max.temp of
Channels 1-6 | 280A
195°F | Channel No. & |

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| Specimen <u>Cables</u> | | | | | |
|---------------------------------------|---------------------------------------|--|-----------------|---------------------------------------|---------------------------|
| Part No. Various | Amb. Temp | 7¢°F | Job | | 47906 |
| SpecWLTP 47906-01 | Photo | Yes | Rep | | 47906-02 |
| Para3.S,S | Test Med | Air | Sta | t Date | 113/85 |
| 5/NN/A | Specimen Te | mp. <u>Ambie</u> | ent | | |
| 3SI No | | | | | |
| Sest Title <u>Configuration No. 4</u> | Test No, 1 | | Overcu | rrent Te | st |
| 16. Initial readings with te | st current on fau | It cable: | | | |
| Target Cable | Voltage (VAC |) | Curr
Phase A | ent (amp:
Phase B | |
| | <u>A-B B-C A-</u> | <u> </u> | nase A | rnase o | Phase C |
| 2 AWG Triplex | 571 573 50 | 68 | 37,0 | 49.9 | (44.7) |
| 7/C - 12 AWG | 120.4 | | 10.6 | | |
| /// 12 000 | 12017 | <u> </u> | 10.0 | | · |
| 1.5 T.P. 16 AWG | 50.3 | | 1.0 | | |
| | <u> </u> | <u> </u> | | | <u></u> |
| · · · · · · · · · · · · · · · · · · · | · · · · · · · · · · · · · · · · · · · | | | | |
| | | ······································ | | · · · · · · · · · · · · · · · · · · · | |
| Fault Cable: 2/0 | AWG TRIPL | .EX | | <u></u> | |
| Rated Current: | 908A | • | | | |
| Measured Current: | 908A | · · · · · · · · · · · · · · · · · · · | | · · · · · · · · · · · · · · · · · · · | |
| <u></u> | | | . | | |
| | | | TP | | |
| | | Tested By | Kiomas | // | ite: <u>9/13/</u>
ite: |
| lotice of No. 4 | | Sheet No
Approved | 3
Nov · | | of _5 |

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|-----------|--|---------------|--------------------|----------------------|----------|
| pecimen _ | | | - 10- | | 1 7 6 6 |
| art No. | Various | Amb. Temp | | Job No | |
| pec | | _ Photo | | Report No | |
| ara | | - Test Med | Air | Start Date | 9-13-85 |
| /N | | _ Specimen Te | mp. <u>Ambient</u> | | |
| SI | | - | | | |
| est Title | Configuration No. 4 | Test No, 1 | | Overcurr | ent Test |
| <u> </u> | | | | | |
| | | | | ···· | |
| 19. Ope | en circuit on fault cable | | | | |
| | Elapsed time: | [| 322 sec | . <u></u> . <u>.</u> | |
| 20. Sta | Maximum fault cable ter
abilized temperature on f | ault cable: | | Channel | NO. 3 |
| | Elapsed time (beginning | | period): N/A | | |
| | Maximum fault cable ter | mperature: | N/A | Channel | No. N/A |
| | Fault Cable Current: | | . N/A | · | <u> </u> |
| 21. Igi | nition of fault cable: | | | | |
| | Elapsed time: | | 650 Sec | | |
| | Maximum fault cable ter | mperature: | 1820° F | Channel | No.5 |
| | Fault cable current: | | 908 A | | |
| | | | Tested By | homao// | Date: |
| tice of | | | Sheet No | <u> </u> | of |

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DATA SHEET

| Specimen <u>Cabl</u>
Part No. Var i | | | Amb. Temp | 7+°F | | VYLE LABO | |
|--|-----------------------------------|----------------|------------------|------------------------|------------|---------------------------------------|---------------------------------------|
| Spec. WLTP | 47906-01 | | Photo | Yes | J | leport No | 47906-02 |
| Para3.5. | 5 | | Test Med | Air | | | |
| SINN/A | | | | remp. <u>Amt</u> | | | |
| GSI <u>No</u> | | | | | | | |
| Test Title <u>Conf</u> | iguration No. | 4 | Test No. | 1 | | Overcurr | ent Test |
| 22. Readings | rest
after let thro | us
ugh curi | rent appl | ied until fa | ault cable | e open cir | cuits: |
| Target C | | | oltage (V
8-C | | Phase A | Current (
Phase | |
| 2 AWG Tr | | | | | | | |
| 2 AWG IF | | 571 | 574. | 568 | 42.3 | 42. | 3 39,9 |
| 7/C - 12 | AWG | 120. | 4 | | 10,5 | | |
| 1 8 T.P. 1 | 6 AWG | 50,2 | _ | | [, (| | |
| | | | | | | | |
| | | | | | | | |
| | | | | <u> </u> | | | |
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| | | | | | <u> </u> | <u> </u> | |
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| | | | | | AL. | | · · · · · · · · · · · · · · · · · · · |
| | | | | Tested By _
Witness | Home More | " | ate: <u>9/13/85</u>
ate: |
| Notice of
AnomalyN | 0.4 | | | Sheet No
Approved - | - S' | 9 | _ of <u>_5</u>
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DATA SHEET

| Customer | Stone & Web | oster | | | WYLE LAB | ORATORIES |
|-----------|--|---------------------------------------|---------------|-------------------|----------------------------|---------------------------------------|
| Specimen | Cables | | | | | |
| Part No. | Various | | Amb. Temp. | 74°E | Job No | 47906 |
| Spec | 10 70 1700/ | -01 | Photo | Yes | Report No. | 47906-02 |
| Para | | | Test Med. | Air | Start Date. | 9/13/85 |
| | N/A | | | emp. <u>Ambie</u> | | |
| 3SI | | | | | | |
| | | aa Na la | Teen Ne. 1 | | | |
| est litle | <u>Configurati</u>
Prostest & | | Post-Test | | unctional Test | |
| Insulati | on Resistance | | | | • | |
| Acceptan | ce Criteria: | Measured in | sulation resi | stance shall | be greater tha | n 1.6 megohm |
| | ····· | | | | r & T.P. 16 AWG | |
| | | for 60 seco | onds. | <u> </u> | fronc | n |
| | ,
, | | | | | |
| Ca | ble |] | est Points | | , Reading | |
| 2 | AWG Triplex | 1 | to 2 | | 1,2×10 | o" |
| | | 1 | to 3 | | 1,4 × 1 | 0'' |
| | | 2 | to 3 | | 7.8 × | · · · · · · · · · · · · · · · · · · · |
| | | 1 | to Unistrut | or Tray | (13 X | |
| | | 2 | to Unistrut | or Tray | 1.2 X (| |
| | | · 3 | to Unistrut | or Tray | 1.2 ×1 | <i>'0</i> " |
| 7/ | C - 12 AWG | | to 4 | | 819× 1.6 | |
| | | | to Tray or (| ondui t | - 1.3 x | |
| <u> </u> | | | · | | 1.3 x. | |
| | | | to Tray or (| | 9,0 x | 10'0 |
| | ······································ | | | ,
1 | · <u>·····</u> | ·······- <u></u> |
| | | | | 7 | | · · · · · · · · · · · · · · · · · · · |
| | ······· | · · · · · · · · · · · · · · · · · · · | <u> </u> | | | |
| | <u>.</u> , . <u>.</u> . | | | | | · · · · · · · · · · · · · · · · · · · |
| | | • | | | $\overline{\mathcal{D}}_{$ | |
| | | | | Tested By | nomao// | Date: <u>9/13/</u> |
| | | | • | Witness | Mone !! | Date: |
| otice of | | | | Sheet No | | of |
| nomaly | None | | ۳ | Approved | Whing 7/13 | 85 |

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DATA SHEET

| Customer | Stone & Webster | | | WYLE LABO | RATORIES |
|------------|---------------------------------------|---|-------------------|------------------|--------------------------|
| Specimen 🔔 | Cables | | 7 10- | | • • |
| Part No. | Various | Amb. Temp. | | Job No | 47906 |
| Spec | WLTP 47906-01 . | Photo | Yes | Report No | 47906-02 |
| Para | 3.5.6 | Test Med | Air | Start Date | 9/13/85 |
| S/N | N/A | Specimen Te | emp. <u>Amb</u> i | ent | |
| GSI | No | | | | |
| Test Title | Configuration No. | | 1 | | |
| | Pre-test-02 | Post-test | | Functional Test | |
| Insulatio | on Resistance Test (C | Continued) | | ······ | |
| Cat | | Test Points | | Reading | |
| great | E
F. P. 16 AWG | 1 to 2 | | A P in all | |
| 10 | | | | 4,5 x10" | 1 |
| | | 3 to 4 NA | ma | | |
| | | 5 to 6 NA | | | ٠ |
| | | 7 to 8 NA | MAL | | |
| ····· | | | 7 | | |
| | | 9 to 10 NA | grac | | |
| | • • • • • • • • • • • • • • • • • • • | l to Shield | <u> </u> | <u>3,5 x 10"</u> | |
| | | 2 to Shield | | 5,0 x 10'0 | |
| | | 3 to Shield A | IA GME | | |
| | | 4 to Shield N | A APPIC | | |
| | • | 5 to Shield | IA Mar | | |
| - | | 4 to Shield N
5 to Shield
6 to Shield | VA APK | | |
| | | 7 to Shield , | | | |
| | | 8 to Shield | NA RIAK | | 1 |
| | | 9 to Shield | NA APPK | | |
| | ٤ | 10 to Shield | NA QME | | |
| | ······ | 4 | | | |
| | | ····· | | | <u></u> |
| | | | Tested By | | ate: <u>9/13</u>
ate: |
| otice of | | ` | Sheet No | • | |
| nomaly/ | None | | Approved | Optimine 9/13 | 185 |

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DATA SHEET

| Customer | Stone & Webste | :r | | WYLE LABO | RATORIES |
|------------|---------------------------------------|---------------------------------------|---------------------------------------|-------------------------|-------------|
| Specimen _ | Cables | | | | |
| Part No. | Various | Amb. Temp. | <u>74°F</u> | Job No | 47906 |
| Spec | WLTP 47906-01 | Photo | Yes | Report No | 47906-02 |
| Para | 3.5.6 | Test Med | Air | Start Date | 9/13/85 |
| | N/A | | emp. <u>Ambier</u> | | |
| GSI | | | | | |
| Test Title | Configuration
Pre-test & | | | nctional Test | |
| High Pot | tential Test | | | | |
| | | here shall be no evide | nce of insulat | ion breakdown o | r flashover |
| | | ith a potential of 220 | | | |
| | | | | | Awd Cables |
| | а | pplied for one minute. | | | |
| | | · · · · · · · · · · · · · · · · · · · | | | |
| Ca | able | Test Points | | Reading | |
| 2 | AWG Triplex | l to 2 | | 730 M | 1 |
| | | <u>1 to 3</u> | | | 4 |
| | · · · · · · · · · · · · · · · · · · · | 2 to 3 | , <u> </u> | 7804 | ·A |
| | · · · · · · · · · · · · · · · · · · · | l to Tray | | 1150 4 | A |
| | | 2 to Tray | · · · · · · · · · · · · · · · · · · · | 1200 M | A |
| | • | 3 to Tray | | 1200 11 | <u>A</u> |
| 7/ | /C - 12 AWG | 1 to 4 | | 1980 M | A |
| | • | l to Conduit | or Tray | 590M | |
| | | 4 to Conduit | or Tray | 620M | |
| | | ···· | <u></u> . | | |
| | | | | | |
| | | | | | |
| 2 | | | | | |
| | | | ~ | $\overline{\mathbf{O}}$ | |
| | | | Transford Al | Romand 5 | 9/12/ |
| | | | Tested By | A. 11 | Date: |
| otice of | | | Witness | | Date: |
| | Non | | Sheet No. | WY SAL | of |
| nomaly | None | <u> </u> | Approved | Ming 9/1 | 185 |

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DATA SHEET

| Customer | Stone & Webster | | | WYLE LABORATORIES |
|-----------|--|--|-------------------|------------------------|
| Soecimen | Cables · | | | |
| Part No. | Various | Amb. Temp | 74°F | Job No 47906 |
| Spec | WLTP 47906-01 | Photo | Yes | Benort No. 47906-02 |
| Para | 3.5.6 | Test Med | Air | Start Date//3/85 |
| | N/A | Specimen T | emp. <u>Ambie</u> | nt |
| GSI | | | | |
| d | | Test No. | 3 | |
| | Pre-test So | Post-test | | unctional_Test |
| High Pot | ential Test (Continued | | | |
| | · · · · · · · · · · · · · · · | | | |
| | able | Test Points | | Reading |
| 18 | γς
Τ.Ρ. 15 AWG | l to 2 | | 700 MA |
| | | 3 to 4 NA | MAR | |
| | | 5 to 6 NA | MAR | |
| | | 5 to 6 NA
7 to 8 NA | ADIC | |
| | | 9 to 10 NA | | |
| | ······································ | <u>l to Shield</u> | | 1380 MA |
|
 | ···· | .2 to Shield | | 1380 MA
1420 MA |
| | | 3 to Shield | NA GAIL | |
| | e | 3 to Shield
4 to Shield | NA APPK | * |
| | | 5 to Shield | NA APOR | |
| | | 6 to Shield | | |
| | | 7 to Shield | NA APEZ | |
| | | 8 to Shield | NA APK | |
|
 | | 9 to Shield | NA APTC | |
| | • | 10 to Shield | NA ATTL | |
| | | | | |
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| | ····· | ···· | (h) | \mathcal{D} |
| PI | | ······································ | Tested By | 10 mao// Date: 9/13/85 |
| | | | Witness | More Date: |
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CONFIGURATION NO. 5 TESTS (Conduit to Conduit and Cable in Free Air Separation)

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Test Report No. 47906-02

SECTION VI

CONFIGURATION NUMBER 5 TESTS (CONDUIT TO CONDUIT AND FREE AIR SEPARATION)

1.0 REQUIREMENTS

1.1 Acceptance Criteria

1.1.1 Insulation Resistance Test

Insulation resistance on all "target cables"* shall be greater than 1.6 x 10^6 ohms with a potential of 1000 VDC (500 VDC 2/C 16 AWG cables) applied for 60 seconds.

1.1.2 High Potential Test

There shall be no evidence of insulation breakdown or. flashover with a potential of 2200 VAC (1600 VAC for 2/C 16 AWG cables) applied for one minute.

1.1.3 Cable Continuity Test

Energized specimens in the target raceway shall conduct 100% of SWEC-rated currents (see table below) at 575 VAC (120 VAC for control cables and 50 VAC for instrument cables) before, during, and after the overcurrent test.

| Cable
Size | No.
Conductors | SWEC
I.D. No. | Cable
<u>Type</u> | Voltage | Rated
Current |
|---------------|-------------------|------------------|----------------------|---------|------------------|
| 1/0 AWG | Triplex | NJM-34 | \mathbf{L} | 575 | 139 |
| 2 AWG | Triplex | NJM-25 | K | 575 | 38.5 |
| 12 AWG | 7 | NJN-37 | С | 120 | 10 |
| 16 AWG | 2/C | NJP-05 | х | 50 | · 1 |

1.1.4 Tolerances

All target cable voltages specified in this procedure shall be maintained within a $\pm 3\%$ tolerance. The initial setting of target cable currents (with rated current on the fault cable) shall have a tolerance of $\pm 10\%$, 0%. Thereafter, all target cables' currents shall be maintained within a $\pm 10\%$ tolerance.

All fault cable currents shall be maintained within a $\pm 3\%$ tolerance, if possible.

* The term "target cable" refers to energized and monitored nonfault cables used in this program.

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Test Report No. 47906-02

2.0 PROCEDURES

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2.1 Test Specimen Preparation

The test specimens were mounted into the test assembly of Figure 10 of Section VIII. This apparatus was manufactured to the indicated dimensions by Wyle technicians using materials supplied by NMP2. The following guidelines were observed with regard to the materials and construction of the assembly:

- 1. The fault cable was a Triplex 2/0 AWG cable from NMP2 stock and mounted in Location 3 of Figure 10 of Section VIII for all three tests.
- 2. The ends of the faulted cable were wrapped from their termination on the copper bus bar to the edge of the test assembly. This wrap consisted of a single layer of HAVEG SILTEMP WT-65 covered with a single layer of 3M No. 69 glass tape. This wrapping was done to ensure that any ignition that might occur was contained to the cable tray test area.
- 3. A Triplex 2 AWG target power cable from NMP2 stock was mounted in Location 2 of Figure 10 of Section VIII for all three tests.
- 4. A 7/C 12 AWG target control cable from NMP2 stock was mounted in Location 1 of Figure 10 of Section VIII for all three tests.
- 5. The conduits and free air cable were orientated as described below:

| Test No. | Location 1 | Location 2 | Location 3 |
|----------|-------------------------------------|--------------------------------|-------------------------------------|
| 1 | 3-Inch Anaconda
Flexible Conduit | 4-Inch Rigid Conduit | Free Air Cable |
| 2 | Free Air Cable | 3-Inch BOA
Flexible Conduit | 4-Inch Rigid Conduit |
| 3 | 4-Inch Rigid Conduit | Free Air Cable | 3-Inch Anaconda
Flexible Conduit |

- 6. The conduits and cable were mounted within 1/4-inch of each other (but not in contact) for all three tests.
- 7. Photographs were taken of the test setup prior to each test.

Test Report No. 47906-02

2.0 PROCEDURES (Continued)

2.2 Instrumentation Setup

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2.2.1 Thermocouple Locations

A total of 24 Type "K" thermocouples were utilized for this test. These thermocouples were mounted as described below.

| Channel No. | Location |
|-------------|--|
| 1-6 | Mounted to the jacket on the fault cable. These thermocouples were mounted approximately 16 inches apart. |
| 7 & 8 | Mounted to the conductor of the fault cables at the two series connections. |
| 9-14 | Mounted to the jacket of the target cable in Location 1. These thermocouples were mounted approximately 16 inches apart. |
| 15-20 | Mounted to the jacket of the target cable in Location 2. These thermocouples were mounted approximately 16 inches apart. |
| 21 & 22 | Mounted to the outside of the flexible conduit on the side towards the rigid conduit. |
| 23 & 24 | Mounted to the outside of the rigid conduit on the side towards the flexible conduit. |

The thermocouples were monitored by a Fluke Datalogger feeding a high-speed printer. The datalogger was operated at its maximum scan rate throughout the overcurrent test.

2.2.2 Electrical Monitoring

All phase-to-phase voltages and phase currents of the target cables and the fault cable current were fed into oscillograph recorders. The oscillograph was operated at the 0.1-inch per minute rate throughout the overcurrent test. The oscillograph channels were as specified in the following table.

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, Test Report No. 47906-02

2.0 PROCEDURES (Continued)

2.2 Instrumentation Setup (Continued)

2.2.2 Electrical Monitoring (Continued)

| Channel No. | Signal | Cable |
|-------------|-----------------|----------------------------|
| 1 | Current | 7/C 12 AWG Target Cable |
| 2 | Voltage | 7/C 12 AWG Target Cable |
| 3 ` | Current-Phase A | Triplex 2 AWG Target Cable |
| 4 | Current-Phase B | Triplex 2 AWG Target Cable |
| 5 | Current-Phase C | Triplex 2 AWG Target Cable |
| 6 | Voltage A-B | Triplex 2 AWG Target Cable |
| 7 | Voltage A-C | Triplex 2 AWG Target Cable |
| 8 | Voltage B-C | Triplex 2 AWG Target Cable |
| 9 & 10 | Skipped | N/A |
| 11 | Current | Fault Cable |
| 12 | Skipped | N/A |

A digital multimeter was utilized to measure all phase-to-phase or phase voltages and phase currents of the target cables prior to, during, and after the overcurrent test. This data was recorded to provide accurate evidence of the specimen's capability to conduct SWEC-rated current at 575 VAC (120 VAC for control cables) throughout the overcurrent test.

2.3 Baseline Functional Tests

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The baseline functional tests consisted of insulation resistance and high potential measurements on each of the target cables. These tests were performed as specified in the following paragraphs.

2.3.1 Insulation Resistance Test

- 1. All power and instrumentation leads were disconnected from the target cables and labeled per Figure 12 or 13 of Section VIII.
- 2. Using a megohmmeter, a potential of 1000 VDC was applied and the minimum insulation resistance indicated after a period of 60 seconds was recorded between the following test points.

Test Report No. 47906-02 -

2.0 PROCEDURES (Continued)

2.3 Baseline Functional Tests (Continued)

2.3.1 Insulation Resistance Test (Continued)

Target Power Cables:

| Phase-to-Phase | Phase-to-Ground | | |
|----------------|--------------------------|--|--|
| 1 to 2 | 1 to unistrut or conduit | | |
| 1 to 3 | 2 to unistrut or conduit | | |
| 2 to 3 | 3 to unistrut or conduit | | |

Target Control Cables:

| Phase-to-Phase | Phase-to-Ground |
|----------------|--|
| 1 to 4 | 1 to conduit or unistrut
4 to conduit or unistrut |

For all performances of this test, the measured values were compared to the acceptance criteria, Paragraph 1.1.1.

2.3.2 High Potential Test

1. Using a Hi-Pot Test Set, a potential of 2200 VAC was applied from each conductor to ground and between conductors on multiconductor cable for a . period of one minute.

Target Power Cables:

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| Phase-to-Phase | Phase-to-Ground | | |
|----------------|--------------------------|--|--|
| 1 to 2 | 1 to unistrut or conduit | | |
| 1 to 3 | 2 to unistrut or conduit | | |
| 2 to 3 | 3 to unistrut or conduit | | |

Target Control Cables:

| Phase-to-Phase | Phase-to-Ground |
|----------------|--|
| 1 to 4 | 1 to conduit or unistrut
4 to conduit or unistrut |

2. All power and instrumentation leads were reconnected per Figure 12 or 13 of Section VIII.

For all performances of this test, the measured values were compared to the acceptance criteria, Paragraph 1.1.2.

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Test Report No. 47906-02

2.0 PROCEDURES (Continued)

2.4 Overcurrent Test

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The overcurrent test was conducted in three sequential steps with no intentional time delay. The first phase consisted of energizing the fault cable with SWEC rated current. The second phase consisted of increasing the current until fault cable temperatures were within 189^o-199^oF for 5 minutes. The third phase consisted of energizing the fault cable with the worst case electrical fault current until the cable open-circuited.

The target control cables conducted SWEC-rated current (see Paragraph 1.1.3) at 575 VAC (power cables) or 120 VAC (control cables) throughout the overcurrent test. The overcurrent test was conducted using the following procedure:

- 1. The Triplex 2/0 AWG fault cable was connected to the copper bus bars per Figure 11 of Section VIII.
- 2. A 7/C 12 AWG target cable was installed per Figure 10 of Section VIII.
- 3. A Triplex 2 AWG target cable was installed per Figure 10 of Section VIII.
- 4. The Triplex 2 AWG target cable was connected to the instrumentation and power supplies of Figure 12 of Section VIII.
- 5. The 7/C 12 AWG target cables were connected to the instrumentation and power supplies of Figure 13 of Section VIII.
- 6. The Triplex 2 AWG target cable was energized with 34 amperes at 575 VAC.
- 7. The 7/C 12 AWG target cable was energized with 10 amperes at 120 VAC.
- 8. The Triplex 2/0 AWG fault cable was energized with 139 amperes per phase (rated current) from the Multi-Amp Test Set.
- 9. Target cable voltages and currents and the fault cable current were recorded.
- 10. The fault cable current was slowly increased until Thermocouple Channels 7 and/or 8 indicates 90 +3°C (189-199°F) conductor temperature.
- 11. The conductor temperature was maintained at 189–199°F for five minutes.
- 12. Fault cable current, conductor temperature, and the highest of thermocouple Channels 1 through 6 were recorded.
- 13. The Multi-Amp Test Set output was increased to 908 amperes (test current).
- 14. Target cable voltages, currents and the fault cable current were recorded.

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Test Report No. 47906-02

2.0 **PROCEDURES** (Continued)

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2.4 Overcurrent Test (Continued)

- 15. The fault cable was allowed to conduct test current until the cable opencircuited.
- 16. The elapsed time and maximum cable temperature were recorded.
- 17. The target cable voltages and currents were recorded.
- 18. The target cables and the Multi-Amp Test Set were de-energized.
- 19. Photographs were taken of the post-test condition.

For all performances of this test, the observed target cable operation was compared to the acceptance criteria, Paragraph 1.1.3.

2.5 Post-Overcurrent Test Functional Test

The functional tests of Paragraph 2.3 were repeated.

Test Report No. 47906-02

3.0 RESULTS

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3.1 Results of Test No. 1

Configuration Number 5, Test No. 1, with a Triplex 2/0 AWG fault cable in free air, was conducted per Paragraph 2.0 and successfully met the requirements of Paragraph 1.0. The 908 amperes test current was applied for 1343 seconds (22.4 minutes) until the cable opencircuited. The maximum observed temperature on the fault cable was 1709°F which occurred on Thermocouple No. 5. The fault cable ignited after 652 seconds (10.9 minutes). The fire burned for approximately 14 minutes.

The capabilities of the target cable to conduct SWEC rated current at 575 VAC (power cable) or 120 VAC (control cable) were not impaired during this test. The maximum observed target cable temperature was 585°F. All target cables successfully completed the Post-Overcurrent Test Functional Test.

Appendix I contains the following data from this test:

- 1. Notices of Anomaly Number 4 and 5.
- 2. Photographs VI-1 through VI-6 which show pretest and post-test conditions.
- 3. A narrative of the test which relates test time, fault cable temperatures, and important events.
- 4. Figure VI-1 which plots the temperature readings versus time.
- 5. Data Sheets which contain Baseline Functional Test data, Overcurrent Test data, and Post-Overcurrent Test Functional Test data.

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Test Report No. 47906-02

3.0 **RESULTS (Continued)**

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3.2 Results of Test No. 2

Configuration Number 5, Test No. 2, with a Triplex 2/0 AWG fault cable in free air, was conducted per Paragraph 2.0 and successfully met the requirements of Paragraph 1.0. The 908 amperes test current was applied for 1135 seconds (18.9 minutes) until the cable opencircuited. The maximum observed temperature on the fault cable was 1392°F which occurred on Thermocouple No. 2. The fault cable did not ignite.

The capabilities of the target cable to conduct SWEC rated current at 575 VAC (power cable) or 120 VAC (control cable) were not impaired during this test. The maximum observed target cable temperature was 318°F. All target cables successfully completed the Post-Overcurrent Test Functional Test.

Appendix II contains the following data from this test:

- 1. Notices of Anomaly applicable to this section are contained in Appendix I.
- 2. Photographs VI-7 through VI-8 which show pretest and post-test conditions.
- 3. A narrative of the test which relates test time, fault cable temperatures, and important events.
- 4. Figure VI-2 which plots the temperature readings versus time.
- 5. Data Sheets which contain Baseline Functional Test data, Overcurrent Test data, and Post-Overcurrent Test Functional Test data.

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Test Report No. 47906-02

3.0 **RESULTS (Continued)**

3.3 Results of Test No. 3

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43-96 46Configuration Number 5, Test No. 3, with a Triplex 2/0 AWG fault cable in free air, was conducted per Paragraph 2.0 and successfully met the requirements of Paragraph 1.0. The 908 amperes test current was applied for 1202 seconds (20.0 minutes) until the cable opencircuited. The maximum observed temperature on the fault cable was 1759°F which occurred on Thermocouple No. 5. The fault cable did not ignite.

The capabilities of the target cable to conduct SWEC rated current at 575 VAC (power cable), 120 VAC (control cable), or 50 VAC (instrument cable) were not impaired during this test. The maximum observed target cable temperature was 248°F. All target cables successfully completed the Post-Overcurrent Test Functional Test.

Appendix III contains the following data from this test:

- 1. Notices of Anomaly applicable to this section are contained in Appendix I.
- 2. Photographs VI-9 through VI-10 which show pretest and post-test conditions.
- 3. A narrative of the test which relates test time, fault cable temperatures, and important events.
- 4. Figure VI-3 which plots the temperature readings versus time.
- 5. Data Sheets which contain Baseline Functional Test data, Overcurrent Test data, and Post-Overcurrent Test Functional Test data.

Test Report No. 47906-02

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APPENDIX I

CONFIGURATION NUMBER 5, TEST NO. 1, DATA

Page No. VI-12 Test Report No. 47906-02

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| LABORATORIES (Eastern Operations) | |
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| NOTICE OF ANOMALY | DATE: September 16, 1985 |
| NOTIFICATION MADE TO: Ranjit Das | WYLE JOB NO: 47906 |
| CATEGORY: SPECIMEN PROCEDURE TESTED
PART NAME: Electrical Power Cable
TEST: Config. 4, Test 1; Config. 5, Tests
SPECIFICATION: WLTP 47906-01 | PART NON/A
1,2,3I.D. NON/A |
| 3. Heating due to rated current of 38.5 am | test.
and within a $\pm 10\%$ tolerance (per NOA2).
Aration 5, Tests 1, 2 and 3, some of the
above the +10% tolerance by as much as
a the worst case cable. During Configura-
below the -10% tolerance by 12.3 amperes
the +10% tolerance by 8.4 amperes and 6.7
have no impact on the test for the follow-
additional conductor heating and therefore
severe condition than required.
arrents was below the -10% tolerance the
appensated for by the additional heating in |
| NOTE: IT IS THE CUSTOMER'S RESPONSIBILITY TO ANALYZE A | NOMALIES AND COMPLY WITH 10 CFR PART 21. |
| TEST WITNESS:
REPRESENTING:
QUALITY ASSURANCE: G.W. Klight 9/20/8 S | PROJECT ENGINEER: P. P. P. P. P. 9/19/85
PROJECT MANAGER: P. Norman 9/20/85
INTERDEPARTMENTAL KTOLY 0. 9-20-85 |
| Wyle Form WH 1068, Rev. JAN '85 | Page of |

Page No. VI-13 Test Report No. 47906-02

| | NOTICE OF AN | OMALY | DATE: | 9/26/85 |
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| ~ . | 5 P.O. NUMBER: | | | |
| | Stone & Webster | | | |
| | ADETO: R. Das | | | |
| NOTIFICATION M | ADE BY: J. King | ······································ | VIA: Telepho | ne |
| CATEGORY: | | | DATE OF
ANOMALY: <u>9/</u> | 9, 9/12, 9/17/8 |
| PART NAME: | Electrical Cable | | PART NO | N/A |
| TEST: Config | g. 2, Test 1; Config. 3. | Test 2: Config | | N/A |
| SPECIFICATION: | 5, Tests 2 and 3 WLTP | 47906 | PARA. NO3.4.5 | . 3.5.5, 3.7.5 |
| REQUIREMENTS: | · · · · · · · · · · · · · · · · · · · | ······································ | | |
| 90 <u>±</u> 30 | increase fault cable curre
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ain the conductor temperatu | temperature. | | nd/or 8 indicate |
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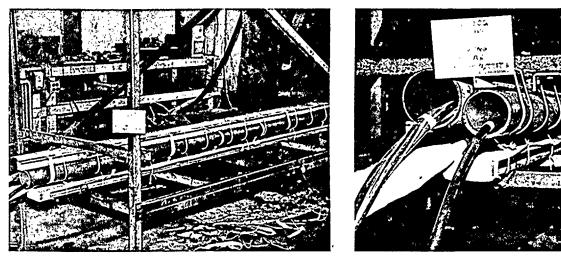
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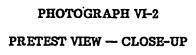
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• Test Report No. 47906-02

CONFIGURATION NUMBER 5, TEST NO. 1



PHOTOGRAPH VI-1 PRETEST VIEW — OVERALL



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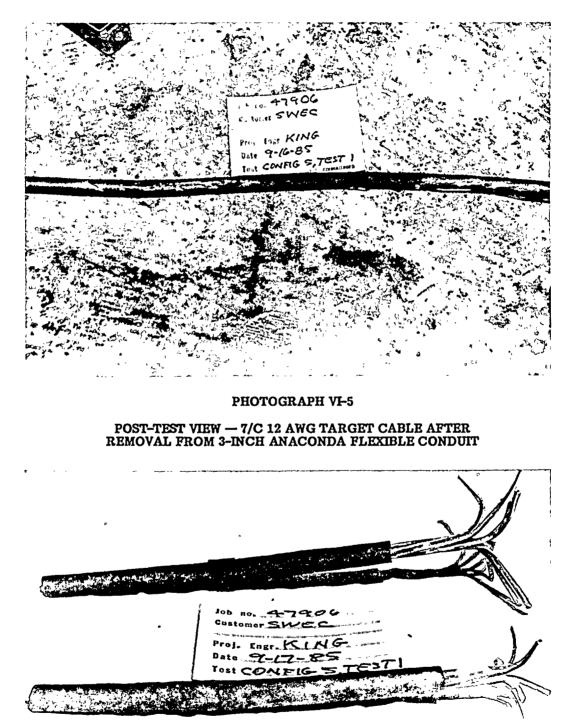
PHOTOGRAPH VI-3 POST-TEST VIEW — OVERALL

PHOTOGRAPH VI-4

POST-TEST VIEW — CLOSE-UP OF 3-INCH ANACONDA FLEXIBLE CONDUIT

Test Report No. 47906-02

CONFIGURATION NUMBER 5, TEST NO. 1



PHOTOGRAPH VI-6

POST-TEST VIEW — 7/C 12 AWG TARGET CABLE WITH CABLE JACKET REMOVED TO SHOW INDIVIDUAL CONDUCTORS

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Test Report No. 47906-02

CONFIGURATION NUMBER 5, TEST NO. 1

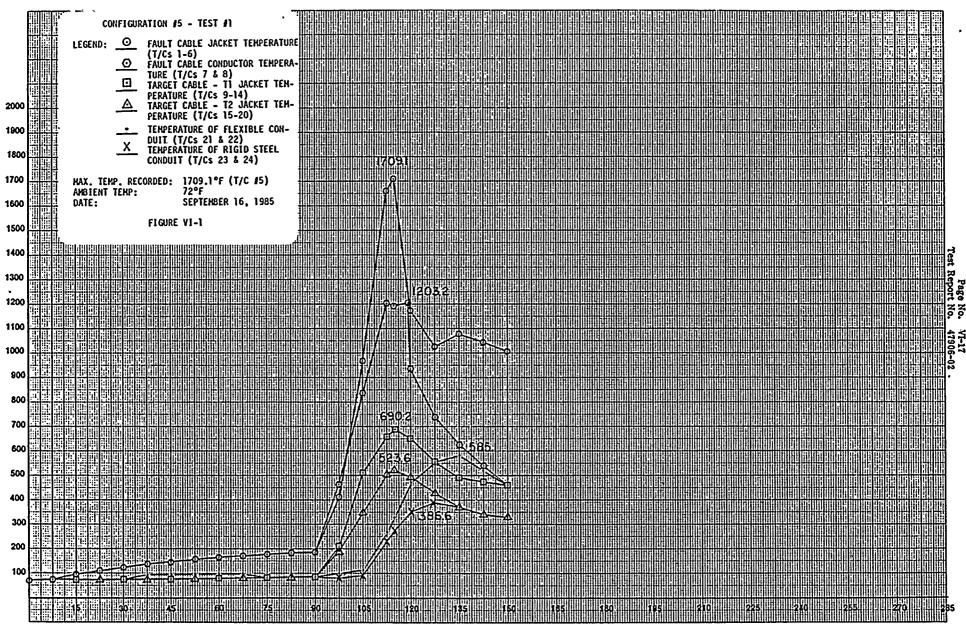
| Approximate
Test Time | Approximate
Fault Cable
Jacket Temperature | Observation |
|--------------------------|--|--|
| 0 Min | 70°F | Energized fault cable with 139A |
| 10 Min | 78 ⁰ F | Energized fault cable with 270A |
| 65 Min | 166 ⁰ F | Energized fault cable with 280A |
| 87.3 Min | 184 ⁰ F | Fault cable conductor reached 189 ⁰ F |
| 92.3 Min | 187 ⁰ F | Energized fault cable with 908A |
| 96.4 Min | 370 ⁰ F | Smoke visible |
| 99.7 Min | 585 ⁰ F | Fault cable jacket rupturing |
| 103.2 Min | 850 ^o F | Ignition of fault cable |
| 114.7 Min | 1709°F | Open circuit |
| 117.2 Min | 1435 ⁰ F | Fire out |

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Page No. VI-18 Test Report No. 47906-02 ~

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DATA SHEET

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bster | | | WYLE LABO | RATORIES |
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| Specimen | Cables | | | 0 | | |
| Part No. | Various | | Amb. Temp. | 72°F | Job No | 47906 |
| Spec | WLTP 47906 | -01 | Photo | Yes | Report No | 47906-02 |
| Para. | 2 - 1 | | Test Med | Air | Start Date_ | 9/16/85 |
| S/N | | | Specimen Te | | <u>. </u> | |
| GS1 | | | | | | |
| | | | | | | |
| Test Title | Configurati | | Test No. 1 | | Functional Te | |
| Inculati | on Resistance | | 30 0000 | | | |
| 1 | | | ularion roci | ctance chall | be greater than | 1 6 meghoms |
| Acceptan | ice criteria: | | | | | |
| | | with a poten | tial of 1000 | VDC applied | for 60 seconds. | |
| | | | | | | |
| Ca | able | | Test Point | <u>ts</u> | | Reading |
| 2 | AWG Triplex | | 1 to 2 | | | 1.5 ×10" ~ |
| [| | | 1 to 3 | <u></u> | | 2.0 × 10" ~ |
| | | | 2 to 3 | | | 1.9 × 10" - |
| | | | l to Unist | trut or Condui | c | 1.5 × 10" ~~ |
| | | | 2 to Unist | rut or Condui | τ | 2.6 × 10"-1 |
| | | | <u>3 to Unist</u> | trut or Condui | t | 1.7 × 10"-~ |
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| 7/ | 'C - 12 AWG | | 1 to 4 | | | 2.6 × 10"- |
| | | | l to Unist | trut or Condui | τ | 2.6×10"~~ |
| | | | 4 to Unist | trut or Condui | t | 1.8 × 10"~ |
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DATA SHEET

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| art No. Various | Amb. Temp 72° F | Job No47906 |
| pec | | Report No 47906-02 |
| ara3.7.4 | | Start Date9-16-85 |
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| SI <u>No</u> | | |
| | | |
| est Title <u>Configuration No.</u>
(Pre-test) | <u>5 Test No. 1</u>
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| | | |
| High Potential Test | | en breskdeur ar flashover |
| | e shall be no evidence of insulati
a potential of 2200 VAC applied f | |
| 5 K 68 (1998) | | ······································ |
| Cable | Test Points | Reading |
| 2 AWG Triplex | 1 to 2 | 750 MA |
| • | 1 to 3 | 720 MA |
| | l to Unistrut or Conduit | 840 MA |
| | 2 to Unistrut or Conduit | 880 MA |
| <u> </u> | 3 to Unistrut or Conduit | 880 MA |
| · · · · · · · · · · · · · · · · · · · | 2 to 3 | 760MA |
| 7/C - 12 AWG | 1 to 4 | 1600,UA |
| | 1 to Unistrut or Conduit | 650 MA |
| | 4 to Unistrut or Conduit | 720 44 |
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| | Specimen | Temp. <u>A</u> | mbienț | | |
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DATA SHEET

| Customer _ | Stone & Webster | | WYLE LABORATORIES |
|---------------|---|--|----------------------------------|
| Specimen _ | Cables | | - |
| Part No | Various | Amb. Temp72°F | |
| Spec | WLTP 47906-01 | Photo <u>Yes</u> | Report No47906-02 |
| Para | | Test Med. <u>Air</u> | Start Date9/16 /85 |
| S/N | | Specimen Temp. <u>Am</u> | bient |
| 3SI | No | | |
| ſest Title | Configuration No. 5 | Test No. 1 | Overcurrent Test |
| <u>10. la</u> | ncreasing current to raise | fault cable temperatur | e to 189°F - 199°F |
| F | AULT CABLE CURRENT | ELAPSED TIME | PAC CABCE CONDUCTOR TEMP/CHANNEL |
| | 270A | 3300 Sec | 171957 |
| | 280A | 1340 sec | 189°F/7 |
| | | | |
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| | | | |
| | | | |
| 12. R | eadings_after_fault_cable_w | armup to 189°F - 199°F | |
| 12. Re | <u>eadings after fault cable w</u>
Fault Cable Current: | armup to 189°F - 199°F
908A | |
| 12. R | | 908A | Channel No. 7 |
| <u>12</u> R | Fault Cable Current: | 908A
191° F | |
| <u>12.</u> R | Fault Cable Current:
Conductor temperature:
Max temp of | 908A
191° F | Channel No. 7 |
| 12R | Fault Cable Current:
Conductor temperature:
Max temp of | 908A
191° F | Channel No. 7 |
| 12. R | Fault Cable Current:
Conductor temperature:
Max temp of | 908A
191° F | Channel No. 7 |
| 12. R | Fault Cable Current:
Conductor temperature:
Max temp of | 908A
191° F | Channel No. 7 |
| 12. R | Fault Cable Current:
Conductor temperature:
Max temp of | 908A
191° F | Channel No. 7 |
| 12R | Fault Cable Current:
Conductor temperature:
Max temp of | 908A
191° F
187° F Chao | Channel No. 7
ne(5) |
| 12. R | Fault Cable Current:
Conductor temperature:
Max temp of | 908А
191° F
187° F С.6.44
Тested By | Channel No. 7
ne(5 |
| 12. Re | Fault Cable Current:
Conductor temperature:
Max temp of | 908A
191° F
187° F Chao | Channel No. 7
ne(5) |

Page No. VI-22 Test Report No. 47906-02

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| | | & Webster | | <u> </u> | | | WYL | .E LABO | RATORIES |
|--------------|------------|---------------------------------------|------------|---------------------------------------|-----------|----------|---------------------|------------------|---------------------|
| Specimen . | | | | | - | 2•F | | | 47906 |
| Part No. | | 47906-01 | | Amb. Temp. | | <u> </u> | | No | 1 |
| Spec | | | | Photo | | | - | ort No | |
| Para. | 3.7. | <u>></u> | | Test Med | Air | | Stai | rt Date_ | 9/16/8 |
| S/N | | | | Specimen T | emp | Ambient | | | |
| GSI | No | | | | | | | | |
| Test Title _ | Confi | <u>guration No</u> | . 5 | Test No. | i | | 0 | vercurr | ent Test |
| 14. 1 | nitial re | eadings with | h test cur | rent on fai | ult cab |) é: | | | |
| 7 | fårget Cal | ble | V
A-8 | Voltage (VA)
B B-C A | C)
-C | Phas | | rent (a
Phase | |
| 2 | AWG T | riplex | | | | | .6 | | |
| | | | 5.10 | 574.5 | <u>01</u> | <u> </u> | 10 | (50,8 | (+1. |
| 7 | /C - 12 / | AWG | 120 | 7.2 | | 10 | .6 | | |
| | | | | | | | | | |
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| | | | | · · · · · · · · · · · · · · · · · · · | | | | | |
| | Fault Cab | le: 2/0 | AWG TX | | | | | | |
| | Fault Cab | | AWG TH | | | | | | |
| Test M | Rated Cur | rent: | 908A | -1PLEX | | | | | |
| Test Ma | | rent: | | -1PLEX | | | | | |
| Test M | Rated Cur | rent: | 908A | -1PLEX | | | | | |
| Test M | Rated Cur | rent: | 908A | | | | | | |
| Test M | Rated Cur | rent: | 908A | -1PLEX | | | | | |
| Test M | Rated Cur | rent: | 908A | | Tested | | 2
tometo | / | Date: <u>9/16</u> / |
| T-eST | Rated Cur | rent: | 908A | | Witne | ss^ | omaso
Ine | / | Date: <u>1/6</u> |
| Test # | Rated Cur | rent: | 908A | <u>LIPLEX</u> | | ss^ | omero
Ine 1
3 | / | |

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DATA SHEET

| Customer | Stone & Webster | | • | WY | LE LABO | RATORIES |
|---------------|---|--------------------------|----------------------------------|---------------|-------------------|-----------------------|
| Specimen | Cables | | • • • • • • • | | | |
| Part No | Various . | Amb. Temp | <u>72°F</u> | Jol | o No | 47906 |
| Spec | | Photo | Yes | Reg | ort No | 47906-02 |
| ara | 3.7.5 | Test Med. | Air | Sta | irt Date | 9/16/85 |
| S/N | N/A | Specimen | Temp. <u>Ambie</u> | ent | | |
| 3SI | No | | | | | |
| est Title | Configuration No. | 5 Test No. | 1 | Overc | urrent T | est |
| 16. | Open circuit on fault | cable: | | - | | ···· |
| | Elapsed time: | | 134 | 43 sec | | |
| | Maximum fault cab | le temperature: | 170 | 09°F | Chann | 15 |
| | | • | | <u>}</u> | | |
| 17. | Stablized temperature of | on fault cable: | | | | · · · · · |
| | Elapsed time (beg | inning of 15-minu | te period): | N/A | | |
| | Maximum fault cabi | le temperature: | / | V/A | | |
| | Fault cable currer | nt: | | N/A | | |
| | | | / | | | |
| 18. | Ignition of fault cable | e: | · | | | |
| | Elapsed time: | | 8772 452
+313 Sec | | | |
| | .Maximum fault cab | le temperature: | 1709 ° F | | | |
| | Fault_cable_curren | nt: | 908 A | | | |
| 20. | +≪s≁
Readings after let-thr | HPK
pugh current appl | ied until faul | lt cable o | open cir | cuits: |
| | Target Cable | Voltage (V
A-B B-C | | Cu
Phase A | rrent (a
Phase | |
| | 2 AWG Triplex | 575 | | 42.3 | | <u> </u> |
| | 2 Awd Triplex | 575 570 . | 570 | 44.5 | (4-2. | 8 41.9 |
| | | | | | | |
| | 7/C - 12 AWG | 119.7 | <u>.</u> . | 10.2 | | |
| | 7/C - 12 AWG | <u>117.</u> 7 | | 10.2 | | |
| | 7/C - 12 AWG | ר, זון | Tested By | 10.2
Homa | | ate: |
| | 7/C - 12 AWG | ר, זון | Tested By | NH2 | | ate: |
| ,
otice of | 7/C - 12 AWG | ר, זון | Tested By
Witness
Sheet No | NH2 | | ate:
ate:
_ of4 |

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DATA SHEET

| Customer | Stone & Webster
Cables | · · · · · · · · · · · · · · · · · · · | WYLE LABORATORIES |
|---------------------|----------------------------------|---------------------------------------|---|
| Specimen
Part No | Various | Amb. Temp. <u>72°F</u> | Job No. 47906 |
| | WLTP 47906-01 | | |
| Spec
Para | 3.7.6 | | Report No. <u>47906-0</u>
Start Date <u>9/16/8</u> |
| S/N | N/A | Specimen TempAmbieu | Start Date |
| GSI | No | Specimen TempAnote | |
| | | ******* | |
| Test Title | Configuration No.
Pro-test 82 | | |
| Inculatio | on Resistance Test | Post-test | Functional Test |
| | | sured insulation resistance shall | be greater than 1.6 megh |
| | | th a potential of 1000 VDC applied | |
| | ····· | | |
| Cal | ble | Test Points | Reading |
| 2 | AWG Triplex | 1 to 2 | 2,8×10" |
| | | 1 to 3 | 3.5 X100 |
| | | 2 to 3 | 3.0 X 10 |
| | | l to Unistrut or Condui | it 4,5 × 10 |
| | | 2 to Unistrut or Condui | it <u>40 x/0</u> |
| | | 3 to Unistrut or Condui | it 4,5 x 10 |
| 7/9 | C - 12 AWG | 1 to 4 | 2,2×10 |
| | | l to Unistrut or Condui | |
| | | 4 to Unistrut or Condui | |
| | | | ••••••••••••••••••••••••••••••••••••••• |
| | | | |
| | | Tested By
Witness | Mare Date: 9// |
| Notice of | | Sheet No. | ct |

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DATA SHEET

| Customer | Stone & Webster | | WYLE LABORATORIES |
|------------|-------------------------|---------------------------------------|----------------------------------|
| Specimen _ | Cables | | |
| Part No. | Various | Amb. Temp72°F | _ Job No 47906 |
| Spec | WLTP 47906-01 | • • • • | _ Report No 47906-02 |
| Para | 3.7.6 | | _ Start Date9/16/85 |
| S/N | N/A | Specimen TempAmbient | _ , , , , , |
| GSI | No | | |
| Fest Title | Configuration No. 5 | Test No. 1
(Post-test) | Functional Test |
| High Pot | ential Test | , | |
| • Acceptan | ice Criteria: There sha | Il be no evidence of insulation | breakdown or flashover |
| | with a po | tential of 2200 VAC applied for | one minute. |
| | | | |
| Ca | ble | Test Points | Reading |
| 2 | AWG Triplex | 1 to 2 | 710 yA |
| | • | 1 to 3 | 700 MA |
| · | | l to Unistrut or Conduit | 820 MA |
| | - | 2 to Unistrut or Conduit | 850 MA |
| | ···· | <u>3 to Unistrut or Conduit</u> | 870 MA |
| | | 2 to 3 | 720 MA |
| 7/ | /C - 12 AWG | 1 to 4 | 2090 MA |
| | | l to Unistrut or Conduit | 780 MA |
| · | | 4 to Unistrut or Conduit | 820 MA |
| | | | |
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| | | · | |
| | | Tested By | <u>mar 17</u> Date: <u>9/16/</u> |
| | | Witness <u>M</u> | C Date: |
| otice of | <i>د</i> ا . | Sheet No. | ع of |
| nomaly | None | Approved | min 9/17/85 |

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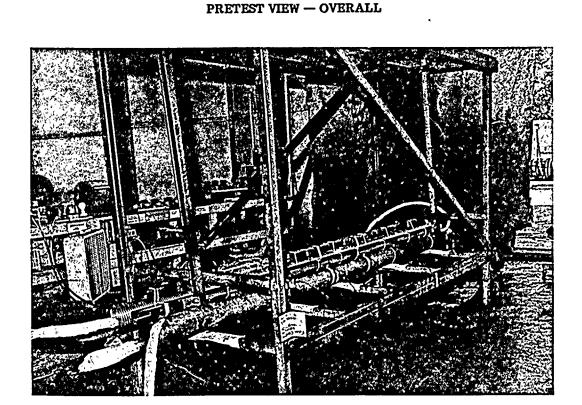
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APPENDIX II

CONFIGURATION NUMBER 5, TEST NO. 2, DATA

POST-TEST VIEW - OVERALL

PHOTOGRAPH VI-8



PHOTOGRAPH VI-7

CONFIGURATION NUMBER 5, TEST NO. 2

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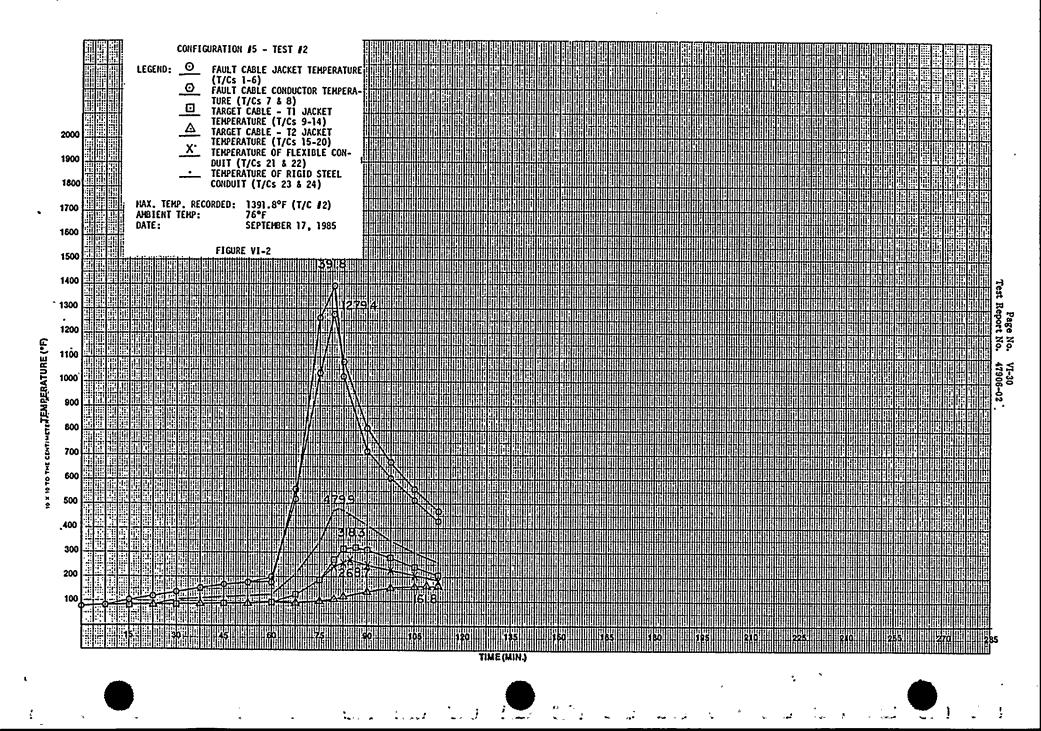
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CONFIGURATION NUMBER 5, TEST NO. 2

| Approximate
Test Time - | Approximate
Fault Cable
Jacket Temperature | Observation |
|----------------------------|--|-------------------------------------|
| 0 Min | 770F | Energized fault cable with 139A |
| 10 Min | 850F | Energized fault cable with 270A |
| 55.5 Min | 190°F | Fault cable conductor reached 190°F |
| 60.5 Min | 197 ⁰ F . | Energized fault cable with 908A |
| 64.3 Min | 380°F | Smoke visible |
| 67.4 Min | 515°F | Fault cable jacket rupturing |
| 79.4 Min | 1389°F | Open circuit |
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| Customer <u>Stone & Webster</u> | | WYLE LABORATORIES |
|-------------------------------------|-----------------------------------|-----------------------------|
| * Specimen <u>Cables</u> | | |
| Part No Various | Amb. Temp76°F | Job No47906 |
| SpecWLTP 47906-01 | Photo Yes | Report No 47906-02 |
| Para3.7.4 | Test MedAir | Start Date7//7/85 |
| S/NN/A | Specimen Temp. <u>Ambien</u> | t |
| GSINo | | |
| Test Title <u>Configuration No.</u> | | |
| Pre-test | -Post-test-PA | Functional Test |
| Insulation Resistance Test | | |
| Acceptance Criteria: Measu | red insulation resistance shall h | be greater than 1.6 megohms |
| with | a potential of 1000 VDC applied | for 60 seconds. |
| | | |
| Cable | Test Points | Reading |
| 2 AWG Triplex | 1 to 2 | 1.8 x10"-~ |
| | 1 to 3 | 2,4 × 10"~ |
| | 2 to 3 | 3.0 × 10"~ |
| | 1 to Unistrut or Conduit | 2.8 × 10"~ |
| | 2 to Unistrut or Conduit | t 2,8 x 10"-2 |
| | 3 to Unistrut or Conduit | t <u>26×10"</u> ~ |
| 7/C - 12 AWG | 1 to 4 | 4.5×10"2 |
| | 1 to Unistrut or Conduit | <u>د 3,5 x 10"مم</u> |
| | 4 to Unistrut of Conduit | t 2.2 × 10"~ |
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| - | Tested By | Date: 9/17/85 |
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| Customer _ | Stone & Web | oster | WYLE LABORATORIES |
|------------------|---------------------------------------|---------------------------------------|---------------------------------|
| Specimen _ | Cables | | |
| Part No. | Various | Amb. Temp | Job No 47906 |
| Spec | WLTP 47906- | | Report No. 47906-02 |
| ⁵ ara | | Test MedAir | Start Date_ 9//7/85 |
| S/N | N/A | Specimen Temp | Ambient |
| 3SI | No | | |
| Fest Title | Configurati | on No. 5 Test No. 2 | |
| | Pre-test | Post-test-Pa | Functional test |
| High Pot | ential Test | | |
| Acceptan | ce Criteria: | There shall be no evidence of in | sulation breakdown or flashover |
| • | | with a potential of 2200 VAC app | lied for one minute. |
| | | · · · · · · · · · · · · · · · · · · · | ,
 |
| Ca | ble | Test Points | Reading |
| 2 | AWG Triplex | 1 to 2 | 790 MA |
| | | 1 to 3 | 800 MA |
| | | 2 to 3 | 780 UA |
| | ····· | l to Unistrut or Condu | it 710 UA |
| | | 2 to Unistrut or Condu | it 690MA |
| ± | | 3 to Unistrut or Condu | it 710MA |
| 7/ | 'C - 12 AWG | 1 to 4 | ISSOMA |
| | | l to Unistrut or Condu | |
| | | 4 to Unistrut or Condu | it 710 MA |
| | · · · · · · · · · · · · · · · · · · · | | |
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| | | Tested B | y |
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| nomaly | None | Approved | - Marie 9/18/85 |

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|------------|---------------------------------------|------------|----------------|------------|---------------------------------------|-----------------------|------------|
| Specimer | n <u>Cables</u> | | | | | | |
| Part No | Various | Ar | nb. Tem | p. 76°E | Job | No. <u>47</u> | 906 |
| Spec | WLTP 47906-01 | Ph | 10to | 165 | | ort No. <u>47</u> | 906-02 |
| Para | 3.7,5 | Te | est Med. | Air | Sta | rt Date | 1/85 |
| S/N | N/A | Sp | becimen | TempAmb | pient | | |
| 3SI | No | - | | | | | |
| fest Title | Configuration No. 5 | Te | <u>st No.</u> | 2 | 0vercu | rrent Test | |
| 9. | Readings with rated curre | nt on f | ault ca | ble. | | | |
| | Target Cable | Vol
A-B | tage (V
8-C | AC) | Cur
Phase A | rent (amps
Phase B |)
Phase |
| | · · · · · · · · · · · · · · · · · · · | | | | | | |
| | 2 AWG Triplex | 579 | 577 | 571 | 42.0 | 41.4 | 39. |
| | 7/C - 12 AWG | 120.4 | | | 10.6 | | |
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| · | | | | | | | |
| | Fault Cable: 2/0 | AWG | TRIP | 1 FY | | | |
| | | | 1 10(1 1 | | | | |
| | Rated Current: | 137A | | | | | |
| | Measured Current: | 139 A | | | | | |
| | | | | | · · · · · · · · · · · · · · · · · · · | | |
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| | | | | Witness | More | Date: | |
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| Customer | Stone & Webster | | WYLE LABORATORIES |
|------------|---|---|--|
| | Cables | | |
| Part No | Various | Amb. Temp. <u>76° F</u>
Photo <u>Yes</u> | Job No 47906 |
| Spec | WLTP 47906-01 | Photo Yes | Report No47906-02 |
| Dara | · | Test Med Air | Start Date_ 9// 7/ 85 |
| 6/N | | | |
| GSI | No | | |
| fest Title | Configuration No. | 5 Test No. 2 | Overcurrent Test |
| 10. Incre | easing current to ra | ise fault cable temperature | to 189°F - 199°F |
| FAULT | T CABLE CURRENT | ELAPSED TIME | CONDUCTOR TEMP/CHANNEL |
| | 270 | 2730 | 190° F/3 |
| | ~ · · · · · · · · · · · · · · · · · · · | | |
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| | | | · · · · · · · · · · · · · · · · · · · |
| 12. Readi | ings after fault cab | le warmup to 189°F - 199°F | |
| | Fault_Cable_curren | | |
| | Conductor temperat | ture: 198°F | Channel No. 8 |
| | Max temp of
Channels 1-6 | 197° F Channel 3 | ····· |
| | | ······································ | |
| <u></u> | <u></u> | | |
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| | | Tested By
Witness | Enomao// Date: |
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| nomaly | Alone No. 4, | <u>No. 5</u> Approved | MALin 7/17/85 |

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| Customer | Stone & Webs | Ler | | | WY | LE LABORATO | RIES |
|---------------------------------------|--|--|--------------------------|---------------------------------------|---------------|---------------------------------------|------------|
| Specimen | Cables | | | | | | |
| Part No. | Various | | Amb. Temp | 76°F | Jo | b No479 | 06 |
| Spec | WLTP 47906-0 | | Photo | Yes | Re | port No479 | 06-02 |
| -
ara | 3.7.5 | | Test Med | Air | Sta | art Date_9/()/ | 28 |
| 5/N | N/A | | | emp. <u>An</u> | | | |
| 3SI | | | - | , | | | |
| fest Title | Configuration | <u>No. 5</u> | Test No. | 2 | | Overcurrent | Test |
| 14. Initi | al readings wi | th test curi | rent on fa | ult cable | : | | |
| Targe | t Cable | | Voltage (
-8 B-C | VAC)
A-C | Cu
Phase A | Phase B |)
Phase |
| | | | | | | | |
| 2 AWG | Triplex | 57 | 30.581 | 5 /5 | (4-8,7) | 37.3 | 37. |
| 7/C - | 12 AWG | 12 | -0.2 | | 10,5 | | |
| | | | | | | | |
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| | | | | | | | |
| Fault | Cable: | 2/0 AWG | <u>τ</u> ωιρι | | | | |
| | Cable: | 2/0 AWG | TRIPL | | | | |
| Test | | 2/0 AWG
BMC+39-A | <u> TILIPL</u>
- 908A | | | | |
| Tes t
-Rated | 102 | | - 908A | | | | |
| Tes t
-Rated | Current: | anc 139A | | | | | |
| Tes t
-Rated | Current: | anc 139A | - 908A | | | | |
| Tes t
-Rated | Current: | anc 139A | - 908A | | Thoma | Date: | 9/17/ |
| Tes t
-Rated | Current: | anc 139A | - 908A | 4 | Thomas | Date:
 | |
| Tes t
-Rated | .Ne.
Current:
red Current: | anc 139A | - 908A | A
Tested By | More | | 9/17/, |

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| Customer _ | Stone & Webster | | | WYLELABORA | TOBIES |
|--------------|--|---------------------------|---------------------------------------|-----------------|----------|
| Specimen _ | Cables | | | | |
| Part No | Various | Amb. Temp | 6°F | | +7906 |
| Spec | WLTP 47906-01 | Photo Ye | 5 | _ Report No | +7906-02 |
| Para | 3.7.5 | Test MedAi | r | _ Start Date_2/ | 17/85 . |
| S/N | N/A | Specimen Temp. | | _ | |
| GSI | No | • | | _ | |
| Test Title _ | Configuration No. 5 | Test No. 2 | 0 | vercurrent Tes | t |
| 16. 0 | pen circuit on fault cable: | 84
7 | · · · · · · · · · · · · · · · · · · · | ····· | |
| | Elapsed time: | · | 35 | | |
| | Maximum fault cable tem | | 392° F Ch | | |
| | | | | annel | |
| <u>17.</u> S | tablized temperature on fau | lt cable: | · | | |
| | Elapsed time (beginning | of 15-minute pe | riod): <u> </u> | 'A | |
| | Maximum fault cable tem | <u>perature:</u> | N/ | 4 | |
| | Fault cable current: | | N/ | | |
| | | • | /// | <u> </u> | |
| 18. 1 | gnition of fault cable: | | | • | |
| | Elapsed time: | | N/A | | |
| | Maximum fault cable tem | | N/A | | |
| | Fault cable current: | | N/A | | • |
| | rault cable current: | | <u>/v//A</u> | | |
| 20. R | test fragmentest fragmentest fragmentest | κ urrent applied u | ntil fault cal | ole open circu | its: |
| | | Voltage (VAC) | | Current (amp | |
| | - | <u>-9 8-C A-C</u> | Phase | | Phase |
| 2 | AWG Triplex 58 | 32 582 578 | 40, | 3 41.1 | 38, |
| 7 | /C - 12 AWG 12 | 20.1 | 10, | 4 | |
| | | | ted By | maoff Date | / / |
| lotice ci | 11 80 | - | et No | | st _4 |
| Anomaly | Alone No. 4, No. 5 | Acc | roved MAL | 9/18/8 | |

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Page No. VI-37 Test Report No. 47906-02

DATA SHEET

| Customer Stone & Webs | ster | | WYLE LABORA | TORIES |
|---------------------------------------|-----------------------|---|---------------------------------------|------------|
| Specimen <u>Cables</u> | | - / / • • - | | |
| Part No. Various | Amb. Ter | пр. <u>66°</u> F | Job No! | +7906 |
| WLTP 47906-0 | DI Photo | Yes | Report No ^l | +7906-02 |
| Para. 3.7.6 | Test Med | Air | Start Date_?/ | 18/85 |
| NN/A | | n Temp. <u>Ambient</u> | | |
| SINo | | | | |
| est Title <u>Configuration</u> | | | Functional | Test |
| Insulation Resistance | Test | | | |
| Acceptance [°] Criteria: | | esistance shall b | e greater than l | .6 megohms |
| | with a potential of l | 000 VDC applied f | or 60 seconds. | |
| | | | | |
| Cable | Test Po | oints | R | eading |
| 2 AWG Triplex | 1 to 2 | | 3.0 x | 1000-0 |
| <u></u> | 1 to 3 | | 1.8 | x 1010 ~ |
| | 2 to 3 | | 2.4 | ×1010-12 |
| | l to Ur | <u>istrut or Conduit</u> | 3.5 | ×10" |
| | 2 to Ur | nistrut or Conduit | 4.0 | × 1010 ~2 |
| | 3 to Ur | histrut or Conduit | 3, 9 | 5x10"1 |
| 7/C - 12 AWG | 1 to 4 | | , حک | 0×1010-5- |
| · · · · · · · · · · · · · · · · · · · | to Ur | nistrut or Conduit | 7. | 0×1010-2- |
| | <u> 4 to Ur</u> | <u>nistrut of Conduit</u> | | 2 X1000 |
| • | | | · · · · · · · · · · · · · · · · · · · | |
| otice of None | | Tested By
Witness
Sheet No.
Approved | Nomaoff Dat
Mre Dat | e: |

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Page No. VI-38 Test Report No. 47906-02 ****

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DATA SHEET

| Customer <u>Stone & Webster</u>
Specimen <u>Cables</u>
Part No. Various
Spec. WLTP 47906-01
Para. 3.7.6
SI <u>NO</u>
SI <u>NO</u>
SI <u>NO</u>
SI <u>Configuration No</u>
Pre-test Sa
High Potential Test | Amb. Temp. <u>66°F</u>
Photo <u>Yes</u>
Test Med. <u>Air</u>
Specimen Temp. <u>Ambien</u> | Report No. <u>47906-02</u>
Start Date <u>9/18/85</u> |
|---|--|---|
| | re shall be no evidence of insulat | |
| · · · · · · · · · · · · · · · · · · · | | |
| Cable | Test Points | Reading |
| 2 AWG Triplex | 1 to 2 | 760 MA |
| | 1 to 3 | 780 MA |
| | 2 to 3 | 740 uA |
| | l to Unistrut or Conduit | 900 MA |
| | 2 to Unistrut or Conduit | 870MA |
| | 3 to Unistrut or Conduit | 890 MA |
| 7/C - 12 AWG | 1 to 4 | 1610 MA |
| | l to Unistrut or Conduit | 690MA |
| | 4 to Unistrut or Conduit | 780 MA |
| | | |
| nice of None | Tested By
Witness
Sheet No
Approved | Momant Date: 9/18/
More Date:
2 Ot
Mring 9/18/85 |

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Test Report No. 47906-02

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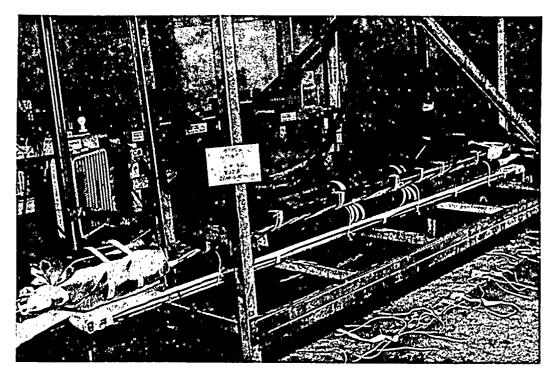
. نته نمبر .



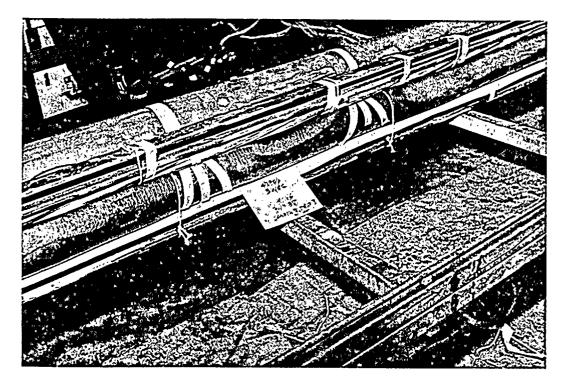
CONFIGURATION NUMBER 5, TEST NO. 3, DATA

Test Report No. 47906-02

CONFIGURATION NUMBER 5, TEST NO. 3



PHOTOGRAPH VI-9 PRETEST VIEW — OVERALL



PHOTOGRAPH VI-10

POST-TEST VIEW — CLOSE-UP OF 3-INCH ANACONDA FLEXIBLE CONDUIT CONTAINING THE FAULT CABLE

14.5 4741

> 4. 4.4

Test Report No. 47906-02

CONFIGURATION NUMBER 5, TEST NO. 3

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| Approximate
Test Time | Approximate
Fault Cable
Jacket Temperature | Observation |
|--------------------------|--|--|
| 0 Min | 67 ⁰ F | Energized fault cable with 139A |
| 10 Min | 74°F | Energized fault cable with 280A |
| 45 Min | 1780F | Energized fault cable with 270A |
| 50 Min | 189 ⁰ F. | Fault cable conductor reached 189 ⁰ F |
| 55 Min | 198°F | Energized fault cable with 908A |
| 58.3 Min | 375°F | Smoke visible |
| 61.6 Min | 5350F | Fault cable jacket rupturing |
| 75 Min | 1709°F | Open circuit |

CONFIGURATION #5 - TEST #3 Ο FAULT CABLE JACKET TEHPERATURE LEGEND: (T/Cs 1-6) FAULT CABLE CONDUCTOR TEMPERA-0 FAULT CABLE CONDUCTOR TEMPERA-TURE (T/CS 7 & 8) TARGET CABLE - TI JACKET TEM-PERATURE (T/CS 9-14) TARGET CABLE - T2 JACKET TEM-PERATURE (T/CS 15-20) TEMPERATURE OF FLEXIBLE COM-DUIT (T/CS 21 & 22) TEMPERATURE OF RIGID STEEL COM-DUIT (T/CS 23 & 24) Δ Ø Х 1758,6 MAX. TEHP. RECORDED: 1758.6°F (T/C 15) AMBIENT TEHP: 73°F September 17, 1985 DATE: FIGURE VI-3 111411 191027 囐 501.5 HTE

2000

1800

1700

1600

1500

1400

1300 . 1200

1100

CONTINUTE JEMPERATURE (*F)

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Page No. VI-42 Test Report No. 47906-02

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Page No. VI-43 Test Report No. 47906-02

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DATA SHEET

| Customer | Stone S Web | stern | | | WYLELAB | ORATORIES |
|--------------|---------------------------------------|--|------------------------|--------------------|---------------|----------------------------|
| Specimen | Cables | | | | | |
| Part No. | Various | | Amb. Temp. | <u>6607</u> | Job No | 47906 |
| Spec | WLTP 47906- | 01 | Photo | | Report No. | 47906-02 |
| Para | 3.7.4 | | Test Med. | Air | Start Date | 9-17-85 |
| S/N | N/A | | Soecimen Te | mp. <u>Ambient</u> | | |
| 3SI | No | | | | | |
| | | | | | | |
| | | on No. 5 | | | Supetic | onal Test |
| | Pre-test
Resistance | | ost-test- R | L | Function | |
| | | | | | l ha avaatar | abox 1.6 |
| Acceptance | Criteria: | measured in | sulation re | sistance shal | De greater | than 1.0 |
| | | megohms wit | h a potenti | al of 1000 VD | C applied for | 60 seconds |
| | | | ٠ | | | |
| Cable | | Т | est Points | | Reading | 9 |
| 2 AWG | Triplex | 1 | to 2 | | 3.5 x | 010- |
| | | 1 | to 3 | | | 1000 22 |
| | | 2 | to 3 | | | 10 ¹⁰ ~ |
| | | | | t or Conduit | | 1010 2 |
| | <u></u> | 2 | to Unistru | t or Conduit | | |
| | | 3 | to Unistru | t or Conduit | <u> </u> | 100 - |
| | · · · · · · · · · · · · · · · · · · · | | | | 3.5 | <i>۱۵^{٬٬٬} ۲۰</i> |
| | | | ····· | | | |
| <u>7/C -</u> | 12 AWG | 1 | to 4 | | 6.6) | : 10 ¹⁰ ~ |
| | | . 1 | to Unistru | t or Conduit | 4.0 | × 10'°~~ |
| | | 4 | to Unistru | t or Conduit | | × 1010_1- |
| | <u> </u> | | | | | |
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| | | | | | maoff_ | Date:///// |
| | | | | | nore !! | Date: |
| otice of | 11- | | | Sheet No | <u></u> | of |
| nomaly | None | | | Approved | King | 7/17/85 |

Alle #107, Ale Braz, Rey, 200, 32

Page No. VI-44 Test Report No. 47906-02

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| Stone & Web | ster | | | WYLE LABO | RATORIES |
|---------------------------------------|--|---|---|--|--|
| Cables | | | | | |
| Various | | Amb. Temo | 46°F | Job No. | 47906 |
| WLTP 47906- | 01 | • | Yes | | 47906-02 |
| 3.7.4 | | | Air | - | |
| N/A | | | | | |
| No | | opeciment | emp | | |
| Configuratio | | 2.44 | | ect | |
| ntial Test | • | | | | |
| e Criteria: | | | | | |
| | over with a | a potential | of 2200 VAC a | applied for on | e minute. |
| | | • | | | <u> </u> |
| <u> </u> | • | Test Points | | Reading | |
| Triplex | | | | 800 | u A |
| | | l to 3 | | 510 | MA |
| <u> </u> | | 2 to 3 | | 790 | MA |
| | | l to Unistr | ut or Conduit | 8 30 | MA |
| | _ <u>.</u> | 2 to Unistr | ut of Conduit | 820 | <u>и</u> А |
| · · · · · · · · · · · · · · · · · · · | | 3 to Unistr | ut or Conduit | 850 | MA |
| 12 AWG | | 1 to 4 | | 1590 | МА |
| | | l to Unistr | ut or Conduit | | |
| | | | | | MA |
| | | | | | |
| | <u></u> | ····· | Tested By | AA // | Date: <u>9//7/</u>
Date: |
| | | | Sheet No. | | of |
| | Cables
Various
WLTP 47906-(
3.7.4
N/A
No
Configuration
ntial Test
e Criteria:
Triplex | Various
WLTP 47906-01
3.7.4
N/A
No
Configuration No. 5
MLC
MLC
MLC
MLC
MLC
MLC
MLC
MLC | Cables Various Amb. Temp. WLTP 47906-01 Photo 3.7.4 Test Med. N/A Specimen T No Monocomment Configuration No. 5 Test No. Mathematical Test Mathematical Test e Criteria: There shall be no evi over with a potential Triplex 1 to 2 1 to 3 2 to 3 1 to Unistr 3 to Unistr 12 AWG 1 to 4 1 to Unistr | Cables Yarious Amb. Temp. <u>GG°F</u> WLTP 47906-01 Photo Yes 3.7.4 Test Med. Air N/A Specimen Temp. Ambient No Itst Med. Air Specimen Temp. Ambient Amb.Temp. Test No. 3 Configuration No. 5 Test No. 3 MLTP 47906-01 Itst Functional Test Configuration No. 5 Test No. 3 Multiple Itst Functional Test e Criteria: There shall be no evidence of insul over with a potential of 2200 VAC a Itst and the potential of 2200 VAC a Itst and the potential of 2200 VAC a Itst and the potential of 2200 VAC a Itst and the potential of 2200 VAC a Itst and the potential of 2200 VAC a Itst and the potential of 2200 VAC a Itst and the potential of 2200 VAC a Itst and the potential of 2200 VAC a Itst and the potential of 2200 VAC a Itst and the potential of 2200 VAC a Itst and the potential of 2200 VAC a Itst and the potential of 2200 VAC a Itst and the potential of 2200 VAC a Itst and the potential of 2200 VAC a Itst and the potential a <t< td=""><td>Cables With 47306-01 Amb. Temp. GC°F Job No. J.1.4 Test Med. Air Start Date NA Specimen Temp. Ambient Start Date NA Specimen Temp. Ambient Start Date NA Specimen Temp. Ambient Start Date No Itest No. 3 Start Date Configuration No. Test No. 3 Start Date Mathematical Test Mathematical Test Frest Functional Test Test No. configuration No. Test No. 3 Start Date Mathematical Test Mathematical Test Test Points Reading Triplex 1 to 2 800 1 to 3 Stor Triplex 1 to 2 800 1 to 3 Stor 2 to 3 790 1 to Unistrut or Conduit S 20 3 to Unistrut or Conduit 50 1 to 4 //S 90 12 AWG 1 to 4 //S 90 1 to Unistrut or Conduit 7/0 12 AWG 1 to 4 //S 90 1 to Unistrut or Conduit 7/0</td></t<> | Cables With 47306-01 Amb. Temp. GC°F Job No. J.1.4 Test Med. Air Start Date NA Specimen Temp. Ambient Start Date NA Specimen Temp. Ambient Start Date NA Specimen Temp. Ambient Start Date No Itest No. 3 Start Date Configuration No. Test No. 3 Start Date Mathematical Test Mathematical Test Frest Functional Test Test No. configuration No. Test No. 3 Start Date Mathematical Test Mathematical Test Test Points Reading Triplex 1 to 2 800 1 to 3 Stor Triplex 1 to 2 800 1 to 3 Stor 2 to 3 790 1 to Unistrut or Conduit S 20 3 to Unistrut or Conduit 50 1 to 4 //S 90 12 AWG 1 to 4 //S 90 1 to Unistrut or Conduit 7/0 12 AWG 1 to 4 //S 90 1 to Unistrut or Conduit 7/0 |

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Page No. VI-45 Test Report No. 47906-02

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DATA SHEET

| Customer | Stone & Webster | | | WYLE | LABORATORIES |
|------------|--------------------|----------------|--------------------|---------|--|
| Specimen | Cables | | | | |
| Part No | Various | Amb. T | emp. <u>73°F</u> | | lo47906 |
| Брес | WLTP 47906-01 | Photo | Yes | Repo | rt No47906-02 |
| Para | 3.7.5 | Test M | ed. <u>Air</u> | Start | Date 9/17/85 |
| 5/N | N/A | Specin | nen Temp. <u>A</u> | mbient | |
| 3SI | No | | | | |
| ïest Title | Configuration No. | 5 Test | No. 3 | 0v | ercurrent Test |
| 9. Readi | ngs with rated cur | rent on fault | cable | | ····· |
| Targe | t Cable | Volta
A-B B | ge (VAC)
-C A-C | | rent (amps)
Phase B Phase |
| | | | | | |
| 2 AWG | Triplex | <u> </u> | 16 571 | 39,0 | <u>42.0 40.</u> |
| 7/C - | 12. AWG | 120.6 | | 10.4 | ······································ |
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| | | · · · | | | |
| | Cable: 2/0 A | | | | |
| | 2/0 / | WE TRIPLE | -X | <u></u> | |
| | • • | 39 A | | | |
| measu | red Current: / | 39A | | | |
| | | | | | |
| | | | Teated R | Alleman | 1. 9/17/ |
| | | | Tested By | (Man | Date: _7//7/ |
| | | | Witness_ | | Date: |
| otice of | 0. | | Sheet No. | 1 | of4 |

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| Customer | Stone & Webster | | WYLE LABORATORIES |
|------------|-----------------------------|--|--|
| | Cables | | |
| Part No. | Various | Amb, Temp, 73°F | Job No47906 |
| Spec | 10 TO 1 TOO/ A1 | Photo Yes | Report No47906-02 |
| Para | 2 | Test Med Air | Start Date 9-17-85 |
| S/N | N/A | Specimen TempAmi | bient |
| GSI | No | | |
| Test Title | Configuration No. 5 | Test No. 73 APA | C Overcurrent Test |
| 10. Incre | asing current to raise f | ault cable temperatur | re to 189°F - 199°F |
| FAULT | CABLE CURRENT | ELAPSED TIME | CONDUCTOR TEMP/CHANNEL |
| | 280A | 2100 sec | 178°F/4 |
| | 270A | 300 sec | 189°F/4 |
| 12. Readi | ngs after fault cable wa | rmup to 189°F - 199°F | |
| · · · · · | Fault_cable_current: | 270A | |
| | Conductor temperature: | 173°F | Channel No. 7 |
| ••••••• | Max temp of
Channels 1-6 | 198°F Chan | nel 4 |
| | | | |
| otice of | Alone No. 4 No. 5 | Tested By.
Witness
Sheet No.
Approved . | Mme Date: 9/17/8
Mme Date: 9/17/8
Date:
Of
9/19/85 |

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DATA SHEET

| Customer | Stone & Webster | | | WYLELA | BORATORIES |
|-------------------|--------------------|------------------|---------------------------------------|--------------------|--|
| Specimen 🔔 | Cables | | | | 1700/ |
| Part No. | Various | Ать. Т | emp. <u>73° F</u> | Job No. | 47906 |
| Spec | WLIF 4/300-01 | Photo | 165 | Report N | o. <u>47905-02</u> |
| Para | | Test M | ed. <u>Air</u> | Start Da | te 9-/7-85 |
| S/N | N/A | Specin | nen Temp. <u>Am</u> t | <u>pient</u> | |
| GSI | No | | | • | |
| | Configuration No. | | | | current Test |
| 14. Initi | al readings with t | | | ···· | |
| Tarce | t Cable | Voltag
A-B B- | ge (VAC)
-C A-C | Current
Phase A | (amps)
Phase B Phas |
| | | | | | $\frown \land$ |
| 2 AWG | Triplex | 578. 5 | 80 5 15 | (22.3) | (50.0) (52 |
| 7/C - | 12 AWG | 120.7 | | 10.5 | ······································ |
| | | | · · · · · · · · · · · · · · · · · · · | | |
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| | | . <u></u> | | | |
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| | | | | | |
| | | | | | |
| | ······ | | | <u> </u> | |
| | Cable 2/0 | AWG TRIPLE | x | | |
| MAL Test
Rated | + Current: | 908 A | | | ····· |
| Measu | ured Current: | 908 A | | | <u> . </u> |
| lotice of | | | Tested By
Witness
Sheet No | Komaoff
More | Date: <u>9//7</u>
Date:
Date: |
| | No. 4, No. 5 | | | | |

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DATA SHEET

| Customer _ | Stone & Webster | | | w | YLE LABOR | TOBIES |
|--------------|---------------------------|-----------------|-----------------|----------------|--|-------------|
| Specimen . | Cables | | | | | |
| Part No. | Various | Amb. Ten | np. <u>73°F</u> | Jo | b No. | 47906 |
| Spec | WLTP 47906-01 | Photo | Yes | Re | port No. | +7906-02 |
| Para | 3,7.5 | Test Med | Air | St | art Date 7 | -/7-85 |
| S/N | N/A | Specime | n TempA | | i | |
| GSI | No | | • | | | |
| Test Title _ | Configuration No, | 5 Test No | . 3 | Overo | urrent Tes | t |
| 16. (| Open circuit on fault c | able: | | | | |
| | Elapsed time: | | · 1202 3 | -e C | | |
| | Maximum fault cabl | | 17590 | | .10 | ···· |
| | | | 11570 | F (hai | mels | |
| 17. S | stablized temperature o | n fault cable: | | | | |
| | Elapsed time (begin | nning of 15-min | ute period) | : <u>н /</u> д | | |
| | Maximum fault cable | e temperature: | | NIA | | |
| | Fault cable curren | | | | | |
| •
• | | | | N/A | | |
| 18. 1 | gnition of fault cable | : | | | <u> . </u> | |
| • | Elapsed time: | | | N/A | | |
| | ····· | | | | | |
| | Maximum fault cable | e temperature: | | N/A | | |
| | Fault_cable_current | t: | | N/A | | |
| 10 9 | test | grac | | | | |
| <u>19.</u> R | eadings after let through | agn current app | fied until i | rault cable | open circu | its: |
| | | Voltage (| | | rrent (amp: | |
| | arget Cable | <u> </u> | A-C | <u>Phase A</u> | Phase 8 | Phase |
| 2 | AWG Triplex | 577 577 | 574 | 38,9 | 39.3 | 37,1 |
| | | | | | | |
| 7 | /C - 12 AWG | 119.9 | - | 10.5 | | |
| | | | | T. | | |
| | | | Tested By | Alomat | Date | 9/17/8 |
| | | | Witness_ | C nore | Date | · · · · · · |
| otice of | Alone No. 4 | | Sheet No. | | 9/17/8 | |
| 01100 01 | // h4 X | | | | | |

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DATA SHEET

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| Customer | Stone & Web | ster | WYLE LABORATORIES |
|-------------|-------------|--------------------------------|-------------------------------|
| Specimen | Cables | | |
| Part No. | Various | Amp Temp $73^{\circ}F$ | Job No 47906 |
| Spec | WLTP 47906- | 01 Photo Yes | Report No. 47906-02 |
| Para | 3.7.6 | Test Med | Start Date9-17-85 |
| 5/N | N/A | Specimen TempAr | |
| GSI | No | | |
| | | A. | |
| | | on No. 5 Test No. 3 | |
| | Pre-test & | | Functional Test |
| | Resistance | Measured insulation resistance | |
| Ассертансе | criteria: | | shall be greater than 1.0 |
| | | megohms with a potential of 10 | 00 VDC applied for 60 seconds |
| ····· | T 1 | | |
| Cable | | Test Points | Reading |
| 2 AWG | Triplex | 1 to 2 | 1.0 ×10" ~ |
| | | 1 to 3 | 1.6 × 10" ~ |
| | | 2 to 3 | 1.3 × 10" - |
| | | l to Unistrut or Con | duit 1.7 × 10"- |
| | | 2 to Unistrut or Con | duit 1.6 x 10"-r_ |
| | | 3 to Unistrut or Con | duit 1.3 × 10"-~ |
| 7/0 - | 12 AWG | 1 to 4 | |
| //0 - | 12 AWG | 1 to Unistrut or Con | 3.0 × 10"~~ |
| | | 4 to Unistrut or Con | 210 770 |
| | | | <u>auit 1.7 x 10" ~~</u> |
| | | | |
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| | • | | 1942 0/17/ |
| | | Tested By | |
| | | Witness - | Date: |
| otice of | None | Sheet No. | MKing 9/17/85 |

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| Customer | Stone & Web | ster | | | WYLE LABORATORIES |
|------------------|--------------|--|----------------------|---------------------------------------|------------------------|
| Specimen _ | Cables | | | | |
| Part No. | Various | | Amb. Temp | _73° F | Job No 47906 |
| Spec | WLTP 47906- | 01 | Photo | | Report No47906-02 |
| Para | 3.7.6 | | Test Med | | Start Date9-17-89 |
| S/N | N/A | ······································ | Specimen T | | |
| GSI | No | | · | · | |
| Test Title | Configuratio | on No. 5
Post-Test | Test No.
Function | | APAC . |
| High Pote | ential Test | | | | |
| Acceptanc | ce Criteria: | There shall | be no evi | dence of insula | ation breakdown or fla |
| · <u>·</u> ····· | | over with a | potential | of 2200'VAC a | pplied for one minute |
| Cable | | `` | est Points | | Reading |
| | 3 Triplex | | to 2 | • | |
| 2 ANG | 1 mprex | | to 3 | | 780 MA |
| | | · · · | | | 790 MA |
| | | 2 | to 3 | · · · · · · · · · · · · · · · · · · · | 770 MA |
| | | 1 | to Unistr | ut or Conduit | 920 MA |
| | | 2 | to Unistr | ut of Conduit | 890 MA |
| | | 3 | to Unistr | ut or Conduit | 900 JU A |
| 7/C - | - 12 AWG | 1 | to 4 | | 1550 MA |
| | | 1 | to Unistr | ut or Conduit | 550 MA |
| | | | | ut or Conduit | 610 MA |
| •
 | ······ | | | | |
| | | · · · · | | Tested By | Demail Date: 9// |
| lotice of | None | | | Sheet No | 2 of 2
Kinz 9/17/85 |

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CONFIGURATION NO. 6 TESTS (Separation Inside Control/ Instrument Cabinets)

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Test Report No. 47906-02

SECTION VII

CONFIGURATION NUMBER 6 TESTS (PANEL INTERNAL SEPARATION TEST FOR CONTROL AND INSTRUMENT CABLES)

- 1.0 REQUIREMENTS
- **1.1** Acceptance Criteria
- **1.1.1** Insulation Resistance Test

Insulation resistance on all "target cables"* shall be greater than 1.6 x 10^6 ohms with a potential of 1000 VDC (500 VDC 2/C 16 AWG cables) applied for 60 seconds.

1.1.2 High Potential Test

There shall be no evidence of insulation breakdown or flashover with a potential of 2200 VAC (1600 VAC for 2/C 16 AWG cables) applied for one minute.

1.1.3 Cable Continuity Test

Energized target specimens shall conduct 100% of SWEC-rated currents (see table below) at 575 VAC (120 VAC for control cables and 50 VAC for instrument cables) before, during, and after the overcurrent test.

| Cable
<u>Size</u> | No.
Conductors | SWEC
LD. No. | Cable
<u>Type</u> | Voltage | Rated
Current |
|----------------------|-------------------|-----------------|----------------------|---------|------------------|
| 1/0 AWG | Triplex | NJM-34 | \mathbf{L} | 575 | . 139 |
| 2 AWG | Triplex | NJM-25 | K | 575 | 38.5 |
| 12 AWG | 7 | NJN-37 | С | 120 | 10 |
| 16 AWG | 2/C | NJP-05 | X | 50 | 1 |
| 12 AWG | 5 | NJN-36 | С | 120 | 10 |
| 12 AWG | 2 | NJN-34 | С | 120 | 10 |
| 14 AWG | 1 | NAF-52 | Ċ | 120 | 10 |

1.1.4 <u>Tolerances</u>

All target cable voltages specified in this procedure shall be maintained within a $\pm 3\%$ tolerance. The initial setting of target cable currents (with rated current on the fault cable) shall have a tolerance of $\pm 10\%$, 0%. Thereafter, all target cables' currents shall be maintained within a $\pm 10\%$ tolerance.

All fault cable currents shall be maintained within a $\pm 3\%$ tolerance, if possible.

*

The term "target cable" refers to energized and monitored nonfault cables used in this program.

Test Report No. 47906-02

2.0 PROCEDURES

2.1 Test Specimen Preparation

The test assembly was manufactured in accordance with Figure 15 by Wyle technicians. The following guidelines were observed with regard to the materials and construction of the assembly:

1. The cable and terminal blocks inside the enclosure were from NMP2 stock. The enclosure was provided by Wyle Laboratories. ł

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- 2. The ends of the faulted cable were wrapped from their connection to the Multi-Amp Test Set to the enclosure. This wrap consisted of a single layer of HAVEG Siltemp WT-65 covered with a single layer of 3M No. 69 glass tape. This wrapping was done to ensure that any ignition that occurred was contained within the enclosure.
- 3. All nonfaulted conductors in the 5/C cable were connected in series as shown in Figure 16 of Section VIII. This circuit was designated Target Conductor Loop No. 1.
- 4. Both conductors in the 2/C cable were connected in series as shown in Figure 16 of Section VIII. This circuit was designated Target Conductor Loop No. 2.
- 5. Photographs were taken of the test setup prior to the test.

2.2 Instrumentation Setup

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2.2.1 Thermocouple Locations

A total of 18 Type "K" thermocouples were utilized for this test. These thermocouples were mounted as described below:

| Channel No. | Location |
|-------------|---|
| 1 & 2 | Mounted to the jacket of the 5/C 12 AWG cable. |
| 3 | Mounted to the jacket of the faulted conductor of the 5/C 12 AWG cable. |
| 4 & 5 | Mounted to the jacket of the faulted 1/C 14 AWG Type SIS cable. |
| 6 & 7 | Mounted to the jacket of the 2/C 12 AWG cable. |

Test Report No. 47906-02

2.0 PROCEDURES (Continued)

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- 2.2 Instrumentation Setup (Continued)
- 2.2.1 Thermocouple Locations (Continued)

| Channel No. | Location |
|-------------|--|
| 8 | Mounted to the jacket of the nonfaulted conductor of the $5/C$ 12 AWG cable. |
| 10-16 | Mounted to the jacket of the nonfaulted $1/C$ 14 AWG Type SIS cable. (Channels 10-14 on 5-conductor bundle. Channels 15 and 16 on 2-conductor bundle.) |
| 17 | Mounted to the faulted bare conductor of the 5/C 12 AWG cable. |
| 18 | Mounted to the faulted bare conductor of the $1/C$ 14 AWG Type SIS cable. |

2.2.2 Electrical Monitoring

The voltage and current of each target conductor loop and the faulted conductor current were fed into an oscillograph recorder. The oscillograph was operated at the 0.1-inch per minute rate throughout the overcurrent test. The oscillograph channels were as specified in the following table.

| Channel No. | Signal | Location | | |
|-------------|---------|-----------------------------|--|--|
| 1 | Current | Target Conductor Loop No. 1 | | |
| 2 | Voltage | Target Conductor Loop No. 1 | | |
| 3 | Current | Target Conductor Loop No. 2 | | |
| 4 | Voltage | Target Conductor Loop No. 2 | | |
| 5 | Current | Faulted Conductor Loop | | |

A digital multimeter was utilized to measure the phase voltage and current of each target conductor loop prior to, and after the application of the 100 ampere current.

2.3 Baseline Functional Tests

The baseline functional tests consisted of insulation resistance and high potential measurements on both target conductor loops.

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Test Report No. 47906-02

- 2.0 PROCEDURES (Continued)
- 2.3 Baseline Functional Tests (Continued)
- 2.3.1 Insulation Resistance Test
 - 1. All power and instrumentation leads from both target conductor loops were disconnected and labeled per Figure 16 of Section VIII.
 - 2. Using a megohmmeter, a potential of 1000 VDC was applied and the minimum insulation resistance indicated after a period of 60 seconds between the following test points was recorded:

| | Target Conductor Loop No. 1 | | |
|-------------|-----------------------------|--------------------------------------|---|
| | Phase-to-Phase | Phase-to-Ground | , |
| | 1-1 to 1-2 | 1-1 to enclosure
1-2 to enclosure | |
| œ́. | Target Conductor Loop No. 2 | | |
| ж. | Phase-to-Phase | Phase-to-Ground | |
| ,* - | 3-1 to 3-2 | 3-1 to enclosure
3-2 to enclosure | |
| • | | | |

For all performances of this test, the measured values were compared to the acceptance criteria, Paragraph 1.1.1.

2.3.2 High Potential Test

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1. Using a Hi-Pot Test Set, a potential of 2200 VAC was applied from each conductor to ground for a period of one minute.

| Target Cond | luctor | Loo | p No. 1 | L | | | | | | |
|--------------|--------|---------------|---------|------------------------|----------|------------------------|------|----------|----|----|
| | Phase | -to- | Phase | | Phas | e-to-Gro | und | | | |
| | 1-1 | . to : | 1-2 | | | to enclos
to enclos | | | | |
| Target Con | ductor | Loo | p No. 2 | 2 | | | | | | |
| | Phase | -t o - | Phase | | Phas | e-to-Gro | und | | | |
| 3–1 to 3–2 | | | | to enclos
to enclos | | | | | | |
| performances | of t | his | test. | the | measured | values | were | compared | to | tł |

For all performances of this test, the measured values were compared to the acceptance criteria, Paragraph 1.1.1.

Test Report No. 47906-02

2.0 **PROCEDURES** (Continued)

2.4 Overcurrent Test

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The overcurrent test was conducted in two sequential steps with no intentional time delay. The first phase consisted of energizing all the conductors with 10 amperes for 15 minutes. The second phase consisted of energizing the fault conductor loop with 100 amperes for a period of 11 seconds.

Each target conductor loop conducted 10 amperes at 120 VAC throughout the overcurrent test. The overcurrent test was conducted using the following procedure:

- 1. The fault conductor loop was connected to the Multi-Amp Test Set per Figure 16 of Section VIII.
- 2. The target conductor loops were connected to the instrumentation and power supplies of Figure 15 of Section VIII.
- 3. Each target conductor loop was energized with 10 amperes at 120 VAC.
- 4. The fault conductor loop was energized with 10 amperes from the Multi-Amp Test Set.
- 5. The voltage and current of each target conductor loop and the fault conductor loop current were recorded.
- 6. The 10 ampere current on the fault conductor loop was maintained for 15 minutes.
- 7. The fault conductor loop was energized with 100 amperes for a period of 11 seconds. The fact that neither an open circuit nor ignition occurred was recorded.
- 8. The voltage and current of each target conductor loop were recorded.
- 9. Each thermocouple temperature that occurred at the following points in the overcurrent test was recorded:
 - a. At the beginning of the 15-minute period of application of 10 amperes on the fault conductor loop.
 - b. At the end of the 15-minute period of application of 10 amperes on the fault conductor loop.
 - c. At the end of the 11-second period of application of 100 amperes on the fault conductor loop.

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Test Report No. 47906-02

2.0 **PROCEDURES** (Continued)

- 2.4 Overcurrent Test (Continued)
 - 10. Thermocouple readouts on the datalogger were observed until all temperatures were decreasing.
 - 11. The target conductor loops were de-energized.
 - 12. The enclosure was opened and the observed condition of the conductors was recorded.
 - 13. Photographs were taken of the post-test condition.

For the performance of this test, the observed operation of the target conductor loops were compared to the acceptance criteria, Paragraph 1.1.3.

2.5 Post-Overcurrent Test Functional Test

The functional tests of Paragraph 2.3 were repeated.

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Test Report No. 47906-02

3.0 RESULTS

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Configuration Number 6, Test No. 1 of cables and bundled, insulated conductors terminated on terminal blocks inside an enclosure, was conducted per Paragraph 2.0 and successfully met the requirements of Paragraph 1.0. The fault current of 100 amperes was applied for 11 seconds. No ignition occurred and the faulted conductor loop did not open circuit. After application of the 100-ampere fault current for 11 seconds, the maximum observed temperature (of jacket or insulation) on the faulted conductor loop was 128.1°F which occurred on Thermocouple No. 18.

The capabilities of the target conductors to conduct SWEC-rated current (10 amperes) at 120 VAC was not impaired during this test. The maximum observed temperature on Target Conductor Loop No. 1 was 115.5°F and occurred on Thermocouple No. 16. The maximum observed temperature on Target Conductor Loop No. 2 was 90.5°F which occurred on Thermocouple No. 15. All target conductors successfully completed the Post-Overcurrent Test Functional Test.

Appendix I contains the following data from this test:

- 1. Photographs VI-1 and VI-2 which show pretest and post-test conditions.
- 2. A narrative of the test which relates test time, conductor temperatures, and important events.
- 3. Data Sheets which contain Baseline Functional Test data, Overcurrent Test data, and Post-Overcurrent Test Functional Test data.

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Test Report No. 47906-02

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Page No. VII-9 Test Report No. 47906-02

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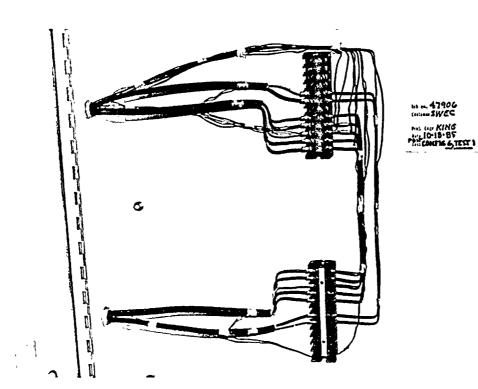
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APPENDIX I

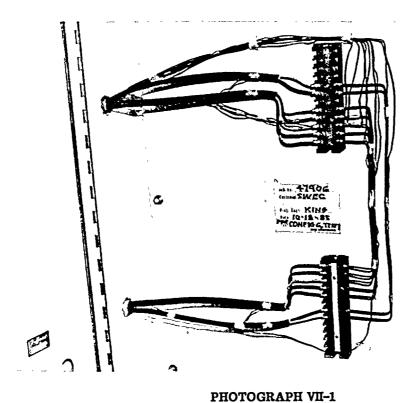
CONFIGURATION NUMBER 6, TEST NO. 1, DATA

PHOTOGRAPH VII-2

POST-TEST VIEW



PRETEST VIEW



CONFIGURATION NUMBER 6, TEST NO. 1

Test Report No. 47906-02

Page No. VII-10

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Test Report No. 47906-02

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CONFIGURATION NUMBER 6, TEST NO. 1

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| Approximate
Test Time | Approximate
Fault Cable
Jacket Temperature | Observation |
|--------------------------|--|--|
| 0 Min | 690E | Energized fault conductor loop with 10A |
| 15 Min | 930F | Energized fault conductor loop with 100A |
| 15 Min, 11 Sec | 116°F | End of required 11 second period with 100A |

Page No. VII-12 Test Report No. 47906-02

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DATA SHEET

| Customer Stone & V | lebster | | | WYLE LABO | RATORIES |
|---------------------------------------|---------------|---------------------------------------|--------------------|---------------|------------------|
| SpecimenCables | | | | | |
| Part No. Various | | Amb. Temp. | 73°F | Job No | 47906 |
| Spec. WLTP 47906-0 | 01 | Photo | Yes | Report No | 47906-02 |
| Para3.8.4 | ···· | _ Test Med | Air | Start Date | 10/18/85 |
| S/NN/A | | _ Specimen Te | mp. <u>Ambient</u> | | |
| GSINo | | - | | | |
| Test Title <u>Con fi gur</u> | ration 6, Tes | st No. 1
-Post-Tost-Be | | Functional | Tast |
| INSULATION RESISTANCE | / | | 4 | | |
| Acceptance Criteria: | | sulation resis | stance shall be | greater than | <u>יייי</u>
ו |
| | 1.6 megor | ms with a pote | ential of 1000 | VDC applied | for |
| | 60 seconds. | | | | |
| | | · · · · · · · · · · · · · · · · · · · | | | <u> </u> |
| CABLE | <u>T</u> E | ST POINTS | | REA | AD ING |
| Target Conductor Loop | No. 2 1- | •l to 1-2 | | 2,2 | -X109 |
| | 1- | l to Enclosure | • | | XIO8 |
| | | 2 to Enclosure | • | | X109 |
| Target Conductor Loop | No. 21 3- | 1 to 3-2 | | | x 108 |
| | 3- | l to Enclosure | • | | × 10 3 |
| | 3- | 2 to Enclosure | | 7,6 | X 108 |
| HIGH POTENTIAL TEST | | | • | | |
| Acceptance Criteria: | There shall | be no evidenc | e of insulatio | n breakdown c | or flashover |
| | with a pote | ential of 2200 | VAC applied fo | r one minute. | |
| CABLE | | ST POINTS | | REA | DING |
| Target Conductor Loop | | l to 1-2 | | 26 | ЗИА |
| | | 1 to Enclosure
2 to Enclosure | | | о MA
Z MA |
| Target Conductor Loop | gp - | 1 to 3-2 | • | | оцА |
| | | l to Enclosure | | 36 | SUR |
| | 3- | <u>2 to Enclosure</u> | · | <u>ວະ</u> | 2-11 A |
| · · · · · · · · · · · · · · · · · · · | <u> </u> | | Tested By | madli | Date: 10/18/85 |
| | | | Witness (| | Date: |
| Notice of | | | Sheet No. | 1 | of |
| Anomaly <u>None</u> | | | Approved | P. King 10 | 118/85 |
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Page No. VII-13 Test Report No. 47906-02

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DATA SHEET

| Customer <u>Stone & Webster</u> | ····· | | WYLE LAP | ORATORIES |
|-------------------------------------|--------------------------|----------------------|--|----------------|
| specimen <u>Cables</u> | | | | 47000 |
| art No. Various | • | | Job No | |
| Spec. <u>WLTP 47906-01</u>
3.8.5 | | <u>Yes</u>
Air | Report No
Start Date | 4/906-02 |
| Para | Test Med
Specimen Ten | n Ambie | ent | |
| SSI No | | ·p | | |
| est Title Configuration No. 6, | Test No. 1 | 0\ | vercurrent Test | |
| 5. Readings immediately after | energizing the | fault condu | ictor loop and | the nonfaulte |
| conductor loop. | | | s | |
| | VOLTA | 38 | | , |
| Target Conductor Loop No. 1 | 121,1 | | 10.14 | |
| Target Conductor Loop No. 2 | | 6 | 10.26 | |
| Faulted Loop | N/A | | 10,4 | |
| 7. Reading after energizing t | he fault conduct | or loop wit | h 100 amperes | for 11 second: |
| Elapsed time to open ci | rcuit: N/A | ····-· | | |
| Elasped time to ignitio | n: N/A | | · ···································· | |
| Length of burning perio | d: N/A | بر | | |
| 8. Reading after energizing t | he fault conducto | or loop wit | h 100 amperes | for 11 second: |
| | VOLTA | <u>3E</u> | CURRENT | |
| Target Conductor Loop No. 1 | 121.8 | | . 10.37 | |
| Target Conductor Loop No. 2 | 121.3 | 5 | 10.43 | |
| | | | | ···-· |
| | | | • | |
| | | | | |
| | | Fested By | Romaoff | Date: 10/18/1 |
| atlas af | , | Witness | ~ More / | Date: |
| otice of <u>Nou e</u> | | Sheet No
Approved | John D. Kin | 01
10/18/85 |

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Page No. VII-14 Test Report No. 47906-02

DATA SHEET

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| Customer | Stone & W | euster | | | WYLE LABO | RATORIES |
|------------|----------------------|---------------------------------------|---------------|--------------------|---------------|-------------------|
| Specimen | Cables | | <u> </u> | ~~~- | | 1.7004 |
| Part No | Various
WLTP 4790 | <u>-01</u> | Amb. Temp | <u>75°F</u>
Yes | Job No. | 47906
47906-02 |
| pec | | | Photo | | Report No | |
| ara | 3.8.5
N/A | · · · · · · · · · · · · · · · · · · · | Test Med. | A | . Start Date_ | 10-18-85 |
| 5/N | No | | Specimen Terr | ip | • | |
| ası | 01 | | | | | |
| est Title | Configura | tion No. 6, Te | est No. 1 | Overcur | rent Test | |
| 9. Tempe | ratures | · · · · · · · · · · · · · · · · · · · | | | | |
| THERMOCO | | BEGINNING OF | -,15- | END OF 15 MIN. | | ID OF 11 SEC |
| <u>NO.</u> | | MIN. PERIOD | <u>(9a)</u> | PERIOD (96) | PE | <u>RIOD (9c)</u> |
| 1 | | 83.6°F | | 85.1°F | 8 | 34,4 |
| 2 | | 81.0 | | 83, 1 | | 82.9 |
| 33 | | 79.8 | | 83.2 | | 91.1 |
| 4 | | 81.0 | | 85.2 | | 93.5 |
| 5 | | <i>8</i> 7.1 | | 93.3 | 1 | 15.5 |
| 6 | | 80.8 | • | 81.5 | | 81.1 |
| | | 80.0 | | 80.7 | | 80.8 |
| 8 | | 85.1 | | 87.1 | | 94.7 |
| 10 | | 82.7 | | 83.9 | | 86.5 |
| 11 | | 88.8 | | 91.8 | | 93.2 |
| 12 | | 89.1 | | 91.7 | » | 93.4 |
| 13 | | 91.3 | | 94.0 | | 94.0 |
| 14 | | 88.8 | | 93.3 | | 93.0 |
| | | 88.7 | | 89.2 | | 88.6 |
| 16 | | 91.0 | | 91.5 | | 90.5 |
| 17 | | 97.5 | <u> </u> | 100.1 | | 15.4 |
| 18 | | 92.0 | | 96.8 | 1. | 28.1 |

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None

Page No. VII-15 Test Report No. 47906-02

DATA SHEET

| Customer Stone & Webster | | | WYLE LABORATORIES |
|---|---------------------|--|---|
| SpecimenCables | | | |
| Part No. Various | Amb. Temp | <u>75°F</u> | Job No47906 |
| Spec. WLTP 47906-01 | Photo | Yes | Report No. <u>47906-02</u> |
| Para3.8.5 | Test Med | Air | Start Date |
| 6/NN/A | Specimen Ter | 8 | nt |
| SINo | | ···• | |
| est Title Configuration No. 6, T | est No. 1 | 0ve | rcurrent Test |
| 12. Observed condition of cond | uctors. | _ | |
| 12. Observed condition of cond
Conductors appea
There were no a
prefest condit | TO be
ared in an | 'as new | " condition. |
| There were no a | apparent c | haveres | from the |
| Deefect coulit | 10. | | |
| prenes: conari | 10M, . | | · <u>· · · · · · · · · · · · · · · · · · </u> |
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| | | | 1.1.1 |
| | | Tested By | Date: 19/0/0 |
| | | Witness | Monell Date: |
| otice of | | Sheet No | |
| nomaly None | | Approved | . Tf. Kings 10/18/85 |

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DATA SHEET

| Customer Stone & Webster | <u></u> | | WYLE LABORATORIES |
|---|---------------------------------------|---------------------|---------------------|
| SpecimenCables | | 4 - | |
| Part No Various | Amb. Temp. | 75°G | Job No 47906 |
| SpecWLTP 47906-01 | Photo | Yes | Report No 47906-02 |
| Para3. %. 6 | Test Med | Air | Start Date/0/_/8/8/ |
| S/NN/A | Specimen Te | emp. <u>Ambient</u> | |
| GSI No | | - | |
| Test Title Configuration 6, | | | |
| Pre-Test Ch | Post-Test |) | Functional Test |
| INSULATION RESISTANCE TEST | | | |
| Acceptance Criteria: Measure | d insulation resi | stance shall be | e greater than |
| 1.6 ന | egohms with a pot | ential of 1000 | VDC applied for |
| 60 seco | nds. | | |
| | · · · · · · · · · · · · · · · · · · · | | |
| CABLE | TEST POINTS | | READING |
| Target Conductor Loop No. 72 | 1-1 to 1-2 | | 1.8 x 109 ~ |
| • • | 1-1 to Enclosur | e | 2.0× 109 2 |
| | 1-2 to Enclosur | e | 2.0×10 2 |
| Target Conductor Loop No. \mathcal{Z}_1 | 3-1 to 3-2 | | 9.4×108 2 |
| · · · · · · · · · · · · · · · · · · · | 3-1 to Enclosur | e | 1.2× 10 2 |
| , | 3-2 to Enclosur | e | 1.3 × 10° 2 |
| HIGH POTENTIAL TEST | | | |
| Acceptance Criteria: There s | | | |
| with a | potential of 2200 | VAC applied for | or one minute. |
| CABLE | TEST POINTS | <u></u> | READING |
| Target Conductor Loop No. X2 | 1-1 to 1-2 | | 271 MA |
| | 1-1 to Enclosur | | н |
| | 1-2 to Enclosur | e | 239 UA |
| Target Conductor Loop No. z_1 | 3-1 to 3-2 | 500 MA | 252UA |
| | 3-1 to Enclosur | e | 430×A |
| | 3-2 to Enclosur | <u>e</u> | <u>42.0 µ.A</u> |
| L <u></u> | | | |
| | | Tested By | |
| | | Witness | Date: |
| Notice of Non a | | Sheet No. | ling 10/18/85 |
| AnomalyNone | . | Approved | 10/18/85 |

Wyle Form WH 614A, Rev, APR '84

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WYLE LABORATORIES' TEST PROCEDURE NO. 47906-01, REVISION A

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TEST PROCEDURE

SCIENTIFIC SERVICES

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LABORATORIES GROUP

Page No. · VIII-1 Test Report No. 47906-01

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TEST PROCEDURE NO. 47906-01

DATE: <u>August 14, 1985</u> Revision A — 11/04/85

ELECTRICAL RACEWAY SEPARATION VERIFICATION TESTING FOR THE STONE AND WEBSTER ENGINEERING CORPORATION FOR USE IN NIAGARA MOHAWK POWER CORPORATION NINE MILE POINT NUCLEAR STATION — UNIT 2

APPROVED BY **PROJECT MANAGER** F. R. Johnson **APPROVED BY** QUALITY ENGINEER: PREPARED BY **PROJECT ENGINEER:**

REVISIONS

(jmk)

FORM 1054-1 Rev. 4/74

| REV. NO. | DATE | PAGES AFFECTED | BY | APP'L. | DESCRIPTION OF CHANGES |
|----------|----------|---------------------|-----|----------------|-----------------------------------|
| A | 11/04/85 | All pages indicated | JPK | 200× 11/6/85 | Incorporate IPR-1 & IPR-2 Changes |
| <u> </u> | | | | mg11/4/81 | |
| | | | | KT11-7:15 | |
| | | | | 6-10-41 1/8/85 | |
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Page No. 1

Test Procedure No. 47906-01, Rev. A

1.0 SCOPE

This document has been prepared by Wyle Laboratories for the Stone and Webster Engineering Company (SWEC) and encompasses the testing of physical separation, with respect to electrical faults, between redundant Class 1E and Class 1E, and non-Class 1E electrical systems in representative configurations at Niagara Mohawk Power Corporation's Nine Mile Point Nuclear Station — Unit 2 (NMP2).

1.1 Objectives

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The purpose of this procedure is to present the requirements, procedures, and sequence to test the design adequacy of worst case configurations in the following electrical separation situations:

- Free Air Separation without barriers (see Figure 2, 3, and 4)
- Free Air Separation with SILTEMP barriers (see Figures 5 and 6)
- Horizontal cable tray to parallel conduit (see Figures 7 and 8)
- Conduit to conduit and free air (see Figure 10)
- Horizontal tray to vertically separated horizontal tray (see Figure 9)
- Free Air Separation without barriers inside control and instrument cabinets (see Figures 15 and 16)

1.2 Applicable Documents

- **1.2.1** Stone and Webster Engineering Corporation Engineering Service Scope of Work (ESSOW) No. E0907.
- 1.2.2 Wyle Laboratories Technical Proposal for Cable Separation Test Program for Stone and Webster Engineering Corporation, No. 543/3965-2/GH, dated July 26, 1985.
- 1.2.3 IEEE Std. 383-1974, "IEEE Standard for Type Test of Class 1E Electric Cables, Field Splices, and Connections for Nuclear Power Generating Stations."
- 1.2.4 IEEE Std. 384-1974, "IEEE Trial Use Standard Criteria for Separation of Class 1E Equipment and Circuits."
- 1.2.5 United States Nuclear Regulatory Commission Guide 1.75, Revision 2, "Physical Independence of Electric Systems."
- **1.2.6** IEEE Std. 323-1974, "IEEE Standard for Qualifying Class 1E Equipment for Nuclear Power Generating Stations."
- 1.2.7 Code of Federal Regulations, Section 10, Part 21.
- 1.2.8 Code of Federal Regulations, Section 10, Part 50, Appendix B.
- **1.2.9** United States Nuclear Regulatory Commission Guide 1.75, Revision 2, "Physical Independence of Electric Systems".

WYLE LABORATORIES Huntsville Facility

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1.0 SCOPE (Continued)

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1.2 Applicable Documents (Continued)

1.2.10 TWX from Stone and Webster Engineering Corporation to Wyle Laboratories, A dated 9 October, 1985, Message 12177/22952.

1.3 Equipment Description

This test procedure encompasses testing of the following IEEE Std. 383-1974 qualified power, control, and instrumentation cables as described below.

| Item No. | Description | Cable Type | SWEC L.D. No. | |
|----------|--------------------------------|--------------|---------------|---|
| 1 | Okonite Triplex 500 MCM Copper | L | NJM-46 | |
| 2 | Okonite Triplex 350 MCM Copper | \mathbf{L} | NJM-45 | |
| 3 | Okonite Triplex 250 MCM Copper | \mathbf{L} | NJM-33 | |
| | Okonite Triplex 4/0 AWG Copper | L | NJM-31 | |
| 4
5 | Okonite Triplex 3/0 AWG Copper | . L | NJM-30 | |
| 6 | Okonite Triplex 2/0 AWG Copper | \mathbf{L} | NJM-28 | |
| 7 | Okonite Triplex 1/0 AWG Copper | L | NJM-34 | |
| 8 | Okonite Triplex 2 AWG Copper | K | NJM-25 | |
| 9 | Okonite Triplex 4 AWG Copper | K | NJM-41 | |
| 10 | Okonite Triplex 6 AWG Copper | K | NJM-40 | |
| 11 | Okonite 3/C 8 AWG Copper | К | NJM-12 | |
| 12 | Okonite 3/C 10 AWG Copper | K | NJM-08 | |
| 13 | Rockbestos 7C 12 AWG Copper | C | NJN-37 | |
| 14 | Okonite 2/C 16 AWG Copper | Х | NJP-05 | Α |
| 15 | Rockbestos 2/C 12 AWG Copper | С | NJN-34 | Α |
| 16 | Rockbestos 5/C 12 AWG Copper | Ċ | NJN-36 | Α |
| 17 | Rockbestos 1/C 14 AWG Type SIS | Ċ | None | Α |

1.4 Test Sequence

The test program shall be performed in the following sequence or as mutually A agreed by SWEC and Wyle Laboratories:

- Test specimen identification
- Screening tests (fault cable determination)
- Configuration Number 1 Test (Free Air Separation Test without barriers)
- Configuration Number 5 Tests (Conduit to Conduit and Cable in Free Air Tests)
- Configuration Number 2 Test (Free Air Separation Test with Siltemp barriers)
- Configuration Number 3 Tests (Horizontal Tray with parallel conduit)
- Configuration Number 4 Tests (3-Horizontal Tray Stack)
- Configuration Number 6 Tests (Internal Separation Test for Control and A Instrument Cables)

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2.0 TEST REQUIREMENTS

2.1 Acceptance Criteria

2.1.1 Insulation Resistance Test

Insulation resistance on all "target cables"* shall be greater than 1.6×10^6 ohms with a potential of 1000 VDC (500 VDC 2/C 16 AWG cables) applied for 60 seconds.

2.1.2 High Potential Test

There shall be no evidence of insulation breakdown or flashover with a potential of 2200 VAC (1600 VAC for 2/C 16 AWG cables) applied for one minute.

2.1.3 Cable Continuity Test

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Energized specimens in the target raceway shall conduct 100% of SWEC-rated currents (see table below) at 575 VAC (120 VAC for control cables and 50 VAC for instrument cables) before, during, and after the overcurrent test.

| Cable
Size | No.
Conductors | SWEC
LD. No. | Cable
<u>Type</u> | Voltage | Rated
Current |
|---------------|-------------------|-----------------|----------------------|---------|------------------|
| 1/0 AWG | Triplex | NJM-34 | L | 575 | 139 |
| 2 AWG | Triplex | NJM-25 | K | 575 | 38.5 |
| 12 AWG | 7 | NJN-37 | С | 120 | 10 |
| 16 AWG | · 2/C | NJP-05 | х | 50 | 1 |
| 12 AWG | 5 | NJN-36 | С | 120 | 10 |
| 12 AWG | 2 | NJN-34 | С | 120 | 10 |
| 14 AWG | 1 | NAF-52 | С | 120 | 10 |

2.1.4 Tolerances

All target cable voltages specified in this procedure shall be maintained within a +3% tolerance. The initial setting of target cable currents (with rated current on the fault cable) shall have a tolerance of +10%, 0%. Thereafter, all target cables' currents shall be maintained within a +10% tolerance.

All fault cable currents shall be maintained within a $\pm 3\%$ tolerance, if possible.

* The term "target cable" refers to energized and monitored nonfault cables used in this program.

Test Procedure No. 47906-01

3.0 TEST PROGRAM

3.1 Test Specimen Identification

An inspection shall be performed upon receipt of the test specimen components at Wyle Laboratories. This inspection will ensure that the test specimens are as described in Paragraph 1.3. Applicable manufacturer, model, part and serial numbers shall be verified and recorded on a Test Specimen Inspection Sheet. The test specimens shall be labeled to facilitate identification throughout the test program.

3.2 Screening Tests

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Twelve tests shall be conducted in free air for various cable loads to determine the cables which, if faulted, would have the most impact on adjacent cables. The first five tests shall be conducted using cables that run from the various motor control centers to smaller motors. The last seven tests shall be conducted using cables that run from the various load centers to various large motors.

3.2.1 Test Specimen Preparation

- 1. The heat rise tests shall be conducted using a single run of cable supported by a 8-foot galvanized steel cable tray from NMP2 stock. The cable tray shall be filled to its siderails for the first five tests. The cables shall be spaced 3/8 inch apart for the last seven tests. The cable shall be connected to the Multi-Amp Test Set per Figure 11.
- 2. The ends of the faulted cable from their termination to the edge of the cable tray shall be wrapped with a single layer, 50% overlap, of SILTEMP WT-65 (or any other barrier material specified by SWEC) covered with a single layer, 50% overlap, of 3M No. 69 glass tape. This shall be done to ensure that any ignition that might occur is contained to the cable tray area.

3.2.2 Instrumentation Setup

3.2.2.1 <u>Thermocouple Locations</u> — A total of 33 Type "K" thermocouples shall be utilized for these tests. These thermocouples shall be mounted as described below:

| Channel No. | Location | |
|-------------|--|--|
| 1-10 | Mounted directly to the outer cable jacket. The thermocouples shall be mounted approximately ten inches apart. | |
| 11 & 12 | Mounted to the conductor of the fault cable at the two series connections. | |
| | | |

13-33 Mounted in free air and spaced as shown in Figure 1.

These thermocouples shall be monitored using a Fluke Datalogger feeding a highspeed printer. The datalogger shall be operated at its maximum scan rate throughout the screening test.

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Test Procedure No. 47906-01, Rev. A

- 3.0 TEST PROGRAM (Continued)
- **3.2** Screening Tests (Continued)
- 3.2.2 Instrumentation Setup (Continued)
- **3.2.2.2** <u>Electrical Monitoring</u> The current to the test specimen shall be recorded with the test time that current was changed. These readings shall be taken using the Multi-Amp Test Set.

3.2.3 Screening Tests

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The screening tests shall consist of three sequential phases with no intentional time delay. The first phase shall consist of powering the cable for 10 minutes with full load current. This shall be done to establish normal operating temperatures on this cable. The second phase shall consist of raising the current to reach $90^{\circ}C$ $\pm 3^{\circ}C$ conductor temperature. The third phase shall consist of energizing the cable with the worst case electrical fault*. The cable shall be subjected to this current level until either the cable open-circuits, the temperatures on the cable stabilize or the test is terminated at the customer's request.

For Tests No. 1 through 12, should the fault cable temperatures stabilize (temperature rise less than 10° F over 15 minutes) or ignite but not open-circuit and cable jacket/conductor temperatures decrease for 15 minutes (indicating that the bare conductors are radiating heat faster than the I²R input), the fault current shall be increased to 660 amperes (Tests 1 through 5) or 2200 amperes (Tests 6 through 12) until the fault cable open-circuits.

The screening test shall be conducted using the following procedure:

- 1. Connect the test specimen to the Multi-Amp Test Set output stabs per Figure 11. The cable termination shall be made in series or in parallel if necessary to obtain the required current.
- 2. Apply the applicable full load current (FLA) from Table 1 to the test specimen for 10 minutes.
- 3. Record applied current and initial maximum cable temperature reached after the FLA current application.
- 4. Slowly increase fault cable current until thermocouple channels 1-11 or 12 indicate 90°C ±3°C (189°-199°F). Each current level shall be maintained for a minimum of 5 minutes and conductor temperature recorded. The current level shall be adjusted to maintain cable temperature 189°-199°F for 15 minutes.
- * The term "worst case electrical fault" refers to the most severe credible electrical fault (as determined by SWEC) at the Nine Mile Point Power Station.

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Test Procedure No. 47906-01, Rev. A

- 3.0 TEST PROGRAM (Continued)
- 3.2 Screening Tests (Continued)
- 3.2.3 Screening Tests (Continued)

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- 5. Record applied current and maximum cable jacket temperature.
- 6. Apply the applicable test current from Table 1 to the test specimen.
- 7. Record the test time of application, applied current level and maximum cable jacket temperature.
- 8. Allow the cable to conduct the test current until either an open circuit occurs, the cable temperatures stabilize, or the test is terminated at the customer's request.
- 9. If an open circuit occurs, record the elapsed time and maximum cable temperature and proceed to Step 13.
- 10. If a 15-minute period of stabilized temperature occurs, record the maximum temperature, elapsed time and applied current level, and proceed to Step 12.
- 11. Should the fault cable ignite but not open-circuit and cable jacket/ conductor temperatures decrease for 15 minutes, record the maximum temperature, elapsed time and applied current, and proceed to Step 12.
- 12. Increase fault cable current to 660 amperes (Tests 1 through 5) or 2200 amperes (Tests 6 through 12) until the fault cable open-circuits or the test is terminated at the customer's request.
- 13. De-energize the Multi-Amp Test Set output.
- NOTE: Skip Steps 6-11 for tests where test current is less than the warmup A current required to raise the conductor temperature to 189°F-199°F.

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- 3.0 TEST PROGRAM (Continued)
- **3.2** Screening Tests (Continued)

3.2.4 Worst Case Cable (WCC) Selection

| Test
No. | Cable
Size | SWEC
I.D No. | Maximum
HP | Maximum
Full-Load
Current
(FLA) | Test
Current
(Amperes) |
|-------------|---------------|-----------------|---------------|--|------------------------------|
| 1 | 10 AWG-Cu | NJM-08 | 5 | 5.6* | 34 |
| 2 | 8 AWG-Cu | NJM-12 | 10 | 10.3 | 51 |
| 3 | 6 AWG-Cu | NJM-40 | 20 | 20.6 | 156 |
| 4 | 4 AWG-Cu | NJM-41- | 20 | 20.6 | 156 |
| 5 | 2 AWG-Cu | NJM-25 | 40 | 38.5 | 264 |
| 6 | 1/0 AWG-Cu | NJM-34 | 150 | 139 | 908 |
| 7 | 2/0 AWG-Cu | NJM-28 | 150 | 139 | 908 |
| 8 | 3/0 AWG-Cu | NJM-30 | 150 | 139 | 908 |
| 9 ` | 4/0 AWG-Cu | NJM-31 | 180 | 159 | 746 |
| 10 | 250 MCM-Cu | NJM-33 | 180 | 159 | 746 |
| 11 | 350 MCM-Cu | NJM-45 | 180 | 159 | 746 |
| 12 | 500 MCM-Cu | NJM-46 | 180 | 159 · | 746 |

TABLE 1

* Initial test current shall be 8 amperes due to Multi-Amp Test Set limitations.

Based on the results of the screening tests, the worst-case cable for the subsequent configuration tests shall be selected using the following criteria:

- 1. If the cables ignite, a combination of time to ignition, insulation burn time, and observed temperatures shall be utilized to determine the worst-case cable.
- 2. If no cables ignite, the cable which produces maximum surface temperatures before open-circuiting shall be considered the worst-case cable.
- 3. If the cables neither ignite nor open-circuit, the cable which produces the maximum surface temperature, when the temperature equilibrium of the conductor/jacket is reached (temperature rise less than 10°F over a 15-minute period), shall be considered to be the worst-case cable.

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3.0 TEST PROGRAM (Continued)

3.3 Configuration Number 1 Tests

Configuration Number 1 shall consist of three tests in free air. Test No. 1 shall consist of a test between a horizontal fault cable, a parallel horizontally separated 2/C 16 AWG cable, a parallel vertically separated Triplex 2 AWG cable, and a perpendicular horizontally separated 7/C 12 AWG cable. Test No. 2 shall consist of a test between a vertical fault cable and two perpendicular cables separated horizontally by 6 inches. Test No. 3 shall consist of a test between a horizontal cable in free air and a parallel cable tray vertically separated by 9 inches.

3.3.1 Purpose

The purpose of the Configuration Number 1 Test is to demonstrate the acceptability of design where two cables in free air pass either 9 inches vertically or 6 inches horizontally from each other or from a cable tray, when the worst case electrical fault occurs to one of these cables. This configuration represents field installation of free air cables going from:

- a. Tray to tray
- b. Tray to conduit
- c. Conduit to conduit
- d. Tray/conduit to equipment.

3.3.2 Test Specimen Preparation

*

The test specimens shall be mounted to the unistrut frame assembly as shown in Figures 2, 3 and 4. This apparatus shall be assembled to the indicated dimensions by Wyle technicians using materials supplied by the customer. The following shall be observed with regard to the materials and construction of the assembly:

- 1. The faulted cable shall be a WCC* cable from NMP2 stock for all three tests.
- 2. The ends of the faulted cable from their termination at the copper bus bar to the edge of the unistrut frame shall be wrapped with a single layer of HAVEG SILTEMP WT-65 covered with a single layer of 3M No. 69 glass tape (or any other barrier material specified by SWEC). This wrapping shall be done to ensure that any ignition that might occur is contained to the test area.

WCC = Worst Case Cable determined during the Screening Tests of Paragraph 3.1.1.

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Test Procedure No. 47906-01, Rev. A

- 3.0 . TEST PROGRAM (Continued)
- 3.3 Configuration Number 1 Tests (Continued)
- 3.3.2 Test Specimen Preparation (Continued)
 - 3. For Test No. 1:
 - The vertically separated target cable shall be a Triplex 2 AWG cable from NMP2 stock. This cable shall be loosely tied to the unistrut of Figure 2, with ceramic tie cords, such that the cable is 9 inches vertically above the centerline of the faulted cable.
 - The horizontally separated target cable shall be a 2/C 16 AWG cable from NMP2 stock. This cable shall be mounted such that the cable is 6 inches horizontally away from the faulted cable.
 - The vertical cable shall be a 7/C 12 AWG cable from NMP2 stock. This cable shall be mounted such that the cable is 6 inches away from the fault cable.
 - 4. For Test No. 2:

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- The upper horizontal target cable shall be a Triplex 2 AWG cable from NMP2 stock. This cable shall be loosely tied to the unistrut of Figure 3 such that the cable is located 6 inches horizontally from the perpendicular fault cable and 9 inches above the lower target cable.
- The lower horizontal target cable shall be a 7/C 12 AWG cable from NMP2 stock. This cable shall be loosely tied to the unistrut of Figure 3 such that the cable is located 6 inches from the perpendicular fault cable.
- 5. For Test No. 3:
 - The horizontal cable tray shall be filled to its siderails with K-Type cables from NMP2 stock. The bottom centerline cable shall be a Triplex 2 AWG cable. The cable tray shall be mounted parallel to the centerline of the fault cable such that it is 9 inches vertically above this cable.
- 6. Photographs shall be taken of the test setup prior to each test.

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- 3.0 TEST PROGRAM (Continued)
- 3.3 Configuration Number 1 Tests (Continued)

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- 3.3.3 Instrumentation Setup
- 3.3.3.1 Thermocouple Locations

Test No. 1

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iak Jura; Ju A total of 26 Type "K" thermocouples shall be utilized for this test. These thermocouples shall be mounted as described below.

| Channel No. | Location |
|-------------|---|
| 1-6 | Mounted to the jacket on the fault cable. These thermocouples shall be mounted approximately 16 inches apart. |
| 7 & 8 | Mounted to the conductor of the fault cables at the two series connections. |
| 9–14 | Mounted to the jacket on the vertically separated target cable. These thermocouples shall be mounted approximately 16 inches apart. |
| 15-20 | Mounted to the jacket on the horizontally separated target cable. These thermocouples shall be mounted approximately 16 inches apart. |
| 21-26 | Mounted to the jacket on the perpendicular target cable. These thermocouples shall be mounted approximately 10 inches apart. |

Test No. 2

A total of 20 Type "K" thermocouples shall be utilized for this test. These thermocouples shall be mounted as described below.

| Channel No. | Location |
|-------------|---|
| 1-6 | Mounted to the jacket on the fault cable. These thermocouples shall be mounted approximately 16 inches apart. |
| 7 & 8 | Mounted to the conductor of the fault cables at the two series connections. |
| 9–14 | Mounted to the jacket on the upper horizontal target cable. These thermocouples shall be mounted approximately 16 inches apart. |
| 15-20 | Mounted to the jacket on the lower horizontal target
cable. These thermocouples shall be mounted
approximately 10 inches apart. |

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3.0 TEST PROGRAM (Continued)

3.3 Configuration Number 1 Tests (Continued)

3.3.3.1 Thermocouple Locations (Continued)

Test No. 3

A total of 14 Type "K" thermocouples shall be utilized for this test. These thermocouples shall be mounted as described below.

| Channel No. | Location |
|-------------|--|
| 1-6 | Mounted to the jacket on the fault cable. These thermocouples shall be mounted approximately 16 inches apart. |
| 7 & 8 | Mounted to the conductor of the fault cables at the two series connections. |
| 9-14 | Mounted to the jacket on the target cable. These thermocouples shall be mounted approximately 16 inches apart. |

The thermocouples shall be monitored by a Fluke Datalogger feeding a highspeed printer. The datalogger shall be operated at its maximum scan rate throughout the overcurrent test.

3.3.3.2 Electrical Monitoring

> All phase-to-phase voltages and phase currents of the target cables and the fault cable current shall be fed into an oscillograph recorder. The oscillograph shall be operated at the 0.1-inch per minute rate throughout the overcurrent test. The oscillograph channels shall be as specified in the following tables:

Test No. 1

| Channel No. | Signal | Location |
|---|-----------------|----------------|
| 1 | Current-Phase A | Triplex 2 AWG |
| 2 | Current-Phase B | Triplex 2 AWG |
| 3 | Current-Phase C | Triplex 2 AWG |
| 4 | Voltage A-B | Triplex 2 AWG |
| 5 | Voltage A-C | Triplex 2 AWG |
| 6 | Voltage B-C | Triplex 2 AWG |
| 7 | Current | 7/C 12 AWG (V) |
| 8 | Voltage | 7/C 12 AWG (V) |
| 9 | Current | 2/C 16 AWG (H) |
| 10 | Voltage | 2/C 16 AWG (H) |
| 11 | Current | Fault Cable |
| 12 | Skipped | N/A |
| H = Parallel Cable
V = Perpendicular | | |

Test Procedure No. 47906-01

3.0 TEST PROGRAM (Continued)

3.3 Configuration Number 1 Tests (Continued)

3.3.3.2 Electrical Monitoring (Continued)

Test No. 2

| Channel No. | Signal | Location |
|-------------|-----------------|---------------|
| 1 | Current-Phase A | Triplex 2 AWG |
| 2 | Current-Phase B | Triplex 2 AWG |
| 3 | Current-Phase C | Triplex 2 AWG |
| 4 | Voltage A-B | Triplex 2 AWG |
| 5 | Voltage A-C | Triplex 2 AWG |
| 6 | Voltage B-C | Triplex 2 AWG |
| 7 | Current | 7/C 12 AWG |
| 8 | . Voltage | 7/C 12 AWG |
| 9 | Skipped | N/A |
| 10 | Skipped | N/A |
| 11 | Current | Fault Cable |
| 12 | Skipped | N/A |

Test No. 3

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| Channel No. | Signal | Location |
|-------------|-----------------|---------------|
| 1. | Current-Phase A | Triplex 2 AWG |
| 2 | Current-Phase B | Triplex 2 AWG |
| 3 | Current-Phase C | Triplex 2 AWG |
| 4 | Voltage A-B | Triplex 2 AWG |
| 5 | Voltage A-C | Triplex 2 AWG |
| 6 | Voltage B-C | Triplex 2 AWG |
| 7 | Skipped | N/A |
| 8 | Skipped | N/A |
| 9 | Skipped | N/A |
| 10 | Skipped | N/A |
| 11 | Current | Fault Cable |
| 12 | Skipped | N/A |

A digital multimeter shall be utilized to measure all phase-to-phase or phase voltages and phase currents of the target cables prior to, during, and after the overcurrent test. This data shall be recorded to provide accurate evidence of the specimen's capability to conduct SWEC-rated current at 575 VAC (120 VAC for control cables) throughout the overcurrent test.

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3.0 TEST PROGRAM (Continued)

3.3 Configuration Number 1 Tests (Continued)

3.3.4 Baseline Functional Tests

The baseline functional tests shall consist of insulation resistance and high potential measurements on each of the target cables.

3.3.4.1 Insulation Resistance Test

- 1. Disconnect all power and instrumentation leads from the target cables and label per Figures 12, 13, and 14.
- 2. Using a megohmmeter, apply a potential of 1000 VDC (500 VDC for 2/C 16 AWG cables) and record the minimum insulation resistance indicated after a period of 60 seconds between the following test points:

Target Power Cable:

| Phase-to-Phase | Phase-to-Ground |
|----------------|-----------------|
| 1 to 2 | 1 to unistrut |
| 1 to 3 | 2 to unistrut |
| 2 to 3 | 3 to unistrut |
| t. | |

Target Control Cable:

Phase-to-Phase 1 to 4

Phase-to-Ground

1 to unistrut 4 to unistrut

Target Instrument Cable:

Phase-to-Ground

1 to unistrut* 2 to unistrut

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* Shield tied to unistrut

For all performances of this test, the measured values shall be compared to the acceptance criteria, Paragraph 2.1.1, i.e., greater than 1.6×10^6 ohms.

Test Procedure No. 47906-01, Rev. A

- 3.0 TEST PROGRAM (Continued)
- 3.3 Configuration Number 1 Tests (Continued)
- 3.3.4 Baseline Functional Tests (Continued)
- 3.3.4.2 High Potential Test

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1. Using a Hi-Pot Test Set, a potential of 2200 VAC (1600 VAC for 2/C A 16 AWG cable) shall be applied from each conductor to ground and between conductors on multiconductor cable for a period of one minute.

Target Power Cable:

| Phase-to-Phase | | Phase-to-Ground |
|----------------|--|-----------------------|
| 1 to 2 | | 1 to unistrut or tray |
| 1 to 3 | | 2 to unistrut or tray |
| 2 to 3 | | 3 to unistrut or tray |

Target Control Cable:

Phase-to-Phase 1 to 4

| Phase-to-Ground | | |
|-----------------|----------------------|--|
| | unistrut
unistrut | |

Target Instrument Cable:

| Phase-to-Phase | Phase-to-Ground |
|----------------|-----------------|
| 1 to 2 | 1 to unistrut* |
| | 2 to unistrut |

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* Shield tied to unistrut

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2. Reconnect all power and instrumentation leads per Figures 12, 13, and 14.

For all performances of this test, the measured values shall be compared to the acceptance criteria, Paragraph 2.1.2, i.e., there shall be no evidence of insulation breakdown or flashover.

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3.0 TEST PROGRAM (Continued)

3.3 Configuration Number 1 Tests (Continued)

3.3.5 Overcurrent Test

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 The overcurrent test shall be conducted in four sequential steps with no intentional time delay. The first phase consists of energizing the fault cable with SWEC rated current. The second phase consists of increasing the current until fault cable temperatures are within $189^{\circ}-199^{\circ}F$ for 5 minutes. The third phase consists of energizing the fault cable with the worst case electrical fault current until the cable open-circuits, temperature stabilizes or decreases, or the test is terminated at the customer's request. In the event that the fault cable is short-circuited (temperature decreasing and insulation burnt-off) or temperatures stabilized, maximum let-through current shall be simulated. This let-through current shall be assumed at the load, based on the backup circuit breaker, and maintained until the fault cable open circuits. The let-through current shall be either 660 amperes for Cables No. 1 through 5, or 2200 amperes for Cables No. 6 through 12, or the maximum Multi-Amp Test Set output.

The target cables shall conduct SWEC-rated current (see Paragraph 2.1.3) at 575 VAC (power cables) or 120 VAC (control cables) throughout the overcurrent test. The overcurrent test shall be conducted using the following procedure:

- 1. Connect the WCC fault cable to the copper bus bars per Figure 11 (Tests No. 1, 2, and 3).
- 2. Install a Triplex 2 AWG target cable per Figure 2 (Test 1), Figure 3 (Test 2), and Figure 4 (Test 3).
- 3. Install a 7/C 12 AWG target cables per Figure 2 (Test 1) and Figure 3 (Test 2).
- 4. Install a 2/C 16 AWG target cable per Figure 2 (Test 1).
- 5. Connect the Triplex 2 AWG target cable to the instrumentation and power supplies of Figure 12 (Tests 1, 2, and 3).
- 6. Connect the 7/C 12 AWG target cable to the instrumentation and power supplies of Figure 13 (Tests 1 and 2).
- 7. Connect the 2/C 16 AWG target cable to the instrumentation and power supplies of Figure 14 (Test 1).
- 8. Energize the Triplex 2 AWG target cable with 38.5 amperes at 575 VAC (Tests 1, 2, and 3).
- 9. Energize the 7/C 12 AWG target cable with 10 amperes at 120 VAC (Tests 1 and 2).
- 10. Energize the 2/C 16 AWG target cable with 1 ampere at 50 VAC (Test 1).

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- 3.0 TEST PROGRAM (Continued)
- 3.3 Configuration Number 1 Tests (Continued)
- 3.3.5 Overcurrent Test (Continued)

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- 11. Energize the WCC fault cable with rated current from the Multi-Amp Test A Set per Table 1.
- 12. Record target cable voltages and currents and the fault cable current.
- 13. Slowly increase fault cable current until thermocouple Channels 7 and/or 8 indicate 90 +3°C (189-199°F) conductor temperature.
- 14. Maintain the conductor temperature at 189-199°F for five minutes.
- 15. Record fault cable current, conductor temperature, and the highest of thermocouple Channels 1 through 6.
- 16. Increase the Multi-Amp Test Set output to test current per Table 1.
- 17. Record target cable voltages and currents and the fault cable current.
- 18. Allow the fault cable to conduct test current until either the cable opencircuits, temperatures stabilize or the test is terminated by the customer.
- 19. If an open circuit occurs, record the elapsed time and maximum cable A temperature and proceed to Step 23.
- 20. If a 15-minute period of stabilized temperature occurs, record the A maximum temperature, elapsed time and applied current level, and proceed to Step 22.
- 21. Should the fault cable ignite but not open-circuit and cable A jacket/conductor temperatures decrease for 15 minutes, record the maximum temperature, elapsed time and applied current level, and proceed to Step 22.
- 22. Increase fault cable current to 660 amperes (Cables 1 through 5) or A 2200 amperes (Cables 6 through 12) until the fault cable open-circuits or the test is terminated at the customer's request.
- 23. Record target cable voltages and currents.

24. De-energize the target cables and the Multi-Amp Test Set.

25. Photograph the post-test condition.

For all performances of this test, the observed target cable operation shall be compared to the acceptance criteria, Paragraph 2.1.3, i.e., they shall maintain continuity of power.

3.3.6 Post-Overcurrent Test Functional Test

The functional tests of Paragraph 3.3.4 shall be repeated.

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3.0 TEST PROGRAM (Continued)

3.4 Configuration Number 2 Tests

Configuration Number 2 shall consist of tests between free air and wrapped cables. For Test No. 1, the faulted cable shall be wrapped and the target cable shall be outside the wrapping. For Test No. 2, the target cable shall be wrapped and the fault cable shall be outside the wrapping.

3.4.1 Purpose

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یور دور در هاه در هاه در هاه The purposes of the Configuration Number 2 tests are to:

- 1. Demonstrate the acceptability of design where two cables in free air come in contact with each other when a worst case electrical fault occurs to a bare cable in contact with a wrapped cable. This configuration represents field installations of free air cable drops for cables going from:
 - a. Tray to tray
 - b. Tray to conduit
 - c. Conduit to conduit
 - d. Tray/Conduit to equipment.
 - e. Tray/Conduit to wall sleeves, etc.
- 2. Demonstrate that a fault cable enclosed within SWEC protective wrap does not affect the external cables with zero-inch separation.
- 3. Demonstrate that a faulted cable external to the SWEC-protected cable wrap does not affect the protected cable with zero-inch separation.
- 4. Demonstrate the acceptability of the SWEC protective wrap as a thermal barrier during a worst case electrical fault.

3.4.2 Test Specimen Preparation

The test specimen shall be mounted to the unistrut frame assembly per Figure 5. This apparatus shall be assembled to the indicated dimensions by Wyle technicians using materials supplied from NMP2. The following guidelines shall be observed with regard to the materials and construction of the assembly:

- 1. The faulted cable for both tests shall be a WCC cable from NMP2 stock.
- 2. For Test No. 1, the faulted cable shall be wrapped using a single layer of SWEC protective wrap using a 400% overlap. For Test No. 2, the ends of the faulted cable from their termination at the copper bus bar to the edge of the unistrut frame shall be wrapped with a single layer of HAVEG SILTEMP WT-65 covered with a single layer of 3M No. 69 glass tape (or any other barrier material specified by SWEC). This wrapping shall be done to ensure that any ignition that might occur is contained to the test area.

Test Procedure No. 47906-01

3.0 TEST PROGRAM (Continued)

3.4 Configuration Number 2 Tests (Continued)

- 3.4.2 <u>Test Specimen Preparation</u> (Continued)
 - 3. The target cable shall be a Triplex 1/0 AWG cable from NMP2 stock.
 - 4. For Test No. 1, the target cable shall be an unwrapped cable. For Test No. 2, the target cable shall be wrapped for the length inside the unistrut test fixture extending approximately two feet on either side as shown in Figure 6. This wrapping shall be done using a 400% overlap of the SWEC protective wrap.
 - 5. Photographs shall be taken of the test setup prior to each test.

3.4.3 Instrumentation Setup

3.4.3.1 Thermocouple Locations

A total of 14 Type "K" thermocouples shall be utilized for these tests. The thermocouples shall be mounted as described below.

| Channel No. | Location | | |
|-------------|--|--|--|
| 1-6 | Mounted to the jacket on the fault cable. These
thermocouples shall be mounted approximately 12
inches apart. For Test No. 1, the thermocouples shall
be underneath the SWEC protective wrap. | | |
| 7 & 8 | Mounted to the conductor of the fault cables at the two series connections. | | |
| 9-14 | Mounted to the jacket on the target cable. These
thermocouples shall be mounted approximately
12 inches apart and close to the location of
Channels 1-6. For Test No. 2, the thermocouples shall
be inside the SWEC protective wrap. | | |

The thermocouples shall be monitored by a Fluke Datalogger feeding a highspeed printer. The datalogger shall be operated at its maximum scan rate throughout the overcurrent test.

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3.0 TEST PROGRAM (Continued)

- 3.4 Configuration Number 2 Tests (Continued)
- 3.4.3 Instrumentation Setup (Continued)

3.4.3.2 Electrical Monitoring

All phase-to-phase voltages and phase currents of the target cables and the fault cable current shall be fed into an oscillograph recorder. The oscillograph shall be operated at the 0.1-inch per minute rate throughout the overcurrent test. The oscillograph channels shall be as specified in the following table:

| Channel No. | Signal | Cable |
|-------------|-----------------|-----------------|
| 1 | Current-Phase A | Triplex 1/0 AWG |
| 2 | Current-Phase B | Triplex 1/0 AWG |
| 3 | Current-Phase C | Triplex 1/0 AWG |
| 4 | Voltage A-B | Triplex 1/0 AWG |
| 5 | Voltage A-C | Triplex 1/0 AWG |
| 6 | Voltage B-C | Triplex 1/0 AWG |
| 7-9 | Skipped | N/A |
| 10 | Current | Fault Cable |
| 11 & 12 | Skipped | N/A |

A digital multimeter shall be utilized to measure all phase-to-phase or phase voltages and phase currents of the target cables prior to, during, and after the overcurrent test. This data shall be recorded to provide accurate evidence of the specimen's capability to conduct SWEC-rated current at 575 VAC throughout the overcurrent test.

3.4.4 Baseline Functional Tests

The baseline functional tests shall consist of insulation resistance and high potential measurements on each of the target cables.

3.4.4.1 Insulation Resistance Test

- 1. Disconnect all power and instrumentation leads from the target cable and label per Figure 12.
- 2. Using a megohimmeter, apply a potential of 1000 VDC and record the minimum insulation resistance indicated after a period of 60 seconds between the following test points:

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3.0 TEST PROGRAM (Continued)

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- 3.4 Configuration Number 2 Tests (Continued)
- 3.4.4 Baseline Functional Tests (Continued)
- 3.4.4.1 Insulation Resistance Test (Continued)

Target Power Cable:

| Phase-to-Phase | Phase-to-Ground |
|----------------|-----------------|
| 1 to 2 | 1 to unistrut |
| 1 to 3 | 2 to unistrut |
| 2 to 3 | 3 to unistrut |

For all performances of this test, the measured values shall be compared to the acceptance criteria, Paragraph 2.1.1, i.e., greater than 1.6×10^6 ohms.

3.4.4.2 High Potential Test

1. Using a Hi-Pot Test Set, a potential of 2200 VAC shall be applied from each conductor to ground and between conductors on multiconductor cable for a period of one minute.

Target Power Cable:

| Phase-to-Phase | Phase-to-Ground |
|----------------|-----------------|
| 1 to 2 | 1 to unistrut |
| 1 to 3 | 2 to unistrut |
| 2 to 3 | 3 to unistrut |

2. Reconnect all power and instrumentation leads per Figure 12.

For all performances of this test, the measured values shall be compared to the acceptance criteria, Paragraph 2.1.2, i.e., there shall be no evidence of insulation breakdown or flashover.

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3.0 TEST PROGRAM (Continued)

3.4 Configuration Number 2 Tests (Continued)

3.4.5 Overcurrent Test

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The overcurrent test shall be conducted in four sequential steps with no intentional time delay. The first phase consists of energizing the fault cable with SWEC rated current. The second phase consists of increasing the current until fault cable temperatures are within $189^{\circ}-199^{\circ}F$ for 5 minutes. The third phase consists of energizing the fault cable with the worst case electrical fault current until the cable open-circuits, temperature stabilize or decrease, or the test is terminated at the customer's request. In the event that the fault cable is short-circuited (temperature decreasing and insulation burnt-off) or temperatures stabilize, a maximum let-through current shall be simulated. This let-through current shall be assumed at the load, based on the backup circuit breaker, and maintained until the fault cable open circuits. The let-through current shall be either 660 amperes for Cables No. 1 through 5, or 2200 amperes for Cables No. 6 through 12, or the maximum Multi-Amp Test Set output.

The target cables shall conduct SWEC rated current (see Paragraph 2.1.3) at 575 VAC throughout the overcurrent test. The overcurrent test shall be conducted using the following procedure:

1. Connect the WCC fault cable to the copper bus bars per Figure 10.

For Test No. 1, this cable is wrapped. For Test No. 2, this cable is unwrapped.

2. Install a Triplex 1/0 AWG target cable per Figure 5 or 6.

For Test No. 1, this cable is unwrapped. For Test No. 2, this cable is wrapped.

- 3. Connect the Triplex 1/0 AWG target cable to the instrumentation and power supplies of Figure 12.
- 4. Energize the Triplex 1/0 AWG target cable with 124 amperes at 575 VAC.
- 5. Energize the WCC fault cable with rated current from the Multi-Amp Test Set per Table 1.
- 6. Record target cable voltages and currents and the fault cable current.
- Slowly increase fault cable current until thermocouple Channels 7 and/or 8 indicate 90 +3°C (189-199°F) conductor temperature.
- 8. Maintain the conductor temperature at 189-199^oF for five minutes.

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- 3.0 TEST PROGRAM (Continued)
- 3.4 Configuration Number 2 Tests (Continued)
- 3.4.5 Overcurrent Test (Continued)

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- 9. Record fault cable current, conductor temperature, and the highest of thermocouple Channels 1 through 6.
- 10. Increase the Multi-Amp Test Set output to test current per Table 1.
- 11. Record target cable voltages and currents and the fault cable current.
- 12. Allow the fault cable to conduct test current until either the cable opencircuits, temperatures stabilize or decrease, or the test is terminated at the customer's request.
- 13. If an open circuit occurs, record the elapsed time and maximum cable A temperature, and proceed to Step 17.
- 14. If a 15-minute period of stabilized temperature occurs, record the A maximum temperature, elapsed time and applied current level, and proceed to Step 16.
- 15. Should the fault cable ignite but not open-circuit and cable A jacket/conductor temperatures decrease for 15 minutes, record the maximum temperature, elapsed time and applied current level, and proceed to Step 16.
- 16. Increase fault cable current to 660 amperes (Cables 1 through 5) or A 2200 amperes (Cables 6 through 12) until the fault cable open-circuits or the test is terminated at the customer's request.
- 17. Record target cable voltages and currents.

18. De-energize the target cables and the Multi-Amp Test Set.

19. Photograph the post-test condition.

For all performances of this test, the observed target cable operation shall be compared to the acceptance criteria, Paragraph 2.1.3, i.e., they shall maintain continuity of power.

3.4.6 Post-Overcurrent Test Functional Test

The functional tests of Paragraph 3.4.4 shall be repeated.

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3.0 TEST PROGRAM (Continued)

3.5 Configuration Number 3 Tests

Configuration Number 3 shall consist of two tests between a horizontal tray and a one-inch conduit mounted parallel to the tray. In Test 1, the faulted cable shall be in the cable tray one inch below the conduit. In Test 2, the faulted cable shall be in the conduit below the cable tray.

3.5.1 Purpose

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The purpose of the Configuration Number 3 tests is to demonstrate that target cables enclosed in rigid steel conduit running parallel and one inch above a filled cable tray are not adversely affected by a faulted cable in the tray, and also that target cables in a tray running parallel and immediately above a cable in a rigid steel conduit are not adversely affected when the worst case fault occurs in the conduit.

3.5.2 <u>Test Specimen Preparation</u>

The test specimens shall be mounted to the unistrut frame assembly of Figure 7. This apparatus shall be assembled to the indicated dimensions by Wyle technicians using materials supplied by NMP2. The following guidelines shall be observed with regard to the materials and construction of the assembly:

- 1. The faulted cable shall be a WCC cable from NMP2 stock.
- 2. For Test 1, the faulted cable shall be contained inside the cable tray at the centerline of the tray as shown in Figure 7. The cable tray shall be mounted one inch below the conduit. For Test 2, the faulted cable shall be contained inside the conduit below the cable tray as shown in Figure 8.
 - 3. The ends of the faulted cable from their termination at the copper bus bar to the edge of the cable tray or conduit shall be wrapped with a single layer of HAVEG SILTEMP WT-65 covered with a single layer of 3M No. 69 glass tape (or any other barrier material specified by SWEC). This wrapping shall be done to ensure that any ignition that might occur is contained to the test area.
 - 4. For Test 1, the conduit shall be 1-inch rigid steel. For Test 2, the conduit shall be 4-inch rigid steel.
 - 5. Photographs shall be taken of the test setup prior to each test.

3.5.3 Instrumentation Setup

3.5.3.1 Thermocouple Locations

A total of 17 Type "K" thermocouples shall be utilized for this test. These thermocouples shall be mounted as described below for both Test 1 and Test 2.

Test Procedure No. 47906-01

3.0 TEST PROGRAM (Continued)

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3.5 Configuration Number 3 Tests (Continued)

3.5.3.1 Thermocouple Locations (Continued)

| Channel No. | Location | | |
|-------------|---|--|--|
| 1-6 | Mounted to the jacket on the fault cable. These thermocouples shall be mounted approximately 16 inches apart. | | |
| 7 & 8 | Mounted to the conductor of the fault cables at the two series connections. | | |
| 9–11 | Mounted to the outside of the conduit. These
thermocouples shall be mounted approximately
16 inches apart and above Channels 3, 4, and 5. | | |
| 12-17 | Mounted to the jacket of the target cable. These thermocouples shall be mounted approximately 16 inches apart and above Channels 1–6. | | |

The thermocouples shall be monitored by a Fluke Datalogger feeding a highspeed printer. The datalogger shall be operated at its maximum scan rate throughout the overcurrent test.

3.5.3.2 Electrical Monitoring

All phase-to-phase voltages and phase currents of the target cables and the fault cable current shall be fed into oscillograph recorders. The oscillograph shall be operated at the 0.1-inch per minute rate throughout the overcurrent test. The oscillograph channels shall be as specified in the following table:

| Channel No. | Signal | Cable/Location* |
|---------------------------|---------|-----------------|
| 1 | Current | 7/C 12 AWG/C |
| 2 | Voltage | 7/C 12 AWG/C |
| 3-7 | Skipped | N/A |
| 8 | Current | Fault Cable/T |
| 9-12 | Skipped | N/A |
| * C = Conduit
T = Tray | | |

For Test 2, in addition to the above, add the below listed thermocouples:

| Channel No. | Location |
|-------------|---|
| 18 & 19 | Mounted to the rungs of the cable tray. |

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Test Procedure No. 47906-01

3.0 TEST PROGRAM (Continued)

3.5 Configuration Number 3 Tests (Continued)

3.5.3 Instrumentation Setup (Continued)

A digital multimeter shall be utilized to measure all phase-to-phase or phase voltages and phase currents of the target cables prior to, during, and after the overcurrent test. This data shall be recorded to provide accurate evidence of the specimen's capability to conduct SWEC-rated current at 120 VAC for the control cables throughout the overcurrent test.

3.5.4 Baseline Functional Tests

The baseline functional tests shall consist of insulation resistance and high potential measurements on each of the target cables.

3.5.4.1 Insulation Resistance Test

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- 1. Disconnect all power and instrumentation leads from the target cables and label per Figures 12 and 13.
- 2. Using a megohmmeter, apply a potential of 1000 VDC and record the minimum insulation resistance indicated after a period of 60 seconds between the following test points.

Target Control Cables:

| Phase-to-Phase | Phase-to-Ground |
|----------------|-----------------|
| 1 to 4 | 1 to conduit |
| | 4 to conduit |

For all performances of this test, the measured values shall be compared to the acceptance criteria, Paragraph 2.1.1, i.e., greater than 1.6×10^6 ohms.

3.5.4.2 High Potential Test

1. Using a Hi-Pot Test Set, a potential of 2200 VAC shall be applied from each conductor to ground and between conductors on multiconductor cable for a period of one minute.

Target Control Cables:

| Phase | ⊱t | o-F | hase |
|-------|---------------|-----|------|
| 1 | l t | o 4 | |

Phase-to-Ground 1 to conduit 4 to conduit

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3.0 TEST PROGRAM (Continued)

3.5 Configuration Number 3 Tests (Continued)

3.5.4.2 High Potential Test (Continued)

2. Reconnect all power and instrumentation leads per Figures 12 and 13.

For all performances of this test, the measured values shall be compared to the acceptance criteria, Paragraph 2.1.2, i.e., there shall be no evidence of insulation breakdown or flashover.

3.5.5 Overcurrent Test

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The overcurrent test shall be conducted in four sequential steps with no intentional time delay. The first phase consists of energizing the fault cable wtih SWEC rated current. The second phase consists of increasing the current until tault cable temperatures are within 1890-1990F for 5 minutes. The third phase consists of energizing the fault cable with the worst case electrical fault current until the cable open-circuits, temperature stabilize or decrease, or the test is terminated at the customer's request. In the event that the fault cable is short-circuited (temperature decreasing and insulation burnt-off) or temperatures have stabilized, maximum let-through current shall be simulated. This let-through current shall be assumed at the load, based on the backup circuit breaker, and maintained until the fault cable open circuits. The let-through current shall be either 660 amperes for Cables No. 1 through 5, or 2200 amperes for Cables No. 6 through 12, or the maximum Multi-Amp Test Set output.

The target control cable shall conduct SWEC-rated current (see Paragraph 2.1.3) at 120 VAC throughout the overcurrent test. The overcurrent test shall be conducted using the following procedure.

- 1. Connect the WCC fault cable to the copper bus bars per Figure 11.
- 2. Install a 7/C 12 AWG target cable per Figure 7 into the conduit (Test 1) or per Figure 8 into the cable tray.
- 3. Connect the 7/C 12 AWG target cable to the instrumentation and power supplies of Figure 13.
- 4. Energize the 7/C 12 AWG target cable with 10 amperes at 120 VAC.
- 5. Energize the WCC fault cable with rated current from the Multi-Amp Test A Set per Table 1.
- 6. Record target cable voltages and currents and the fault cables current.

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3.0 TEST PROGRAM (Continued)

- 3.5 Configuration Number 3 Tests (Continued)
- 3.5.5 Overcurrent Test (Continued)

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- Slowly increase fault cable current until Thermocouple Channels 7 and/or 8 indicate 90 +3°C (189-199°F) conductor temperature.
- 8. Maintain the conductor temperature at 189–199°F for five minutes.
- 9. Record fault cable current, conductor temperature, and the highest of Thermocouple Channels 1 through 6.
- 10. Increase the Multi-Amp Test Set output to test current per Table 1.
- 11. Record target cable voltages, currents and the fault cable current.
- 12. Allow the fault cable to conduct test current until either the cable opencircuits, temperatures stabilize or decrease, or the test is terminated at the customer's request.
- 13. If an open circuit occurs, record the elapsed time and maximum cable temperature, and proceed to Step 17.
- 14. If a 15-minute period of stabilized temperature occurs, record the maximum temperature, elapsed time and applied current level, and proceed to Step 16.
- 15. Should the fault cable ignite but not open-circuit and cable jacket/conductor temperatures decrease for 15 minutes, record the maximum temperature, elapsed time and applied current level, and proceed to Step 16.
- 16. Increase fault cable current to 660 amperes (Cables 1 through 5) or 2200 amperes (Cables 6 through 12) until the fault cable open-circuits or the test is terminated at the customer's request.
- 17. Record target cable voltages and currents.
- 18. De-energize the target cables and the Multi-Amp Test Set.
- 19. Photograph the post-test condition.

For all performances of this test, the observed target cable operation shall be compared to the acceptance criteria, Paragraph 2.1.3, i.e., they shall maintain continuity of power.

3.5.6 Post-Overcurrent Test Functional Test

The functional tests of Paragraph 3.5.4 shall be repeated.

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3.0 TEST PROGRAM (Continued)

3.6 Configuration Number 4 Test

Configuration Number 4 shall consist of a test between three vertically separated horizontal cable trays. The faulted cable shall be in the center horizontal cable tray.

3.6.1 Purpose

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\$: The purpose of the Configuration Number 4 test is to demonstrate the acceptability of design where three horizontal cable trays are separated by 9 inches (from the top of one tray to the bottom of the next tray) when the worst case electrical fault occurs in the center cable tray.

3.6.2 Test Specimen Preparation

The test specimens shall be mounted into the test assembly of Figure 9. This apparatus shall be manufactured to the indicated dimensions by Wyle technicians using materials supplied by NMP2. The following guidelines shall be observed with regard to the materials and construction of the assembly:

- 1. The fault cable shall be a WCC cable from NMP2 stock.
- 2. The faulted cable shall be located at the centerline of Tray T2 as shown in Figure 9.
- 3. The ends of the fault cable shall be wrapped from their termination on the copper bus bar to the edge of their cable tray. This wrap shall consist of a single layer of HAVEG SILTEMP WT-65 covered with a single layer of 3M No. 69 glass tape (or any other barrier material specified by SWEC). This wrapping shall be done to ensure that any ignition that might occur is contained to the cable tray test area.
- 4. The horizontal cable trays shall be mounted such that there are nine inches between the top of the siderail of one tray to the bottom of the siderail to the next higher cable tray.
- 5. The cable trays shall contain the following cables from NMP2 stock:

| Raceway No. | Raceway Cable Fill | | |
|-------------|--|--|--|
| T1 | Mixture of <u>K-Type</u> cables with one Triplex 2 AWG target cable in the bottom layer at the centerline of the tray. | | |
| T2 | Mixture of <u>K-Type</u> cables with one WCC fault cable at the top centerline of the tray. | | |
| Т3 | Mixture of <u>C- and X-Type</u> cables with one 7/C 12 AWG
and one 2/C 16 AWG target cables at the top centerline
of the tray. | | |

6. Photographs shall be taken of the test setup prior to the test.

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Test Procedure No. 47906-01

- 3.0 TEST PROGRAM (Continued)
- 3.6 Configuration Number 4 Test (Continued)
- 3.6.3 Instrumentation Setup

3.6.3.1 Thermocouple Locations

A total of 20 Type "K" thermocouples shall be utilized for this test. These thermocouples shall be mounted as described below.

| Channel No. | Location | | |
|-------------|--|--|--|
| 1-6 | Mounted to the jacket on the fault cable. These thermocouples shall be mounted approximately 16 inches apart. | | |
| 7 & 8 | Mounted to the conductor of the fault cables at the two series connections. | | |
| 9-14 | Mounted to the jacket of the target cable in Tray T1.
These thermocouples shall be mounted approximately
16 inches apart. | | |
| 15-20 | Mounted to the jacket of the target cables in Tray T3.
These thermocouples shall be mounted approximately
16 inches apart. | | |
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The thermocouples shall be monitored by a Fluke Datalogger feeding a highspeed printer. The datalogger shall be operated at it maximum scan rate throughout the overcurrent test.

3.6.3.2 Electrical Monitoring

All phase-to-phase voltages and phase currents of the target cables and the fault cable current shall be fed into oscillograph recorders. The oscillograph shall be operated at the 0.1-inch per minute rate throughout the overcurrent test. The oscillograph channels shall be as specified in the following table:



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Test Procedure No. 47906-01, Rev. A

3.0 TEST PROGRAM (Continued)

3.6 Configuration Number 4 Test (Continued)

3.6.3.2 Electrical Monitoring (Continued)

| Channel No. | Signal | Cable/Location |
|-------------|-----------------|------------------|
| 1 | Current-Phase A | Triplex 2 AWG/T1 |
| 2 | Current-Phase B | Triplex 2 AWG/T1 |
| 3 | Current-Phase C | Triplex 2 AWG/T1 |
| 4 | Voltage A-B | Triplex 2 AWG/T1 |
| 5 | Voltage A-C | Triplex 2 AWG/T1 |
| 6 | Voltage B-C | Triplex 2 AWG/T1 |
| 7 | Current | 7/C 12 AWG/T3 |
| 8 | Voltage | 7/C 12 AWG/T3 |
| 9 | Current | 2/C 16 AWG/T3 |
| 10 | Voltage | 2/C 16 AWG/T3 |
| 11 | Skipped | N/A |
| 12 | Current | Fault Cable/T2 |
| | | |

Oscillograph No. 1

A digital multimeter shall be utilized to measure all phase-to-phase or phase voltages and phase currents of the target cables prior to, during, and after the overcurrent test. This data shall be recorded to provide accurate evidence of the specimen's capability to conduct SWEC-rated current at 575 VAC (120 VAC for control cables and 50 VAC for instrument cables) throughout the overcurrent test.

3.6.4 Baseline Functional Tests

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The baseline functional tests shall consist of insulation resistance and high potential measurements on each of the target cables.

3.6.4.1 Insulation Resistance Test

- 1. Disconnect all power and instrumentation leads from the target cables and label per Figures 12, 13, or 14.
- 2. Using a megohumeter, apply a potential of 1000 VDC (500 VDC for 2/C A 16 AWG cable) and record the minimum insulation resistance, indicated after a period of 60 seconds between the following test points:

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3.0 TEST PROGRAM (Continued)

3.6 Configuration Number 4 Test (Continued)

3.6.4.1 Insulation Resistance Test (Continued)

Target Power Cables:

| Phase-to-Phase | Phase-to-Ground |
|----------------|-----------------------|
| 1 to 2 | 1 to unistrut or tray |
| 1 to 3 | 2 to unistrut or tray |
| 2 to 3 | 3 to unistrut or tray |

Target Control Cables:

| Phase-to-Phase | |
|----------------|--|
| 1 to 4 | |

| Phase-to-Ground | | | |
|-----------------|------|----|---------|
| 1 to | tray | or | conduit |
| 4 to | tray | or | conduit |

Target Instrument Cables:

Phase-to-Phase 1 to 2

Phase-to-Ground 1 to shield* 2 to shield*

*One end of shield tied to unistrut, tray or conduit.

For all performances of this test, the measured values shall be compared to the acceptance criteria, Paragraph 2.1.1, i.e., greater than 1.6 x 10^6 ohms.

3.6.4.2 High Potential Test

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1. Using a Hi-Pot Test Set, a potential of 2200 VAC (1600 VAC for 2/C 16 AWG cable) shall be applied from each conductor to ground and between conductors on multiconductor cable for a period of one minute.

Target Power Cables:

| Phase-to-Phase | Phase-to-Ground |
|----------------|-----------------|
| 1 to 2 | 1 to tray |
| 1 to 3 | 2 to tray |
| 2 to 3 | 3 to tray |

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3.0 TEST PROGRAM (Continued)

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3.6 Configuration Number 4 Test (Continued)

3.6.4.2 <u>High Potential Test</u> (Continued)

Target Control Cables:

| Phase-to-Phase | Phase-to-Ground |
|---------------------------|--|
| 1 to 4 | 1 to conduit or tray
4 to conduit or tray |
| Target Instrument Cables: | |

| Phase-to-Phase | | Phase-to-Ground | |
|----------------|---|------------------------------|--|
| 1 to 2 | • | 1 to shield*
2 to shield* | |

*One end of shield tied to conduit or tray.

2. Reconnect all power and instrumentation leads per Figure 12, 13, or 14.

For all performances of this test, the measured values shall be compared to the acceptance criteria, Paragraph 2.1.2, i.e., there shall be no evidence of insulation breakdown or flashover.

3.6.5 Overcurrent Test

The overcurrent test shall be conducted in four sequential steps with no intentional time delay. The first phase consists of energizing the fault cable with SWEC rated current. The second phase consists of increasing the current until fault cable temperatures are within $189^{\circ}-199^{\circ}F$ for 5 minutes. The third phase consists of energizing the fault cable with the worst case electrical fault current until the cable open-circuits, temperature stabilize or decrease, or the test is terminated at the customer's request. In the event that the fault cable is short-circuited (temperature decreasing and insulation burnt-off) or temperatures have stabilized, maximum let-through current shall be simulated. This let-through current shall be assumed at the load, based on the backup circuit breaker, and maintained until the fault cable open circuits. The letthrough current shall be either 660 amperes for Cables No. 1 through 5, or 2200 amperes for Cables No. 6 through 12, or the maximum Multi-Amp Test Set output.

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Test Procedure No. 47906-01, Rev. A

- 3.0 TEST PROGRAM (Continued)
- 3.6 Configuration Number 4 Test (Continued)

3.6.5 Overcurrent Test (Continued)

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145. . 11. 195 The target control cables shall conduct SWEC-rated current (see Paragraph 2.1.3) at 575 VAC (power cables), 120 VAC (control cables), or 50 VAC (instrument cables) throughout the overcurrent test. The overcurrent test shall be conducted using the following procedure:

- 1. Connect the WCC fault cable to the copper bus bars per Figure 11.
- 2. Install a 7/C 12 AWG and a 2/C 16 AWG target cable per Figure 9 into A Tray T3.
- 3. Install a Triplex 2 AWG target cable per Figure 9 into Tray T1.
- 4. Connect the Triplex 2 AWG target cable to the instrumentation and power supplies of Figure 12.
- 5. Connect the 7/C 12 AWG target cables to the instrumentation and power supplies of Figure 13.
- 6. Connect the 2/C 16 AWG target cable to the instrumentation and power supplies of Figure 14.
- 7. Energize the Triplex 2 AWG target cable with 38.5 amperes at 575 VAC.
- 8. Energize the 7/C 12 AWG target cables with 10 amperes at 120 VAC.
- 9. Energize the 2/C 16 AWG target cable with one ampere at 50 VAC.
- 10. Energize the WCC fault cable with rated current from the Multi-Amp Test A Set per Table 1.
- 11. Record target cable voltages and currents and the fault cables current.
- 12. Slowly increase fault cable current until thermocouple Channels 7 and/or 8 indicate 90 +3°C (189-199°F) conductor temperature.
- 13 Maintain the conductor temperature at 189–199^oF for five minutes.
- 14. Record fault cable current, conductor temperature, and the highest of thermocouple Channels 1 through 6.

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Test Procedure No. 47906-01, Rev. A

- 3.0 TEST PROGRAM (Continued)
- 3.6 Configuration Number 4 Test (Continued)
- 3.6.5 Overcurrent Test (Continued)

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- 15. Increase the Multi-Amp Test Set output to <u>TBD</u> amperes (test current).
- 16. Record target cable voltages, currents and the fault cable current.
- 17. Allow the fault cable to conduct test current until either the cable opencircuits, temperatures stabilize or decrease, or the test is terminated at the customer's request.
- 18. If an open circuit occurs, record the elapsed time and maximum cable A temperature, and proceed to Step 22.
- 19. If a 15-minute period of stabilized temperature occurs, record the A maximum temperature, elapsed time and applied current level, and proceed to Step 21.
- 20. Should the fault cable ignite but not open-circuit and cable A jacket/conductor temperatures decrease for 15 minutes, record the maximum temperature, elapsed time and applied current level, and proceed to Step 21.
- 21. Increase fault cable current to 660 amperes (Cables 1 through 5) or A 2200 amperes (Cables 6 through 12) until the fault cable open-circuits or the test is terminated at the customer's request.
- 22. Record target cable voltages and currents.
- 23. De-energize the target cables and the Multi-Amp Test Set.
- 24. Photograph the post-test condition.

For all performances of this test, the observed target cable operation shall be compared to the acceptance criteria, Paragraph 2.1.3, i.e., they shall maintain continuity of power.

3.6.6 Post-Overcurrent Test Functional Test

The functional tests of Paragraph 3.6.4 shall be repeated.

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3.0 TEST PROGRAM (Continued)

3.7 Configuration Number 5 Tests

Configuration Number 5 shall consist of tests between flexible conduit, rigid conduit, and cable in free air mounted within 1/4-inch of each other. For Test No. 1, the faulted cable shall be the bare cable. For Test No. 2, the faulted cable shall be in the rigid conduit. For Test No. 3, the faulted cable shall be in the flexible conduit.

3.7.1 Purpose

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The purpose of the Configuration Number 5 tests is to demonstrate the acceptability of design where a rigid conduit, flexible conduit, and a cable in free air are separated by less than 1/4-inch from each other (but not in contact), when the worst-case electrical fault occurs in either conduit or to the bare cable.

3.7.2 Test Specimen Preparation

The test specimens shall be mounted into the test assembly of Figure 10. This apparatus shall be manufactured to the indicated dimensions by Wyle technicians using materials supplied by NMP2. The following guidelines shall be observed with regard to the materials and construction of the assembly:

- 1. The fault cable shall be a WCC cable from NMP2 stock and mounted in Location 3 of Figure 10 for all three tests.
- 2. The ends of the faulted cable shall be wrapped from their termination on the copper bus bar to the edge of the test assembly. This wrap shall consist of a single layer of HAVEG SILTEMP WT-65 covered with a single layer of 3M No. 69 glass tape (or any other barrier materials specified by SWEC). This wrapping shall be done to ensure that any ignition that might occur is contained to the cable tray test area.
- 3. A Triplex 2 AWG target power cable from NMP2 stock shall be mounted in Location 2 of Figure 10 for all three tests.
- 4. A 7/C 12 AWG target control cable from NMP2 stock shall be mounted in Location 1 of Figure 10 for all three tests.
- 5. The conduits and free air cable shall be orientated as described below:

| Test No. | Location 1 | Location 2 | Location 3 |
|----------|---------------------------|----------------------|---------------------------|
| 1 | Anaconda Flexible Conduit | Rigid Conduit | Free Air Cable |
| . 2 | Free Air Cable | BOA Flexible Conduit | Rigid Conduit |
| 3 | Rigid Conduit | Free Air Cable | Anaconda Flexible Conduit |

Test Procedure No. 47906-01

3.0 TEST PROGRAM (Continued)

3.7 Configuration Number 5 Tests (Continued)

- 3.7.2 Test Specimen Preparation (Continued)
 - 6. The conduits and cable shall be mounted within 1/4-inch of each other (but not in contact) for all three tests.
 - 7. Photographs shall be taken of the test setup prior to each test.

3.7.3 Instrumentation Setup

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3.7.3.1 Thermocouple Locations

A total of 24 Type "K" thermocouples shall be utilized for this test. These thermocouples shall be mounted as described below.

| Channel No. | Location | |
|-------------|--|--|
| 1-6 | Mounted to the jacket on the fault cable. These thermocouples shall be mounted approximately 16 inches apart. | |
| 7 & 8 | Mounted to the conductor of the fault cables at the two series connections. | |
| 9-14 | Mounted to the jacket of the target cable in
Location 1. These thermocouples shall be mounted
approximately 16 inches apart. | |
| 15-20 | Mounted to the jacket of the target cable in
Location 2. These thermocouples shall be mounted
approximately 16 inches apart. | |
| 21 & 22 | Mounted to the outside of the flexible conduit on the side towards the rigid conduit. | |
| 23 & 24 | Mounted to the outside of the rigid conduit on the side towards the flexible conduit. | |

The thermocouples shall be monitored by a Fluke Datalogger feeding a highspeed printer. The datalogger shall be operated at its maximum scan rate throughout the overcurrent test.

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Test Procedure No. 47906-01

3.0 TEST PROGRAM (Continued)

3.7 Configuration Number 5 Tests (Continued)

3.7.3.2 Electrical Monitoring

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All phase-to-phase voltages and phase currents of the target cables and the fault cable current shall be fed into oscillograph recorders. The oscillograph shall be operated at the 0.1-inch per minute rate throughout the overcurrent test. The oscillograph channels shall be as specified in the following table.

| Channel No. | Signal | Cable |
|-------------|-----------------|----------------------------|
| 1 | Current | 7/C 12 AWG Target Cable |
| 2 | Voltage | 7/C 12 AWG Target Cable |
| 3 | Current-Phase A | Triplex 2 AWG Target Cable |
| 4 | Current-Phase B | Triplex 2 AWG Target Cable |
| 5 | Current-Phase C | Triplex 2 AWG Target Cable |
| 6 | Voltage A-B | Triplex 2 AWG Target Cable |
| 7 | Voltage A-C | Triplex 2 AWG Target Cable |
| 8 | Voltage B-C | Triplex 2 AWG Target Cable |
| 9 & 10 | Skipped | N/A |
| 11 | Current | Fault Cable |
| 12 | Skipped | N/A |

A digital multimeter shall be utilized to measure all phase-to-phase or phase voltages and phase currents of the target cables prior to, during, and after the overcurrent test. This data shall be recorded to provide accurate evidence of the specimen's capability to conduct SWEC-rated current at 575 VAC (120 VAC for control cables) throughout the overcurrent test.

3.7.4 Baseline Functional Tests

The baseline functional tests shall consist of insulation resistance and high potential measurements on each of the target cables.

3.7.4.1 Insulation Resistance Test

- 1. Disconnect all power and instrumentation leads from the target cables and label per Figure 12 or 13.
- 2. Using a megohimmeter, apply a potential of 1000 VDC and record the minimum insulation resistance indicated after a period of 60 seconds between the following test points.

Test Procedure No. 47906-01

3.0 TEST PROGRAM (Continued)

3.7 Configuration Number 5 Tests (Continued)

3.7.4.1 Insulation Resistance Test (Continued)

Target Power Cables:

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| Phase-to-Phase | Phase-to-Ground |
|----------------|--------------------------|
| 1 to 2 | 1 to unistrut or conduit |
| 1 to 3 | 2 to unistrut or conduit |
| 2 to 3 | 3 to unistrut or conduit |
| | |

Target Control Cables:

| Phase-to-Phase | | Phase-to-Ground | |
|----------------|---|--------------------------|--|
| 1 to 4 | • | 1 to conduit or unistrut | |
| | | 4 to conduit or unistrut | |

For all performances of this test, the measured values shall be compared to the acceptance criteria, Paragraph 2.1.1, i.e., greater than 1.6×10^6 ohms.

3.7.4.2 High Potential Test

1. Using a Hi-Pot Test Set, a potential of 2200 VAC shall be applied from each conductor to ground and between conductors on multiconductor cable for a period of one minute.

Target Power Cables:

| Phase-to-Phase | Phase-to-Ground |
|----------------------------|--|
| 1 to 2
1 to 3
2 to 3 | 1 to unistrut or conduit
2 to unistrut or conduit
3 to unistrut or conduit |
| Target Control Cables: | |

| Phase-to-Phase | |
|----------------|--|
| 1 to 4 | |

Phase-to-Ground

1 to conduit or unistrut 4 to conduit or unistrut

2. Reconnect all power and instrumentation leads per Figure 12 or 13.

For all performances of this test, the measured values shall be compared to the acceptance criteria, Paragraph 2.1.2, i.e., there shall be no evidence of insulation breakdown or flashover.

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### 3.0 TEST PROGRAM (Continued)

### 3.7 Configuration Number 5 Tests (Continued)

### 3.7.5 Overcurrent Test

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The overcurrent test shall be conducted in four sequential steps with no intentional time delay. The first phase consists of energizing the fault cable with SWEC rated current. The second phase consists of increasing the current until fault cable temperatures are within 1890-1990F for 5 minutes. The third phase consists of energizing the fault cable with the worst case electrical fault current until the cable open-circuits, temperature stabilize or decrease, or the test is terminated at the customer's request. In the event that the fault cable is short-circuited (temperature decreasing and insulation burnt-off) or temperatures have stabilized, maximum let-through current shall be simulated. This let-through current shall be assumed at the load, based on the backup circuit breaker, and maintained until the fault cable open circuits. The let-through current shall be either 660 amperes for Cables No. 1 through 5, or 2200 amperes for Cables No. 6 through 12, or the maximum Multi-Amp Test Set output.

The target control cables shall conduct SWEC-rated current (see Paragraph 2.1.3) at 575 VAC (power cables) or 120 VAC (control cables) throughout the overcurrent test. The overcurrent test shall be conducted using the following procedure:

- 1. Connect the WCC fault cable to the copper bus bars per Figure 11.
- 2. Install a 7/C 12 AWG target cable per Figure 10.
- 3. Install a Triplex 2 AWG target cable per Figure 10.
- 4. Connect the Triplex 2 AWG target cable to the instrumentation and power supplies of Figure 12.
- 5. Connect the 7/C 12 AWG target cables to the instrumentation and power supplies of Figure 13.
- 6. Energize the Triplex 2 AWG target cable with 34 amperes at 575 VAC.
- 7. Energize the 7/C 12 AWG target cable with 10 amperes at 120 VAC.
- 8. Energize the WCC fault cable with rated current from the Multi-Amp Test A Set per Table 1.
- 9. Record target cable voltages and currents and the fault cables current.
- 10. Slowly increase fault cable current until thermocouple Channels 7 and/or 8 indicate 90 +3°C (189-199°F) conductor temperature.
- 11. Maintain the conductor temperature at 189-199°F for five minutes.

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# Test Procedure No. 47906-01, Rev. A

- 3.0 TEST PROGRAM (Continued)
- 3.7 Configuration Number 5 Tests (Continued)
- 3.7.5 Overcurrent Test (Continued)

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- 12. Record fault cable current, conductor temperature, and the highest of thermocouple Channels 1 through 6.
- 13. Increase the Multi-Amp Test Set output to test current per Table 1. A
- 14. Record target cable voltages, currents and the fault cable current.
- 15. Allow the fault cable to conduct test current until either the cable opencircuits, temperatures stabilize or decrease, or the test is terminated at the customer's request.
- 16. If an open circuit occurs, record the elapsed time and maximum cable A temperature, and proceed to Step 20.
- 17. If a 15-minute period of stabilized temperature occurs, record the A maximum temperature, elapsed time and applied current level, and proceed to Step 19.
- 18. Should the fault cable ignite but not open-circuit and cable A jacket/conductor temperatures decrease for 15 minutes, record the maximum temperature, elapsed time and applied current level, and proceed to Step 19.
- 19. Increase fault cable current to 660 amperes (Cables 1 through 5) or A 2200 amperes (Cables 6 through 12) until the fault cable open-circuits or the test is terminated at the customer's request.
- 20. Record target cable voltages and currents.

21. De-energize the target cables and the Multi-Amp Test Set.

22. Photograph the post-test condition.

For all performances of this test, the observed target cable operation shall be compared to the acceptance criteria, Paragraph 2.1.3, i.e., they shall maintain continuity of power.

# 3.7.6 Post-Overcurrent Test Functional Test

The functional tests of Paragraph 3.7.4 shall be repeated.

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### 3.0 TEST PROGRAM (Continued)

### 3.8 Configuration Number 6 Tests

Configuration Number 6 shall consist of a test of cables and bundled, insulated conductors terminated on terminal blocks inside an enclosure, wherein a fault occurs on one of the cable conductors.

### 3.8.1 Purpose

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The purpose is to demonstrate the acceptability of design where control and/or instrument cables are bundled together inside any control and/or instrument cabinet when the worst case electrical fault occurs on any control cable.

### 3.8.2 Test Specimen Preparation

The test assembly shall be manufactured in accordance with Figure 15 by Wyle technicians. The following guidelines shall be observed with regard to the materials and construction of the assembly:

- 1. The cable and terminal blocks inside the enclosure shall be from NMP2 stock. All other materials shall be provided by Wyle Laboratories.
- 2. The ends of the faulted cable shall be wrapped from their connection to the Multi-Amp Test Set to the enclosure. This wrap shall consist of a single layer of HAVEG Siltemp WT-65 covered with a single layer of 3M No. 69 glass tape (or any other barrier materials specified by SWEC). This wrapping shall be done to ensure that any ignition that might occur is contained within the enclosure.
- 3. All nonfaulted conductors in the 5/C cable shall be connected in series as shown in Figure 16. This circuit is designated Target Conductor Loop No. 1.
- 4. Both conductors in the 2/C cable shall be connected in series as shown in Figure 16. This circuit is designated Target Conductor Loop No. 2.

### 3.8.3 Instrumentation Setup

### 3.8.3.1 Thermocouple Locations

A total of 18 Type "K" thermocouples shall be utilized for this test. These thermocouples shall be mounted as described below:

| Channel No. | Location                                                                |  |  |  |  |
|-------------|-------------------------------------------------------------------------|--|--|--|--|
| 1 & 2       | Mounted to the jacket of the 5/C 12 AWG cable.                          |  |  |  |  |
| 3           | Mounted to the jacket of the faulted conductor of the 5/C 12 AWG cable. |  |  |  |  |

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# Test Procedure No. 47906-01, Revision A

3.0 TEST PROGRAM (Continued)

# 3.8 Configuration Number 6 Tests (Continued)

3.8.3.1 Thermocouple Locations (Continued)

| Channel No. | Location                                                                                                                                             |  |  |
|-------------|------------------------------------------------------------------------------------------------------------------------------------------------------|--|--|
| 4 & 5       | Mounted to the jacket of the faulted 1/C 14 AWG Type SIS cable.                                                                                      |  |  |
| 6 & 7       | Mounted to the jacket of the 2/C 12 AWG cable.                                                                                                       |  |  |
| 8           | Mounted to the jacket of the nonfaulted conductor of the $5/C$ 12 AWG cable.                                                                         |  |  |
| 10-16       | Mounted to the jacket of the nonfaulted 1/C 14 AWG Type SIS cable. (Channels 10-14 on 5-conductor bundle. Channels 15 and 16 on 2-conductor bundle.) |  |  |
| 17          | Mounted to the faulted bare conductor of the 5/C 12 AWG cable.                                                                                       |  |  |
| `18         | Mounted to the faulted bare conductor of the 1/C 14 AWG Type SIS cable.                                                                              |  |  |

# 3.8.3.2 Electrical Monitoring

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> The voltage and current of each target conductor loop and the faulted conductor current shall be fed into an oscillograph recorder. The oscillograph shall be operated at the 0.1-inch per minute rate throughout the overcurrent test. The oscillograph channels shall be as specified in the following table.

| Channel No. | Signal  | Location                    |  |
|-------------|---------|-----------------------------|--|
| 1           | Current | Target Conductor Loop No. 1 |  |
| 2           | Voltage | Target Conductor Loop No. 1 |  |
| 3           | Current | Target Conductor Loop No. 2 |  |
| 4           | Voltage | Target Conductor Loop No. 2 |  |
| 5           | Current | Faulted Conductor Loop      |  |

# 3.8.4 Baseline Functional Tests

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The baseline functional tests shall consist of insulation resistance and high potential measurements on the nonfaulted conductor loop.

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- 3.0 **TEST PROGRAM (Continued)**
- Configuration Number 6 Tests (Continued) 3.8
- **Baseline Functional Tests (Continued)** 3.8.4
- 3.8.4.1 **Insulation Resistance Test** 
  - Disconnect all power and instrumentation leads from the nonfaulted 1. conductor loop and label per Figure 16.
  - Using a megohmmeter, apply a potential of 1000 VDC and record the 2. minimum insulation resistance indicated after a period of 60 seconds between the following test points:

Target Conductor Loop No. 1

| Phase-to-Phase |   | Phase-to-Ground  |
|----------------|---|------------------|
| 1-1 to 1-2     | • | 1-1 to enclosure |
|                |   | 1-2 to enclosure |

Target Conductor Loop No. 2 Phase-to-Phase 3-1 to 3-2

Phase-to-Ground 3-1 to enclosure 3-2 to enclosure

For all performances of this test, the measured values shall be compared to the acceptance criteria, Paragraph 2.1.1, i.e., greater than  $1.6 \times 10^6$  ohms.

### 3.8.4.2 **High Potential Test**

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Using a Hi-Pot Test Set, a potential of 2200 VAC shall be applied from each conductor to ground for a period of one minute. 1.

Target Conductor Loop No. 1 Phase-to-Phase Phase-to-Ground 1-1 to 1-2 Target Conductor Loop No. 2 Phase-to-Phase

1-1 to enclosure 1-2 to enclosure

3-1 to 3-2

Phase-to-Ground 3-1 to enclosure 3-2 to enclosure

For all performances of this test, the measured values shall be compared to the acceptance criteria, Paragraph 2.1.1, i.e., there shall be no evidence of insulation breakdown or flashover.

### Page No. 44

# Test Procedure No. 47906-01, Revision A

3.0 TEST PROGRAM (Continued)

### 3.8 Configuration Number 6 Tests (Continued)

### 3.8.5 Overcurrent Test

The overcurrent test shall be conducted in two sequential steps with no intentional time delay. The first phase consists of energizing the fault conductor loop with 10 amperes for 15 minutes. The second phase consists of energizing the fault conductor loop with 100 amperes for a period of 11 seconds.

Each target conductor loop shall conduct 10 amperes at 120 VAC throughout the overcurrent test. The overcurrent test shall be conducted using the following procedure:

- 1. Connect the fault conductor loop to the Multi-Amp Test Set per Figure 16.
- 2. Connect the target conductor loops to the instrumentation and power supplies of Figure 15.
- 3. Energize each target conductor loop with 10 amperes at 120 VAC.
- 4. Energize the fault conductor loop with 10 amperes from the Multi-Amp Test Set.
- 5. Record voltage and current of each target conductor loop and the fault conductor loop current.
- 6. Maintain the 10 ampere current on the fault conductor loop for 15 minutes.
- 7. Energize the fault conductor loop with 100 amperes for a period of 11 seconds. If an open-circuit occurs, record the elapsed time and deenergize the Multi-Amp Test set. If ignition occurs, record the approximate elapsed time to ignite and to stop burning.
- 8. Record voltage and current of each target conductor loop.
- 9. Record each thermocouple temperature that occurred at the following points in the overcurrent test:
  - a. Before energizing either the faulted or nonfaulted conductor loop.
  - b. At the end of the 15-minute period of application of 10 amperes on the fault conductor loop.
  - c. At the end of the 11-second period of application of 100 amperes on the fault conductor loop.

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# Page No. 45

Test Procedure No. 47906-01, Revision A

# 3.0 TEST PROGRAM (Continued)

# 3.8 Configuration Number 6 Tests (Continued)

# 3.8.5 Overcurrent Test (Continued)

- 10. Observe thermocouple readouts on the datalogger until the maximum temperature has dropped below 300°F.
- 11. De-energize the target conductor loops.
- 12. Open the enclosure and record the observed condition of the conductors.
- 13. Photograph the post-test condition.

For the performance of this test, the observed operation of the target conductor loops shall be compared to the acceptance criteria, Paragraph 2.1.3, i.e., they shall maintain continuity of power.

## 3.8.6 Post-Overcurrent Test Functional Test

The functional tests of Paragraph 3.8.4 shall be repeated.

## 3.9 Quality Assurance

All test equipment and instrumentation to be used in the performance of this test program will be calibrated in accordance with Wyle Laboratories' (Eastern Operations) Quality Assurance Program Manual, which conforms to the applicable portions of ANSI N45.2, 10 CFR 50 Appendix B, 10 CFR 21, and Military Specification MIL-STD-45662. Standards used in performing all calibrations are traceable to the National Bureau of Standards.

## 3.10 Report

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Ten copies of the test report and one reproducible copy shall be issued, describing the test requirements, procedures, and results. The report shall be prepared in accordance with the requirements of Section 8, Documentation, of IEEE Std. 323-1974, as applicable.

Page No. 46 Test Procedure No. 47906-01, Revision A

FALLT CABLE T/C'S EVERY z 26" 514 14 14 +5" 10" A γØ ₹ ¢ μ ℃ 2 Ø 1 2.5" Z 20" 96" その A (8) ч 6 •/1 Ś ₹⁄c@• Ă G 14 γ ා 2'd' 88888 **A**11 YY У Ф 76BA FAULT CABLE 3 3ď. ישו 30" 0 Ψ Α  ${\mathbb O}$ 4 FRONT VIEW TOP VIEW

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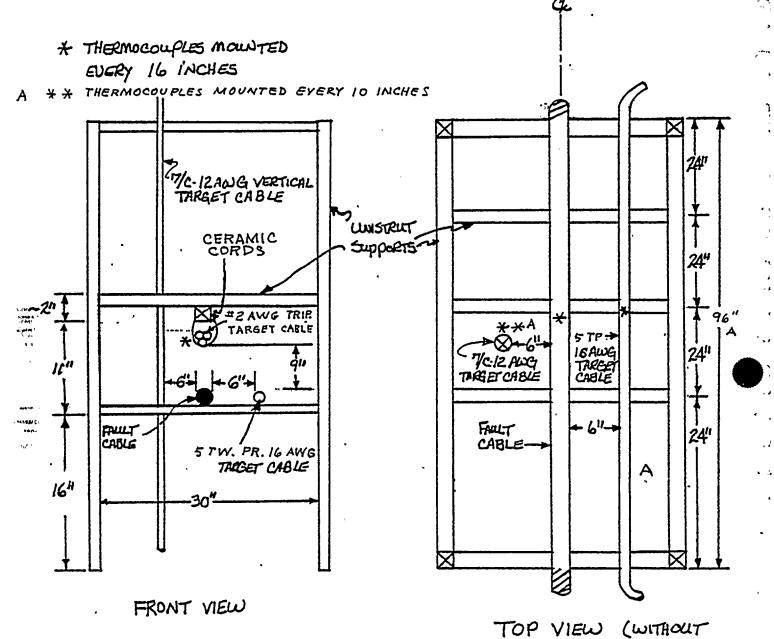
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FIGURE 1: SCREENING TEST SETUP

Page No. VIII-48 Test Report No. 47906-01

Page No. 47 Test Procedure No. 47906-01, Revision A

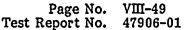


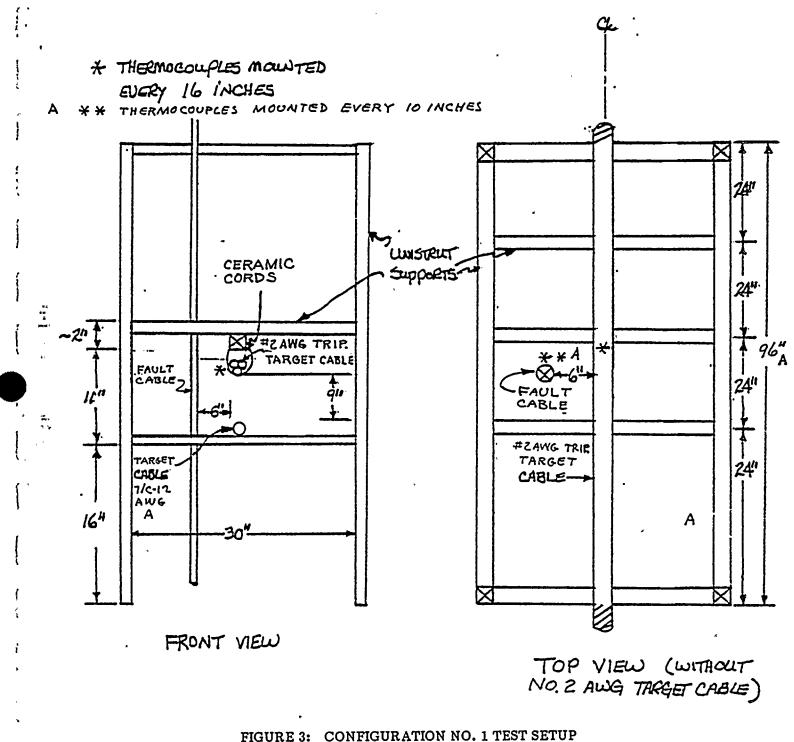
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NO. 2 AWG TARGET CABLE)

FIGURE 2: CONFIGURATION NO. 1 TEST SETUP

Test No. 1: Cable in Free Air to Cable in Free Air — Fault in Horizontal Cable





Test No. 2: Cable in Free Air to Cable in Free Air — Fault in Vertical Cable Page No. 49 Test Procedure No. 47906-01, Revision A Page No. VIII-50 Test Report No. 47906-01 Ĵ,

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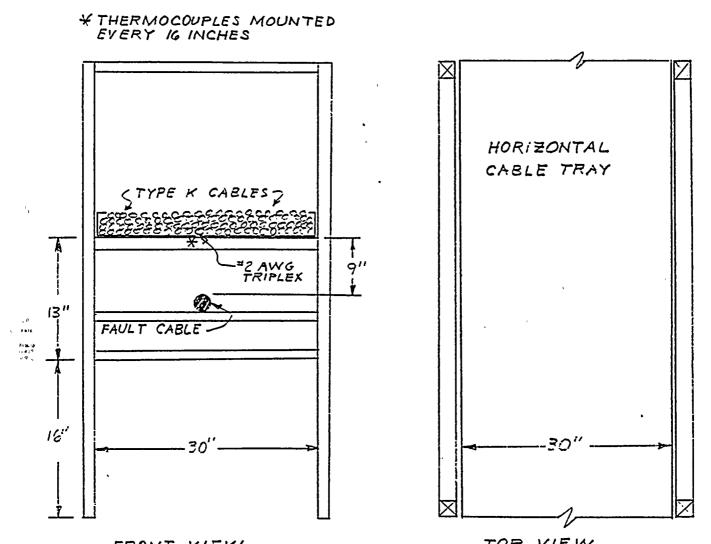
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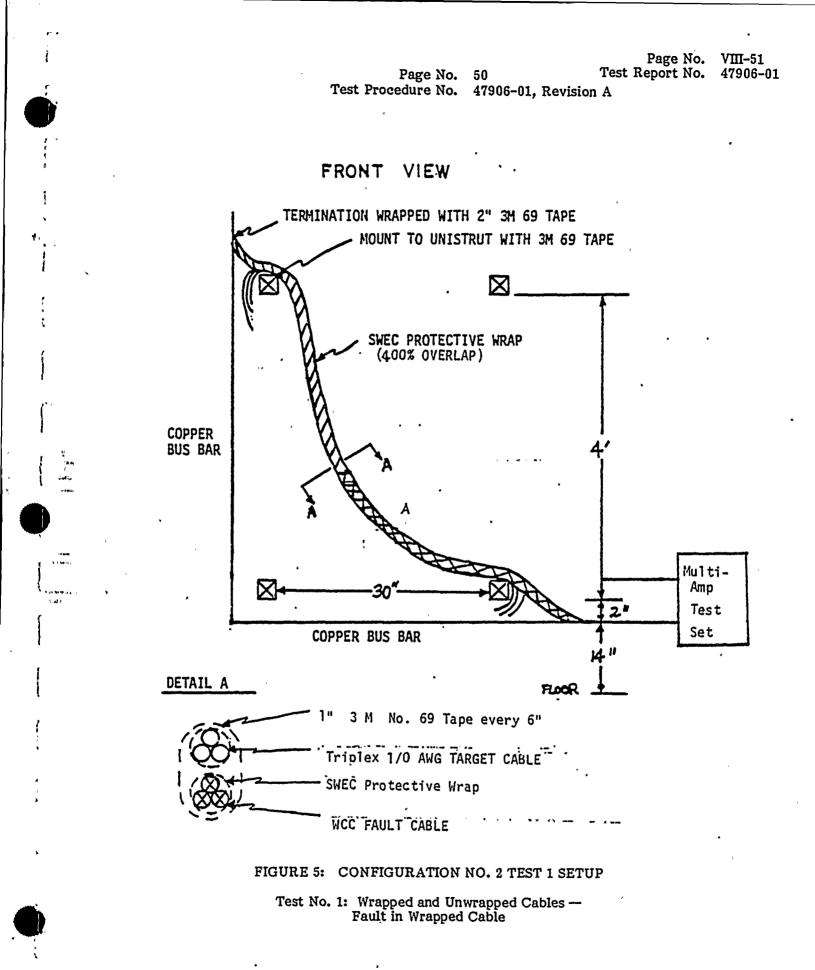


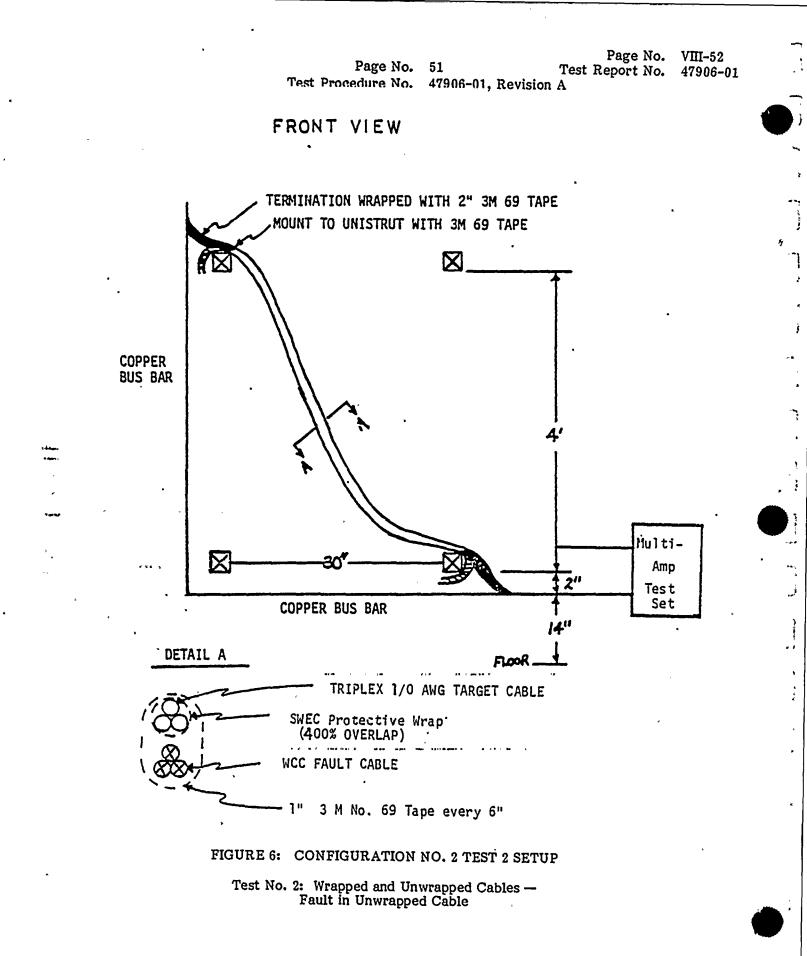
FRONT VIEW

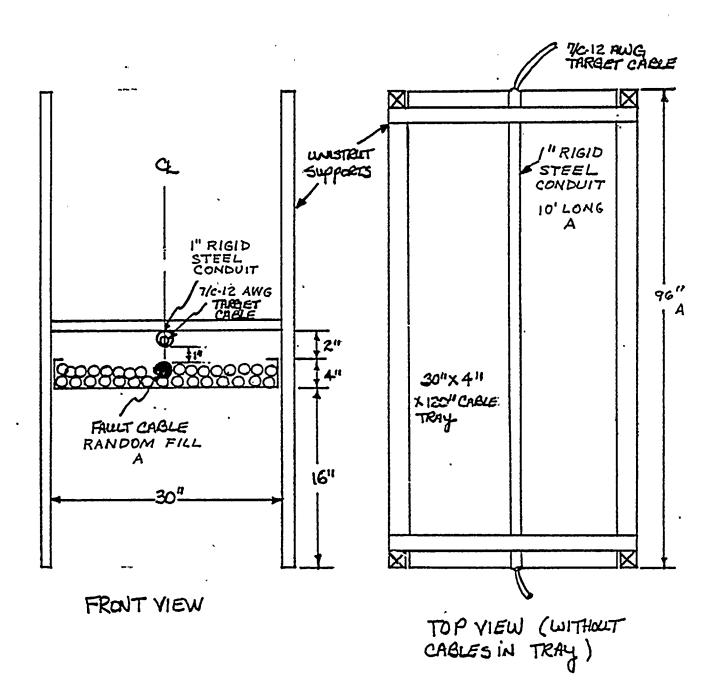
TOP VIEW

# FIGURE 4: CONFIGURATION NO. 1 TEST SETUP

Test No. 3: Cable in Free Air to Cable Tray — Fault in Horizontal Cable





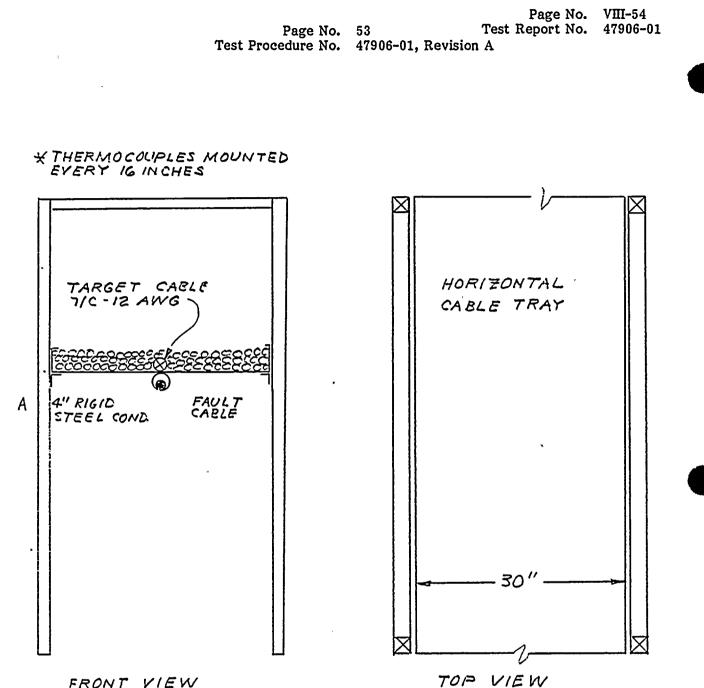


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FIGURE 7: CONFIGURATION NO. 3 TEST SETUP

Test No. 1: Horizontal Tray to Horizontal Conduit — Fault in Tray



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FRONT VIEW

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Test No. 2: Horizontal Tray to Horizontal Conduit Fault in Conduit

Page No. 54 <sup>1</sup> Test Procedure No. 47906-01, Revision A

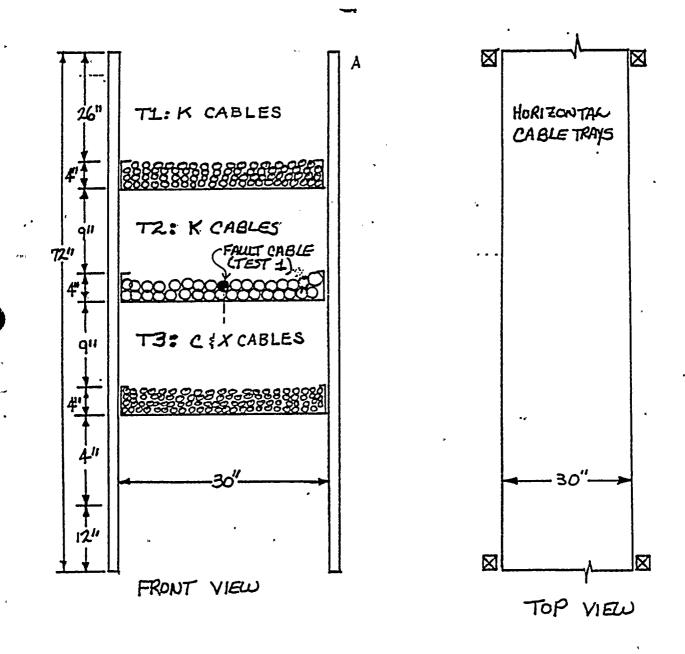


FIGURE 9: CONFIGURATION NO. 4 TEST SETUP Test No. 1: Horizontal Tray — Vertical Separation

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Page No. 55 Test Procedure No. 47906-01, Revision A

# A CONDUITS TO BE APPROX. 10' LONG

1 7/C - 12 AWG FILLER

CABLE (UNENERGIZED)

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A DO NOT SEAL CONDUIT ENDS

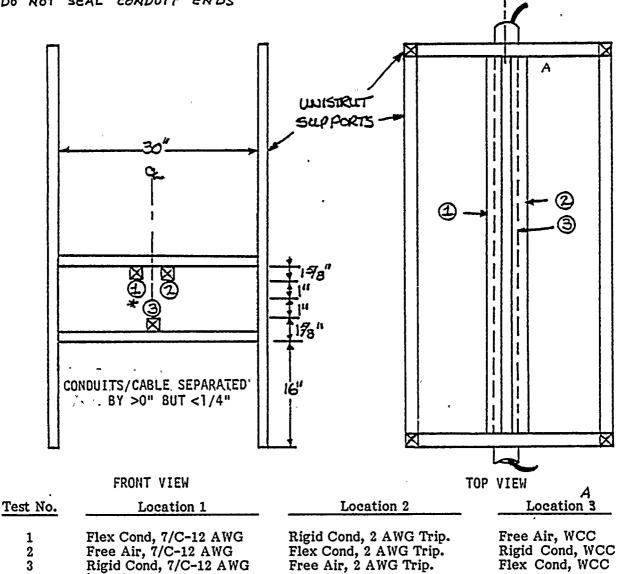
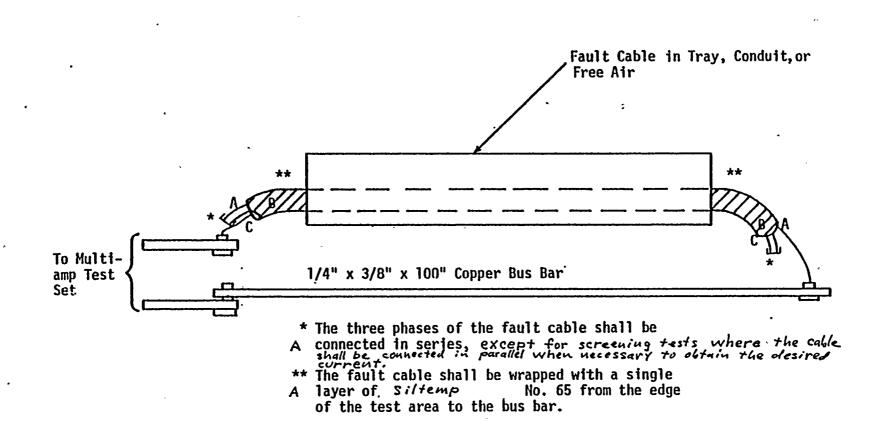


FIGURE 10: CONFIGURATION NO. 5 TEST SETUP

Flexible Conduit, Rigid Conduit and Cable in Free Air



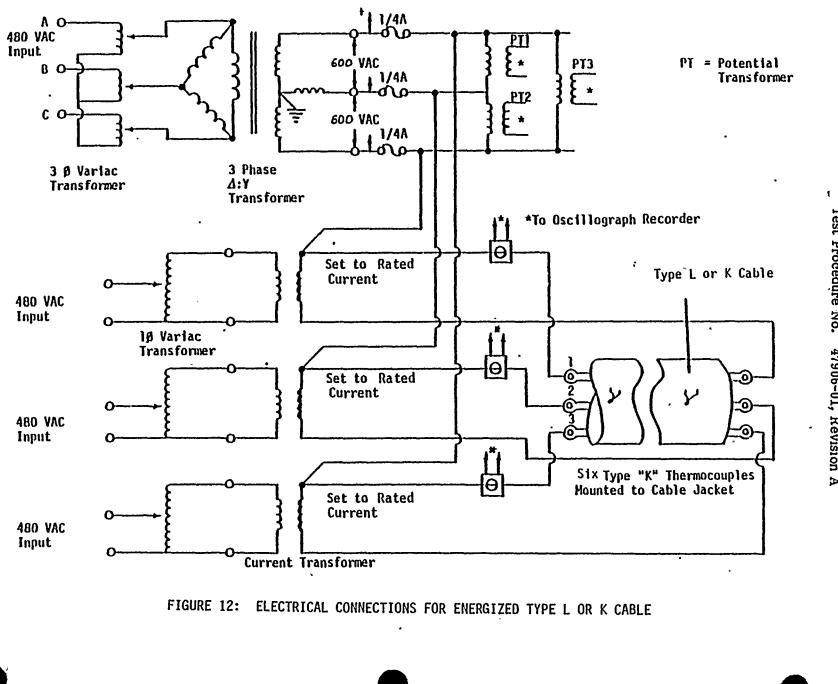
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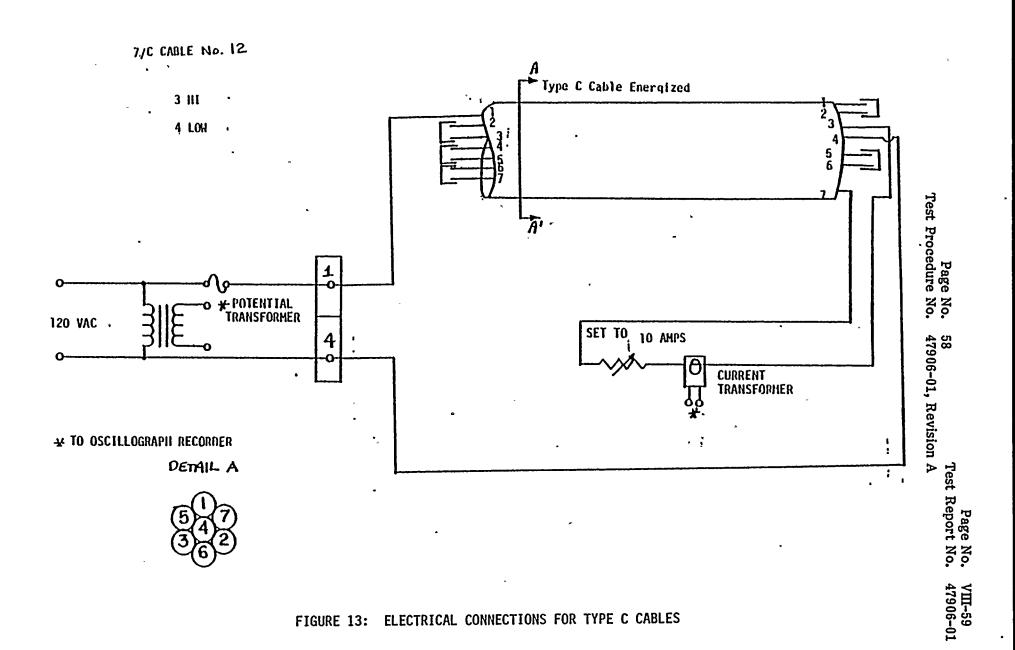
### FIGURE 11: TYPICAL FAULT CABLE CONNECTIONS

Page No. Test Procedure No. -1e 47906-01, Revision A Page No. Test Report No. VIII-57 47906-01



Page No. Test Procedure No. Page No. 57 Test Report No. 47906-01, Revision A VШ-58 47906-01

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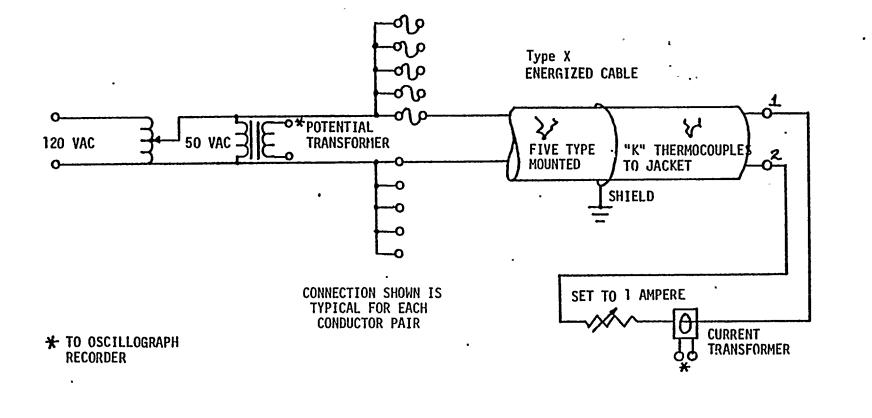


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# FIGURE 14: ELECTRICAL CONNECTIONS FOR TYPE X CABLES

Page No. Page No. 59 Test Report No. Test Procedure No. 47906-01, Revision A

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Page No. 60 Test Procedure No. 47906-01, Revision A Page No. VIII-61 Test Procedure No. 47906-01

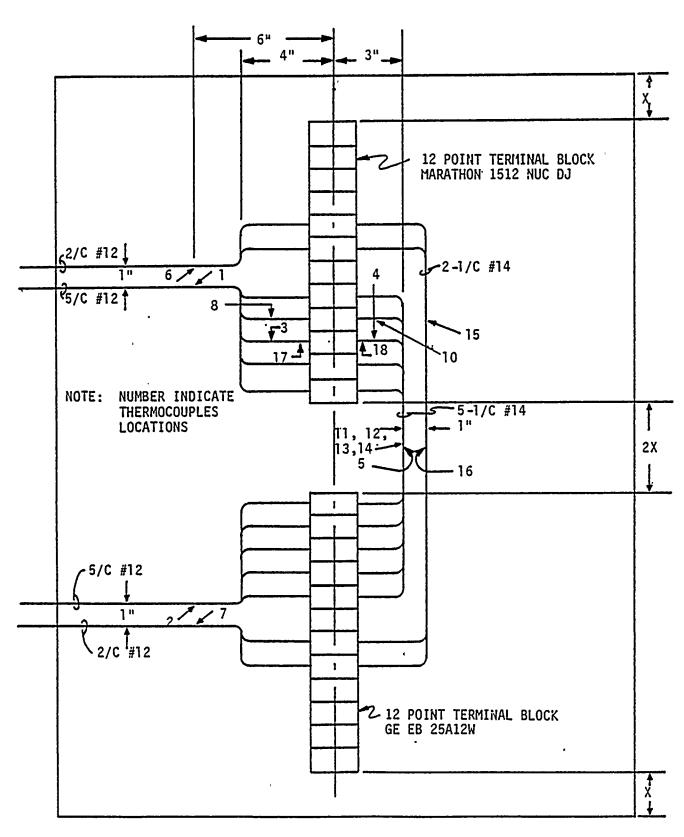
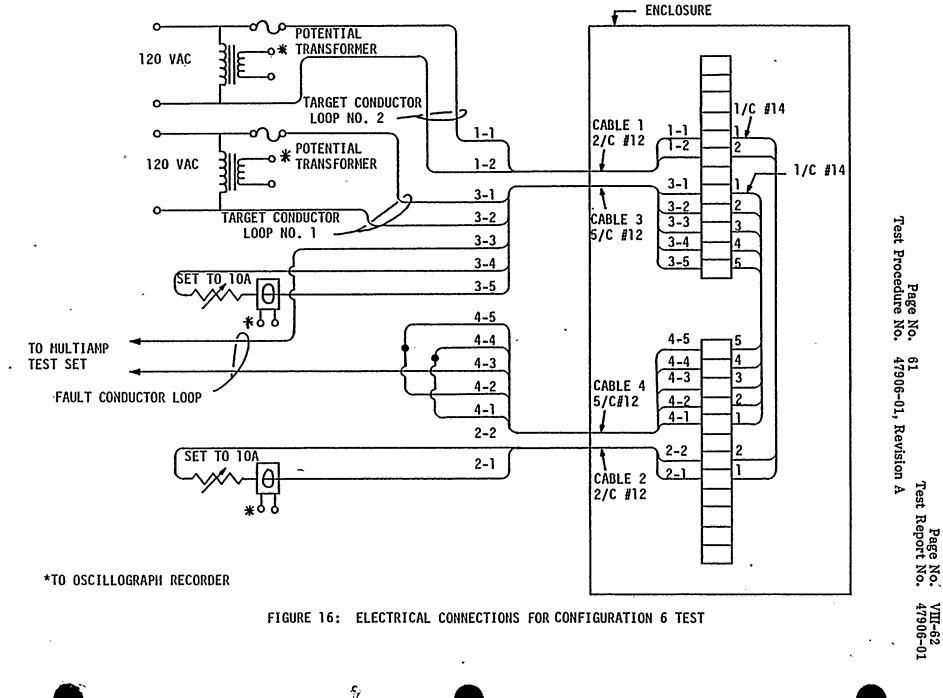


FIGURE 15: CONFIGURATION NO. 6 TEST SETUP



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### SUMMARY OF INCORPORATED CHANGES

Legend

- R = Response to NRC Question or SER Item
- E = Editorial or Typographical change that has not effected basis of FSAR.

N = Nonsafety-related change in design, schedule, and/or procedure. SN = Change to a safety-related item that has no effect on SER. SS = Change to safety-related item that has an effect on SER.





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|   | Pages                                                                         | Change<br>Code | Description                                                                                                           |
|---|-------------------------------------------------------------------------------|----------------|-----------------------------------------------------------------------------------------------------------------------|
| F | Pages 1.10-69a, 1.10-69b<br>Fig. 6A.3-43, 6A.3-44                             | R              | Response to staff questions concerning<br>THI Action Plan II.D.1                                                      |
|   | Page 3.8-73                                                                   | R              | Response to staff questions concerning<br>visual weld acceptance criteria                                             |
|   | Page 6A.4-5a                                                                  | · R            | Confirmatory Item 13(a) dynamic reponse<br>of the primary containment structures<br>due to pool swell                 |
|   | Page 6A.4-8                                                                   | R              | Confirmatory Item 13(b) pool swell<br>analysis for pedestal region                                                    |
| • | Pages 6A.4-12, 6A.4-12a                                                       | R              | Confirmatory Item 13(d) clarification<br>of computer code for CO load inside<br>pedestal                              |
|   | Page 6A.4-24                                                                  | R              | Confirmatory Item 13(c) to clarify the<br>method of design for the drywell floor<br>multivent lateral loads           |
|   | •                                                                             | ۰<br>۲         | · · · · · · · · · · · · · · · · · · ·                                                                                 |
| F | Pages 7.3-7, 7.3-9, 7.6-2a<br>Fig. 5.4-13 sheets 1 and 2<br>of 2, 6.3-7       | R              | Confirmatory Item 25 low-pressure core<br>spray and injection valves interlock<br>(Letter NMP2L 0523, dated 10/30/85) |
|   | Fig. 8.3-8B Sh 13 of 13                                                       | R              | Response to staff (NRR) question regarding clarification of Figure                                                    |
|   | Q/R F210.58-1                                                                 | R              | Epdate to response to question                                                                                        |
|   | Q/R F210.62-1, F210.62-2,<br>F210.62-3<br>Table 210.62-1 page 1 and<br>2 of 2 | R              | Revision to question based on new leakage<br>rate limit                                                               |
|   | Q/R F210.63-1                                                                 | R              | Completed reply to question                                                                                           |
|   | Q/R F240.10-2<br>Table 240.10-1 page 1 of 2                                   | R              | To bring FSAR into agreement with designed details                                                                    |
|   | Q/R F250.1-1                                                                  | R              | Update of response to question                                                                                        |
|   | Q/R F410.49-1                                                                 | R              | Update of question F410.49                                                                                            |
|   | Q/R F421.3-1 and F421.3-2                                                     | R              | Update of question F421.3                                                                                             |



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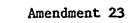
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| Pages                                                                                                                                                                                                                                                                                                                                                                                                                                           | Change<br>Code | Description                                                                       |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|-----------------------------------------------------------------------------------|
| Q/R F421.47<br>Table 421.47-1 pages 1, 2,<br>4, 5, 7, 8, 9, and 14 of 17                                                                                                                                                                                                                                                                                                                                                                        | R              | Revision to Q/R F421.47 response to be consistent with revised R.G. 1.75 position |
| Q/R F430.74-1, F430.74-2                                                                                                                                                                                                                                                                                                                                                                                                                        | R              | To make consistent with FSAR                                                      |
| 'Q/R F440.16-1, F440.16-2                                                                                                                                                                                                                                                                                                                                                                                                                       | R              | Revision to Q/R F440.16 response due to changes in leak detection design          |
| Q/R F480.37<br>Table 480.37-1 page 2 of 2                                                                                                                                                                                                                                                                                                                                                                                                       | ~ <b>R</b>     | Revised response to reflect design conditions                                     |
| Pages 1.1-3, 1.7-1, 1.10-7,<br>1.10-11, 1.10-18, 1.10-25,<br>1.10-27, 1.10-30, 1.10-34,<br>1.10-36, 1.10-37, 1.10-47,<br>1.10-48, 1.10-56, 1.10-65,<br>1.10-66, 1.10-73b, 1.10-73ja<br>1.10-74, 1.10-76, 1.10-81,<br>1.10-85, 1.10-85a, 1.10-85g,<br>1.10-86, 1.10-88, 1.10-90,<br>1.10-95, 1.10-97, 1.10-98,<br>1.10-107, 1.10-108, 1.10-124<br>Table 1.7-1 pages 1, 2, 3,<br>57, 58, 58a, 59, 60, 60a and<br>60b of 60, 1.10-1 page<br>1.10-3 |                | Editorial changes and update of drawing package                                   |
| Fig. 1.2-15 sheets 1, 2 and<br>3 of 3                                                                                                                                                                                                                                                                                                                                                                                                           | E              | Editorial corrections                                                             |
| Table 1.3-8 page 2 of 2,<br>1.4-1 page 2 of 2,<br>3.8-6 page 1 of 2                                                                                                                                                                                                                                                                                                                                                                             | E              | Inadvertent omissions to Amendment 21                                             |
| Pages 3.4-2, 3.4-4, 3.5-19,<br>3.8-3, 3.8-6, 3.8-16,<br>3.8-30, 3.8-34, 3.8-37,<br>3.8-38, 3.8-74, 3B-4, 3B-5,<br>3.9A-5, 3.9A-13, 3.9A-18,<br>3.9A-27<br>Tabel 3.4-1 page 1 of 2,<br>3.9A-12 pages 1 and 10 of 12                                                                                                                                                                                                                              | E              | Editorial                                                                         |
| Pages 3.5-19, 3.9A-5,<br>3.9A-13, 3.9A-18, 3A.18-1,<br>3A.18-1a, 3B-2, 3B-4, 3B-5,<br>3B-6                                                                                                                                                                                                                                                                                                                                                      | E              | Editorial and typos                                                               |



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|   | Pages                                                                                                                                                                                                                                                                                                                                                                                                                                  | Change<br>Code | Description                                    |
| D | Table 3.2-1 page 22 of 26,<br>3.4-1 page 1 of 2,<br>3.9A-12 page 1 and 10 of 12<br>3A.1-1, 3B-1 page 2 of 2,<br>3B-2, 3B-9, 3B-10<br>Appendix 3B pages 3B-iv,<br>3B-v, 3B-vi                                                                                                                                                                                                                                                           |                |                                                |
|   | Pages $3.8-1$ , $3.8-3$ , $3.8-6$ ,<br>3.8-7, $3.8-13$ , $3.8-16$ ,<br>3.8-28, $3.8-34$ , $3.8-37$ ,<br>3.8-38, $3.8-43$ , $3.8-45$ ,<br>3.8-49, $3.8-74$ , $3.8-77Table 3.8-1 pages 1, 2and 6 of 6, 3.8-3pages 1, 2 and 3 of 5,3.8-4$ pages $1$ , $2$ and $3$ of $43.8-5$ page $1$ of $2$ ,<br>3.8-6 page $1$ of $2$ ,<br>3.8-10 pages $2$ and $3$ of $3$ ,<br>3.8-11 pages $2$ and $3$ of $3$ ,<br>3.8-12 page $3$ of $4$ , $3.8-13$ | E<br>,         | Editorial corrections                          |
| _ | Page 4.6-8a<br>Fig. (see Attachment A)                                                                                                                                                                                                                                                                                                                                                                                                 | E              | Nomenclature clarification                     |
| Ţ | Page 5.2-10<br>Table 5.2-6                                                                                                                                                                                                                                                                                                                                                                                                             | E ,            | Editorial                                      |
|   | Pages 5.4-37, 5.4-51                                                                                                                                                                                                                                                                                                                                                                                                                   | E              | Editorial                                      |
|   | Pages 6A.2-7,<br>6A.3-7                                                                                                                                                                                                                                                                                                                                                                                                                | E              | Editorial '                                    |
|   | Pages 6A.3-2, 6A.4-4, 6A.4-8<br>6A.4-14, 6A.4-20, 6A.4-24a,<br>6A.4-26, 6A.4-27, 6A.4-28,<br>6A.4-29, 6A.4-31, 6A.4-37<br>Table 6A.4-3,<br>Fig. 6A.4-36                                                                                                                                                                                                                                                                                | , E            | Editorial changes and correction of references |
|   | Page 6A.4-5                                                                                                                                                                                                                                                                                                                                                                                                                            | E              | Editorial                                      |
|   | Page 7-xi (List of Figures)                                                                                                                                                                                                                                                                                                                                                                                                            | E              | Editorial                                      |
|   | Pages 7.3-31, 7.4-7                                                                                                                                                                                                                                                                                                                                                                                                                    | Е              | Editorial and typographical corrections        |
|   | Pages 8.2-15, 8.2-16,<br>8.2-24a, 8.3-11, 8.3-43<br>8.3-46, 8.3-50a, 8.3-57                                                                                                                                                                                                                                                                                                                                                            | Е              | Editorial ,                                    |
| ) | Amendment 23                                                                                                                                                                                                                                                                                                                                                                                                                           | SIC            | -4 December 1985                               |

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| Ţ | Table 8.2-1 page 1 and 4 of<br>4, 8.3-8, 8.3-9, 8.3-11,<br>8.3-12, 8.3-13                                                                           |                | ų     |                                                                               |
|   | Page 9.2-25                                                                                                                                         | E              |       | Editorial                                                                     |
|   | Page 9.4-22                                                                                                                                         | E              |       | Editorial                                                                     |
|   | Pages 9.5-2 through 9.5-6,<br>9.5-9                                                                                                                 | E              |       | Editorial                                                                     |
|   | Pages 9.5-61a, 9.5-61b                                                                                                                              | E              |       | Editorial replacement of material inadvertently omitted in Amendment 21       |
|   | Pages 9A-iv, 9A-vi, 9A-vii,<br>9A.3-11, 9A.3-23, 9A.3-27,<br>9A.3-30, 9A.3-31, 9A.3-43,<br>9A.3-48, 9A.3-50, 9A.3-51,<br>9A.3-55, 9A.3-55a, 9A.3-60 | E              |       | Editorial                                                                     |
|   | Page 12.4-1c                                                                                                                                        | E              |       | Editorial                                                                     |
|   | Q/R F440.17-1                                                                                                                                       | E              |       | Typographical correction                                                      |
|   | Fig. 1.2-2, 1.2-29 sheet 3<br>of 3,<br>1.2-32 sheets 1, 2 and 3<br>of 3,<br>1.2-33, 1.2-35, 1.2-36,<br>1.2-40                                       | N              |       | Update arrangement drawings                                                   |
|   | Fig. 1.7-1 sheets 1 through 5 of 5                                                                                                                  | N              |       | Update of P&ID symbols                                                        |
|   | Page 6.2-84                                                                                                                                         | N              |       | Clarification of test program                                                 |
|   | Pages 9.2-22, 9.2-23,<br>9.2-24<br>Fig. 9.2-5a through<br>9.2-5e                                                                                    | N              |       | Design update of makeup water treatment<br>text and P&IDs                     |
|   | Page 9.2-23                                                                                                                                         | N              |       | Design update for filtered water transfer<br>pumps text                       |
|   | Pages 9.2-25, 9.2-25a, 9.2-26<br>Fig. 9.2-8a, 9.2-8b                                                                                                | 5 N            |       | Design update of sanita <del>ry w</del> aste text<br>and domestic water P&IDs |
|   | Page 9.3-11f<br>Fig. 9.3-20b                                                                                                                        | N              |       | Design update of nitrogen system text<br>and P&ID                             |
| ) | Amendment 23                                                                                                                                        |                | SIC-5 | December 1985                                                                 |

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|   | Pages 9.3-13, 9.3-14,<br>9.3-15, 9.3-16<br>Table 9.3-1 pages 5, 8,<br>9 and 10 of 10                                                                                                                                                                                                                                                | <b>N</b> .       |       | Design update of sample system design                                                                                                                                                                                                                                                                                                                                                                                                  |
|   | Pages 9.3-24, 9.3-27                                                                                                                                                                                                                                                                                                                | N                |       | Design update for location of level switch for water buildup                                                                                                                                                                                                                                                                                                                                                                           |
|   | Fig. 9.3-11a through 9.3-                                                                                                                                                                                                                                                                                                           | lle N            |       | Design update of radwaste building<br>drains P&IDs                                                                                                                                                                                                                                                                                                                                                                                     |
|   | Fig. 9.4-8j                                                                                                                                                                                                                                                                                                                         | N                |       | Design update of drywell cooling P&ID                                                                                                                                                                                                                                                                                                                                                                                                  |
|   | Fig. 9.4-10a through 9.4-                                                                                                                                                                                                                                                                                                           | 10e N            |       | Design update of radwaste building<br>ventilation P&IDs                                                                                                                                                                                                                                                                                                                                                                                |
|   | Pages 9.4-39 through 9.4-<br>Table 9.4-5 pages 1 throu<br>17 and 21 of 21<br>Fig. 9.4-12a through 9.4-                                                                                                                                                                                                                              | gh               |       | Design update of turbine building<br>ventilation text and P&IDs                                                                                                                                                                                                                                                                                                                                                                        |
|   | Pages 9.4-69, 9.4-72, 9.4<br>Fig. 9.4-22a through 9.4-                                                                                                                                                                                                                                                                              |                  |       | Design update of plant hot water and glycol heating text and P&IDs                                                                                                                                                                                                                                                                                                                                                                     |
| , | Page 9.5-3                                                                                                                                                                                                                                                                                                                          | N                | . *   | Update of yard fire protection design                                                                                                                                                                                                                                                                                                                                                                                                  |
|   | Fig. 9.1-26a, 9.2-6a, 9.2<br>9.2-9b, 9.2-17a, 9.2-17b<br>9.2-17c, 9.3-3a, 9.3-3b,<br>9.3-3c, 9.3-3d, 9.3-3e,<br>9.3-10a through 9.3-10h,<br>9.3-10j, 9.3-12a through<br>9.3-12h, 9.3-12j, 9.3-12<br>9.3-12l, 9.3-9a, 9.3-9b,<br>9.3-9c, 9.3-9d, 9.3-9e,<br>9.4-3a through 9.4-3f, 9<br>through 9.5-1h, 9.5-52a,<br>9.5-52b, 9.5-52c | ,<br>k,<br>.5-1a |       | P&IDs design update for: <ul> <li>Decontamination</li> <li>Makeup water storage</li> <li>Sanitary plumbing</li> <li>Condensate storage and transfer</li> <li>Breathing air</li> <li>Turbine building drains</li> <li>Miscellaneous floor drains</li> <li>Reactor building equipment/floor drains</li> <li>Chilled water and normal switchgear building ventilation</li> <li>Fire protection water</li> <li>Auxiliary boiler</li> </ul> |
|   | Fig. 10.1-7a through 10.1<br>10.1-7j through 10.1-7n,<br>10.1-7q through 10.1-7u,<br>10.1-7w                                                                                                                                                                                                                                        |                  |       | Design update for feedwater heater and extraction steam                                                                                                                                                                                                                                                                                                                                                                                |
|   | Fig. 10.4-2a                                                                                                                                                                                                                                                                                                                        | N                |       | Design update of condenser air removal<br>P&ID                                                                                                                                                                                                                                                                                                                                                                                         |
|   | Fig. 10.4-7a through 10.4                                                                                                                                                                                                                                                                                                           | -7h N            |       | Design update of circulating water, acid<br>and hypochlorite P&IDs                                                                                                                                                                                                                                                                                                                                                                     |
| ) | Amendment 23                                                                                                                                                                                                                                                                                                                        |                  | SIC-6 | December 1985                                                                                                                                                                                                                                                                                                                                                                                                                          |
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|   | Pages 13.5-1 through 13.5-7<br>Table 13.1-3 pages 1 through<br>7 of 7<br>13.1-4 page 1 of 5,<br>13.5-1 pages 1 and 2 of 2,<br>13.5-1a,<br>13.5-2,<br>13.5-3 pages 1 through 3 of 3<br>13.5-4,<br>13.5-5,<br>13.5-6 pages 1 through 8 of 8<br>13.5-7<br>Fig. 13.5-1 | -             | Update of plant procedures                                                                                                          |
|   | Pages 1.2-19, 1.2-33, 1.2-39                                                                                                                                                                                                                                       | SN            | Design update for plant electrical systems                                                                                          |
|   | Pages 1.12-14, 1.12-15                                                                                                                                                                                                                                             | SN            | Design update for diesel generators                                                                                                 |
|   | Table 1.3-9 pages 8 and 10 of 10                                                                                                                                                                                                                                   | SN            | Design update of table 1.3-9 data                                                                                                   |
|   | Table 1.7-1 pages 18, 19, 19a<br>and 20 through 54 of 60                                                                                                                                                                                                           | SN            | Design update to agree with current plant arrangement                                                                               |
| Û | Table 1.8-1 pages 5, 31, 33<br>89 and 89a of 169                                                                                                                                                                                                                   | SN            | Clarification of Regulatory Guide positions                                                                                         |
|   | Table 1.9-1 page 6 of 11,<br>Attach 1.9-52, 1.9-61<br>· page 2 of 4                                                                                                                                                                                                | SN -          | Design update of electrical components                                                                                              |
|   | Table 2.1-1                                                                                                                                                                                                                                                        | SN            | Clarification update of table                                                                                                       |
|   | Table 3.2-1 pages 13 and<br>15 of 26                                                                                                                                                                                                                               | SN            | Clarification of construction<br>details                                                                                            |
|   | Table 3.4-7                                                                                                                                                                                                                                                        | SN            | Confirmation of waterstop specification requirements                                                                                |
|   | Page 3.5-19a<br>Table 3.5-21, 3.5-22                                                                                                                                                                                                                               | SN            | Update design of tornado missile<br>protection for diesel generator exhaust<br>penetrations and clarification of valve<br>enclosure |
|   | Page 3.6A-37<br>Table 3.4-7,<br>3.6A-1 pages 1, 3 and 4 of 5,<br>3.6A-28 page 2 of 8, 3.6A-34                                                                                                                                                                      | SN            | Update based on current plant design                                                                                                |
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| ų | Pages 3.8-67, 3.8-71                                                                                                                                                                                                                  | SN             | Design update and revision to agree with<br>design specification for threadbar and<br>reinforcing steel |
|   | Pages 3A-iv, 3A-2, 3A-33,<br>Table 3A.32-1, 3A.32-2                                                                                                                                                                                   | SN             | Design update for trunnion diameter<br>to pipe diameter                                                 |
|   | Pages 3A.31-1, 3A.31-2                                                                                                                                                                                                                | SN             | Addition of SNUFFE computer program                                                                     |
|   | Pages 3.7A-29, 3.7A-30,<br>3.7A-32                                                                                                                                                                                                    | SN             | To agree with equipment physical location                                                               |
|   | Fig. 3.7A-18, 3.7A-21,<br>3.7A-22, 3.7A-23, 3.7A-24,<br>3.7A-25, 3.7A-26, 3.7A-32                                                                                                                                                     | SN             | Update various building acceleration profiles to the designed values                                    |
|   | Pages 3.9A-2, 3.9A-2a,<br>3.9A-24, 3.9A-24a                                                                                                                                                                                           | SN             | Design update of code and specification requirements                                                    |
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|   | Page 3.9A-25                                                                                                                                                                                                                          | SN             | Design update of snubber test results                                                                   |
|   | Table 3.9B-2u pages 1, 2 and 3 of 3                                                                                                                                                                                                   | SN             | Design update of new loads                                                                              |
|   | Pages 3.9A-24, 3.9B-8,<br>3.9B-15, 3.9B-16, 3.9B-20                                                                                                                                                                                   | SN             | Corrections based on current plant design                                                               |
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| •             | Pages 3B-6, 6.2-2a, 6.2-6,<br>6.2-15, 6.2-16, 6.2-35,<br>6A.4-5, 6A.4-24a<br>Table 3B-2, 3B-9, 3B-10,<br>6.2-3 page 1 of 2, 6.2-51<br>Fig. 6.2-33 sheets 1 through<br>8 of 8, 6.2-54, 6.2-56 sheets<br>2 through 10 of 10, 6.2-60,<br>6.2-71a, 6.2-71b | SN<br>S |            | Design update based on revised<br>calculations and design changes                                                                                |
|               | Table 4.4-8                                                                                                                                                                                                                                            | SN      |            | Update of sensor locations to be consistent with design specification                                                                            |
|               | Pages 5.2-31, 5.2-32, 5.2-37, 5.2-38                                                                                                                                                                                                                   | SN      |            | Design 'update of building monitors                                                                                                              |
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| <b>2</b><br>k | Page 5.4-4<br>Table 3.2-4 page 2 of 2                                                                                                                                                                                                                  | SN      | ar<br>bi   | To identify compliance with ASME III code<br>requirements for the recirculation piping<br>system                                                 |
|               | Page 5.4-22                                                                                                                                                                                                                                            | SN      |            | Update of RCIC turbine electronic<br>trip design                                                                                                 |
| -             | Table 5.2-1 pages 2, 3, 6,<br>6a, 6b, 8al and 8b of 8                                                                                                                                                                                                  | SN      |            | Update of Code Cases Nos. 1644-2,<br>1644-3, 1644-5 and 1644-6 including<br>N-318 (Note: N-318 updated to<br>Regulatory Guide 1.84, Revision 22) |
| v             | Pages 5.4-22, 5.4-25,<br>5.4-29<br>Fig. (See Attachment A)                                                                                                                                                                                             | SN      |            | Design update of text and figures based<br>on current plant design                                                                               |
| -             | Pages 5.4-36, 5.4-37,<br>5.4-37a, 5.4-38, 5.4-38a,<br>5.4-39, 5.4-41                                                                                                                                                                                   | SN      |            | Design update of residual heat removal<br>system                                                                                                 |
|               | Amendment 23                                                                                                                                                                                                                                           | ,<br>(  | ,<br>SIC-9 | December 1985                                                                                                                                    |

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|             | Page 6.2-6a                                                                                                                                                                                                                                                                                                                                                                                                      | SN .           | Clarification of test results for<br>vacuum breakers mounted in pipin<br>connects the drywell and suppres<br>chamber | g that  |
| \$ <u>,</u> | Pages 6.2-46a,<br>7.3-18                                                                                                                                                                                                                                                                                                                                                                                         | SN             | Update based on fission product clarification for BWR plant                                                          | removal |
|             | Pages 6.2-47, 6.2-61a                                                                                                                                                                                                                                                                                                                                                                                            | SN .           | Design update for residual heat<br>pump                                                                              | removal |
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|             | Pages 6.2-83, 6.2-84<br>Fig. 6.2-72a, 6.2-72b,<br>6.2-73a                                                                                                                                                                                                                                                                                                                                                        | SN             | Design update for hydrogen recom<br>and containment leakage monitori<br>and/or P&IDs                                 |         |
|             | Pages 6.3-8a, 6.3-8b, 6.3-8c,<br>6.3-12, 6.3-14, 6.3-14a,<br>6.3-15, 6.3-16, 6.3-17,<br>6.3-20a<br>Table 6.1-2 pages 1 and 2 of                                                                                                                                                                                                                                                                                  | Ŧ              | Design update based on current p<br>design                                                                           | lant    |
| ٨           | Pages 6.4-3, 9.4-2, 9.4-4,<br>9.4-10                                                                                                                                                                                                                                                                                                                                                                             | SN             | Desígn update for control buildi<br>text                                                                             | ng HVAC |
|             | Pages 6.5-6, 6.5-7<br>Fig. 9.4-8k, 9.4-81                                                                                                                                                                                                                                                                                                                                                                        | SN             | Design update for standby gas tr<br>text and P&IDs                                                                   | eatment |
|             | Table 6.2-56 pages 1, 2, 3,<br>4, 5, 6, 7, 8, 9, 10, 11,<br>12, 13, 14, 16, 17, 18, 22<br>and 23 of 24                                                                                                                                                                                                                                                                                                           | SN             | Design update based on current p<br>design to agree with technical s<br>fication and editorial correctio             | peci-   |
|             | Amendment 23                                                                                                                                                                                                                                                                                                                                                                                                     | - S            | December                                                                                                             | 1985    |
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|   | Fig. 6.2-70 sheets 42 of 43<br>Table 6.2-56 pages 7 and 20<br>of 24                                                                                                                                                                                                                                                                                   | SN             | Design update for traversing incore<br>probe for leak testing                            |
|   | Pages 6A.2-12, 6A.7-5,<br>6A.7-6, 6A.7-7<br>Table 6A.4-7 page 2 of 2,<br>6A.5-1, 6A.5-2 pages 1<br>and 2 of 2,<br>6A.5-3, 6A.5-4 page 1 of 2,<br>6A.5-6 page 1 of 2,<br>6A.6-1 page 1 of 2,<br>6A.6-2 pages 1 and 2 of 2,<br>6A.7-2<br>Fig. 6A.2-23, 6A.2-27,<br>6A.5-12, 6A.5-26 through<br>6A.5-31,<br>6A.5-33, 6A.5-34,<br>6A.5-37 through 6A.5-43 | SN             | Design update of section for Design<br>Assessment Report for hydrodynamic loads          |
|   | Table 6A.9-3, 6A.9-4, 6A.9-5<br>6A.9-6<br>Fig. 6A.9-1, 6A.9-2, 6A.9-3                                                                                                                                                                                                                                                                                 | , SN           | Design update to comply with final<br>stress analysis including editorial<br>corrections |
|   | FSAR Logic Diagrams<br>Figures (See Attachment B)                                                                                                                                                                                                                                                                                                     | SN             | Design update of listed logic diagrams                                                   |
| 9 | Pages 7-ii, 7.3-4, 7.7-27,<br>7.7-29, 9.1-18, 9.1-41,<br>9.1-42, 9.1-43                                                                                                                                                                                                                                                                               | SN             | Design update of high pressure core<br>spray pump and refueling operation<br>changes     |
|   | Pages 7.1-2, 7.2-1, 7.3-3,<br>7.3-12, 7.3-29, 7.3-31,<br>7.4-3, 7.4-13, 7.4-14,<br>7.4-15, 7.4-21, 7.4-22,<br>7.4-23<br>Table 7.1-2 page 1 of 3,<br>7.3-1, 7.3-2, 7.3-3,<br>7.3-4, 7.3-5 pages 1 and<br>2 of 2,<br>7.3-6, 7.3-7, 7.4-1,<br>8.3-10                                                                                                     | SN             | Update based on current plant design                                                     |
|   | Pages 7.2-12, 7.5-6, 7.6-12<br>Table 7.3-8, 7.5-1 page 3 of<br>14                                                                                                                                                                                                                                                                                     |                | Corrections incorporated based on current<br>plant design                                |



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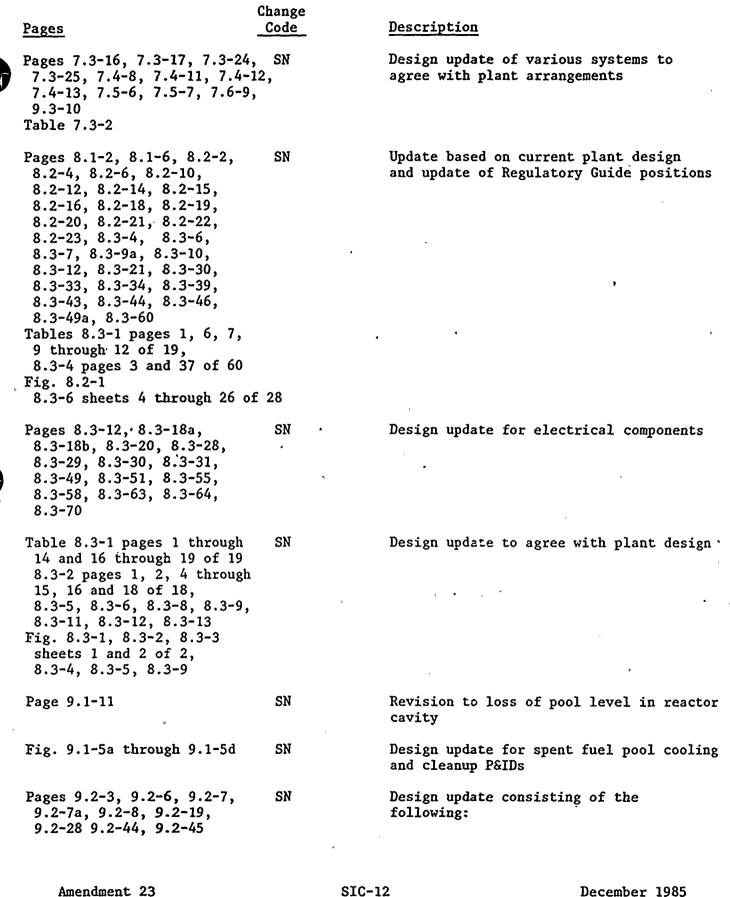
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|             | Page 9.2-50<br>Fig. 9.2-19a through 9.2-19f                                                                                                                                                                                                                                                                                                                                                                        | SN             | Design update of turbine building closed<br>loop cooling text and P&IDs                                                                                                                                                                                                                                                                                                      |
|             | Pages 9.3-1 through 9.3-4,<br>9.3-6 through 9.3-11a,<br>9.3-11g, 9.3-13, 9.3-31<br>Table 9.3-2 page 2 of 2                                                                                                                                                                                                                                                                                                         | SN             | Update based on current plant design                                                                                                                                                                                                                                                                                                                                         |
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|             | Fig. 9.4-15a                                                                                                                                                                                                                                                                                                                                                                                                       | SN             | Design update of diesel generator<br>building HVAC P&ID                                                                                                                                                                                                                                                                                                                      |
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|   | Pages 9.5-2, 9.5-9, 9.5-18,<br>9.5-19, 9.5-20a, 9.5-21,<br>9.5-22, 9.5-22a, 9.5-23,<br>9.5-24, 9.5-39, 9.5-40<br>Table 9.5-1 pages 5, 6 and<br>8 of 9,<br>9.5-2 page 3 of 8                                                                                                                  | <b>SN</b>      | Update to agree with plant design, and technical specification                                                                                                                     |
|   | Page 9.5-25                                                                                                                                                                                                                                                                                  | SN             | Design update for diesel generator day tanks to as-built conditions                                                                                                                |
|   | Pages 9.5-53, 9.5-55, 9.5-59<br>and 9.5-61<br>Table 9.5-1 pages 5, 6, and<br>8 of 9<br>9.5-2 page 3 of 8                                                                                                                                                                                     | SN             | Corrections based on current plant design<br>including updating the logic diagrams for<br>cooling water system for Division III<br>diesel generator and auxiliary boiler<br>system |
|   | Fig. 9.5-2a, 9.5-2b                                                                                                                                                                                                                                                                          | SN             | Design update of fire protection foam<br>P&IDs                                                                                                                                     |
|   | Fig. 9.5-3a                                                                                                                                                                                                                                                                                  | SN             | Design update of fire protection $CO_2$ P&ID                                                                                                                                       |
|   | Fig. 9.5-4a .                                                                                                                                                                                                                                                                                | SN             | Design update of fire protection halon<br>P&ID                                                                                                                                     |
|   | Pages 9A.2-3, 9A.2-6,<br>9A.2-7, 9A.3-13, 9A.3-26,<br>9A.3-28, 9A.3-43, 9A.3-46,<br>9A.3-51, 9A.3-60<br>Table 9B.8-2 page 33 of 38                                                                                                                                                           | SN             | Update based on current plant design<br>and as-built conditions                                                                                                                    |
|   | Fig. 10.1-3a through 10.1-3h<br>10.1-3j, 10.1-3k                                                                                                                                                                                                                                             | , SN           | Update of P&IDs to present design                                                                                                                                                  |
| • | Pages 10.2-8, 10.3-3, 10.3-5<br>10.4-3                                                                                                                                                                                                                                                       | , SN           | Update based on current plant design                                                                                                                                               |
|   | Pages 11.2-1, 11.2-3, 11.2-6<br>11.2-8, 11.2-9 through<br>11.2-15, 11.2-17, 11.3-2,<br>11.3-2a, 11.3-3, 11.3-4,<br>11.3-6, 11.3-7; 11.4-3a,<br>11.4-4, 11.4-5, 11.5-1<br>through 11.5-12, 11.5-12a,<br>11.5-13, 11.5-14<br>Table 11.1-2, 11.4-4<br>page 1 of 2,<br>11.5-1 pages 1 and 2 of 2 | , SN           | Design update of text and/or P&IDs for:<br>•Radioactive liquid waste<br>•Radioactive solid waste<br>•Offgas<br>•Radiation monitors                                                 |

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Nine Mile Point Unit 2 FSAR

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|-----|----------------------------------------------------------------------------------------------------------------|---------|-----------------------------------------------------------------------------------|
|     | Pages _                                                                                                        | Code    | Description                                                                       |
| 6   | Fig. 11.21a through 11.2-1h,<br>11.21j through 11.2-1m,<br>11.3-1a through 11.3-1c,<br>11.4-1a through 11.4-1h |         |                                                                                   |
| ,   | Fig. 11.5-4, 11.5-7                                                                                            | SN      | Design update to reflect current design                                           |
|     | Page 12.2-5                                                                                                    | SN      | Design udpate of startup sources                                                  |
|     | Table 12.3-2 pages 1, 2, and 3 of 3                                                                            | SN      | Design update to current design                                                   |
|     | Fig. 12.3-1 through 12.3-66                                                                                    | i v     |                                                                                   |
| 4   | Pages 15.2-16, 15.6-14,<br>15.6-15, 15.7-3,<br>15.7-10                                                         | SN      | Update based on current plant design and analysis                                 |
|     | Table 15.6-6 page 2 of 2                                                                                       |         | • •                                                                               |
|     | Pages 15.6-8, 15.6-11,<br>15.6-12c, 15.6-13, 15.6-14,<br>15.7-13                                               | SN .    | Update based on current plant design<br>and as-built conditions                   |
|     | Table 15.6-13 pages 9 and<br>11 of 11<br>15.6-14, 15.6-15a,<br>15.6-15b, 15.6-16a,<br>15.6-16b                 |         |                                                                                   |
|     | 15.6-16b,<br>15.7-8 page 1 of 2,<br>15.7-9 pages 1 and 2 of 2,<br>15.7-16 page 1 of 2,<br>15.7-17              |         |                                                                                   |
|     | Table 1.9-1 page 5 of 11,<br>Attach 1.9-47                                                                     | SS      | Revised design to conform with contain-<br>ment isolation requirements            |
|     | Pages 1.10-62, 1.10-64c,<br>1.10-64d, 1.10-64m, 1.10-64n                                                       | SS      | Update sample system to reflect design                                            |
|     | Pages 1.10-73a, 1.10-73b,<br>1.10-73d, 1.10-73e, 1.10-73g,<br>1.10-73k                                         | SS<br>, | Update of containment dependability<br>study                                      |
|     | Page 2.2-6<br>Table 2.2-7, 2.2-8                                                                               | SS ,    | Update of control room habitability                                               |
|     | Pages 2.3-6, 2.3-33,<br>2.3-39, 2.3-40, 2.3-43,<br>2.3-46, 2.3-47, 2.3-51                                      | SS      | To update meteorological data text and<br>tables to agree with latest information |
| _ \ |                                                                                                                |         |                                                                                   |
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|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|--------------------------------------------------------------------------------------------------|
| Table 2F-1 pages 1, 2 and<br>4 of 4,<br>2F-2a, b, c,<br>2F-3,<br>2F-6 pages 4 through 12<br>of 12,<br>2F-8, 2F-11 pages 3 through<br>9 of 9,<br>2G-6, 2G-7, 2G-7A, 2G-8 |               | v                                                                                                |
| Pages 2.4-4, 2.4-4a, 2.4-5,<br>2.4-6, 2.4-16<br>Table 2.4-3<br>Fig. 2.4-1                                                                                               | SS            | Update of probable maximum precipitation<br>and analyses                                         |
| Pages 2.4-6, 2.5-194<br>Fig. 2.4-1, 2.5-128,<br>2.5-209                                                                                                                 | SS            | Update of flood control berm                                                                     |
| Pages 2.5-171, 2.5-171a                                                                                                                                                 | SS            | Reactor dewatering system design change<br>due to constructability                               |
| Pages 3.8-26, 3.8-39, 3.8-50<br>Table 3.8-15                                                                                                                            | SS            | Update of containment test requirements                                                          |
| Page 3.8-73<br>Table 3.9A-15 page 2 of 2                                                                                                                                | SS            | Clarification of inspection welding acceptance and procedures                                    |
| Pages 7.3-2, 7.3-5, 7.3-6                                                                                                                                               | SS            | Update of automatic depressurization<br>system logic based on NUREG 0737 -<br>TMI Item II.K.3.18 |
| Pages 8.3-50, 8.3-50a, 8.3-51,<br>8.3-52, 8.3-52a                                                                                                                       | SS            | To update electrical separation to<br>current plant design (Letter NMP2L 0588<br>dated 12/10/85) |
| Page 9.1-8a<br>Fig. 9.1-3, 9.1-4                                                                                                                                        | SS            | Design of spent fuel storage racks relative to installation tolerances                           |
| Fig. 9.5-42                                                                                                                                                             | SS            | Update of diesel generator cooling water                                                         |
| Pages 9A.3-6, 9A.3-7,<br>9A.3-8, 9A.3-16,9A.3-17,<br>9A.3-18, 9A.3-20<br>Table 9A.3-16<br>Fig. 9A.3-16                                                                  | SS            | Update of plant design for fire protection                                                       |
| Page 9A.3-23                                                                                                                                                            | SS            | Revision of cable trays based on<br>Appendix R audit                                             |
|                                                                                                                                                                         |               | ·                                                                                                |

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| Pages                                                                                                                                                                                                                                                                                                                 | Change<br>Code | Description                                                             |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|-------------------------------------------------------------------------|
| Page 9A.3-55                                                                                                                                                                                                                                                                                                          | SS             | Update of fire protection/detection<br>based on Appendix R audit        |
| Table 9A.3-1, 9A.3-2,<br>9A.3-3, 9A.3-4, 9A.3-5,<br>9A.3-6, 9A.3-7, 9A.3-8,<br>9A.3-9, 9A.3-10, 9A.3-11,<br>9A.3-12 and 9A.3-41                                                                                                                                                                                       | SS             | Design update of fire protection and<br>penetration seals position      |
| Fig. 9A.3-1, 9A.3-2, 9A.3-3,<br>9A.3-4, 9A.3-5, 9A.3-6,<br>9A.3-7, 9A.3-8, 9A.3-9,<br>9A.3-10, 9A.3-11, 9A.3-12,<br>9A.3-13                                                                                                                                                                                           | SS .           | Update of fire protection arrangement                                   |
| Pages 9B-i, 9B-ii, 9B-iii,<br>9B.1-1, 9B.3-1, 9B.5-5,<br>9B.6-3, 9B.7-1, 9B.8-1,<br>9B.12-1                                                                                                                                                                                                                           | SS             | To incorporate design changes meeting<br>the requirements of Appendix R |
| Table 9B.6-1 pages 2 through<br>6 of 6,<br>9B.6-3 pages 1, 3 and 7 of 9<br>9B.8-2 pages 29, 29a through<br>29f of 38,<br>9B.8-1 pages 1, 7, 26 throug<br>29, 34, 36 through 50, 53<br>through 55, 58 through 61,<br>66, 67, 71, 72, 74 and<br>75 of 75,<br>9B.8-2 pages 1, 19, 20, 21,<br>27, 28, 29 through 29f, 33, | L .            |                                                                         |
| 34, 35, 36 and 38 of 38,<br>9B.8-3 pages 1 through 18<br>of 18                                                                                                                                                                                                                                                        | v              |                                                                         |



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# Nine Mile Point Unit 2 FSAR

## Attachment A FSAR NSSS P&IDs, Process and Control Diagrams

|   | FSAR<br>Fig. No.                                                                     | Sheet(s)                                                               |
|---|--------------------------------------------------------------------------------------|------------------------------------------------------------------------|
| • | 4.6-5<br>4.6-7                                                                       | 1 through 3<br>1 and 2                                                 |
|   | 5.1-2                                                                                | 1 through 3                                                            |
|   | 5.4-2<br>5.4-9<br>5.4-10<br>5.4-13<br>5.4-14<br>5.4-16<br>5.4-17<br>5.4-18<br>5.4-19 | 1 and 2<br>1 and 2<br>1 and 2<br>1 and 2<br>1 through 3<br>1<br>3<br>1 |
|   | 6.3-1<br>6.3-2<br>6.3-6<br>6.3-7                                                     | 1 and 2<br>1<br>1<br>1                                                 |
|   | 7.2-1                                                                                | 1 through 5<br>1 and 2                                                 |
|   | 7.6-1<br>7.7-2                                                                       | 1 through 35                                                           |
|   | 7.7-8                                                                                | 1                                                                      |
|   | 9.3-17                                                                               | 1                                                                      |
|   | IIB.3-1                                                                              | 1 and 2                                                                |

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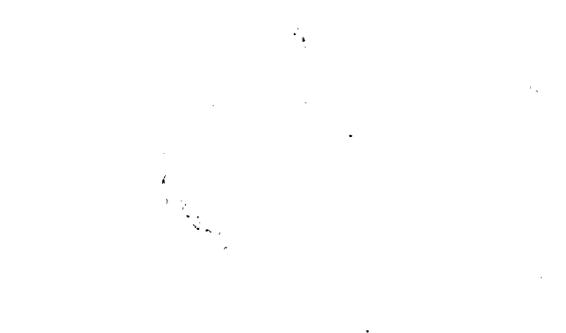




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# Nine Mile Point Unit 2 FSAR

## Attachment B FSAR Logic Diagrams

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| Ł | FSAR<br>Fig. No. | Sheet(s)           | FSAR<br>Fig. No.            | Sheet(s)                                   |
|---|------------------|--------------------|-----------------------------|--------------------------------------------|
| ļ |                  |                    |                             | 7 Aburnah 6                                |
|   | 6.2-38           | 1 through 12       | 10.4-1                      | 1 through 5                                |
|   | 6.2-72k          | 1 through 5        | 10.4-3                      | 1 through 6.                               |
|   | 6.5-1            | 1 through 8        | 10.4-8<br>10.4-9<br>10.4-10 | 1 through 6<br>1 through 9<br>1 through 22 |
|   | 7.3-10           | 1 and 2 $^{\circ}$ | 10.4-11<br>10.4-12          | 1 through 8<br>1 through 7                 |
|   | 8.3-6            | 1 through 28       | 10.4-13                     | 1 through 8                                |
|   | 9.1-6            | 1 through 8        |                             | •                                          |
|   | 9.2-2            | 1 through 20       |                             |                                            |
|   | 9.2-4            | 1 through 9        |                             |                                            |
|   | 9.2-7            | 1 through 13       |                             |                                            |
|   | 9.2-18           | 1 through 4        |                             |                                            |
|   | 9.2-20           | 1 through 5        |                             |                                            |
|   | 9.3-2            | 1 through 10       |                             |                                            |
|   | 9.3-4            | 1 and 2            |                             |                                            |
|   | 9.3-6            | 1 through 4        |                             |                                            |
|   | 9.3-7            | 1 through 6        |                             |                                            |
|   | 9.3-8            | 1 through 3        |                             | •                                          |
|   | 9.3-13           | 1 through 10       | •                           |                                            |
|   | 9.3-14           | 1 through 3        |                             |                                            |
| } | 9.3-15           | 1                  |                             |                                            |
|   | 9.3-15<br>9.3-16 | 1 through 7        |                             |                                            |
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|   | 9.4-4            | 1 through 9        |                             |                                            |
|   | 9.4-5            | 1 through 7        |                             |                                            |
|   | 9.4-6            | 1 through 7        |                             |                                            |
|   | 9.4-7            | 1 through 13       |                             |                                            |
|   | 9.4-9            | 1 through 19       |                             |                                            |
|   | 9.4-11           | 1 through 5        |                             |                                            |
|   | 9.4-13           | 1 through 12       |                             |                                            |
|   | 9.4-14           | 1 through 3        |                             |                                            |
|   | 9.4-16           | 1 through 6        |                             |                                            |
|   | 9.4-17           | 1 through 10       |                             |                                            |
|   | 9.4-18           | 1 and 2            |                             | ,                                          |
|   | 9.4-19           | 1 through 3        |                             |                                            |
|   | 9.4-20           | 1 through 5        |                             |                                            |
|   | 9.4-21           | 1 and 2            |                             |                                            |
|   | 9.4-23           | 1 through 5        |                             |                                            |
|   | 9.5-41           | 1 through 11       |                             |                                            |
|   | 9.5-53           | 1 through 5        |                             |                                            |
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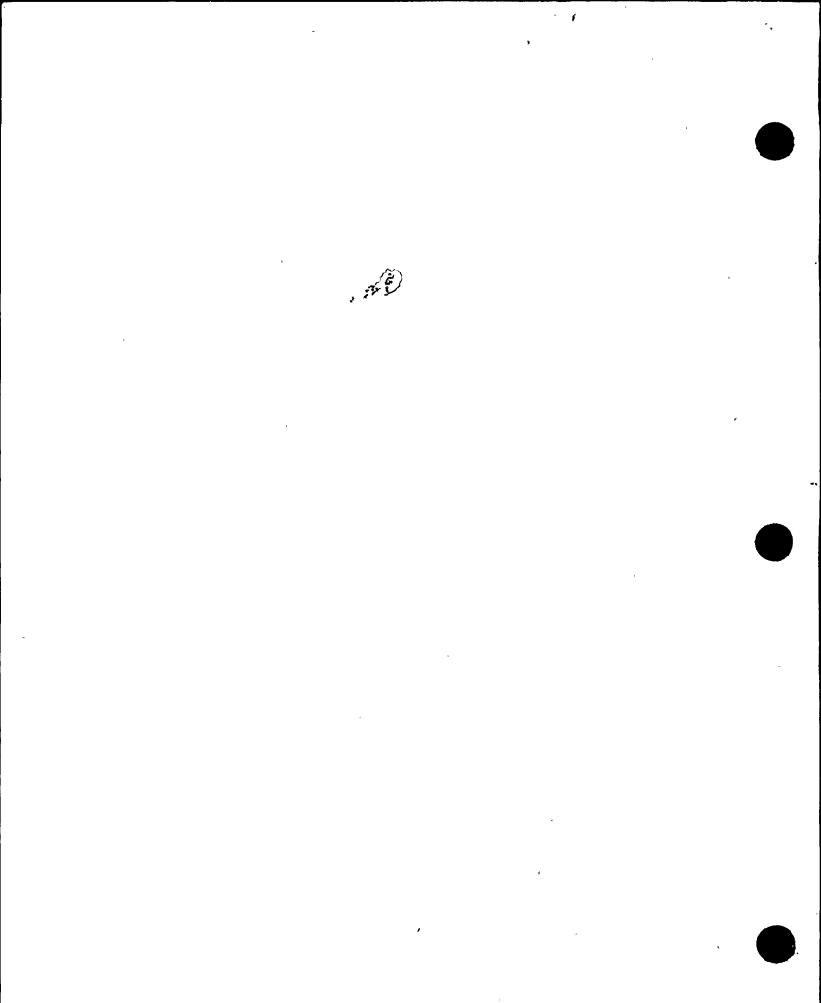
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### NINE MILE POINT NUCLEAR STATION UNIT 2 NIAGARA MOHAWK POWER CORPORATION

#### FSAR AMENDMENT RECEIPT ACKNOWLEDGEMENT

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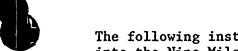
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### INSERTION INSTRUCTIONS



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The following instructions are for the insertion of the current amendment into the Nine Mile Point Unit 2 FSAR.

Remove pages, tables, and/or figures listed in the REMOVE column and replace them with the pages, tables, and/or figures listed in the INSERT column. Dashes (---) in either column indicate no action required.

Vertical bars have been placed in the margins of inserted pages and tables to indicate revision locations.



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## INSERTION INSTRUCTIONS

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| l-vii/viii<br>l-ix/x                                                                                                                                                                                                                                                                                                                                                                                                                       | 1-vii/viii<br>1-ix/x                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| 1.1-3/-                                                                                                                                                                                                                                                                                                                                                                                                                                    | 1.1-3/-                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| 1.2-33/33a<br>1.2-39/40<br>F 1.2-2<br>F 1.2-15 (1 through 3 of 3)<br>F 1.2-17 (1, 5 and 6 of 6)<br>F 1.2-18<br>F 1.2-29 (3 of 3)<br>F 1.2-32 (1 and 3 of 3)<br>F 1.2-35<br>F 1.2-40                                                                                                                                                                                                                                                        | 1.2-33/33a<br>1.2-39/40<br>F 1.2-2<br>F 1.2-15 (1 through 3 of 3)<br>F 1.2-17 (1, 5 and 6 of 6)<br>F 1.2-18<br>F 1.2-29 (3 of 3)<br>F 1.2-32 (1 and 3 of 3)<br>F 1.2-35<br>F 1.2-40                                                                                                                                                                                                                                                                          |
| T 1.3-8 (2 of 2)<br>T 1.3-9 (8 of 10)<br>T 1.3-9 (10 of 10)                                                                                                                                                                                                                                                                                                                                                                                | T 1.3-8 (2 of 2)<br>T 1.3-9 (8 of 10)<br>T 1.3-9 (10 of 10)<br>T 1.3-9 (10a of 10)                                                                                                                                                                                                                                                                                                                                                                           |
| T 1.4-1 (2 of 2)                                                                                                                                                                                                                                                                                                                                                                                                                           | T 1.4-1 (2 of 2)                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| 1.7-1/-<br>T 1.7-1 (1 of 60)<br>T 1.7-1 (2 of 60)<br>T 1.7-1 (3 of 60)<br>T 1.7-1 (18 of 60)<br>T 1.7-1 (19 of 60)<br>T 1.7-1 (19 of 60)<br>T 1.7-1 (20 of 60)<br>T 1.7-1 (21 of 60)<br>T 1.7-1 (22 of 60)<br>T 1.7-1 (23 of 60)<br><br>T 1.7-1 (25 of 60)<br>T 1.7-1 (26 of 60)<br>T 1.7-1 (27 of 60)<br>T 1.7-1 (28 of 60)<br>T 1.7-1 (30 of 60)<br>T 1.7-1 (31 of 60)<br>T 1.7-1 (32 of 60)<br>T 1.7-1 (32 of 60)<br>T 1.7-1 (32 of 60) | 1.7-1/-<br>T 1.7-1 (1 of 60)<br>T 1.7-1 (2 of 60)<br>T 1.7-1 (3 of 60)<br>T 1.7-1 (18 of 60)<br>T 1.7-1 (19 of 60)<br>T 1.7-1 (19 of 60)<br>T 1.7-1 (20 of 60)<br>T 1.7-1 (21 of 60)<br>T 1.7-1 (22 of 60)<br>T 1.7-1 (23 of 60)<br>T 1.7-1 (23 of 60)<br>T 1.7-1 (24 of 60)<br>T 1.7-1 (25 of 60)<br>T 1.7-1 (26 of 60)<br>T 1.7-1 (27 of 60)<br>T 1.7-1 (28 of 60)<br>T 1.7-1 (30 of 60)<br>T 1.7-1 (31 of 60)<br>T 1.7-1 (33 of 60)<br>T 1.7-1 (33 of 60) |
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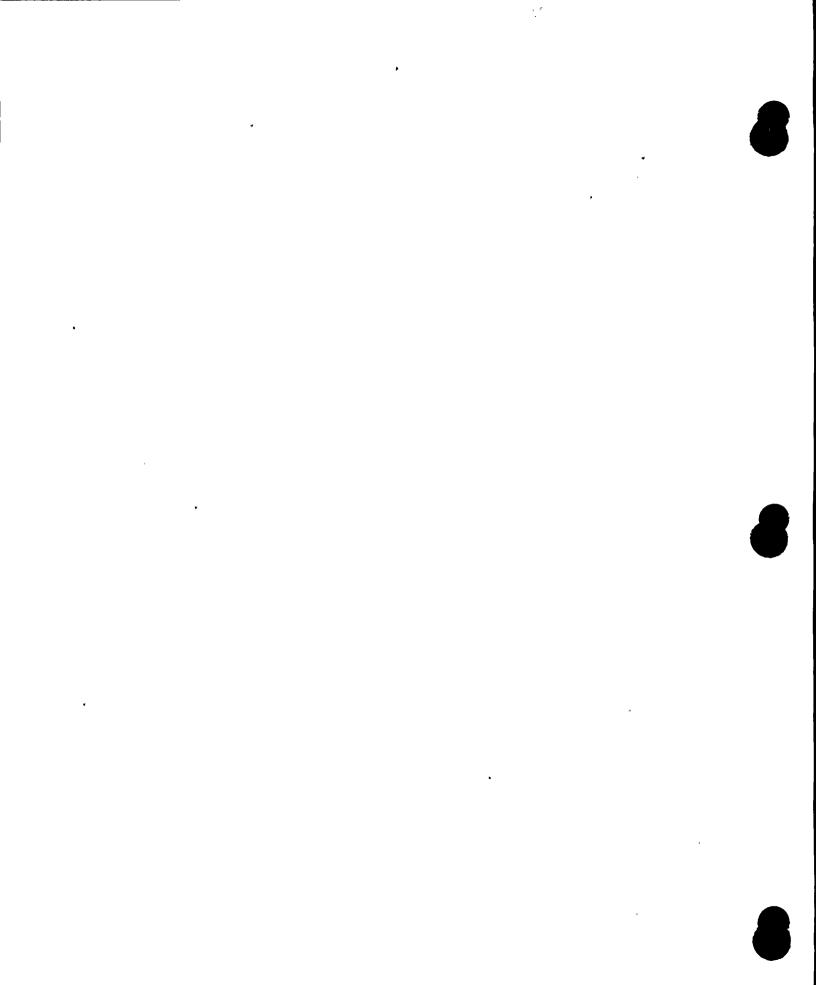
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| T 1.7-1 (60a of 60)                   |
| T 1.7-1 (60b of 60)                   |
| T 1.7-1 (60c of 60)                   |
| F 1.7-1 (1 through 5 of 5)            |
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## INSERTION INSTRUCTIONS

### VOLUME 2

#### Remove

Insert

| T 1.8-1 (5 of 169)<br>T 1.8-1 (31 of 169)<br>                                                                                                                                                                                                                                                                                                                                                                                                         |  |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| T 1.8-1 (33 of 169)<br>T 1.8-1 (89 of 169)<br>T 1.8-1 (89a of 169)<br>T 1.8-1 (169 of 169)<br>T 1.8-1 (169 of 169)                                                                                                                                                                                                                                                                                                                                    |  |
| T 1.9-1 (5 and 6 of 11)<br>Att 1.9-47<br>Att 1.9-51<br>Att 1.9-52<br>Att 1.9-61 (2 of 4)                                                                                                                                                                                                                                                                                                                                                              |  |
| 1.10-3/3a<br>1.10-7/8<br>1.10-11/12<br>1.10-17/18<br>1.10-25/26<br>1.10-27/28<br><br>1.10-29/30<br>1.10-30a/30b<br>1.10-30a/30b<br>1.10-33b/34<br>1.10-35b/36<br>1.10-37/38<br>1.10-47/47a<br>1.10-47/47a<br>1.10-47b/48<br>1.10-55/56<br>1.10-64c/64d<br>1.10-64m/64n<br>F II.B.3-1 (1 and 2 of 2)<br>1.10-65/66<br>1.10-69/69a<br>1.10-69/69a<br>1.10-73/73a<br><br>1.10-73b/73c<br>1.10-73f/73g<br>1.10-73j/73ja<br>1.10-73j/73ja<br>1.10-73j/73ja |  |

T 1.8-1 (5 of 169) T 1.8-1 (31 of 169) T 1.8-1 (31a of 169) T 1.8-1 (33 of 169) T 1.8-1 (89 of 169) T 1.8-1 (89a of 169) T 1.8-1 (169 of 169) T 1.9-1 (5 and 6 of 11) Att 1.9-47 Att 1.9-51 Att 1.9-52 Att 1.9-61 (2 of 4) 1.10-3/3a 1.10-7/8 1.10-11/12 1.10-17/18 1.10-25/26 1.10-27/27a 1:10-27b/28 1.10-29/30 1.10-30a/30b 1.10-33b/34 1.10-35b/36 1.10-37/38 1.10-47/47a 1.10-47b/48 1.10-55/56 1.10-61/62 1.10-64c/64d 1.10-64m/64nF II.B.3-1 (1 and 2 of 2) 1.10-65/66 1.10-69/69a 1.10-69b/69b.1 1.10-69b.2/69c 1.10-73/73a 1.10-73a1/73a2 1.10-73b/73c 1.10-73d/73e 1.10-73f/73g 1.10-73j/73ja 1.10-73jb/73k 1.10-73n/74 1.10-75/76







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## INSERTION INSTRUCTIONS

VOLUME 2 (Cont)

## Remove

<u>Insert</u>

| 1.10-81/82<br>1.10-85/85a                                                                                                                                           |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1.10-85f/85g<br>1.10-85h/86<br>1.10-87/88<br>1.10-89/90<br>1.10-95/96<br>1.10-97/98<br>1.10-107/108<br>1.10-109/110<br>1.10-111/112<br>1.10-113/114<br>1.10-115/116 |
| 1.10-117/118<br>1.10-119/120                                                                                                                                        |
| 1.12-13/14<br>1.12-15/16                                                                                                                                            |

| 1.10-81/82     |
|----------------|
| 1.10-85/85.1   |
| 1.10-85.2/85a  |
| 1.10-85a1/85a2 |
| 1.10-85f/85g   |
| 1.10-85h/86    |
|                |
| 1.10-87/88     |
| 1.10-89/90     |
| 1.10-95/96     |
| 1.10-97/98     |
| 1.10-107/108   |
| 1.10-109/110   |
| 1.10-111/112   |
| 1.10-113/114   |
| 1.10-115/116   |
| -              |
| 1.10-117/118   |
| 1.10-119/120   |
|                |
| 1.12-13/14     |

1.12-15/16



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#### INSERTION INSTRUCTIONS

VOLUME 3

| Remove                                                                                     | Insert                                                                                                                     |
|--------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------|
| 2-iii/iv                                                                                   | 2-iii/iv                                                                                                                   |
| T 2.1-1                                                                                    | T 2.1-1                                                                                                                    |
| 2.2-5b/6<br>T 2.2-7<br>T 2.2-8                                                             | 2.2-5b/6<br>T 2.2-7<br>T 2.2-8                                                                                             |
| 2.3-5b/6<br>2.3-33/34<br><br>2.3-39/40<br>2.3-43/44<br>2.3-45/46<br>2.3-47/48<br>2.3-51/52 | 2.3-5b/6<br>2.3-33/33a<br>2.3-33b/34<br>2.3-39/40<br>2.3-43/44<br>2.3-45/46<br>2.3-47/48<br>2.3-51/51a<br>2.3-51b/52       |
| 2.4-3b/4<br>2.4-4a/4b<br>2.4-5/6<br><br>2.4-15/16<br><br>2.4-47/38<br>T 2.4-3<br>F 2.4-1   | 2.3-510/52<br>2.4-3b/4<br>2.4-4a/4b<br>2.4-5/5a<br>2.4-5b/6<br>2.4-15/16<br>2.4-16a/16b<br>2.4-37/38<br>T 2.4-3<br>F 2.4-1 |
| 2.5-171/171a                                                                               | 2.5-171/171a                                                                                                               |





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#### VOLUME 4

#### Remove

#### Insert

| F 2.5-128 | F 2.5-128 |
|-----------|-----------|
| F 2.5-209 | F 2.5-209 |
| F 2.5-209 | r 2.J-209 |



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#### INSERTION INSTRUCTIONS

#### VOLUME 6

| Remove                                                                                                                         | Insert                                                                                                                                                                                        |
|--------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 2F-i/ii<br>                                                                                                                    | 2F-i/ia<br>2F-ib/ii                                                                                                                                                                           |
| T 2F-1 (1 and 2 of 2)<br><br>T 2F-3<br>T 2F-6 (4 of 12)<br>T 2F-6 (6 through 12 of 12)<br>T 2F-8<br>T 2F-11 (3 through 9 of 9) | T 2F-1 (1 through 3 of 3)<br>T 2F-2a (1 and 2 of 2)<br>T 2F-2b<br>T 2F-2c (1 and 2 of 2)<br>T 2F-3<br>T 2F-6 (4 of 12)<br>T 2F-6 (6 through 12 of 12)<br>T 2F-8<br>T 2F-11 (3 through 9 of 9) |
| 2G-i/-                                                                                                                         | 2G-i/-                                                                                                                                                                                        |
| T 2G-6<br>T 2G-7<br><br>T 2G-8                                                                                                 | T 2G-6<br>T 2G-7<br>T 2G-7a<br>T 2G-8                                                                                                                                                         |

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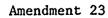
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#### VOLUME 8

#### Remove

#### Insert

| 3-xiii/xiv                  | 3-xiii/xiv                  |
|-----------------------------|-----------------------------|
| 3-xxxiiib/xxxiv             | 3-xxxiiib/xxxiv             |
| 3-xxxiva/xxxivb             | 3-xxxiva/xxxivb             |
| T 3.2-1 (1 through 3 of 26) | T 3.2-1 (1 through 3 of 26) |
| T 3.2-1 (8 of 26)           | T 3.2-1 (8 of 26)           |
| T 3.2-1 (13 and 13a of 26)  | T 3.2-1 (13 and 13a of 26)  |
| T 3.2-1 (15 of 26)          | T 3.2-1 (15 of 26)          |
| T 3.2-1 (22 of 26)          | T 3.2-1 (22 of 26)          |
| T 3.2-1 (26d of 26)         | T 3.2-1 (26d of 26)         |
| T 3.2-3                     | T 3.2-3                     |
| T 3.2-4 (2 of 2)            | T 3.2-4 (2 of 2)            |
| 3.4-1b/2                    | 3.4-1b/2                    |
| 3.4-3b/4                    | 3.4-3b/4                    |
| T 3.4-1 (1 of 2)            | T 3.4-1 (1 of 2)            |
| T 3.4-7                     | T 3.4-7                     |















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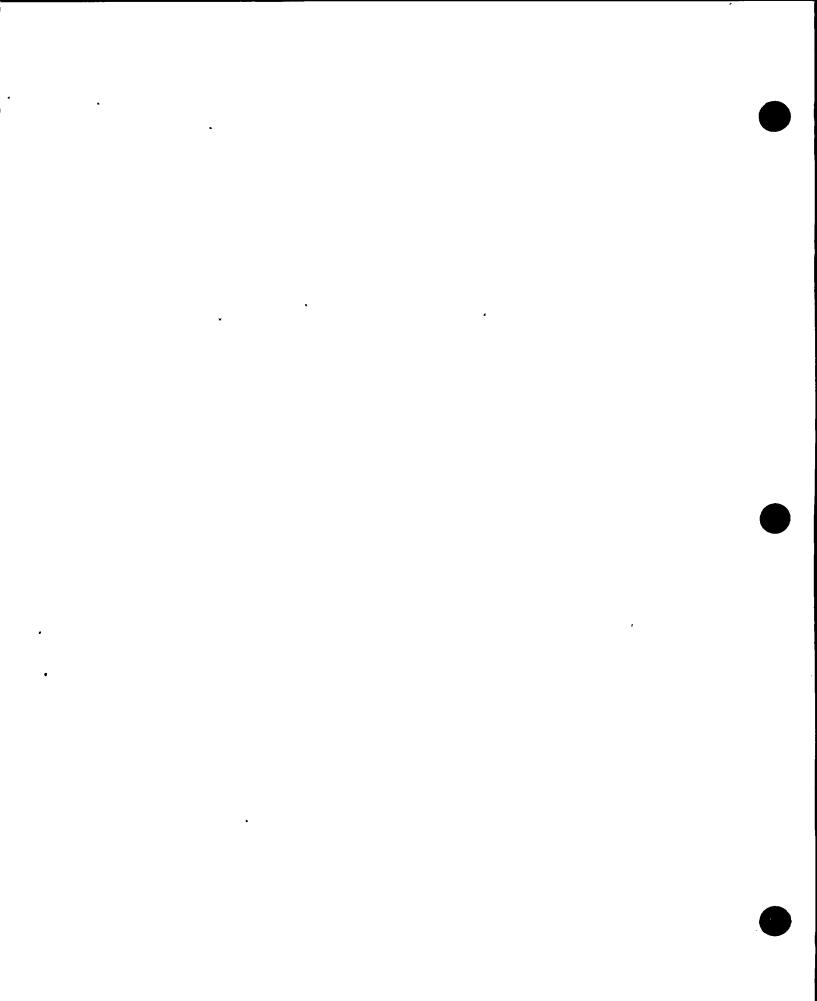
VOLUME 9

#### Remove

#### Insert

| 3.5-19/19a                  | 3.5-19/19a                  |
|-----------------------------|-----------------------------|
| T 3.5-21                    | T 3.5-21                    |
| T 3.5-22 (1 of 1)           | T 3.5-22 (1 and 2 of 2)     |
| 3.6A-37/38                  | 3.6A-37/38                  |
| T 3.6A-1 (1, 3, and 4 of 5) | T 3.6A-1 (1, 3, and 4 of 5) |
| T 3.6A-28 (2 of (12)→8      | T 3.6A-28 (2 of 12)         |
| T 3.6A-34 (3 of 18)         | T 3.6A-34 (3 of 18)         |
| T 3.6A-41 (2 of 4)          | T 3.6A-41 (2 of 4)          |
| T 3.6A-44 (7 and 8 of 28)   | T 3.6A-44 (7 and 8 of 28)   |

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#### VOLUME 10

| Remove     | Insert      |
|------------|-------------|
| 3.6B-3/4   | 3.6B-3/4    |
| 3.6B-21/-  | 3.6B-21/-   |
| 3.7A-1/2   | 3.7A-1/2    |
| 3.7A-3/3a  | 3.7A-3/3a   |
| 3.7A-5/5a  | 3.7A-5/5a   |
| 3.7A-5b/6  | 3.7A-5b/6   |
| 3.7A-7/7a  | 3.7A-7/7a   |
| 3.7A-7b/8  | 3.7A-7b/8   |
| 3.7A-19/20 | 3.7A-19/20  |
| 3.7A-23/24 | 3.7A-23/24  |
| 3.7A-25/26 | 3.7A-25/26  |
| 3.7A-29/30 | 3.7A-29/30  |
| 3.7A-31/32 | 3.7A-31/32  |
| F 3.7A-18  | F 3.7A-18   |
| F 3.7A-21  | F 3.7A-21   |
| F 3.7A-22  | F 3.7A-22   |
| F 3.7A-23  | F 3.7A-23   |
| F 3.7A-24  | F 3.7A-24   |
| F 3.7A-25  | F 3.7A-25   |
| F 3.7A-26  | F 3.7A-26   |
| F 3.7A-32  | F 3.7A-32   |
| 3.7B-3/4   | 3.7B-3/4    |
| 3.7B-7/8   | 3.7B-7/8    |
| 3.7B-13/14 | 3.78-13/14  |
| 3.7B-15/16 | 3.7B-15/16  |
| 3.7B-21/22 | 3.7B-21/22  |
| 3.7B-23/24 | 3.7B-23/24  |
| T 3.7B-1   | T 3.7B-1    |
| 3.8-1/2    | 3.8-1/2     |
| 3.8-25d/26 | 3.8-25d/26  |
|            | 3.8-26a/26b |
| 3.8-37/38  | 3.8-37/38   |
| 3.8-39/40  | 3.8-39/40   |
| 3.8-43/43a | 3.8-43/43a  |
| 3.8-49/50  | 3.8-49/50   |
| 3.8-65/65a | 3.8-65/65a  |
| 3.8-67/68  | 3.8-67/68   |
| 3.8-71/71a | 3.8-71/71a  |

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VOLUME 10 (Cont)

#### Remove

#### Insert

| 3.8-73/73a  |                |
|-------------|----------------|
| 3.8-73Ъ/74  |                |
| 3.8-77/78   |                |
| T 3.8-1 (1, | 2, and 6 of 6) |
| T 3.8-10 (2 | and 3 of 3)    |
| T 3.8-11 (2 | and 3 of 3)    |
| T 3.8-12 (3 | of 4)          |
| T 3.8-13    |                |
|             |                |

3.8-73/73a 3.8-73b/74 3.8-77/78 T 3.8-1 (1, 2, and 6 of 6) T 3.8-10 (2 and 3 of 3) T 3.8-11 (2 and 3 of 3) T 3.8-12 (3 of 4) T 3.8-13 T 3.8-15 (1 and 2 of 2)

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#### VOLUME 12

| Remove                                                                       | Insert                                                                       |
|------------------------------------------------------------------------------|------------------------------------------------------------------------------|
| 3A-iii/iv<br>3A-vii/vii                                                      | 3A-iii/iv<br>3A-vii/viii                                                     |
| 3A-1/2                                                                       | 3A-1/2                                                                       |
| T 3A.1-1                                                                     | T 3A.1-1                                                                     |
| 3A.18-1/1a                                                                   | 3A.18-1/1a                                                                   |
|                                                                              | 3A.32-1/2                                                                    |
|                                                                              | 3A.33-1/2<br>T 3A.33-1<br>T 3A.33-2                                          |
| 3B-iii/iv<br>3B-v/vi                                                         | 3B-iii/iv<br>3B-v/vi                                                         |
| 3B-1/2<br>3B-3/4<br>3B-5/6<br>T 3B-1 (2 of 2)<br>T 3B-2<br>T 3B-9<br>T 3B-10 | 3B-1/2<br>3B-3/4<br>3B-5/6<br>T 3B-1 (2 of 2)<br>T 3B-2<br>T 3B-9<br>T 3B-10 |
| T 4.4-8                                                                      | T 4.4-8                                                                      |
| 4.6-8a/8b<br>F 4.6-5 (1 through 3 of 3)<br>F 4.6-7 (1 and 2 of 2)            | 4.6-8a/8b<br>F 4.6-5 (1 through 3 of 3)<br>F 4.6-7 (1 through 3 of 3)        |



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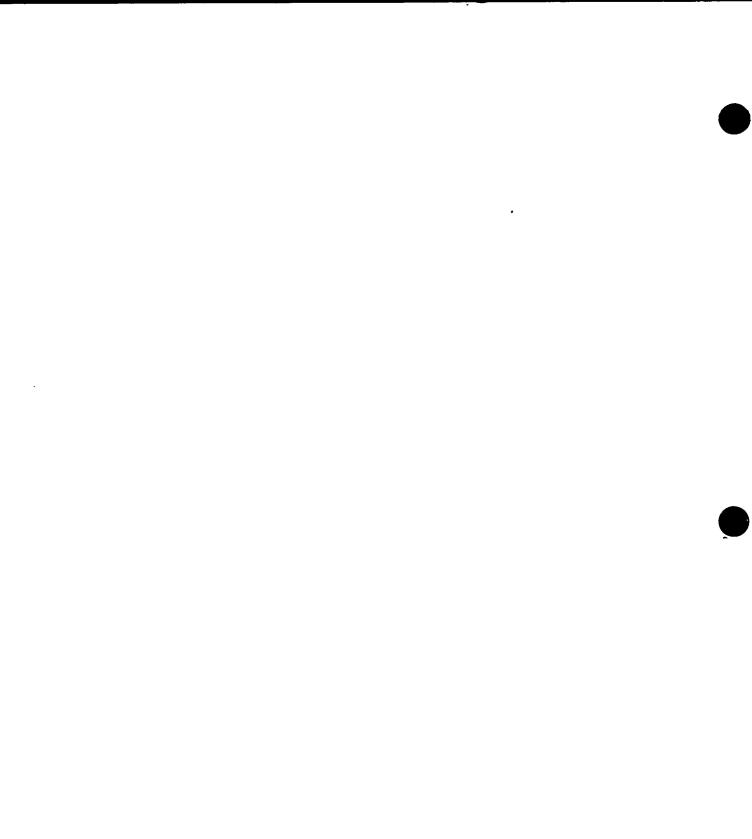
#### VOLUME 13

Remove

Insert

F 5.1-2 (1 through 3 of 3) F 5.1-2 (1 through 3 of 3) 5.2-9b/10 5.2-9b/10 5.2-31/32 5.2-31/32 5.2-32a/32b 5.2-32a/32b 5.2-37/38 5.2-37/37a \_\_\_ 5.2-37b/38 T 5.2-1 (1, 2, and 3 of 8) T 5.2-1 (1, 2, and 3 of 8) ---\* T 5.2-1 (3a of 8) T 5.2-1 (6, 6a, and 6b of 8) T 5.2-1 (6, 6a, and 6b of 8) T 5.2-1 (8a1 of 8) T 5.2-1 (8b of 8) T 5.2-1 (8al of 8) T 5.2-1 (8b and 8b1 of 8) T 5.2-5 (2 and 6 of 6) T 5.2-5 (2 and 6 of 6) T 5.2-6 T 5.2-6 F 5.2-4 (1 and 2 of 2) F 5.2-4 (1 of 1), 5.3 - 1/25.3 - 1/25.3-17/18 5.3-17/18 5.3-19/20 5.3-19/20 5.4-3/4 5.4-3/4 5.4 - 4a/4b---5.4-9/10 5.4-9/10 5.4-11/12 5.4-11/12 5.4-13/14 5.4-13/14 5.4-21b/22 5.4-21b/22 5.4-25/26 5.4-25/26 5.4-29/30 5.4-29/30 5.4-35/36 5.4-35/36 5.4-37/37a 5.4-37/37a 5.4-37b/38 5.4-37b/38 5.4-38a/38b 5.4-38a/38b 5.4-39/40 5.4-39/40 5.4-41/42 5.4-41/42 5.4-51/51a 5.4-51/51a T 5.4-2 T 5.4-2 F 5.4-2 (1 and 2 of 2) F 5.4-2 (1 and 2 of 2) F 5.4-9 (1 and 2 of 2) F 5.4-9 (1 and 2 of 2) F 5.4-10 (1 and 2 of 2) F 5.4-10 (1 and 2 of 2) F 5.4-13 (1 and 2 of 2) F 5.4-13 (1 and 2 of 2)

\*Place new page 3a of 8 ahead of existing 3a of 8.



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#### INSERTION INSTRUCTIONS

VOLUME 13 (Cont)

#### Remove

Insert

| F 5.4-14 (1 through 3 of 3)   | F 5.4-14 (1 through 3 of 3)   |
|-------------------------------|-------------------------------|
| F 5.4-16<br>F 5.4-17 (2 of 3) | F 5.4-16<br>F 5.4-17 (2 of 3) |
| F 5.4-18                      | F 5.4-18                      |
| F 5.4-19                      | F 5.4-19                      |
| T 6.1-2 (1 and 2 of 2)        | T 6.1-2 (1 and 2 of 2)        |



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#### VOLUME 14

#### Remove

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#### Insert

| 6.2-2a/2b                      | 6.2-2a/2b                           |
|--------------------------------|-------------------------------------|
| 6.2-5/6                        | 6.2-5/6                             |
| 6.2-6a/6b                      | 6.2-6a/6b                           |
| 6.2-7/8                        | 6.2-7/8                             |
| •                              | 6.2-9/10                            |
| 6.2-9/10                       | 6.2-15/16                           |
| 6.2-15/16                      | •                                   |
| 6.2-35/35a                     | 6.2-35/35a                          |
| 6.2-37/37a                     | 6.2-37/37a                          |
| 6.2-43/43a                     | 6.2-43/43a                          |
|                                | 6.2-46a/46b                         |
| 6.2-47/47a                     | 6.2-47/47a                          |
| 6.2-57/57a                     | 6.2-57/57a                          |
| 6.2-57b/57c                    | 6.2-57b/57c                         |
| 6.2-57d/58                     | 6.2-57d/58                          |
| 6.2-61/61a                     | 6.2-61/61a                          |
| 6.2-61b/62                     | 6.2-61b/62                          |
| 6.2-62a/62b                    | 6.2-62a/62b                         |
| 6.2-83/84                      | 6.2-83/83a                          |
|                                | 6.2-83b/84                          |
|                                | 6.2-84a/84b                         |
| 6.2-85b/86                     | 6.2-85b/86                          |
| 6.2-86/86b                     | 6.2-86a/86b                         |
| T 6.2-3 (1 of 2)               | T 6.2-3 (1 of 2)                    |
|                                | T 6.2-51                            |
| T 6.2-51                       | T 6.2-56 (1 of 24)                  |
| T 6.2-56 (1 of 24)             | T 6.2-56 (3 and 4 of 24)            |
|                                | T = 0.2-50 (5 and 4 of 24)          |
| T 6.2-56 (6 through 10 of 24)  | T 6.2-56 (6 through 10 of 24)       |
| T 6.2-56 (16, 17 and 18 of 24) | T 6.2-56 (16, 17, 17a and 18 of 24) |
| T 6.2-56 (20 of 24)            | T 6.2-56 (20 of 24)                 |
| T 6.2-56 (22 and 23 of 24)     | T 6.2-56 (22 and 23 of 24)          |
| F 6.2-33 (1 through 8 of 8)    | F 6.2-33 (1 of 8)                   |
| F 6.2-38 (1 through 12 of 12)  | F 6.2-38 (1 through 12 of 12)       |
| F 6.2-54                       | F 6.2-54                            |
| F 6.2-56 (2 through 10 of 10)  | F 6.2-56 (2 through 10 of 10)       |
| F 6.2-60                       | F 6.2-60                            |
| F 6.2-70 (42 of 43)            | F 6.2-70 (42 of 43)                 |
| F 6.2-71A                      | F 6.2-71A                           |
| F 6.2-71B                      | F 6.2-71B                           |
| F 6.2-72A                      | F 6.2-72A                           |
| F 6.2-72B                      | F 6.2-72B                           |
| F 6.2-72K (1 through 5 of 5)   | F 6.2-72K (1 through 5 of 5)        |
| F 6.2-73A                      | F 6.2-73A                           |
| F 6.2-76                       | F 6.2-76                            |
|                                | F 6.2-77                            |
| F 6.2-77                       | 1 V+4 II                            |

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#### VOLUME 15

Remove Insert 6.3-5/6 6.3-5/6 6.3-8a/8aa 6.3-8a/8aa 6.3-8ab/8b 6.3-8ab/8b 6.3-8c/8d 6.3-8c/8d 6.3-11/12 6.3-11/12 6.3-13/14 6.3-13/14 6.3-14a/14b 6.3-14a/14b 6.3-15/16 6.3-15/16 6.3-17/18 6.3-17/18 6.3-20a/20b 6.3-20a/20b F 6.3-1 (1 and 2 of 2) F 6.3-1 (1 and 2 of 2) F 6.3-2 F 6.3-2 F 6.3-6 F 6.3-6 F 6.3-7 F 6.3-7 6.4-3/4 6.4-3/4 6.5-5/6 6.5-5/6 6.5-7/8 6.5-7/7a 6.5-7b/8 ~ - -F 6.5-1 (1 through 8 of 8)F 6.5-1 (1 through 8 of 8) 6B-3/4 6B-3/4 6B-5/6 6B-5/6 6B-7/8 6B-7/8 7-i/ii 7-i/ii 7-xi/xii 7-xi/xii 7.1-1/2 7.1-1/2 T 7.1-2 (1 of 3) T 7.1-2 (1 of 3) 7.2-1/2 7.2-1/2 7.2-11/12 7.2-11/12 F 7.2-1 (1 through 4 of 4) F 7.2-1 (1 through 5 of 5)7.3-1/2 7.3-1/2 7.3-3/4 7.3-3/4 7.3-5/6 7.3-5/6 7.3-7/7a 7.3-7/7a 7.3-9/9a 7.3-9/9a 7.3-11/12 7.3-11/12 7.3-15/16 7.3-15/16 7.3-17/18 7.3-17/18 7.3-23/24 7.3-23/24

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VOLUME 15 (Cont)

#### Remove

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#### Insert

| 7.3-25/26                  |
|----------------------------|
| 7.3-29/30                  |
| 7.3-31/31a                 |
| T 7.3-1                    |
| T 7.3-2                    |
| T 7.3-3                    |
| Т 7.3-4                    |
| T 7.3-5 (1 and 2 of 2)     |
| Т 7.3-6                    |
| T 7.3-7                    |
| T 7.3-8                    |
| F 7.3-2 (1 through 3 of 3) |
| F 7.3-3 (1 through 3 of 3) |
| F 7.3-4 (1 through 5 of 5) |
| F 7.3-5 (1 and 2 of 2)     |
| F 7.3-6 (1 through 5 of 5) |
| F 7.3-7                    |
| F 7.3-10 (1 and 2 of 2)    |

7.3-25/26 7.3-29/30 7.3-31/31a T 7.3-1 T 7.3-2 T 7.3-3 T 7.3-4 T 7.3-5 (1 and 2 of 2) T 7.3-6 T 7.3-7 T 7.3-8 F 7.3-2 (1 through 3 of 3) F 7.3-3 (1 through 3 of 3) F 7.3-4 (1 through 5 of 5) F 7.3-5 (1 and 2 of 2) F 7.3-6 (1 through 5 of 5) F 7.3-7 F 7.3-10 (1 and 2 of 2)

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#### VOLUME 16

Remove

Insert

7.4-3/4 7.4-7/8 7.4-11/12 ---7.4-13/13a 7.4-13b/14 7.4-15/16 7.4-21/22 ---7.4-23/24 \_ \_ \_ T 7.4-1 F 7.4-1 (1 through 5 of 5) F 7.4-2 7.5-5/6 7.5-7/-T 7.5-1 (3 of 14) 7.6-2a/2b 7.6-9/9a 7.6-11/12 F 7.6-1 (1 and 2 of 2) F 7.6-3 (1 and 2 of 2) F 7.6-6 (1 through 7 of 7) F 7.6-9 (1 through 10 of 10) 7.7-27/28 7.7-29/30 F 7.7-1 (1 through 9 of 9) F 7.7-2 (1 of 1) F 7.7-6 (1 through 7 of 7) F 7.7-8 8.2-5b/6 مر مو رو ار ار 8.2-9/10 8.2-11/12 8.2-13/14 8.2-15/16 8.2-19/20 8.2-21/22 8.2-23/23a 8.2-24a/24b F 8.2-1

7.4-3/4 7.4-7/8 7.4-11/11a 7.4-11b/12 7.4-13/13a 7.4-13b/14 7.4-15/16 7.4-21/22 7.4-22a/22b 7.4-23/23a 7.4-23b/24 T 7.4-1 F 7.4-1 (1 through 6 of 6) F 7.4-2 7.5-5/6 7.5-7/-T 7.5-1 (3 of 14) 7.6-2a/2b 7.6-9/9a 7.6-11/12 F 7.6-1 (1 and 2 of 2) F 7.6-3 (1 and 2 of 2) F 7.6-6 (1 through 7 of 7) F 7.6-9 (1 through 10 of 10) 7.7-27/27a 7.7-27b/28 7.7-29/30 F 7.7-1 (1 through 7 of 7) F 7.7-2 (1 through 35 of 35) F 7.7-6 (1 through 7 of 7) F 7.7-8 8.2-5b/6 8.2-9/10 8.2-11/12 8.2-13/14 8.2-15/16 8.2-19/20 8.2-21/22 8.2-23/23a

8.2-24a/24b F 8.2-1

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#### VOLUME 16 (Cont)

Insert

Remove

8.3-3/4 8.3-3/4 8.3-5/16 8.3-5/6 8.3-9/9a 8.3-9/9a 8.3-9b/10 8.3-9b/10 8.3-11/11a 8.3-11/11a 8.3-11b/12 8.3-11b/12 8.3-12a/12b \_ \_ \_ \_ 8.3-18a/18b 8.3-18a/18b 8.3-19/20 8.3-19/20 8.3-20a/20b -----8.3-27b/28 8.3-27b/28 8.3-29/30 8.3-29/30 8.3-31/32 8.3-31/32 8.3-33/34 8.3-33/34 8.3-35/36 8.3-35/36 8.3-43/44 8.3-43/44 8.3-45b/46 8.3-45b/46 8.3-49/49a 8.3-49/49a 8.3-49b/50 8.3-49b/50 8.3-50a/50b 8.3-50a/50b 8.3-51/51a 8.3-51/52 8.3-51b/52 \_ \_ \_ 8.3-52a/52b 8.3-52a/52b 8.3-55/56 8.3-55/56 8.3-57b/58 8.3-57b/58 8.3-59/60 8.3-59/60 8.3-63/64 8.3-63/64 8.3-69/70 8.3-69/70 T 8.3-1 (1 through 13 of 13) T 8.3-1 (1 through 19 of 19) T 8.3-2 (1 through 11 of 11) T 8.3-2 (1 through 18 of 18) T 8.3-5 T 8.3-5 T 8.3-6 T 8.3-6 T 8.3-8 T 8.3-8 T 8.3-9 T 8.3-9 T 8.3-10 (1 and 2 of 2) T 8.3-10 (1 of 1) T 8.3-11 T 8.3-11 T 8.3-12 T 8.3-12 T 8.3-13 T 8.3-13 F 8.3-1 F 8.3-1 ' F 8.3-3 (1 and 2 of 2) F 8.3-3 (1 and 2 of 2) F 8.3-4 F 8.3-4 F 8.3-5 F 8.3-5 F 8.3-6 (1 through 30 of 30) F 8.3-6 (1 through 28 of 28) F 8.3-8B (13 of 13) F 8.3-8b (13 of 13)

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#### VOLUME 16 (Cont)

| Remove                     | Insert                     |
|----------------------------|----------------------------|
| F 8.3-9 (1 of 2)           | F 8.3-9 (1 of 2)           |
| F 8.3-10                   | F 8.3-10                   |
| F 8.3-11                   | F 8.3-11                   |
| 9-vii/viii                 | 9-vii/viia                 |
|                            | 9-viib/viii                |
| 9-ix/x                     | 9-ix/x                     |
| 9-xi/xii                   | 9-xi/xii                   |
| 9.1-8a/8b                  | 9.1-8a/8b                  |
| 9.1-11/11a                 | 9.1-11/11a                 |
| 9.1-11b/12                 | 9.1-11b/12                 |
| 9.1-13/14                  | 9.1-13/14                  |
| 9.1-15/15a                 | 9.1-15/15a                 |
| 9.1-17/18                  | 9.1-17/18                  |
| 9.1-41/42                  | 9.1-41/42                  |
| 9.1-43/44                  | 9.1-43/44                  |
| F 9.1-3                    | F 9.1-3                    |
| F 9.1-4                    | F 9.1-4                    |
| F 9.1-5a                   | F 9.1-5a                   |
| F 9.1-5b                   | F 9.1-5b                   |
| F 9.1-5c                   | F 9.1-5c                   |
| F 9.1-5c                   | F 9.1-5c                   |
| F 9.1-5d                   | F 9.1-5d                   |
| F 9.1-6 (1 through 8 of 8) | F 9.1-6 (1 through 8 of 8) |
| F 9.1-26a                  | F 9.1-26a                  |
| 9.2-5b/6                   | 9.2-5b/6                   |
| 9.2-7/8                    | 9.2-7/7a                   |
|                            | 9.2-7b/8                   |
| 9.2-11/12                  | 9.2-11/11a                 |
|                            | 9.2-11b/12                 |
| 9.2-13/14                  | 9.2-13/14                  |
| 9.2-21/22                  | 9.2-17/18                  |
| 9.2-23/24                  | 9.2-21/22                  |
|                            | 9.2-23/23a                 |
| 9.2-25/25a                 | 9.2-23b/24                 |
| 9.2-25b/26                 | 9.2-25b/26                 |
| 9.2-26a/26b                | 9.2-25b/26                 |
| 9.2-26a/26b                | 9.2-25b/26                 |
| 9.2-27/28                  | 9.2-25b/26                 |
| 9.2-27/28                  | 9.2-25b/26                 |
| 9.2-43/44                  | 9.2-27/28                  |
| 9.2-43/44                  | 9.2-27/28                  |
| 9.2-45/46                  | 9.2-43/44                  |
| 9.2-45/46                  | 9.2-45/46                  |
| 9.2-49/50                  | 9.2-49/50                  |
| T 9.2-1 (1 of 2)           | T 9.2-1 (1 of 2)           |
| T 9.2-2 (1 and 2 of 2)     | T 9.2-2 (1 and 2 of 2)     |

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#### VOLUME 18

#### Remove

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#### Insert

| T 9.2-3 (1 and 2 of 2)<br>T 9.2-4 (1 and 2 of 2)<br>F 9.2-1a<br>F 9.2-1b<br>F 9.2-1c<br>F 9.2-1d<br>F 9.2-1d<br>F 9.2-1f<br>F 9.2-1f<br>F 9.2-1g<br>F 9.2-1g<br>F 9.2-1j<br>F 9.2-1j<br>F 9.2-1j<br>F 9.2-1k<br>F 9.2-1n<br>F 9.2-1m<br>F 9.2-1n<br>F 9.2-1p<br>F 9.2-1q | T 9.2-3 (1 and 2 of 2)<br>T 9.2-4 (1 through 3 of 3)<br>F 9.2-1a<br>F 9.2-1b<br>F 9.2-1c<br>F 9.2-1d<br>F 9.2-1d<br>F 9.2-1e<br>F 9.2-1f<br>F 9.2-1g<br>F 9.2-1g<br>F 9.2-1j<br>F 9.2-1j<br>F 9.2-1j<br>F 9.2-1h<br>F 9.2-1h<br>F 9.2-1n<br>F 9.2-1n<br>F 9.2-1p<br>F 9.2-1q |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| F 9.2-14<br>F 9.2-2 (1 through 20 of 20)<br>F 9.2-3a<br>F 9.2-3b<br>F 9.2-3c<br>F 9.2-3d<br>F 9.2-3e                                                                                                                                                                     | F 9.2-1q<br>F 9.2-2 (1 through 25 of 25)<br>F 9.2-3a<br>F 9.2-3b<br>F 9.2-3c<br>F 9.2-3d<br>F 9.2-3d<br>F 9.2-3e<br>F 9.2-3f<br>F 9.2-3g                                                                                                                                     |
| F 9.2-4 (1 through 9 of 9)<br>F 9.2-5a<br>F 9.2-5b<br>F 9.2-5c<br>F 9.2-5d<br>F 9.2-5d<br>F 9.2-5e<br>F 9.2-6a                                                                                                                                                           | F 9.2-4 (1 through 12 of 12)<br>F 9.2-5a<br>F 9.2-5b<br>F 9.2-5c<br>F 9.2-5d<br>F 9.2-5e<br>F 9.2-5e<br>F 9.2-6a                                                                                                                                                             |
| F 9.2-7 (1 through 13 of 13)<br>F 9.2-8a<br>F 9.2-8b<br>F 9.2-9a<br>F 9.2-9b<br>F 9.2-11<br>F 9.2-12<br>F 9.2-17a<br>F 9.2-17b<br>F 9.2-17b<br>F 9.2-17c<br>F 9.2-18 (1 through 4 of 4)                                                                                  | F 9.2-7 (1 through 12 of 12)<br>F 9.2-8a<br>F 9.2-8b<br>F 9.2-9a<br>F 9.2-9b<br>F 9.2-11<br>F 9.2-12<br>F 9.2-17a<br>F 9.2-17b<br>F 9.2-17c<br>F 9.2-18 (1 through 4 of 4)                                                                                                   |
| F 9.2-19a                                                                                                                                                                                                                                                                | F 9.2-19a                                                                                                                                                                                                                                                                    |

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#### VOLUME 18 (Cont)

#### Remove

#### Insert

| F 9.2-19b                   | F 9.2-19b                   |
|-----------------------------|-----------------------------|
| F 9.2-19c                   | F 9.2-19c                   |
| F 9.2-19d                   | F 9.2-19d                   |
| F 9.2-19e                   | F 9.2-19e                   |
| F 9.2-19f                   | F 9.2-19f                   |
| F 9.2-20 (1 through 5 of 5) | F 9.2-20 (1 through 5 of 5) |

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#### VOLUME 19

Remove

9.3-1/2 9.3-3/4 9.3-7/8 9.3-9/10 9.3-11/11a 9.3-11f/11g 9.3-13/14 9.3-15/16 9.3-23b/24 9.3-27/28 9.3-31/32 T 9.3-1 (5 of 10) T 9.3-1 (8 of 10) T 9.3-1 (9 and 9a of 10) T 9.3-1 (10 of 10) T 9.3-2 (2 of 2) F 9.3-2 (1 through 10 of 10) F 9.3-3a F 9.3-3b F 9.3-3c F 9.3-3d F 9.3-3e F 9.3-4 (1 and 2 of 2) F 9.3-6 (1 through 4 of 4)F 9.3-7 (1 through 6 of 6) F 9.3-8 (1 through 3 of 3) F 9.3-9a F 9.3-9b F 9.3-9c F 9.3-9d F 9.3-9e F 9.3-9f F 9.3-10a F 9.3-10b F 9.3-10c Ĺ F 9.3-10d F 9.3-10e F 9.3-10f F 9.3-10g F 9.3-10h F 9.3-10j F 9.3-11a F 9.3-11b

Insert

9.3-1/2 9.3-3/4 9.3-7/8 9.3-9/10 9.3-11/11a 9.3-11f/11g 9.3-13/14 9.3-15/16 9.3-23b/24 9.3-27/28 9.3-31/32 T 9.3-1 (5 and 5a of 10) T 9.3-1 (8 of 10) T 9.3-1 (9 and 9a of 10) T 9.3-1 (10 of 10) T 9.3-2 (2 of 2) F 9.3-2 (1 through 11 of 11) F 9.3-3a F 9.3-3b F 9.3-3c F 9.3-3d F 9.3-3e F 9.3-4 (1 and 2 of 2) F 9.3-6 (1 through 4 of 4) F 9.3-7 (1 through 8 of 8) F 9.3-8 (1 through 3 of 3) F 9.3-9a F 9.3-9b F 9.3-9c F 9.3-9d F 9.3-9e F 9.3-9f F 9.3-10a F 9.3-10b F 9.3-10c F 9.3-10d F 9.3-10e F 9.3-10f F 9.3-10g F 9.3-10h F 9.3-10j F 9.3-11a F 9.3-11b F 9.3-11c

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F 9.3-11d

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VOLUME 19 (Cont)

Remove

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### Insert

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|                               | <b>N</b> A A A                |
|-------------------------------|-------------------------------|
|                               | F 9.3-11e                     |
| F 9.3-12a                     | F 9.3-12a                     |
| F 9.3-12b                     | F 9.3-12b                     |
| F 9.3-12c                     | F 9.3-12c                     |
| F 9.3-12d                     | F 9.3-12d                     |
| F 9.3-12e                     | F 9.3-12e                     |
| F 9.3-12f                     | F 9.3-12f                     |
| F 9.3-12g                     | F 9.3-12g                     |
| F 9.3-12h                     | F 9.3-12h                     |
| F 9.3-12j                     | F 9.3-12j                     |
| F 9.3-12k                     | F 9.3-12k                     |
| F 9.3-121                     | F 9.3-121                     |
| F 9.3-13 (1 through 10 of 10) | F 9.3-13 (1 through 10 of 10) |
| F 9.3-14 (1 through 3 of 3)   | F 9.3-14 (1 through 3 of 3)   |
| F 9.3-15                      | F 9.3-15                      |
| F 9.3-16 (1 through 7 of 7)   | F 9.3-16 (1 through 7 of 7)   |
|                               | F 9.3-20a                     |
|                               | F 9.3-20b                     |



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#### VOLUME 20

Insert Remove 9.4 - 1/29.4 - 1/29.4-3/4 9.4-3/4 9.4-7/8 9.4-7/8 4 9.4-9/10 9.4-9/10 9.4-21b/22 9.4-21b/22 9.4-27/28 9.4-27/28 9.4-29/30 9.4-29/30 9.4-35/36 9.4-35/36 9.4-39/40 9.4-39/40 9.4-41/42 9.4-41/42 9,4-45/46 9.4-45/46 9.4-47/48 9.4-47/48 9.4-49/50 9.4-49/50 9.4-51/52 9.4-51/52 9.4-53/54 9.4-53/54 9.4-54a/54b ---9.4-55/56 9.4-55/56 9.4-56a/56b ---9.4-57/57a 9.4-57/58 9.4-57b/58 9.4-58a/58b 9.4-58a/58b 9.4-59/59a 9.4-59/60 9.4-59b/60 ----9.4-63/64 9.4-63/64 9.4-65/66 9.4-65/66 9.4-71/72 9.4-71/72 9.4-72a/72b ----9.4-73/-9.4-73/-T 9.4-3 (3 of 11) T 9.4-3 (3 of 11) T 9.4-5 (1 through 3 of 21) T 9.4-5 (1 through 3 of 21) T 9.4-5 (3a of 21) \_ \_ \_ T 9.4-5 (4 of 21) T 9.4-5 (4 of 21) T 9.4-5 (4a and 4b of 21) T 9.4-5 (5 through 15 of 21) T 9.4-5 (5 through 15 of 21) T 9.4-5 (15a of 21) T 9.4-5 (16 and 17 of 21) T 9.4-5 (16 and 17 of 21) T 9.4-5 (21 of 21) T 9.4-5 (21 of 21) T 9.4-6 T 9.4-6 T 9.4-7 (1 and 2 of 2) T 9.4-7 (1 and 2 of 2) T 9.4-8 (1 through 6 of 6) T 9.4-8 (1 through 5 of 5) T 9.4-9 T 9.4-9 T 9.4-10 (1 and 2 of 2) T 9.4-10 (1 and 2 of 2) F 9.4-2a F 9.4-2a F 9.4-2b -----

Amendment 23

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VOLUME 20 (Cont)

#### Remove

### Insert

|                              | <b>T</b> A ( A               |
|------------------------------|------------------------------|
|                              | F 9.4-2c                     |
|                              | F 9.4-2d                     |
|                              | F 9.4-2e                     |
| F 9.4-3a                     | F 9.4-3a                     |
|                              | F 9.4-3b                     |
|                              | F 9.4-3c                     |
|                              | F 9.4-3d                     |
|                              |                              |
| ••• •= ==                    | F 9.4-3e                     |
|                              | F 9.4-3f                     |
| F 9.4-4 (1 through 9 of 9)   | F 9.4-4 (1 through 9 of 9)   |
| F 9.4-5 (1 through 7 of 7)   | F 9.4-5 (1 through 8 of 8)   |
| F 9.4-6 (1 through 7 of 7)   | F 9.4-6 (1 through 7 of 7)   |
| F 9.4-7 (1 through 13 of 13) | F 9.4-7 (1 through 14 of 14) |
| F 9.4-8a                     | F 9.4-8a                     |
| F 9.4-8b                     | F 9.4-8b                     |
| F 9.4-8c                     | F 9.4-8c                     |
| F 9.4-8d                     | F 9.4-8d                     |
|                              | F 9.4-8e                     |
| F 9.4-8e                     |                              |
| F 9.4-8f                     | F 9.4-8f                     |
| F 9.4-8g                     | F 9.4-8g                     |
| F 9.4-8h                     | F 9.4-8h                     |
| F 9.4-8j                     | F 9.4-8j                     |
| F 9.4-8k                     | F 9.4-8k                     |
| F 9.4-81                     | F 9.4-81                     |
|                              |                              |



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#### VOLUME 21

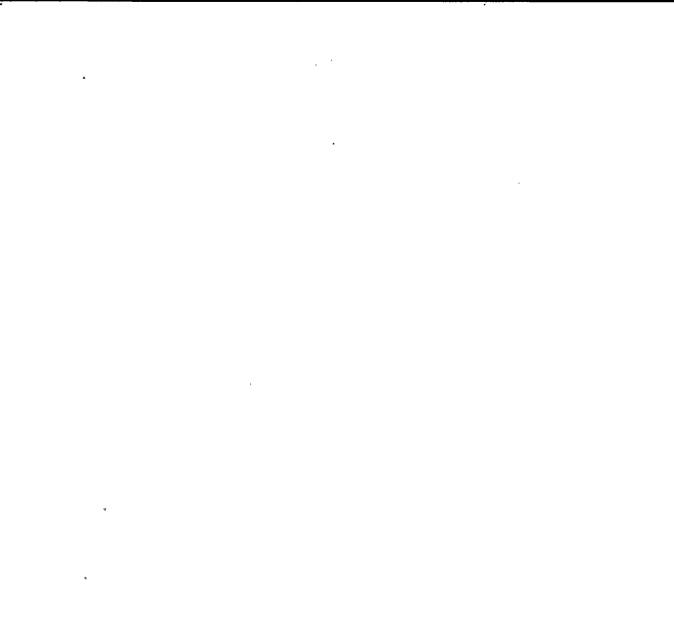
#### Remove

<u>Insert</u>

F 9.4-9 (1 through 19 of 19) F 9.4-10a F 9.4-10b F 9.4-10c F 9.4-10d F 9.4-10e F 9.4-11 (1 through 5 of 5) F 9.4-12a F 9.4-12b F 9.4-12c F 9.4-12d F 9.4-13 (1 through 12 of 12) F 9.4-14 (1 through 3 of 3) F 9.4-15a F 9.4-16 (1 through 6 of 6) F 9.4-17 (1 through 10 of 10) F 9.4-18 (1 and 2 of 2) F 9.4-19 (1 through 3 of 3) F 9.4-20 (1 through 5 of 5) F 9.4-21 (1 and 2 of 2) F 9.4-22a F 9.4-22b F 9.4-22c F 9.4-22d F 9.4-23 (1 through 5 of 5) 9.5-1/2 9.5-3/4 9.5-5/6 9.5-9/10 9.5-11/12 9.5-17b/18 9.5-19/20 9.5-20a/20b 9.5-21/22 9.5-22a/22a1 9.5-23/23a 9.5-23b/24 9.5-25/25a 9.5-39/40 9.5-53/54 9.5-55/55a 9.5-59/60

F 9.4-9 (1 through 24 of 24) F 9.4-10a F 9.4-10b F 9.4-10c F 9.4-10d F 9.4-10e F 9.4-11 (1 through 17 of 17) F 9.4-12a F 9.4-12b F 9.4-12c F 9.4-12d F 9.4-13 (1 through 12 of 12) F 9.4-14 (1 through 3 of 3) F 9.4-15a F 9.4-16 (1 through 9 of 9) F 9.4-17 (1 through 12 of 12) F 9.4-18 (1 through 4 of 4) F 9.4-19 (1 through 3 of 3) F 9.4-20 (1 through 5 of 5) F 9.4-21 (1 through 4 of 4) F 9.4-22a F 9.4-22b F 9.4-22c F 9.4-22d F 9.4-22e F 9.4-23 (1 through 7 of 7) 9.5 - 1/29.5-3/4 9.5-5/6 9.5-9/10 9.5-11/12 9.5-12a/12b 9.5-17b/18 9.5-18a/18b 9.5-19/20 9.5-20a/20b 9.5-21/22 9.5-22a/22a1 9.5-23/23a 9.5-23b/24 9.5-25/25a 9.5-39/40 9.5-53/54 9.5-55/55a 9.5-59/60

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Nine Mile Point Unit 2 FSAR

### INSERTION INSTRUCTIONS

VOLUME 21 (Cont)

Remove

### Insert

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of 9)

| 9.5-61/61a             | 9.5-61/61a       |
|------------------------|------------------|
| 9.5-61b/62             | 9.5-61b/62       |
| 9.5-65/66              | 9.5-65/66        |
| T 9.5-1 (5 and 6 of 9) | T 9.5-1 (5 and 6 |
| T 9.5-1 (8 of 9)       | T 9.5-1 (8 of 9) |
| T 9.5-2 (3 of 8)       | T 9.5-2 (3 of 8) |



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# VOLUME 22

### Remove

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### Insert

| F 9.5-1a                      | F 9.5-1a                    |
|-------------------------------|-----------------------------|
| F 9.5-1b                      | F 9.5-1b                    |
| F 9.5-1c                      | F 9.5-1c                    |
| F 9.5-1d                      | F 9.5-1d                    |
| F 9.5-1e                      | F 9.5-1e                    |
| F 9.5-1f                      | F 9.5-1f                    |
| F 9.5-1g                      | F 9.5-1g                    |
|                               | F 9.5-1h                    |
| F 9.5-2a                      | F 9.5-2a                    |
| F 9.5-2b                      | F 9.5-2b                    |
| F 9.5-3a                      | F 9.5-3a                    |
|                               |                             |
| F 9.5-4a                      | F 9.5-4a                    |
| F 9.5-41 (1 through 11 of 11) | F 9.5-41 (1 through 5 of 5) |
| F 9.5-42                      | F 9.5-42                    |
| F 9.5-52a                     | F 9.5-52a                   |
| F 9.5-52b                     | F 9.5-52b                   |
|                               |                             |
| F 9.5-52c                     | F 9.5-52c                   |
| F 9.5-53 (1 through 5 of 5)   | F 9.5-53 (1 through 7 of 7) |



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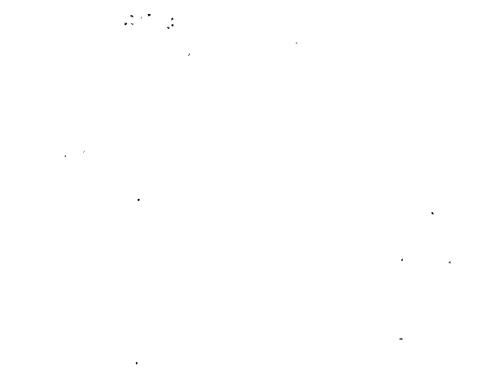
### VOLUME 23

| Remove                                                | Insert                                             |
|-------------------------------------------------------|----------------------------------------------------|
| 9A-i/ii                                               | 9A-i/ii                                            |
| 9A-iii/iv                                             | 9A-iii/iv                                          |
| 9A-v/vi                                               | 9A-v/vi                                            |
| 9A-vii/-                                              | 9A-vii/-                                           |
| y (22)                                                |                                                    |
| 9A.2-3/4                                              | 9A.2-3/4                                           |
| 94.3-5/6                                              | 9A.3-5/6                                           |
| 9A.3-7/8                                              | 9A.3-7/8                                           |
| 9A.3-11/12                                            | 9A.3-11/12                                         |
| 9A.3-13/14                                            | 9A.3-13/14                                         |
| 9A.3-15/16                                            | 9A.3-15/16                                         |
| 9A.3-17/18                                            | 9A.3-17/17a                                        |
|                                                       | 9A.3-17b/18                                        |
| 9A.3-19/20                                            | 9A.3-19/20                                         |
|                                                       | 9A.3-20a/20b                                       |
| 9A.3-23/24                                            | 9A.3-23/24                                         |
| 9A.3-25/26                                            | 9A.3-25/26                                         |
| 9A.3-27/28                                            | 9A.3-27/28                                         |
| 9A.3-29/30                                            | 9A.3-29/30                                         |
| 9A.3-31/31a                                           | 9A.3-31/31a                                        |
| 9A.3-41/42                                            | 9A.3-41/41a                                        |
|                                                       | 9A.3-41b/42                                        |
| 9A.3-43/44                                            | 9A.3-43/44                                         |
| 9A.3-45b/46                                           | 9A.3-45b/46                                        |
| 9A.3-47/48                                            | 9A.3-47/48                                         |
| 9A.3-49/49a                                           | 9A.3-49/49a                                        |
| 9A.3-49b/50                                           | 9A.3-49b/50                                        |
| 9A.3-51/51a                                           | 9A.3-51/51a                                        |
| 9A.3-55/55a                                           | 9A.3-55/55a                                        |
| 9A.3-59/60                                            | 9A.3-59/60                                         |
| T 9A.3-1 (1 through 4 of 4)                           | T 9A.3-1 (1 through 4 of 4)                        |
| T 9A.3-2 (1 through 3 of 3)                           | T 9A.3-2 (1 through 3 of 3)                        |
| T 9A.3-3                                              | T 9A.3-3                                           |
| T 9A.3-4 (1 through 6 of 6)                           | T 9A.3-4 (1 through 6 of 6)                        |
| T 9A.3-5                                              | T 9A.3-5<br>T 9A.3-6 (1 through 5 of 5)            |
| T 9A.3-6 (1 through 5 of 5)<br>T $(1, 2, 3, 4, 5, 5)$ | T 9A.3-7 (1 and 2 of 2)                            |
| T 9A.3-7 (1 of 1)<br>T 9A $2-8$ (1 ord 2 of 2)        | T 9A.3-8 (1 and 2 of 2)<br>T 9A.3-8 (1 and 2 of 2) |
| T 9A.3-8 (1 and 2 of 2)                               | T 9A.3-9 (1 through 3 of 3)                        |
| T 9A.3-9 (1 of 1)<br>T 9A $2-10$ (1 and 2 of 2)       | T 9A.3-10 (1 and 2 of 2)                           |
| T 9A.3-10 (1 and 2 of 3)                              | 1 7A.J~10 (1 and 2 01 2)                           |



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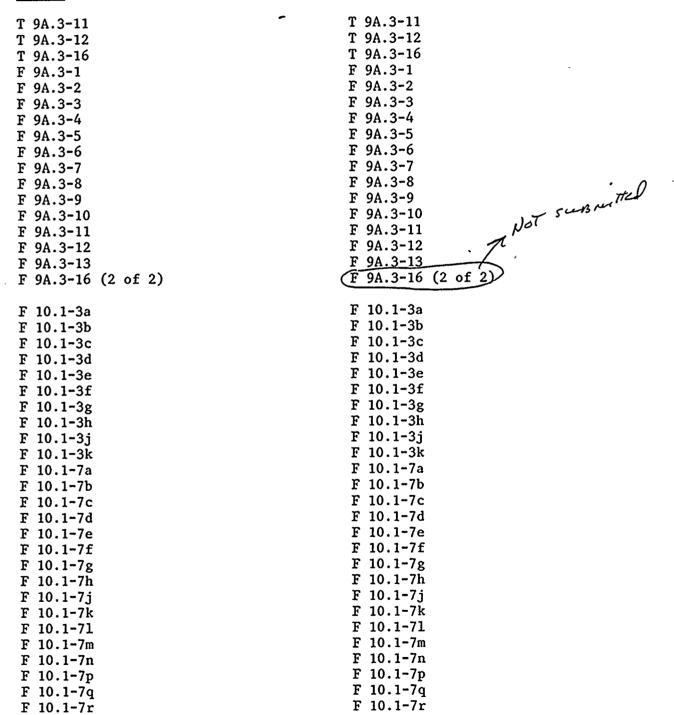
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VOLUME 23 (Cont)

#### Remove

#### <u>Insert</u>



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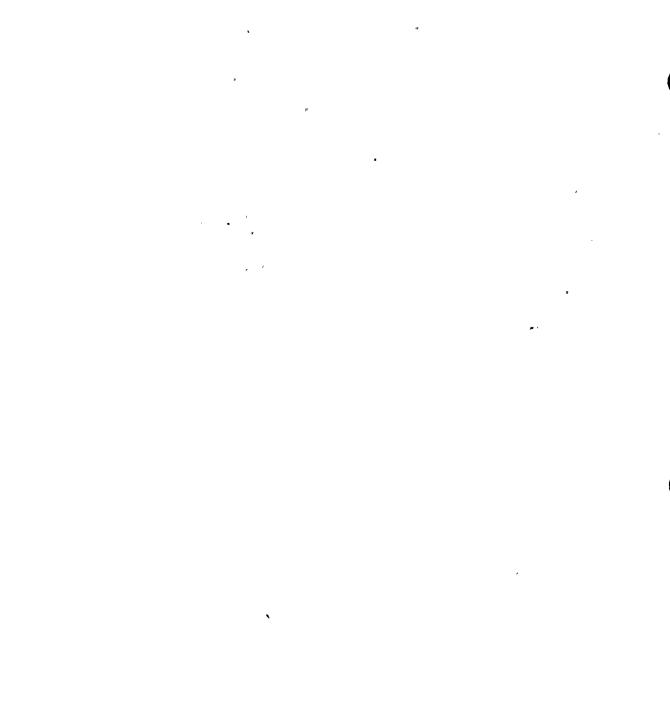
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### VOLUME 23 (Cont)

| Remove    | Insert    |  |
|-----------|-----------|--|
| F 10.1-7s | F 10.1-7s |  |
| F 10.1-7t | F 10.1-7t |  |
| F 10.1-7u | F 10.1-7u |  |
| F 10.1-7w | F 10.1-7w |  |
| 10.2-7/8  | 10.2-7/8  |  |



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### VOLUME 24

#### Remove

Insert

| 10.3-3/3a                                                                                                                                                                                                                                                                                                                                                  | 10.3-3/3a                                                                                                                                                                                                                                                                                                                                                                                                  |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 10.3-5/-                                                                                                                                                                                                                                                                                                                                                   | 10.3-5/-                                                                                                                                                                                                                                                                                                                                                                                                   |
| F 10.4-1 (1 through 5 of 5)<br>F 10.4-2a<br>F 10.4-3 (1 through 6 of 6)<br>F 10.4-7a<br>F 10.4-7b<br>F 10.4-7c<br>F 10.4-7c<br>F 10.4-7d<br>F 10.4-7f<br>F 10.4-7f<br>F 10.4-7g<br>F 10.4-7h<br>F 10.4-8 (1 through 6 of 6)<br>F 10.4-9 (1 through 9 of 9)<br>F 10.4-10 (1 through 9 of 8)<br>F 10.4-11 (1 through 8 of 8)<br>F 10.4-13 (1 through 8 of 8) | F 10.4-1 (1 through 5 of 5)<br>F 10.4-2a<br>F 10.4-3 (1 through 5 of 5)<br>F 10.4-7a<br>F 10.4-7b<br>F 10.4-7c<br>F 10.4-7c<br>F 10.4-7d<br>F 10.4-7f<br>F 10.4-7f<br>F 10.4-7g<br>F 10.4-7g<br>F 10.4-7h<br>F 10.4-8 (1 through 9 of 9)<br>F 10.4-9 (1 through 10 of 10)<br>F 10.4-10 (1 through 2 of 22)<br>F.10.4-11 (1 through 9 of 9)<br>F 10.4-12 (1 through 7 of 7)<br>F 10.4-13 (1 through 8 of 8) |
| 11-i/ii                                                                                                                                                                                                                                                                                                                                                    | 11-i/ii                                                                                                                                                                                                                                                                                                                                                                                                    |
|                                                                                                                                                                                                                                                                                                                                                            | 11-iia/iib                                                                                                                                                                                                                                                                                                                                                                                                 |
| 11-iii/iv                                                                                                                                                                                                                                                                                                                                                  | 11-iii/iv                                                                                                                                                                                                                                                                                                                                                                                                  |
| 11-v/vi                                                                                                                                                                                                                                                                                                                                                    | 11-v/vi                                                                                                                                                                                                                                                                                                                                                                                                    |
| 11.1-15/-                                                                                                                                                                                                                                                                                                                                                  | 11.1-15/-                                                                                                                                                                                                                                                                                                                                                                                                  |
| T 11.1-2                                                                                                                                                                                                                                                                                                                                                   | T 11.1-2                                                                                                                                                                                                                                                                                                                                                                                                   |
| 11.2-1/2                                                                                                                                                                                                                                                                                                                                                   | 11.2-1/2                                                                                                                                                                                                                                                                                                                                                                                                   |
| 11.2-3/4                                                                                                                                                                                                                                                                                                                                                   | 11.2-3/3a                                                                                                                                                                                                                                                                                                                                                                                                  |
|                                                                                                                                                                                                                                                                                                                                                            | 11.2-3b/4                                                                                                                                                                                                                                                                                                                                                                                                  |
| 11.2-5b/6                                                                                                                                                                                                                                                                                                                                                  | 11.2-5b/6                                                                                                                                                                                                                                                                                                                                                                                                  |
| 11.2-7/8                                                                                                                                                                                                                                                                                                                                                   | 11.2-7/8                                                                                                                                                                                                                                                                                                                                                                                                   |
| 11.2-9/10                                                                                                                                                                                                                                                                                                                                                  | 11.2-9/10                                                                                                                                                                                                                                                                                                                                                                                                  |
| 11.2-11/12                                                                                                                                                                                                                                                                                                                                                 | 11.2-11/12                                                                                                                                                                                                                                                                                                                                                                                                 |
| 11.2-13/14                                                                                                                                                                                                                                                                                                                                                 | 11.2-13/14                                                                                                                                                                                                                                                                                                                                                                                                 |
|                                                                                                                                                                                                                                                                                                                                                            | 11.2-13/14                                                                                                                                                                                                                                                                                                                                                                                                 |
| 11.2-15/16                                                                                                                                                                                                                                                                                                                                                 | 11.2-15/16                                                                                                                                                                                                                                                                                                                                                                                                 |
| 11.2-17/18                                                                                                                                                                                                                                                                                                                                                 | 11.2-17/18                                                                                                                                                                                                                                                                                                                                                                                                 |
| F 11.2-1a                                                                                                                                                                                                                                                                                                                                                  | F 11.2-1a                                                                                                                                                                                                                                                                                                                                                                                                  |
| F 11.2-1b                                                                                                                                                                                                                                                                                                                                                  | F 11.2-1b                                                                                                                                                                                                                                                                                                                                                                                                  |
| F 11.2-1c                                                                                                                                                                                                                                                                                                                                                  | F 11.2-1c                                                                                                                                                                                                                                                                                                                                                                                                  |
| F 11.2-1d.                                                                                                                                                                                                                                                                                                                                                 | F 11.2-1d                                                                                                                                                                                                                                                                                                                                                                                                  |





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# VOLUME 24 (Cont)

### Remove

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### <u>Insert</u>

| F 11.2-1e              | F 11.2-1e |
|------------------------|-----------|
| F 11.2-1f              | F 11.2-1f |
| F <sup>.</sup> 11.2-1g | F 11.2-1g |
|                        | F 11.2-1h |
|                        | F 11.2-1j |
|                        | F 11.2-1k |
|                        | F 11.2-11 |
|                        | F 11.2-1m |
|                        |           |





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### INSERTION INSTRUCTIONS

### VOLUME 25

Remove

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Insert

| 11.3-2a/2b                                                                                                                                                   | 11.3-2a/2b                                                                                                                                                                                  |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 11.3-3/4                                                                                                                                                     | 11.2-3/4                                                                                                                                                                                    |
| 11.3-5b/6                                                                                                                                                    | 11.3-5b/6                                                                                                                                                                                   |
| F 11.3-1a                                                                                                                                                    | F 11.3-1a                                                                                                                                                                                   |
| F 11.3-1b                                                                                                                                                    | F 11.3-1b                                                                                                                                                                                   |
| F 11.3-1c                                                                                                                                                    | F 11.3-1c                                                                                                                                                                                   |
| 11.4-3b/4<br><br>11.4-5/6<br>T 11.4-4 (1 of 2)<br>F 11.4-1a<br>F 11.4-1b<br>F 11.4-1c<br>F 11.4-1c<br>F 11.4-1d<br>F 11.4-1f<br>F 11.4-1g<br>                | 11.4-3b/4<br>11.4-4a/4b<br>11.4-5/6<br>T 11.4-4 (1 of 2)<br>F 11.4-1a<br>F 11.4-1b<br>F 11.4-1c<br>F 11.4-1c<br>F 11.4-1c<br>F 11.4-1f<br>F 11.4-1f<br>F 11.4-1g<br>F 11.4-1h               |
| 11.5-1/2<br><br>11.5-3/4<br><br>11.5-5/6<br><br>11.5-7/8<br>11.5-9/10<br><br>11.5-11/12<br><br>11.5-13/14<br>T 11.5-1 (1 and 2 of 2)<br>F 11.5-4<br>F 11.5-7 | 11.5-1/2<br>11.5-2a/2b<br>11.5-3/3a<br>11.5-3b/4<br>11.5-5b/6<br>11.5-7/8<br>11.5-9/10<br>11.5-10a/10b<br>11.5-11b/12<br>11.5-13/14<br>T 11.5-1 (1, 2, and 2a of 2)<br>F 11.5-4<br>F 11.5-7 |
| 12.2-5/6                                                                                                                                                     | 12.2-5/6                                                                                                                                                                                    |
| T 12.3-2 (1 through 3 of 3)                                                                                                                                  | T 12.3-2 (1 through 3 of 3)                                                                                                                                                                 |
| F 12.3-1                                                                                                                                                     | F 12.3-1                                                                                                                                                                                    |
| F 12.3-2                                                                                                                                                     | F 12.3-2                                                                                                                                                                                    |
| F 12.3-3                                                                                                                                                     | F 12.3-3                                                                                                                                                                                    |
| F 12.3-4                                                                                                                                                     | F 12.3-4                                                                                                                                                                                    |
| F 12.3-5                                                                                                                                                     | F 12.3-5                                                                                                                                                                                    |
| F 12.3-6                                                                                                                                                     | F 12.3-6                                                                                                                                                                                    |

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### VOLUME 25 (Cont)

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Remove

Insert

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|------------------------|------------------------|
| F 12.3-7<br>F 12.3-8   | F 12.3-7<br>F 12.3-8   |
| F 12.3-9               | F 12.3-9               |
| F 12.3-10              | F 12.3-10              |
| F 12.3-11              | F 12.3-11              |
| F 12.3-12<br>F 12.3-13 | F 12.3-12<br>F 12.3-13 |
| F 12.3-13<br>F 12.3-14 | F 12.3-13<br>F 12.3-14 |
| F 12.3-14              | F 12.3-15              |
| F 12.3-16              | F 12.3-16              |
| F 12.3-17              | F 12.3-17              |
| F 12.3-18              | F 12.3-18              |
| F 12.3-19              | F 12.3-19              |
| F 12.3-20              | F 12.3-20              |
| F 12.3-24              | F 12.3-24              |
| F 12.3-25              | F 12.3-25<br>F 12.3-26 |
| F 12.3-26<br>F 12.3-27 | F 12.3-27              |
| F 12.3-28              | F 12.3-28              |
| F 12.3-29              | F 12.3-29              |
| F 12.3-30              | F 12.3-30              |
| F 12.3-31              | F 12.3-31              |
| F 12.3-32              | F 12.3-32              |
| F 12.3-33              | F 12.3-33              |
| F 12.3-34              | F 12.3-34              |
| F 12.3-35              | F 12.3-35<br>F 12.3-36 |
| F 12.3-36<br>F 12.3-37 | F 12.3-36<br>F 12.3-37 |
| F 12.3-37              | F 12.3-37              |
| F 12.3-39              | F 12.3-39              |
| F 12.3-40              | F 12.3-40              |
| F 12.3-41              | F 12.3-41              |
| F 12.3-42              | F 12.3-42              |
| F 12.3-43              | F 12.3-43              |
| F 12.3-44              | F 12.3-44              |
| F 12.3-45              | F 12.3-45<br>F 12.3-46 |
| F 12.3-46<br>F 12.3-47 | F 12.3-46<br>F 12.3-47 |
| F 12.3-48              | F 12.3-48              |
| F 12.3-49              | F 12.3-49              |
| F 12.3-50              | 'F 12.3-50             |
| F 12.3-51              | F 12.3-51              |
| F 12.3-52              | F 12.3-52              |
| F 12.3-53              | F 12.3-53              |
| F 12.3-57              | F 12.3-57<br>F 12.3-58 |
| F 12.3-58              | F 12.3-58              |
|                        |                        |

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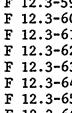
-\* <sup>\*</sup> • • • • • • • • • · . • F • 1 • • • • • . · · · ·

### VOLUME 25 (Cont)

### Remove

### Insert

| F 12.3 | -59   | 3 | 12.3-59 |
|--------|-------|---|---------|
| F 12.3 | -60 ] | 3 | 12.3-60 |
| F 12.3 | -61   | 3 | 12.3-61 |
| F 12.3 | -62   | 3 | 12.3-62 |
| F 12.3 | -63 ] | F | 12.3-63 |
| F 12.3 | -64 ] | F | 12.3-64 |
| F 12.3 | -65   | F | 12.3-65 |
| F 12.3 | -66   | F | 12.3-66 |





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#### VOLUME 26

#### Remove

#### Insert

| 12.4-1b/1c                                                                         |
|------------------------------------------------------------------------------------|
| T 13.1-3 (1, 3, 3a, 4, 5 of 7)<br>T 13.1-4 (1 of 5)                                |
| 13.5-1/2<br>13.5-3/3a<br>13.5-7/-<br>T 13.5-1a                                     |
| T 13.5-2<br>T 13.5-3 (1 through 3 of 3)<br>T 13.5-6 (1 through 5 of 5)<br>T 13.5-7 |

12.4-1b/1c T 13.1-3 (1, 3, 3a, 4, 5 of 7) T 13.1-4 (1 of 5) 13.5-1/2 13.5-3/3a 13.5-7/-T 13.5-1a T 13.5-2 T 13.5-3 (1 and 2 of 2) T 13.5-6 (1 through 5 of 5) T 13.5-7 ۰,



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### VOLUME 27

| Remove                     | Insert                     |
|----------------------------|----------------------------|
| 15-xiii/xiv                | 15-xiii/xiv                |
| 15-xxi/xxii                | 15-xxi/xxii                |
| 15.2-15/16                 | 15.2-15/16                 |
| 15.6-7/8                   | 15.6-7/8                   |
| 15.6-11/12                 | 15.6-11/12                 |
| 15.6-12c/12d               | 15.6-12c/12d               |
| 15.6-13/13a                | 15.6-13/13a                |
| 15.6-13b/14                | 15.6-13b/14                |
| T 15.6-6 (2 of 2)          | T 15.6-6 (2 of 2)          |
| T 15.6-13 (9 and 11 of 11) | T 15.6-13 (9 and 11 of 11) |
| T 15.6-15a                 | T 15.6-15a                 |
| Т 15.6-15Ъ                 | Т 15.6-15Ъ                 |
| T 15.6-16a                 | T 15.6-16a                 |
| T 15.6-16b                 | Т 15.6-16Ъ                 |
|                            |                            |
| 15.7-3/4                   | 15.7-3/4                   |
| 15.7-13/14                 | 15.7-13/14                 |
| T 15.7-8 (1 of 2)          | T 15.7-8 (1 of 2)          |
| T 15.7-9 (1 and 2 of 2)    | T 15.7-9 (1 and 2 of 2)    |
| T 15.7-16 (1 of 2)         | T 15.7-16 (1 of 2)         |
| T 15.7-17                  | T 15.7-17                  |



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#### QUESTIONS AND RESPONSES

#### VOLUME 1

#### Remove

Insert

Q&R F210.58-1/-Q&R F210.62-1/2 Q&R F210.62-3/-T 210.62-1 (1 and 2 of 2) Q&R F210.63-1/-

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Q&R F240.10-1/2 T 240.10-1 (1 of 2)

Q&R F250.1-1/-

Q&R F210.58-1/2 Q&R F210.62-1/2 Q&R F210.62-3/-T 210.62-1 (1 and 2 of 2) Q&R F210.63-1/-

Q&R F240.10-1/2 T 240.10-1 (1 of 2)

Q&R F250.1-1/2 T 250.1-1 (1 through 17 of 17)

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QUESTIONS AND RESPONSES

VOLUME 2

Remove

Q&R F410.49-1/-

Q&R F421.3-1/2 T 421.47-1 (1, 3, and 4 of 17) T 421.47-1 (5 of 17) T 421.47-1 (7 through 9 of 17) T 421.47-1 (14 of 17)

Q&R F430.74-1/2

Insert

Q&R F410.49-1/-

Q&R F421.3-1/2 T 421.47-1 (1, 3, and 4 of 17) T 421.47-1 (5 of 17) T 421.47-1 (7 through 9 of 17) T 421.47-1 (14 of 17)

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Q&R F430.74-1/2

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### QUESTIONS AND RESPONSES

### VOLUME 3

### Remove

Q&R F440.16-1/2 Q&R F440.17-1/- Q&R F440.16-1/2 Q&R F440.17-1/-

Insert

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T 480.37-1 (2 of 2)

T 480.37-1 (2 of 2)



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### INSERTION INSTRUCTIONS

### DESIGN ASSESSMENT REPORT

### APPENDIX 6A

| Remove                                                                                                                                                                                                                                                                                 | Insert                                                                                                                                                                                                                                                                                                                           |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 6A.1-5/-                                                                                                                                                                                                                                                                               | 6A.1-5/-                                                                                                                                                                                                                                                                                                                         |
| 6A.2-7/8<br>6A.2-9/10<br>6A.2-11/12<br>6A.2-13/14<br>T 6A.2-2 (1 through 3 of 3)<br>T 6A.2-3 (2 of 3)<br>F 6A.2-23<br>F 6A.2-27                                                                                                                                                        | 6A.2-7/8<br>6A.2-9/10<br>6A.2-11/12<br>6A.2-13/14<br>T 6A.2-2 (1 through 3 of 3)<br>T 6A.2-3 (2 of 3)<br>F 6A.2-23<br>F 6A.2-27                                                                                                                                                                                                  |
|                                                                                                                                                                                                                                                                                        | F 6A.3-43<br>F 6A.3-44                                                                                                                                                                                                                                                                                                           |
| $6A. 4-1/2$ $6A. 4-3/4$ $6A. 4-5/5a$ $6A. 4-7/8$ $6A. 4-8a/8b$ $6A. 4-11/12$ $6A. 4-12a/12b$ $6A. 4-13/14$ $6A. 4-19b/20$ $6A. 4-23/24$ $6A. 4-23/24$ $6A. 4-25b/26$ $6A. 4-27/28$ $6A. 4-27/28$ $6A. 4-27/28$ $6A. 4-31/32$ $6A. 4-37/37a$ $T \ 6A. 4-3$ $T \ 6A. 4-3$ $T \ 6A. 4-36$ | $ \begin{array}{l} 6A.4-1/2 \\ 6A.4-3/4 \\ 6A.4-5/5a \\ 6A.4-5/5a \\ 6A.4-7/8 \\ 6A.4-7/8 \\ 6A.4-11/12 \\ 6A.4-12a/12b \\ 6A.4-13/14 \\ 6A.4-19b/20 \\ 6A.4-23/24 \\ 6A.4-23/24 \\ 6A.4-25b/26 \\ 6A.4-25b/26 \\ 6A.4-27/28 \\ 6A.4-29/30 \\ 6A.4-31/32 \\ 6A.4-37/37a \\ T & 6A.4-3 \\ T & 6A.4-3 \\ T & 6A.4-36 \end{array} $ |
| T $6A.5-1$<br>T $6A.5-2$ (1 and 2 of 2)<br>T $6A.5-3$<br>T $6A.5-4$ (1 of 2)<br>T $6A.5-6$ (1 of 2)<br>F $6A.5-12$<br>F $6A.5-26$<br>F $6A.5-27$<br>F $6A.5-28$<br>F $6A.5-29$                                                                                                         | T 6A.5-1<br>T 6A.5-2 (1 and 2 of 2)<br>T 6A.5-3<br>T 6A.5-4 (1 of 1)*<br>T 6A.5-6 (1 of 1)*<br>F 6A.5-12<br>F 6A.5-26<br>F 6A.5-27<br>F 6A.5-28<br>F 6A.5-29                                                                                                                                                                     |

\*New pagination is incorrect. Do not remove existing 2 of 2.

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### APPENDIX 6A (Cont)

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#### Remove

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### Insert

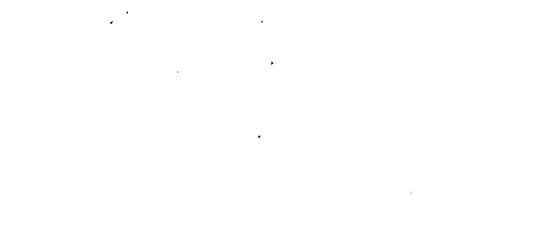
| F $6A.5-30$             | F 6A.5-30               |
|-------------------------|-------------------------|
| F $6A.5-31$             | F 6A.5-31               |
| F $6A.5-33$             | F 6A.5-33               |
| F $6A.5-34$             | F 6A.5-34               |
| F $6A.5-37$             | F 6A.5-37               |
| F $6A.5-38$             | F 6A.5-38               |
| F $6A.5-39$             | F 6A.5-39               |
| F $6A.5-39$             | F 6A.5-39               |
| F $6A.5-40$             | F 6A.5-40               |
| F $6A.5-41$             | F 6A.5-41               |
| F $6A.5-42$             | F 6A.5-42               |
| F $6A.5-43$             | F 6A.5-43               |
| T 6A.6-1 (1 and 2 of 2) | T 6A.6-1 (1 of 1)       |
| T 6A.6-2 (1 and 2 of 2) | T 6A.6-2 (1 and 2 of 2) |
| 6A.7-5/5a               | 6A.7-5/5a               |
| 6A.7-5b/6               | 6A.7-5b/6               |
| 6A.7-7/-                | 6A.7-7/-                |
| T 6A.7-2                | T 6A.7-2                |
| 6A.9-11f/12             | 6A.9-11f/12             |
| T 6A.9-1                | T 6A.9-1                |
| T 6A.9-3                | T 6A.9-3                |
| T 6A.9-4                | T 6A.9-4                |
| T 6A.9-5                | T 6A.9-5                |
| T 6A.9-5                | T 6A.9-5                |
| F 6A.9-1                | F 6A.9-1                |
| F 6A.9-2                | F 6A.9-2                |
| F 6A.9-3                | F 6A.9-3                |

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### APPENDIX R REVIEW

### APPENDIX 9B

| Remove                                     | Insert                                     |
|--------------------------------------------|--------------------------------------------|
| 9B-i/ii                                    | 9B-i/ia                                    |
|                                            | 9B-ib/ii                                   |
| 9B-iii/iv                                  | 9B-iii/iv                                  |
| 9B.1-1/-                                   | 9B.1-1/-                                   |
| 9B.3-1/-                                   | 9B.3-1/-                                   |
| 9B.5-5/-                                   | 9B.5-5/-                                   |
| 98.6-3/4                                   | 9B.6-3/4                                   |
| T 9B.6-1 (2 and 3 of 6)                    | T 9B.6-1 (2 and 3 of 6)                    |
| T 9B.6-1 (5 and 6 of 6)                    | T 9B.6-1 (5 and 6 of 6)                    |
| T 9B.6-3 (1 of 9)                          | T 9B.6-3 (1 of 9)                          |
| T 9B.6-3 (3 of 9)                          | T 9B.6-3 (3 of 9)                          |
| T 9B.6-3 (7 of 9)                          | T 9B.6-3 (7 and 7a of 9)                   |
| 9B.7-1/-                                   | 9B.7-1/-                                   |
| 98.8-1/-                                   | 9B.8-1/2                                   |
|                                            | 9B.8-3/4                                   |
|                                            | 9B.8-5/6                                   |
|                                            | 9B.8-7/-                                   |
| T 9B.8-1 (7 of 75)                         | T 9B.8-1 (7 of 75)                         |
| T 9B.8-1 (26 of 75)                        | T 9B.8-1 (26 of 75)<br>T 9B.8-1 (27 of 75) |
| T 9B.8-1 (27 of 75)<br>T 9B.8-1 (28 of 75) | T 9B.8-1 (28 of 75) $T$ 9B.8-1 (28 of 75)  |
| T 9B.8-1 (29 of 75)                        | T 9B.8-1 (29 of 75)                        |
| T 9B.8-1 (34 of 75)                        | T 9B.8-1 (34 of 75)                        |
| T 9B.8-1 (36 of 75)                        | T 9B.8-1 (36 of 75)                        |
| T 9B.8-1 (37 of 75)                        | T 9B.8-1 (37 of 75)                        |
| T 9B.8-1 (38 of 75)                        | T 9B.8-1 (38 of 75)                        |
| T 9B.8-1 (39 of 75)                        | T 9B.8-1 (39 of 75)                        |
| T 9B.8-1 (40 of 75)                        | T 9B.8-1 (40 of 75)                        |
| T 9B.8-1 (41 of 75)                        | T 9B.8-1 (41 of 75)<br>T 9B.8-1 (42 of 75) |
| T 9B.8-1 (42 of 75)<br>T 9B.8-1 (43 of 75) | T 9B.8-1 (43 of 75)                        |
| T 9B.8-1 (44 of 75)                        | T 9B.8-1 (44 of 75)                        |
| T 9B.8-1 (45 of 75)                        | T 9B.8-1 (45 of 75)                        |
| T 9B.8-1 (46 of 75)                        | T 9B.8-1 (46 of 75)                        |
| T 9B.8-1 (47 of 75)                        | T 9B.8-1 (47 of 75)                        |
| T 9B.8-1 (48 of 75)                        | T 9B.8-1 (48 of 75)                        |
| T 9B.8-1 (49 of 75)                        | T 9B.8-1 (49 of 75)                        |
| T 9B.8-1 (50 of 75)                        | T 9B.8-1 (50 of 75)                        |



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APPENDIX 9B (Cont)

#### Remove

9B.12-1/-

#### Insert

| T 9B.8-1<br>T 9B.8-1<br>T 9B.8-1<br>T 9B.8-1<br>T 9B.8-1<br>T 9B.8-1<br>T 9B.8-1<br>T 9B.8-1<br>T 9B.8-2<br>T 9B.8-2<br>T 9B.8-2<br>T 9B.8-2<br>T 9B.8-2 | (53 of 75)<br>(54 of 75)<br>(55 of 75)<br>(60 of 75)<br>(61 of 75)<br>(66 of 75)<br>(67 of 75)<br>(71 of 75)<br>(72 of 75)<br>(1 of 38)<br>(19, 20, 21 of 38)<br>(27 through 29f of 38)<br>(33 of 38) |
|----------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| T 9B.8-2                                                                                                                                                 | (27 through 29f of 38)                                                                                                                                                                                |
| T 9B.8-2<br>T 9B.8-2                                                                                                                                     | (34 of 38)<br>(36 of 38)<br>(38 of 38)                                                                                                                                                                |
|                                                                                                                                                          |                                                                                                                                                                                                       |

T 9B.8-1 (53 of 75) T 9B.8-1 (54 of 75) T 9B.8-1 (55 of 75) T 9B.8-1 (60 of 75) T 9B.8-1 (61 of 75) T 9B.8-1 (66 of 75) T 9B.8-1 (67 of 75) T 9B.8-1 (71 of 75) T 9B.8-1 (72 of 75) T 9B.8-2 (1 of 38) T 9B.8-2 (19, 20, 21 of 38) T 9B.8-2 (27 through 29f of 38) T 9B.8-2 (33 and 33a of 38) T 9B.8-2 (34 of 38) T 9B.8-2 (36 of 38) T 9B.8-2 (38 and 38a of 38) T 9B.8-3 (1 through 14 of 14)

9B.12-1/-

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#### LIST OF EFFECTIVE PAGES

#### Remove

#### Insert

| EP 1-1 through EP 1-8   |
|-------------------------|
| EP 2-1 through EP 2-19  |
| EP 3-1 through EP 3-14  |
| EP 4-1 and EP 4-2       |
| EP 5-1 through EP 5-3   |
| EP 6-1 through EP 6-6   |
| EP 7-1 through EP 7-3   |
| EP 8-1 through EP 8-3   |
| EP 9-1 through EP 9-10  |
| EP 10-1 and 10-2        |
| EP 11-1 and 11-2        |
| EP 12-1 through EP 12-3 |
| EP 13-1 through EP 13-4 |
|                         |
| EP 15-1 through EP 15-4 |
| Q&R-1 through Q&R-14    |
| DAR-1 through DAR-8     |
| 4                       |
| SSA-1 through SSA-2     |
|                         |

EP 1-1 through EP 1-8 EP 2-1 through EP 2-20 EP 3-1 through EP 3-14 EP 4-1 and EP 4-2 EP 5-1 through EP 5-3 EP 6-1 through EP 6-6 EP 7-1 through EP 7-4 EP 8-1 through EP 8-3 EP 9-1 through EP 9-11 EP 10-1 and 10-2 EP 11-1 and 11-2 EP 12-1 through EP 12-3 EP 13-1 through EP 13-4 EP 15-1 through EP 15-4 Q&R-1 through Q&R-14 DAR-1 through DAR-8 SSA-1 and SSA-2

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#### NMP2 FSAR DRAWING PACKAGE

#### INSERTION INSTRUCTIONS

The following instructions are for the insertion of the current amendment into the Nine Mile Point Unit 2 FSAR Drawing Package.

Remove drawings listed in the REMOVE column and replace them with the drawings listed in the INSERT column. Dashes (---) in either column indicate no action required.

Vertical bars have been placed in the margins of the index to indicate revision locations.



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#### NMP2 FSAR DRAWING PACKAGE

#### INSERTION. INSTRUCTIONS

#### VOLUME 1

#### Remove

Entire contents of Volume 1

Volume 1 index sheet 807E153TY Sh 1-6 807E155TY Sh 1-15 807E156TY Sh 1, 2 807E152TY Sh 1-15 761E791TY Sh 1-30 791E406TY Sh 1-34 807E159TY Sh 1, 2 807E160TY Sh 1, 2 807E160TY Sh 1-5 807E164TY Sh 1-5 807E162TY Sh 1-12

Insert



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#### NMP2 FSAR DRAWING PACKAGE

#### INSERTION INSTRUCTIONS

#### **VOLUME 2**

Insert

#### Remove

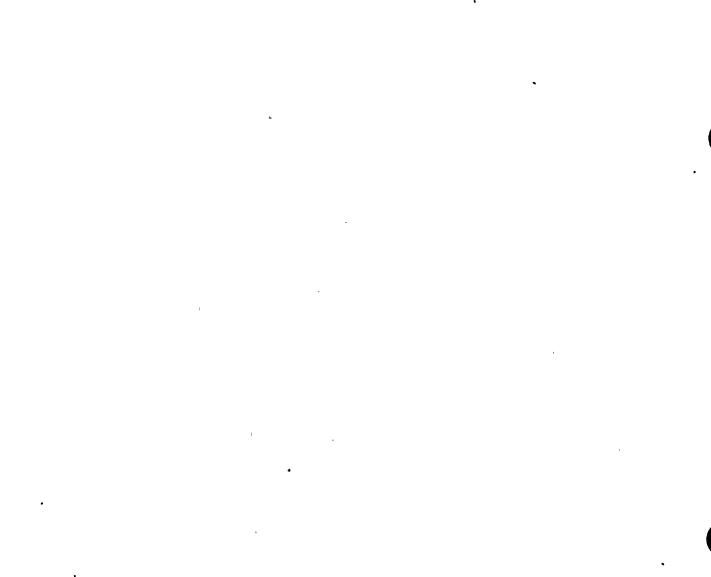
Entire contents of Volume 2

Volume 2 index sheet 807E163TY 1-50 \*807E166TY 1-19 115D6268TY Sh 1, 2 807E179TY Sh 1-3 807E168TY Sh 1, 2 807E170TY Sh 1-23 807E171TY Sh 1-7 807E172TY Sh 1-7 807E183TY Sh 1-14 807E154TY Sh 1-14 807E173TY Sh 1-13 807E175TY Sh 1-5 731E302AF Sh 1-4 807E165TY Sh 1-5 828E255TY Sh 1-14



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#### NMP2 FSAR DRAWING PACKAGE

#### INSERTION INSTRUCTIONS

#### VOLUME 5

Insert

#### Remove

#### Entire contents of Volume 5

Volume 2 index sheet 12177-ESK-2A 12177-ESK-2B 12177-ESK-2C 12177-ESK-2D 12177-ESK-2H 12177-ESK-2J 12177-ESK-2K 12177-ESK-2L 12177-ESK-2M 12177-ESK-3A 12177-ESK-3B 12177-ESK-3C 12177-ESK-3D 12177-ESK-3E 12177-ESK-3F 12177-ESK-3G 12177-ESK-3H 12177-ESK-3J 12177-ESK-4CECO1 Sh 1, 2 12177-ESK-4CECO2 Sh 1, 2 12177-ESK-4CEC13A Sh 1, 2 12177-ESK-4CEC13B 12177-ESK-4CEC14A Sh 1, 2 12177-ESK-4CEC14B Sh 1, 2 12177-ESK-4CEC15 Sh 1, 2 12177-ESK-4CEC19 12177-ESK-4CEC20 Sh 1, 2 12177-ESK-4CEC22 Sh 1, 2 12177-ESK-4CEC23 12177-ESK-4CEC24A Sh 1, 2 12177-ESK-4CEC25A Sh 1, 2 12177-ESK-4CEC26A Sh 1, 2 12177-ESK-4CEC29A Sh 1, 2 12177-ESK-4CEC30A Sh 1, 2 12177-ESK-4CEC35 Sh 1, 2 12177-ESK-5CSL01 12177-ESK-5EGP01 Sh 1, 2 12177-ESK-5EGP03 Sh 1, 2 12177-ESK-5EGP05



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VOLUME 5 (Cont)

Remove

### Insert

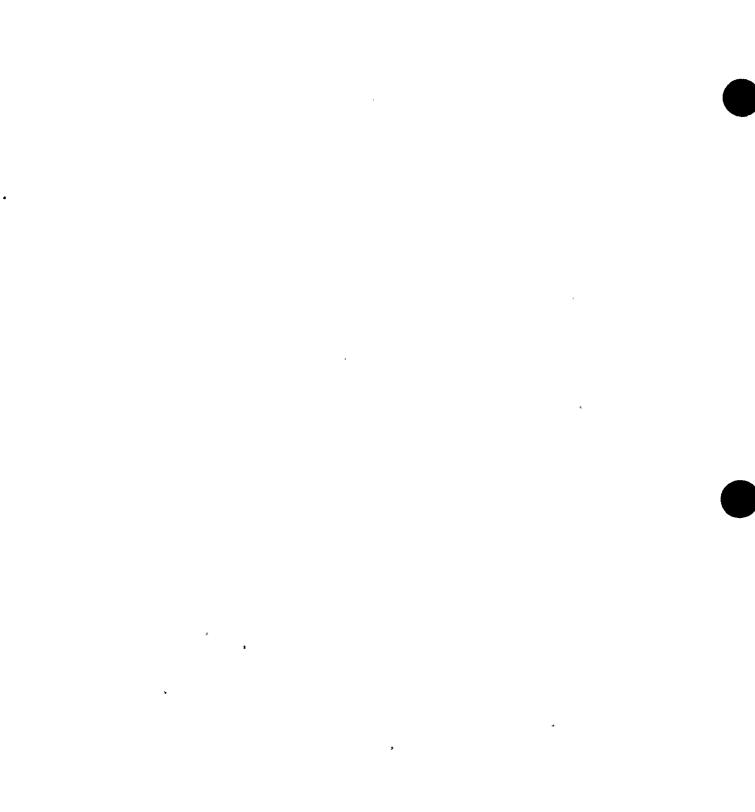
| 12177-ESK-5EGP06 |               |    |                                      |
|------------------|---------------|----|--------------------------------------|
| 12177-ESK-5EJS01 |               |    |                                      |
| 12177-ESK-5EJS02 |               |    |                                      |
| 12177-ESK-5EJS03 |               |    | -                                    |
| 12177-ESK-5EJS04 |               |    |                                      |
| 12177-ESK-5ENS02 |               |    |                                      |
| 12177-ESK-5ENS03 |               |    |                                      |
| 12177-ESK-5ENS05 |               |    |                                      |
| 12177-ESK-5ENS07 |               |    |                                      |
| 12177-ESK-5ENS08 |               |    |                                      |
| 12177-ESK-5ENS09 |               |    |                                      |
| 12177-ESK-5ENS11 |               |    |                                      |
| 12177-ESK-5ENS12 |               |    |                                      |
| 12177-ESK-5ENS13 |               |    |                                      |
| 12177-ESK-5ENS14 |               |    |                                      |
| 12177-ESK-5ENS15 |               |    |                                      |
| 12177-ESK-5ENS16 |               |    |                                      |
| 12177-ESK-5ENS17 |               |    |                                      |
| 12177-ESK-5ENS18 |               |    |                                      |
| 12177-ESK-5ENS19 |               |    |                                      |
| 12177-ESK-5ENS20 |               |    |                                      |
| 12177-ESK-5ENS21 | Sh            | 1, | 2                                    |
| 12177-ESK-5ENS22 | Sh            |    |                                      |
| 12177-ESK-5ENS23 | ы             | 1, | 4                                    |
| 12177-ESK-5RHS01 |               |    |                                      |
| 12177-ESK-5RHS02 |               |    |                                      |
| 12177-ESK-5RHS03 |               |    |                                      |
| 12177-ESK-5RHS04 |               |    |                                      |
| 12177-ESK-5RHS05 |               |    |                                      |
| 12177-ESK-5SFC01 | Sh            | 1, | 2                                    |
| 12177-ESK-5SFC02 |               |    | 2<br>2                               |
| 12177-ESK-5SWP01 |               |    |                                      |
| 12177-ESK-5SWP02 |               |    | 2<br>2                               |
| 12177-ESK-5SWP03 |               | 1, | 2                                    |
| 12177-ESK-5SWP04 |               | 1, | 2                                    |
| 12177-ESK-5SWP05 | Sh            | 1, | 2<br>2                               |
| 12177-ESK-5SWP06 | Sh            | 1, | 2                                    |
| 12177-ESK-5SWP07 | Sh            | 1, |                                      |
| 12177-ESK-5SWP08 | Sh            | 1, | 2                                    |
| 12177-ESK-5SWP09 | Sh            | 1, | 2                                    |
| 12177-ESK-5SWP10 | Sh            | 1, | 2<br>2<br>2<br>2<br>2<br>2<br>2<br>2 |
| 12177-ESK-5SWP11 | Sh            | 1, | 2                                    |
| 12177-ESK-5SWP12 | $\mathbf{Sh}$ | 1, | 2                                    |
| 12177-ESK-6CCP07 |               | •  |                                      |
| 12177-ESK-6CCP09 |               |    |                                      |
|                  |               |    |                                      |



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VOLUME 5 (Cont)

Remove

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## Insert

| 12177-ESK-6CCP11 | Sh | 1, | 2 |
|------------------|----|----|---|
| 12177-ESK-6CCP12 |    |    |   |
| 12177-ESK-6CCP13 |    |    |   |
| 12177-ESK-6CCP16 | Sh | 1, | 2 |
| 12177-ESK-6CCP17 | Sh | 1, | 2 |
| 12177-ESK-6CCP18 |    | •  |   |
| 12177-ESK-6CCP19 |    |    |   |
| 12177-ESK-6CCP20 |    |    |   |
| 12177-ESK-6CCP21 | Sh | 1, | 2 |
| 12177-ESK-6CCP22 |    |    |   |
| 12177-ESK-6CSH01 |    |    |   |
| 12177-ESK-6CSH02 |    |    |   |
| 12177-ESK-6CSH03 |    |    |   |
| 12177-ESK-6CSH04 |    |    |   |
| 12177-ESK-6CSH05 |    |    |   |
| 12177-ESK-6CWS01 |    |    |   |
| 12177-ESK-6CSL01 |    |    |   |
| 12177-ESK-6CSL02 |    |    |   |
| 12177-ESK-6CSL03 |    |    |   |
| 12177-ESK-6DER01 |    |    |   |
| 12177-ESK-6DER02 |    |    |   |
| 12177-ESK-6DFR07 |    |    |   |
| 12177-ESK-6DFR11 |    |    |   |
| 12177-ESK-6EGA01 |    |    |   |
| 12177-ESK-6EGA02 |    |    |   |
| 12177-ESK-6EGF01 |    |    |   |
| 12177-ESK-6EGF02 |    |    |   |
| 12177-ESK-6EGF03 |    |    |   |
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# NMP2 FSAR DRAWING PACKAGE

# INSERTION INSTRUCTIONS

### VOLUME 6

### Remove

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Entire contents of Volume 6

### Insert

| Volume 6 index sh | eet |    |                                      |
|-------------------|-----|----|--------------------------------------|
| 12177-ESK-6EJS01  | •   |    |                                      |
| 12177-ESK-6EJS02  |     |    |                                      |
| 12177-ESK-6EJS03  |     |    |                                      |
| 12177-ESK-6EJS04  |     |    |                                      |
| 12177-ESK-6EJS05  |     |    |                                      |
| 12177-ESK-6FWS07  |     |    |                                      |
| 12177-ESK-6GTS01  |     |    |                                      |
| 12177-ESK-6GTS02  |     |    |                                      |
| 12177-ESK-6GTS03  | Sh  | 1, | 2                                    |
| 12177-ESK-6GTS04  |     | 1, | 2<br>2                               |
| 12177-ESK-6GTS05  | •   | -, | -                                    |
| 12177-ESK-6HCS01  | Sh  | 1, | 2                                    |
| 12177-ESK-6HCS02  |     |    | $\frac{1}{2}$                        |
| 12177-ESK-6HCS03  |     |    | $\frac{1}{2}$                        |
| 12177-ESK-6HCS04  |     |    | $\frac{1}{2}$                        |
| 12177-ESK-6HCS05  | Sh  |    | 2<br>2<br>2<br>2<br>2<br>2<br>2<br>2 |
| 12177-ESK-6HCS05  | Sh  |    | 2                                    |
| 12177-ESK-6HCS07  | on  | ±, | -                                    |
| 12177-ESK-6HCS07  |     |    |                                      |
| 12177-ESK-6HCS09  |     |    |                                      |
| 12177-ESK-6HCS10  |     |    |                                      |
| 12177-ESK-6HCS11  |     |    |                                      |
| 12177-ESK-6HVC01  |     |    |                                      |
| 12177-ESK-6HVC02  |     |    |                                      |
| 12177-ESK-6HVC02  | SP  | 1, | 2                                    |
| 12177-ESK-6HVC04  | on  | 1, | 4                                    |
| 12177-ESK-6HVC04  |     |    |                                      |
| 12177-ESK-6HVC05  |     |    |                                      |
| 12177-ESK-6HVC09  |     |    |                                      |
| 12177-ESK-6HVC10  |     |    |                                      |
| 12177-ESK-6HVC11  |     |    |                                      |
| 12177-ESK-6HVC12  |     |    |                                      |
| 12177-ESK-6HVC12  |     |    |                                      |
| 12177-ESK-6HVK01  | Sh  | 1, | 2                                    |
| 12177-ESK-6HVK02  | bii | 1, | 2                                    |
| 12177-ESK-6HVK02  |     |    |                                      |
| 12177-ESK-6HVK04  |     |    |                                      |
| 12177-ESK-6HVP01  | Sh  | 1, | 2                                    |
| 12177-ESK-6HVP02  | Sh  | 1, | 2<br>2                               |
| 12177-ESK-6HVP02  | Sh  | 1, | 2                                    |
| 12177-ESK-6HVP06  | ы   | т, | 4                                    |
| 12177-ESK-6HVR01  |     |    |                                      |
| 12177-ESK-6HVR01  |     |    |                                      |
| 12177-ESK-6HVR11  |     |    |                                      |
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VOLUME 6 (Cont)

Remove

# <u>Insert</u>

| 12177-ESK-6HVR12                     |
|--------------------------------------|
| 12177-ESK-6HVR13                     |
| 12177-ESK-6HVR14                     |
| 12177-ESK-6HVR15                     |
| 12177-ESK-6HVR15<br>12177-ESK-6HVR16 |
| 12177-ESK-6HVR17                     |
| 12177-ESK-6HVR18                     |
| 12177-ESK-6HVR19                     |
| 12177-ESK-6HVR20                     |
| 12177-ESK-6HVR21                     |
| 12177-ESK-6HVR22                     |
| 12177-ESK-6HVR22<br>12177-ESK-6HVR23 |
| 12177-ESK-6HVR24                     |
| 12177-ESK-6HVR25                     |
| 12177-ESK-6HVR26                     |
| 12177-ESK-6HVR27                     |
| 12177-ESK-6HVR28                     |
|                                      |
| 12177-ESK-6HVR29<br>12177-ESK-6HVR30 |
| 12177-ESK-6HVY12                     |
| 12177-ESK-6HVY13                     |
| 12177-ESK-6HVY13<br>12177-ESK-6ICS01 |
| 12177-ESK-6ICS02                     |
| 12177-ESK-6ICS03                     |
| 12177-ESK-6ICS04                     |
| 12177-ESK-61CS04<br>12177-ESK-6MSS08 |
| 12177-ESK-6MSS20 *                   |
| 12177-ESK-6RHS01                     |
| 12177-ESK-6RHS01<br>12177-ESK-6RHS02 |
| 12177-ESK-6RHS03                     |
| 12177-ESK-6RHS04                     |
| 12177-ESK-6RHS05                     |
| 12177-ESK-6RHS06                     |
| 12177-ESK-6RHS07                     |
| 12177-ESK-6RHS08<br>12177-ESK-6RHS09 |
|                                      |
| 12177-ESK-6RHS10                     |
| 12177-ESK-6RHS11<br>12177-ESK-6RHS12 |
|                                      |
| 12177-ESK-6RHS13                     |
| 12177-ESK-6RHS14                     |
| 12177-ESK-6RHS15                     |
| 12177-ESK-6RHS16                     |
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### Insert

| 12177-ESK-6RHS17 |               |    |   |
|------------------|---------------|----|---|
| 12177-ESK-6RHS18 |               |    |   |
| 12177-ESK-6RHS19 |               |    |   |
| 12177-ESK-6RHS20 |               |    |   |
| 12177-ESK-6RHS21 |               |    |   |
| 12177-ESK-6RHS22 |               |    |   |
| 12177-ESK-6RHS23 |               |    |   |
| 12177-ESK-6RHS24 |               |    |   |
| 12177-ESK-6RHS25 |               |    |   |
| 12177-ESK-6RHS26 |               |    |   |
| 12177-ESK-6RHS27 |               |    |   |
| 12177-ESK-6RHS28 |               |    |   |
| 12177-ESK-6RHS29 |               |    |   |
| 12177-ESK-6RHS30 |               |    |   |
| 12177-ESK-6RHS31 |               |    |   |
| 12177-ESK-6RHS32 |               |    |   |
| 12177-ESK-6RHS33 |               |    |   |
| 12177-ESK-6RHS34 |               |    |   |
| 12177-ESK-6RHS35 |               |    |   |
| 12177-ESK-6RHS36 |               |    |   |
| 12177-ESK-6RHS37 |               |    |   |
| 12177-ESK-6RHS38 |               |    |   |
| 12177-ESK-6RHS39 |               |    |   |
| 12177-ESK-6RHS40 |               |    |   |
| 12177-ESK-6RHS41 |               |    |   |
| 12177-ESK-6RHS42 |               |    |   |
| 12177-ESK-6SLS01 | Sh            | 1, | 2 |
| 12177-ESK-6SLS02 | $\mathbf{Sh}$ | 1, | 2 |
| 12177-ESK-6RHS03 | $\mathbf{Sh}$ | 1, | 2 |
|                  |               | -  |   |



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### NMP2 FSAR DRAWING PACKAGE

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Insert

#### INSERTION INSTRUCTIONS

### VOLUME 7

### Remove

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### Entire contents of Volume 7

| Volume 7 index sl | heef | 5  |   |
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| 12177-ESK-6SWP01  |      |    |   |
| 12177-ESK-6SWP05  |      |    |   |
| 12177-ESK-6SWP06  |      |    |   |
| 12177-ESK-6SWP07  |      |    |   |
| 12177-ESK-6SWP08  |      |    |   |
| 12177-ESK-6SWP09  |      |    |   |
| 12177-ESK-6SWP10  |      |    |   |
|                   |      |    |   |
| 12177-ESK-6SWP11  | ~1   |    | ~ |
| 12177-ESK-6SWP12  | Sh   |    | 2 |
| 12177-ESK-6SWP13  | Sh   | 1, | 2 |
| 12177-ESK-6SWP14  |      |    |   |
| 12177-ESK-6SWP16  |      |    |   |
| 12177-ESK-6SWP17  |      |    |   |
| 12177-ESK-6SWP18  | Sh   | 1, | 2 |
| 12177-ESK-6SWP19  | Sh   | 1, | 2 |
| 12177-ESK-6SWP20  | Sh   | 1, | 2 |
| 12177-ESK-6SWP21  | Sh   | 1, | 2 |
| 12177-ESK-6SWP22  | Sh   | 1, | 2 |
| 12177-ESK-6SWP23  | Sh   | 1, | 2 |
| 12177-ESK-6SWP24  | 511  | т, | 2 |
|                   | ~    | -  | ~ |
| 12177-ESK-6SWP25  | Sh   | ı, | 2 |
| 12177-ESK-6SWP26  |      |    |   |
| 12177-ESK-6SWP27  |      |    |   |
| 12177-ESK-6SWP28  |      |    |   |
| 12177-ESK-6SWP32  |      |    |   |
| 12177-ESK-6SWP33  |      |    |   |
| 12177-ESK-6SWP34  |      |    |   |
| 12177-ESK-6SWP35  |      |    |   |
| 12177-ESK-6SWP36  |      |    |   |
| 12177-ESK-6SWP37  |      |    |   |
| 12177-ESK-6SWP38  |      |    |   |
| 12177-ESK-6SWP39  |      |    |   |
| 12177-ESK-6SWP40  |      |    |   |
| 12177-ESK-6WCS03  |      |    |   |
|                   |      |    |   |
| 12177-ESK-6WCS11  |      |    |   |
| 12177-ESK-7BYS01  |      |    |   |
| 12177-ESK-7CCP01  |      |    |   |
| 12177-ESK-7CCP03  |      |    |   |
| 12177-ESK-7CCP04  |      |    |   |
| 12177-ESK-7CCP05  |      |    |   |
| 12177-ESK-7CCP06  |      |    |   |
| 12177-ESK-7CCP07  |      |    |   |
| 12177-ESK-7CMS01  |      |    |   |
| 12177-ESK-7CMS02  |      |    |   |
|                   |      |    |   |



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| 12177-ESK-7CMS03                      |
|---------------------------------------|
| 12177-ESK-7CMS04                      |
| 12177-ESK-7CMS05                      |
| 12177-ESK-7CMS06                      |
| 12177-ESK-7CMS07                      |
|                                       |
| 12177-ESK-7CMS08                      |
| 12177-ESK-7CMS09                      |
| 12177-ESK-7CMS10                      |
| 12177-ESK-7CMS11                      |
| 12177-ESK-7CMS12                      |
| 12177-ESK-7CMS13                      |
| 12177-ESK-7CMS15                      |
| 12177-ESK-7CMS16                      |
| 12177-ESK-7CMS17                      |
| 12177-ESK-7CMS18                      |
| 12177-ESK-7CMS19                      |
| 12177-ESK-7CMS20.                     |
| 12177-ESK-7CMS21                      |
| 12177-ESK-7CMS22                      |
| 12177-ESK-7CPS01                      |
| 12177-ESK-7CPS02                      |
| 12177-ESK-7CPS02                      |
| · · · · · · · · · · · · · · · · · · · |
| 12177-ESK-7CPS04                      |
| 12177-ESK-7CPS06                      |
| 12177-ESK-7DER02                      |
| 12177-ESK-7DER03                      |
| 12177-ESK-7DRF03                      |
| 12177-ESK-7DFR06                      |
| 12177-ESK-7DRS01                      |
| 12177-ESK-7EGF01                      |
| 12177-ESK-7EGF02                      |
| 12177-ESK-7EGF03                      |
| 12177-ESK-7EGP01 Sh 1, 2              |
| 12177-ESK-7EJS01                      |
| 12177-ESK-7ENS01                      |
| 12177-ESK-7ENS02 Sh 1, 2              |
| 12177-ESK-7ENS03                      |
| 12177-ESK-7ENS04 Sh 1, 2              |
| 12177-ESK-7FPW04                      |
| 12177-ESK-7FPW05                      |
| 12177-ESK-76TS01 Sh 1, 2              |
| 12177-ESK-761501 511 1, 2             |
| 12177-ESK-7GTS02                      |
| 12177-ESK-7GTS03                      |
| 12177-ESK-7HCS01                      |
| 12177-ESK-7HCS01<br>12177-ESK-7HCS02  |
| 12177-EON-78602                       |





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VOLUME 7 (Cont)

Remove

## Insert

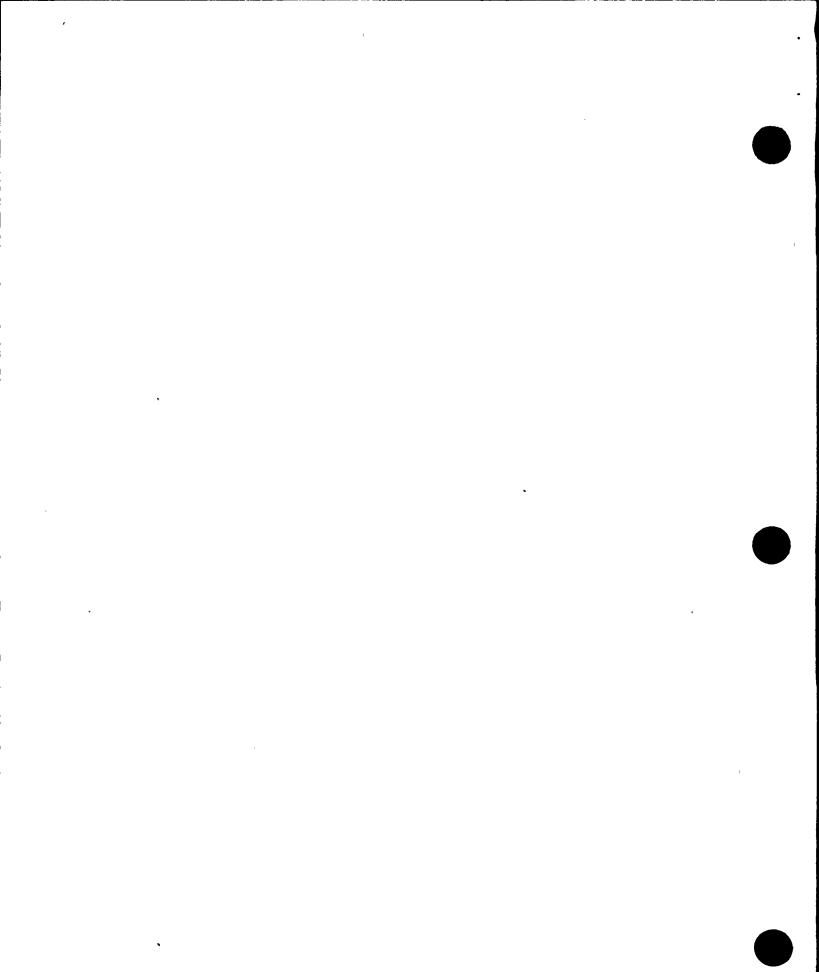
| 12177-ESK-7HCS03 |               |    |    |   |
|------------------|---------------|----|----|---|
| 12177-ESK-7HCS04 |               |    |    |   |
| 12177-ESK-7HVC01 |               |    |    |   |
| 12177-ESK-7HVC02 |               |    |    |   |
| 12177-ESK-7HVC03 |               |    |    |   |
| 12177-ESK-7HVC04 |               |    |    |   |
| 12177-ESK-7HVC05 |               |    |    |   |
| 12177-ESK-7HVC08 | Sh            | 1. | 2  |   |
| 12177-ESK-7HVC11 |               |    |    |   |
| 12177-ESK-7HVC12 |               |    |    |   |
| 12177-ESK-7HVC13 |               |    |    |   |
| 12177-ESK-7HVC14 |               |    |    |   |
| 12177-ESK-7HVC15 |               |    |    |   |
| 12177-ESK-7HVC18 |               |    |    |   |
| 12177-ESK-7HVC19 |               |    |    |   |
| 12177-ESK-7HVC20 | Sh            | 1, | 2  |   |
| 12177-ESK-7HVC22 | Sh            | 1, | 2  |   |
| 12177-ESK-7HVK01 |               |    |    |   |
| 12177-ESK-7HVK02 |               |    |    |   |
| 12177-ESK-7HVK03 | $\mathbf{Sh}$ | 1, | 2  |   |
| 12177-ESK-7HVP01 |               |    |    |   |
| 12177-ESK-7HVP02 |               |    |    |   |
| 12177-ESK-7HVP03 |               |    |    |   |
| 12177-ESK-7HVP06 |               |    |    |   |
| 12177-ESK-7HVP07 |               |    |    |   |
| 12177-ESK-7HVP08 | Sh            | 1, | 2, | 3 |
| 12177-ESK-7HVR01 |               |    |    |   |
| 12177-ESK-7HVR02 |               |    |    |   |
| 12177-ESK-7HVR05 |               |    |    | _ |
| 12177-ESK-7HVR06 | Sh            | 1, | 2, | 3 |
| 12177-ESK-7HVR07 |               |    |    |   |
| 12177-ESK-7HVR08 |               | _  | •  |   |
| 12177-ESK-7HVR09 | Sh            | 1, | 2  |   |
| 12177-ESK-7HVR10 |               |    |    |   |



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#### INSERTION INSTRUCTIONS

## VOLUME 8

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|--------|----------|----|--------|---|
|        |          |    |        |   |

|   | Volume 8 index sh | leet | -  |
|---|-------------------|------|----|
|   | 12177-ESK-7HVY05  |      |    |
|   | 12177-ESK-7HVY06  |      |    |
|   | 12177-ESK-7HVY08  |      |    |
|   |                   |      |    |
|   | 12177-ESK-7IAS01  |      | _  |
|   | 12177-ESK-7IAS02  | Sh   | 1, |
|   | 12177-ESK-7IAS03  |      |    |
|   | 12177-ESK-7IAS04  |      |    |
|   | 12177-ESK-7IAS07  |      |    |
|   | 12177-ESK-7IAS08  |      |    |
|   | 12177-ESK-7IAS09  |      |    |
|   | 12177-ESK-71SC01  |      |    |
|   |                   |      |    |
|   | 12177-ESK-7LMS02  |      |    |
|   | 12177-ESK-7MSS10  |      |    |
|   | 12177-ESK-7MSS11  |      |    |
|   | 12177-ESK-7MSS12  |      |    |
|   | 12177-ESK-7MSS13  |      |    |
|   | 12177-ESK-7MSS14  |      |    |
|   | 12177-ESK-7MSS15  |      |    |
|   | 12177-ESK-7MSS15  |      |    |
|   |                   |      |    |
|   | 12177-ESK-7MSS17  |      |    |
|   | 12177-ESK-7MSS18  |      |    |
|   | 12177-ESK-7MSS19  |      |    |
|   | 12177-ESK-7MSS20  |      |    |
|   | 12177-ESK-7SCI01  |      |    |
|   | 12177-ESK-7SCI02  |      |    |
| 9 | 12177-ESK-7SCI03  |      |    |
|   | 12177-ESK-7SCI04  |      |    |
|   |                   |      |    |
|   | 12177-ESK-7SCI05  |      |    |
|   | 12177-ESK-7SCI06  |      |    |
|   | 12177-ESK-7SCI07  |      |    |
|   | 12177-ESK-7SCI08  |      |    |
|   | 12177-ESK-7SCI09  |      |    |
|   | 12177-ESK-7SCI10  |      |    |
|   | 12177-ESK-7SCI11  |      |    |
|   | 12177-ESK-7SCI12  |      |    |
|   | 12177-ESK-7SCI13  |      |    |
|   |                   |      |    |
|   | 12177-ESK-7SCI14  |      |    |
|   | 12177-ESK-7SCI15  |      |    |
|   | 12177-ESK-7SCI16  |      |    |
|   | 12177-ESK-7SCI17  |      |    |
|   | 12177-ESK-7SCI18  |      |    |
|   | 12177-ESK-7SCI19  |      |    |
|   | 12177-ESK-7SCI20  |      |    |
|   | 12177-ESK-7SCI21  |      |    |
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VOLUME 8 (Cont)

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## Insert

| 12177-ESK-7SCI22 |    |    |   |
|------------------|----|----|---|
| 12177-ESK-7SCI23 |    |    |   |
| 12177-ESK-7SCI24 |    |    |   |
| 12177-ESK-7SCI25 |    |    |   |
| 12177-ESK-7SCI26 |    |    |   |
| 12177-ESK-7SCI27 |    |    |   |
| 12177-ESK-7SCI28 |    |    |   |
| 12177-ESK-7SCI29 |    |    |   |
| 12177-ESK-7SCI30 | •  |    |   |
| 12177-ESK-7SCI31 |    |    |   |
| 12177-ESK-7SCI32 |    |    |   |
| 12177-ESK-7SCI36 |    |    |   |
| 12177-ESK-7SCI37 |    |    |   |
| 12177-ESK-7SCI38 |    |    |   |
| 12177-ESK-7SCI39 |    |    |   |
| 12177-ESK-7SCI40 |    |    |   |
| 12177-ESK-7SCI41 |    |    |   |
| 12177-ESK-7SCI41 |    |    |   |
|                  |    |    |   |
| 12177-ESK-7SCI43 |    |    |   |
| 12177-ESK-7SCI44 |    |    |   |
| 12177-ESK-7SCI45 |    |    |   |
| 12177-ESK-7SCI46 |    |    |   |
| 12177-ESK-7SFC01 |    |    |   |
| 12177-ESK-7SFC02 |    |    |   |
| 12177-ESK-7SFC04 |    |    |   |
| 12177-ESK-7SFC05 |    |    |   |
| 12177-ESK-7SFC07 |    |    |   |
| 12177-ESK-7SFC08 |    |    |   |
| 12177-ESK-7SFC09 |    |    |   |
| 12177-ESK-7SFC10 |    |    |   |
| 12177-ESK-7SWP03 |    |    |   |
| 12177-ESK-7SWP04 |    |    |   |
| 12177-ESK-7SWP05 |    |    |   |
| 12177-ESK-7SWP06 |    |    |   |
| 12177-ESK-7SWP07 |    |    |   |
| 12177-ESK-7SWP08 |    |    |   |
| 12177-ESK-7SWP09 |    |    |   |
| 12177-ESK-7SWP10 |    |    |   |
| 12177-ESK-7SWP11 |    |    |   |
| 12177-ESK-7SWP12 |    |    |   |
| 12177-ESK-7SWP13 |    |    |   |
| 12177-ESK-7SWP14 |    |    |   |
| 12177-ESK-7SWP15 |    |    |   |
| 12177-ESK-7SWP16 |    |    |   |
| 12177-ESK-7SWP17 | Sh | 1, | 2 |
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## Insert

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|------------------|---------------|----|----|---|
| 12177-ESK-7SWP19 |               |    |    |   |
| 12177-ESK-8BYS06 |               |    |    |   |
| 12177-ESK-8BYS12 |               |    |    |   |
| 12177-ESK-8BYS13 |               |    |    |   |
| 12177-ESK-8BYS14 |               |    |    |   |
| 12177-ESK-8EGP01 | Sh            | 1, | 2, | 3 |
| 12177-ESK-8EGP02 |               |    |    |   |
| 12177-ESK-8EGP03 | Sh            | 1, | 2, | 3 |
| 12177-ESK-8EGP04 |               |    |    |   |
| 12177-ESK-8EGP05 |               |    |    |   |
| 12177-ESK-8EGP06 | $\mathbf{Sh}$ | 1, | 2  |   |
| 12177-ESK-8EGP07 |               |    |    |   |
| 12177-ESK-8EGP08 | Sh            | 1, | 2  |   |
| 12177-ESK-8EGP09 |               |    |    |   |
| 12177-ESK-EGP10  |               |    |    |   |
|                  |               |    |    |   |



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#### NMP2 FSAR DRAWING PACKAGE

## INSERTION INSTRUCTIONS

# VOLUME 9

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| Volume 9 index sheets                                |
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| 12177-ESK-8EGS01                                     |
| 12177-ESK-8EGS02                                     |
| 12177-ESK-8ENS01 Sh 1, 2<br>12177-ESK-8ENS02 Sh 1, 2 |
| 12177-ESK-8ENS02 Sh 1, 2                             |
| 12177-ESK-8ENS03                                     |
| 12177-ESK-8ENS04                                     |
| 12177-ESK-8SYD01                                     |
| 12177-ESK-8SYD02                                     |
| 12177-ESK-10IHA01                                    |
| 12177-ESK-10IHA10                                    |
| 12177-ESK-10IHA11                                    |
| 12177-ESK-10IHA12                                    |
| 12177-ESK-10IHA20                                    |
| 12177-ESK-10IHA21                                    |
| 12177-ESK-10IHA22                                    |
| 12177-ESK-10IHA30                                    |
| 12177-ESK-10IHA31                                    |
| 12177-ESK-10IHA100A<br>12177-ESK-10IHA100B           |
| 12177-ESK-10IHA101A                                  |
| 12177-ESK-101HA101H                                  |
| 12177-ESK-10IHA102A                                  |
| 12177-ESK-10IHA102B                                  |
| 12177-ESK-10IHA103A                                  |
| 12177-ESK-10IHA103B                                  |
| 12177-ESK-10IHA104A                                  |
| 12177-ESK-10IHA104B                                  |
| 12177-ESK-10IHA105A                                  |
| 12177-ESK-10IHA105B                                  |
| 12177-ESK-10IHA106A                                  |
| 12177-ESK-10IHA106B                                  |
| 12177-ESK-10IHA107A                                  |
| 12177-ESK-10IHA107B                                  |
| 12177-ESK-10IHA108A                                  |
| 12177-ESK-10IHA109A                                  |
| 12177-ESK-10IHA109B                                  |
| 12177-ESK-10IHA110A                                  |
| 12177-ESK-10IHA110B<br>12177-ESK-10IHA200A           |
| 12177-ESK-101HA200A<br>12177-ESK-101HA200B           |
| 12177-ESK-101HA200B                                  |
| 12177-ESK-101HA201A                                  |
| 12177-ESK-101HA201B                                  |
| 12177-ESK-101HA202B                                  |
|                                                      |

## Insert

| Volume 9 index sheets                                |
|------------------------------------------------------|
| 12177-ESK-8EGS01                                     |
|                                                      |
| 12177-ESK-8EGS02 Sh 1, 2<br>12177-ESK-8ENS01 Sh 1, 2 |
| 12177-ESK-8ENS01 Sh 1, 2                             |
|                                                      |
| 12177-ESK-8ENS03                                     |
| 12177-ESK-8ENS04 Sh 1, 2                             |
| 12177-ESK-8SYD01                                     |
|                                                      |
| 12177-ESK-10IHA01                                    |
| 12177-ESK-10IHA10                                    |
| 12177-ESK-10IHA11                                    |
| 12177-ESK-10IHA12                                    |
| 12177-ESK-10IHA20                                    |
|                                                      |
| 12177-ESK-10IHA21                                    |
| 12177-ESK-10IHA22                                    |
| 12177-ESK-10IHA30                                    |
| 12177-ESK-10IHA31                                    |
| 12177-ESK-10IHA100A                                  |
| 12177-ESK-10IHA100B                                  |
| 12177-ESK-10IHA101A                                  |
| 12177-ESK-10IHA101B                                  |
| 12177-ESK-10IHA102A                                  |
| 12177-ESK-10IHA102B                                  |
|                                                      |
| 12177-ESK-10IHA103A                                  |
| 12177-ESK-10IHA103B                                  |
| 12177-ESK-10IHA104A                                  |
| 12177-ESK-10IHA104B                                  |
| 12177-ESK-10IHA105A                                  |
| 12177-ESK-10IHA105B                                  |
| 12177-ESK-10IHA106A                                  |
| 12177-ESK-10IHA106B                                  |
| 12177-ESK-10IHA107A                                  |
| 12177-ESK-10IHA107B                                  |
| 12177-ESK-10IHA108A                                  |
| 12177-ESK-101HA109A                                  |
| 12177-ESK-101HA109A                                  |
|                                                      |
| 12177-ESK-10IHA110A                                  |
| 12177-ESK-10IHA110B                                  |
| 12177-ESK-10IHA200A                                  |
| 12177-ESK-10IHA200B                                  |
| 12177-ESK-10IHA201A                                  |
| 12177-ESK-10IHA201B                                  |
| 12177-ESK-10IHA202A                                  |
| 12177-ESK-10IHA202B                                  |
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#### Remove

# <u>Insert</u>

| 12177-ESK-10IHA203A |
|---------------------|
| 12177-ESK-10IHA203B |
| 12177-ESK-10IHA204A |
| 12177-ESK-10IHA204B |
| 12177-ESK-10IHA205A |
| 12177-ESK-10IHA205B |
| 12177-ESK-10IHA206A |
| 12177-ESK-10IHA206B |
| 12177-ESK-10IHA207A |
| 12177-ESK-10IHA207B |
| 12177-ESK-10IHA208A |
| 12177-ESK-10IEGA01  |
| 12177-ESK-10IEGA02  |
| 12177-ESK-10IEGA03  |
| 12177-ESK-11IAS01   |
| 12177-ESK-11ICS01   |
| 12177-ESK-11ICS02   |
| 12177-ESK-11ICS03   |
| 12177-ESK-11ICS04   |
| 12177-ESK-111CS05   |
| 12177-ESK-11ICS06   |
| 12177-ESK-11ICS07   |
| 12177-ESK-11ICS09   |
| 12177-ESK-11ICS10   |
| 12177-ESK-11ICS11   |
| 12177-ESK-111CS12   |
| 12177-ESK-11ICS13   |
| 12177-ESK-11ISC01   |
| 12177-ESK-11ISC02   |
| 12177-ESK-11ISC03   |
| 12177-ESK-11ISC04   |
| 12177-ESK-11ISC05   |
| 12177-ESK-11ISC06   |
| 12177-ESK-11MSS05   |
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| 12177-ESK-10IHA203A     |
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| 12177-ESK-10IHA203B     |
| 12177-ESK-10IHA204A     |
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| 12177-ESK-10IHA205A     |
| 12177-ESK-10IHA205B     |
| 12177-ESK-10IHA206A     |
| 12177-ESK-10IHA206B     |
| 12177-ESK-10IHA207A     |
| 12177-ESK-10IHA207B     |
| 12177-ESK-10IHA208A     |
| 12177-ESK-10IEGA01      |
| 12177-ESK-10IEGA02      |
| 12177-ESK-10IEGA03      |
| 12177-ESK-11IAS01       |
| 12177-ESK-11ICS01       |
| 12177-ESK-11ICS02       |
| 12177-ESK-11ICS03       |
| 12177-ESK-11ICS04       |
| 12177-ESK-11ICS05       |
| 12177-ESK-11ICS06       |
| 12177-ESK-11ICS07       |
| 12177-ESK-11ICS09       |
| 12177-ESK-11ICS10       |
| 12177-ESK-11ICS11       |
| 12177-ESK-11ICS12       |
| 12177-ESK-11ICS13 Sh 1, |
| 12177-ESK-11ISC01       |
| 12177-ESK-11ISC02       |
| 12177-ESK-11ISC03       |
| 12177-ESK-11ISC04       |
| 12177-ESK-11ISC05       |
| 12177-ESK-11ISC06       |
| 12177-ESK-11MSS05       |
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## NMP2 FSAR DRAWING PACKAGE

## INSERTION INSTRUCTIONS

# VOLUME 9A

## Remove

# Insert

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| 12177-EE-1B-8                    | 12177-EE-1B-10                   |
| 12177-EE-1C-8                    | 12177-EE-1C-10                   |
| 12177-EE-1D-8                    | 12177-EE-1D-10                   |
| 12177-EE-1F-6                    | 12177-EE-1F-9                    |
| 12177-EE-1G-6                    | 12177-EE-1G-8                    |
| 12177-EE-1H-6                    | 12177-EE-1H-10                   |
| 12177-EE-1J-5                    | 12177-EE-1J-7                    |
| 12177-EE-1K-7                    | 12177-EE-1K-10                   |
| 12177-EE-1L-5                    | 12177-EE-1L-8                    |
| 12177-EE-1M-5                    | 12177-EE-1M-8                    |
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| 12177-EE-1P-4                    | 12177-EE-1P-6                    |
| 12177-EE-1Q-5                    | 12177-EE-1Q-9                    |
| 12177-EE-1R-5                    | 12177-EE-1R-8                    |
| 12177-EE-1T-10                   | 12177-EE-1T-12                   |
| 12177-EE-1U-7                    | 12177-EE-1U-10                   |
| 12177-EE-1V-9                    | 12177-EE-1V-11                   |
| 12177-EE-1W-8                    | 12177-EE-1W-10                   |
| 12177-EE-1X-7                    | 12177-EE-1X-9                    |
| 12177-EE-1Y-6                    | 12177-EE-1Y-8                    |
| 12177-EE-1Z-7                    | 12177-EE-1Z-9                    |
| 12177-EE-1AA-3                   | 12177-EE-1AA-4                   |
| 12177-EE-1AB-3                   | 12177-EE-1AB-5                   |
| 12177-EE-1AD-3                   | 12177-EE-1AD-6                   |
| 12177-EE-1AE-3                   | 12177-EE-1AE-5                   |
| 12177-EE-1AF-1                   | 12177-EE-1AF-4                   |
| 12177-EE-1AG-3                   | 12177-EE-1AG-4                   |
| 12177-EE-1AH-3                   | 12177-EE-1AH-4                   |
| 12177-EE-1AK-3                   | 12177-EE-1AK-4                   |
| 12177-EE-1AL-3                   | 12177-EE-1AL-4                   |
| 12177-EE-1AM-3                   | 12177-EE-1AL-4<br>12177-EE-1AM-4 |
| 12177-EE-1AN-3                   | 12177-EE-1AN-4                   |
| 12177-EE-1AQ-3                   | 12177-EE-1AQ-4                   |
| 12177-EE-1AQ-3<br>12177-EE-1AR-3 | 12177-EE-1AQ-4<br>12177-EE-1AR-8 |
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| 12177-EE-1AS                     | <br>12177-EE-1AT-5               |
| 12177-EE-1AT-3                   | 12177-EE-1AU-4                   |
| 12177-EE-1AU-3                   | 12177-EE-1AU-4<br>12177-EE-1AV-4 |
| 12177-EE-1AV-3                   | 12177-EE-1AV-4<br>12177-EE-1AW-6 |
| 12177-EE-1AW-3<br>12177-EE-1AX-3 | 12177-EE-1AX-6                   |
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| 12177-EE-1AY-3                   | 12177-EE-1AY-4<br>12177-EE-1AZ-2 |
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VOLUME 9A (Cont)

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12177-EE-1BR-7

12177-EE-1CA-6

12177-EE-1CB-6

12177-EE-1CC-5

12177-EE-1CM-9

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| 12177-EE-1BH-2                                                                                     |
|----------------------------------------------------------------------------------------------------|
| 12177-EE-1BR-5                                                                                     |
| 12177-EE-1CA-4                                                                                     |
| 12177-EE-1CB-5                                                                                     |
| 12177-EE-1CC-4                                                                                     |
| 12177-EE-1CM-5                                                                                     |
| 12177-EE-1CN-5                                                                                     |
| 12177-EE-1CP-1                                                                                     |
| 12177-EE-1CT-1                                                                                     |
|                                                                                                    |
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|                                                                                                    |
| 12177-EE-1EA-8                                                                                     |
|                                                                                                    |
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| <br>                                                                                               |
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| <br><br>12177-EE-2B-4                                                                              |
| 12177-EE-2C-2                                                                                      |
| 12177-EE-2C-2<br>12177-EE-2E-3                                                                     |
| 12177-EE-2C-2<br>12177-EE-2E-3<br>12177-EE-2F-2                                                    |
| 12177-EE-2C-2<br>12177-EE-2E-3<br>12177-EE-2F-2<br>12177-EE-2G-3                                   |
| 12177-EE-2C-2<br>12177-EE-2E-3<br>12177-EE-2F-2<br>12177-EE-2G-3<br>12177-EE-2J-3                  |
| 12177-EE-2C-2<br>12177-EE-2E-3<br>12177-EE-2F-2<br>12177-EE-2G-3<br>12177-EE-2J-3<br>12177-EE-2R-2 |
| 12177-EE-2C-2<br>12177-EE-2E-3<br>12177-EE-2F-2<br>12177-EE-2G-3<br>12177-EE-2J-3                  |

12177-EE-1CN-9 12177-EE-1CP-2 12177-EE-1CT-2 12177-EE-1CX-5 12177-EE-1CY-6 12177-EE-1CZ-4 12177-EE-1EA-9 12177-1FA-8 12177-1FB-3 12177-1FC-2 12177-1FD-1 12177-EE-2B-5 12177-EE-2C-3 12177-EE-2E-4 12177-EE-2F-3 12177-EE-2G-4 12177-EE-2J-4 12177-EE-2R-4 12177-EE-2U-3 12177-EE-2W-5



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