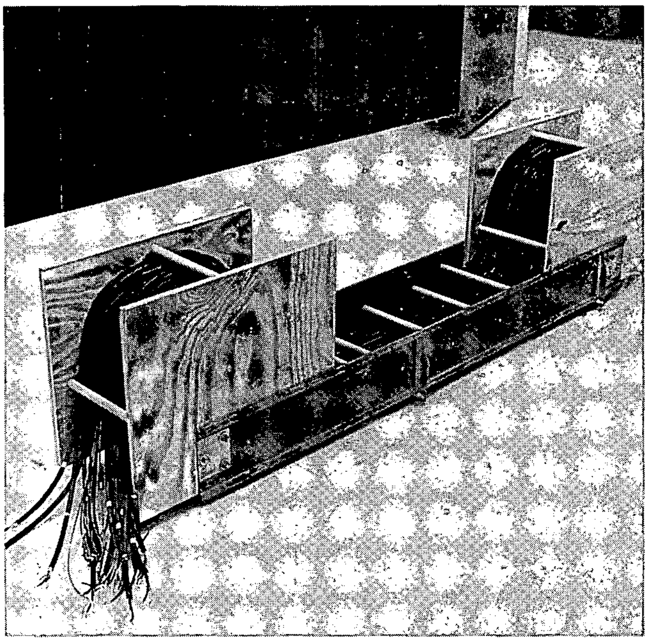
QUALIFICATION TEST REPORT

ON

IN-CONTAINMENT CABLES

FOR

CAROLINA POWER AND LIGHT COMPANY
RALEIGH, NORTH CAROLINA



NEQ

Nuclear Environmental Qualification

Test Report

REPORT NO. 45307-1

WYLE JOB NO. 45307

CUSTOMER P. O. NO. HBR 01616

PAGE 1 OF 361 PAGE REPORT

DATE December 23, 1981

SPECIFICATION (S) See References in Paragraph 5.0

1.0 CUSTOMER Carolina Power & Light Company

ADDRESS Box 1551, Raleigh, NC 27602

2.0 TEST SPECIMEN In-Containment Cables and Cable Splice Assemblies

3.0 MANUFACTURER Various

4.0 SUMMARY

In-Containment Cables and Cable Splice Assemblies were subjected to a Qualification Test Program to verify their functional integrity when subjected to the environmental tests specified herein.

A description of the specimens is presented in Paragraph 6.1 of this report.

The Qualification Test Program was performed to satisfy the intent of IEEE 323-1974, "Standard for Qualifying Class IE Equipment for Nuclear Power Generating Stations."

STATE OF ALABAMA }
COUNTY OF MADISON } ss. Ala. Professional Eng. Reg. No. 8256

Flavous R. Johnson, being duly sworn, deposes and says: The information contained in this report is the result of complete and carefully conducted tests and is to the best of his knowledge true and correct in all respects.

Flavous R. Johnson

SEAL

SUBSCRIBED and sworn to before me this 23rd day of December, 1981

Virginia R. Dent

Notary Public in and for the State of Alabama at large.

My Commission expires June 13, 1983

PREPARED BY James E. Marconnet
J. Marconnet

APPROVED BY Herschel Jordan
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WYLE Q. A. M. Kimbrell
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WYLE LABORATORIES
SCIENTIFIC SERVICES AND SYSTEMS GROUP
HUNTSVILLE, ALABAMA

4.0 SUMMARY (Continued)

The Qualification Test Program was performed as specified in Reference 5.1 and in accordance with References 5.2, 5.3, 5.4, and 5.5. The cables and cable splice assemblies are thus qualified to the environments stated in Wyle Laboratories' Qualification Plan 45307-1, subject to the following limitations:

During the LOCA Qualification Test temperature peaks (286°F), the insulation resistance of several of the cable splice assemblies was as low as 0.5 megohms measured at 500 VDC. Reference Notices of Anomaly Nos. 1, 2, and 3 presented in Appendix I of Section VI of this report.

Seven (7) anomalies occurred during this test program. Details of these anomalies are included in the appropriate sections of this report.

Following the Qualification Test Program specified in Reference 5.1, additional testing was performed on two (2) of the test specimens as specified in Reference 5.6 and in accordance with References 5.3 and 5.7. This additional testing was performed to further demonstrate the operability of the cables and cable splice assemblies following a LOCA simulation. One (1) anomaly occurred during this test. A maximum leakage current of 5 ma (at 825 volts, 60 Hz) was recorded on one (1) cable splice assembly wrapped on a 40X mandrel and submerged in tap water.

This qualification Test Report contains the sections listed below. The qualification program was performed in the sequence indicated by section numbers I through X. Test results are indicated in each respective section.

- Section I - Baseline Functional Tests
- Section II - Radiation Exposure
- Section III - Post-Radiation Functional Tests
- Section IV - Thermal Aging
- Section V - Post-Thermal Aging Functional Tests
- Section VI - Loss of Coolant Accident (LOCA) Qualification
- Section VII - Post-LOCA Functional Tests
- Section VIII - Post-Test Inspection
- Section IX - Mandrel Bend Tests
- Section X - Post-Test Inspection
- Section XI - Wyle Laboratories' Qualification Plan 45307-1
- Section XII - Wyle Laboratories' Test Procedure 45307-1
- Section XIII - Wyle Laboratories' Test Procedure 45307-2

5.0 REFERENCES

5.1 Wyle Laboratories' Qualification Plan 45307-1

5.2 Wyle Laboratories' Test Procedure 45307-1

5.3 Carolina Power & Light Purchase Order HBR 01616

5.4 Wyle Laboratories' Quote No. 543/4464/ES

5.5 IEEE 323-1974, "Standard for Qualifying Class IE Equipment for Nuclear Power Generating Stations"

5.6 Wyle Laboratories' Test Procedure 45307-2

5.7 IEEE 383-1974, "IEEE Standard for Type Test of Class IE Electrical Cables, Field Splices, and Connections for Nuclear Power Generating Stations"

6.0 TEST SPECIMEN AND EQUIPMENT DESCRIPTION

6.1 Test Specimen Description

The cables to be qualified were 2- and 4-conductor #16 AWG shielded instrumentation cables. These cables have been in service in the H. B. Robinson Nuclear Power Plant for 10 years.

The cable splice assemblies to be qualified were made by splicing the 2- and 4-conductor cable specimens to 2- and 4-conductor test cables, utilizing two (2) splice configurations. A Carolina Power & Light-approved cable splice procedure and a Raychem-approved splice procedure were used.

Twenty-four (24) cable splice assemblies were subjected to the Qualification Test Program. Six (6) assemblies were made with 10-year old PVC-jacketed and PVC-insulated cables (hereafter referred to as PVC cables). Eighteen (18) assemblies were made with new currently-available single-, 2- and 4-conductor cables for potential qualification of the CP&L-approved cable splices in the event of failure of the PVC cables.

6.2 Test Equipment Description

The test equipment used in recording data is shown on Instrumentation Equipment Sheets located in the appendices of the appropriate sections of this report. All test equipment and instrumentation used in the performance of this test program were calibrated in accordance with Wyle Laboratories' (Eastern Operations) Quality Assurance Policies and Procedures Manual, which conforms to the applicable portions of ANSI N 45.2, 10 CFR 50, Appendix B, and Military Specification MIL-C-45662A. Standards used in performing all calibrations are traceable to the National Bureau of Standards.

SECTION I

BASELINE FUNCTIONAL TEST

1.0 REQUIREMENTS

1.1 Visual Inspection

A visual inspection of the equipment shall be performed by Wyle Laboratories. This inspection shall assure that the equipment has no obvious visible damage. Equipment identification shall also be verified.

1.2 Test Specimen Preparation

1.2.1 PVC Cable Test Specimens

Prior to any testing, splices shall be applied to both ends of each test specimen. The splice shall join the customer-supplied cable (specimen) to the Wyle-supplied test cable. The Wyle-supplied test cable shall be previously qualified to IEEE 383 and certified as such by the supplier. Wyle test cables shall be long enough to penetrate the LOCA chamber to be used during the Accident Test.

The following six (6) cable splice assemblies shall be prepared, utilizing the two (2) cable splice configurations and the three (3) cable samples of each identified cable.

Test Specimen No.	Cable	Splice Configuration
1	2-conductor	Raychem
2	4-conductor	CP&L
3	4-conductor	Raychem
4	2-conductor	CP&L
5	2-conductor	Raychem
6	4-conductor	CP&L

1.2.2 Test Specimens for the Optional Aging Program

Six (6) each of single-, 2-, and 4-conductor cable splice assemblies shall be prepared for potential qualification of the CP&L-approved cable splices in the event of failure of the PVC cables. Prior to any testing, each of these cables shall be cut into 2 pieces and spliced, using the CP&L-approved splice configuration.

1.0 REQUIREMENTS (Continued)

1.2.3 CP&L-Approved Cable Splice Procedure

The CP&L-approved cable splice procedure is as follows:

1) Strip approximately 3 inches (this length may vary, depending on the number of conductors being spliced) of the cable jacket, shielding tape, fillers, and binder tape to expose the conductor(s) and associated insulation.

2) Cut the conductor(s) in such a manner as to stagger the spacing of the connectors.

3) Ensure the wire is in the AMP 53548-1 preinsulated butt splice fully.

4) Using the AMP crimping tool, crimp the splice. The tool will not reverse until a full crimp is completed.

5) Place Raychem shrink tubing over the cable. Ensure that enough tubing is used to allow for a minimum of a 3-inch overlap on the cable jacket.

6) Using a mini-torch for a heat source, cure the shrink tubing. The cure must be started from the center of the splice and worked out to one end. Return to the center of the splice and work out to the other end. Using this method, no air pockets shall be trapped within the splice.

7) While curing the shrink tubing, work the torch around the splice for an even cure.

8) The red nuclear adhesive shall protrude from the end of the splice when the cure is complete.

1.2.4 Raychem-Approved Cable Splice Procedure

The Raychem-approved cable splice procedure is as follows:

1) Strip approximately 3 inches (this length may vary, depending on the number of conductors being spliced) of the cable jacket, shielding tape, fillers, and binder tape to expose the conductor(s) and associated insulation.

1.0 REQUIREMENTS (Continued)

1.2.4 Raychem-Approved Cable Splice Procedure (Continued)

2) Cut the conductor(s) in such a manner as to stagger the spacing of the connectors.

3) Using uninsulated butt connectors, crimp one end to the conductor.

4) Cut the Raychem shrink tubing so that the sleeve has a 2-inch (minimum) seal area at each end.

5) Abrade cable, if required, per cable manufacturer's or engineering information.

6) Mark an area on each end of the cable, which defines the surface to be cleaned, using any type of tape or cable marker. These marks should extend 1/4" to 1/2" past the end of the sleeve when the tubing is centered on the splice.

7) Clean all surfaces thoroughly, using a good commercial cleaning solvent or 1,1,1 Trichloroethane.

8) Position the shrink tubing onto the cable and complete the crimping operation.

9) Center the shrink tubing, using the previously installed tape or other location marks.

NOTE: If the cable construction is dual type (i.e., the outer layer is cross-linked but the inner is not), then Step 10 is not applicable.

10) For noncross-linked or nonvulcanized insulating material, position a glass heat shield cloth over the exposed cable when shrinking.

11) Shrink the tubing by starting the shrinking action at the approximate center of the sleeve. Work the heat gun or torch from the center toward each end, using a waving action of the tool. Continue until the sleeve is smoothly shrunk onto the cable surface and a visible flow of adhesive is evident from each end of the sleeve.

12) Repeat Steps 3 through 11 for each conductor. When all conductors have been spliced, go to Step 13.

13) Repeat Steps 4 through 11 for the cable jacket. Raychem shrink tubing will now be shrunk over the spliced conductors and the cable jacket, as applicable, for an outer seal.

1.0 REQUIREMENTS (Continued)

1.3 Functional Tests

The subject equipment shall be functionally tested on the system level. A system is defined as a cable and its associated cable splice assembly.

The following functional tests shall be performed on the subject equipment:

1.3.1 Insulation Resistance

Measure insulation resistance between each conductor and ground (plane) at 500 VDC for 1 minute (minimum).

1.3.2 Dielectric Withstand

Measure dielectric strength between all conductors and ground at 1250 VAC, 60 Hz, single-phase, for 1 minute with tester set at 0.5 milliamperes.

NOTE: Subsequent to the Baseline Functional Tests, all dielectric withstands shall be performed at 80% of the initial value.

1.3.3 Continuity

Verify the continuity of each conductor using an ohmmeter or equivalent.

1.3.4 Acceptance Criteria

The acceptance criteria for the instrumentation cables and cable splice assemblies are as follows:

1) The insulation resistance shall not be less than 1 megohm.

2) There shall be no breakdown or flashover during the dielectric withstand.

3) The cable must be continuous.

2.0 PROCEDURES

2.1 Visual Inspection

The test specimen cables were inspected per Paragraph 1.1 of this section.

2.0 PROCEDURES (Continued)

2.2 Test Specimen Preparation

2.2.1 Cable Splice Assembly Components

2.2.1.1 2-Conductor #16 AWG PVC-jacketed and PVC-insulated shielded instrumentation cable in service in the H. B. Robinson Nuclear Power Plant for 10 years (supplied by CP&L).

2.2.1.2 4-Conductor #16 AWG PVC-jacketed and PVC-insulated shielded instrumentation cable in service in the H. B. Robinson Nuclear Power Plant for 10 years (supplied by CP&L).

2.2.1.3 1-Conductor Anaconda Y #16 AWG NSIS Switchboard Wire 600 V (supplied by Wyle).

2.2.1.4 2-Conductor 014320-17 Dekoron® Dekorad Inst. Wire Type 1952 Samuel A. Moore Aurora O. (supplied by CP&L).

2.2.1.5 4-Conductor Anaconda Y #16 AWG Flame Guard FR-EP 600 V shielded instrumentation cable (supplied by Wyle).

2.2.1.6 Raychem WCSF-115-N Splicing Sleeve (supplied by CP&L and Wyle).

2.2.1.7 Raychem WCSF-200-N Splicing Sleeve (supplied by CP&L and Wyle),

2.2.1.8 Raychem WCSF-500-N Splicing Sleeve (supplied by CP&L and Wyle).

2.2.1.9 AMP 53548-1 preinsulated Butt Splices (supplied by CP&L and Wyle).

2.2.2 Cable Splice Assembly Tools

The following assembly tools are listed for information purposes only.

2.2.2.1 1,1,1 Trichloroethane solvent (supplied by Wyle).

2.2.2.2 Tuffy® Cleaning pad (supplied by Wyle).

2.2.2.3 Norton K224, 240J Grit EZ Flex® Cloth 01832-2 (supplied by Wyle).

2.2.2.4 Chicopee Shop Towel 8007 (supplied by Wyle).

2.2.2.5 AMP 59250 T-head hand crimp tool (supplied by CP&L).

2.2.2.6 Master Appliance HG-501 Heat Gun 500-750°F (supplied by Wyle).

2.0 PROCEDURES (Continued)

2.2.3 Cable Splice Designs

Five (5) different cable splice configurations were designed based on the applicable general splice configuration (CP&L or Raychem), the number of conductors of each cable (1, 2, or 4), the Raychem Cable Splicing Sleeve Selection Guide (Drawing No. 47005-006-03), and the manufacturer's recommendations for abrading and cleaning cables for adhesive bonding. The Raychem Cable Splicing Sleeve Selection Guide and Raychem Installations Sheets are presented as Figures I-1 through I-3 in Appendix I of this section. The Eaton Dekoron Installation Guide HS-01, the Anaconda Cable Data Sheets, and the Anaconda Cable Cleaning Data Sheet are presented as Figures I-4 through I-14 in Appendix I of this section. The Amp PIDG Butt Splice Data Sheets and Splice Tooling Data Sheet are presented as Figures I-15 through I-17 in Appendix I of this section. The five (5) cable splice designs are presented as Figures I-18 through I-22 in Appendix I of this section.

2.2.4 Cable Splice Preparation

The 24 cable splice assemblies were prepared per Paragraph 1.2 of this section, using the five (5) cable splice designs and according to check-lists prepared for each assembly. Photographs were taken of representative cable splice assemblies at several stages in the splicing process. The ends of each cable splice assembly were stripped and the cables were placed in a steel cable tray.

2.3 Functional Test

Functional tests were performed per Paragraph 1.3 of this section.

3.0 RESULTS

3.1 Visual Inspection

The PVC cables provided by CP&L had no identifying markings other than field-applied wire markers. The other cables and the Raychem splice sleeving had factory imprinting, which agreed with the expected part numbers. The Amp butt splices had only a red stripe to indicate that they are nuclear grade. There was no obvious visible damage noted.

3.0 RESULTS (Continued)

3.2 Test Specimen Preparation

The cable splice assemblies were prepared as specified in Paragraph 1.2 and as described in Paragraph 2.2.4 of this section.

3.3 Functional Test

The cable splice assemblies successfully met the functional requirements as specified in Paragraph 1.3 and as described in Paragraph 2.3 of this section.

Figures I-1 through I-22 are presented in Appendix I of this section.

Photographs I-1 through I-22 are presented in Appendix II of this section.

Cable splicing checklists are presented in Appendix III of this section.

Data Sheets showing functional test data recorded in this test sequence are presented in Appendix IV of this section.

Equipment used in recording data is shown on the Instrumentation Equipment Sheet presented in Appendix V of this section.

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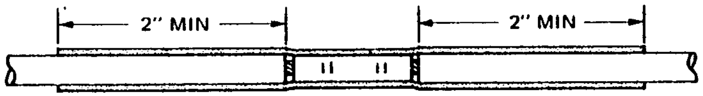
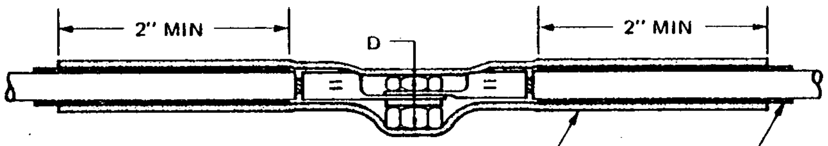
APPENDIX I

FIGURES

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED



STANDARD IN-LINE SPLICE



BOLT-TOGETHER CONNECTION

Part Number	Minimum Expanded ID As Supplied	Maximum Recovered ID After Heating	Expanded Wall Thickness ±20%	Nominal Recovered Wall Thickness	Standard Lengths	Application Diameter Range For In-Containment Applications Minimum	Maximum
WCSF-070-N	.250	.070	.02	.08	6	.08	.14
WCSF-115-N	.350	.115	.03	.09	6	.13	.23
WCSF-200-N	.750	.200	.03	.11	6, 9, 12	.22	.40
WCSF-300-N	1.200	.300	.04	.17	6, 9, 12	.33	.60
WCSF-500-N	1.500	.500	.05	.17	6, 9, 12	.55	1.00
WCSF-650-N	2.000	.650	.05	.17	6, 9, 12	.72	1.30
WCSF-1000-N	3.000	1.000	.05	.17	12, 18	1.10	2.00
WCSF-1500N	4.500	1.500	.05	.17	12, 18	1.65	3.00

NOTES:

1. Select sleeve no. 1 with a maximum application diameter larger than the connection diameter "D".
2. Use additional sleeve(s) no. 2, if necessary, to build up the wire diameter to the minimum application diameter of the no. 1 sleeve selected.
3. Use of largest size sleeve that will fit a given wire is recommended to obtain maximum as installed wall thickness.
4. Splice sleeve length selected should allow for 2" minimum overlap onto wire insulation.

FIGURE I-1

DASH NO	MATL DESCRIPTION	RT SPEC

DO NOT SCALE THIS DRAWING

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES AND TOLERANCES ARE:
.XXX : ±
.XX : ±
: ±

NEXT ASSY
USED ON

DRAWN	Ken Tanaka
CHECKED	S. Grosch
DSGN APPD	R. Kimmins
MFG APPD	J. S. Sidhu
QC APPD	M. Ajalon
	11/1/77
PROJECT	47005-006

Raychem

RAYCHEM CORPORATION
300 CONSTITUTION DRIVE
MENLO PARK, CALIFORNIA 94025

TITLE
Cable Splicing Sleeve Selection Guide
Nuclear Power Plant In-Containment Use

CODE IDENT. NO. 06090	DWG. NO. 47005-006-03	
SIZE B	SCALE ---	SHEET 1 OF 1

WCSF-N

Installation Instructions

Procedure

The correct procedure for the selection and installation of WCSF type splicing sleeves is an easy and simple process. Reliable splicing can be performed with completed splices being equal to or better than a cable insulation itself.

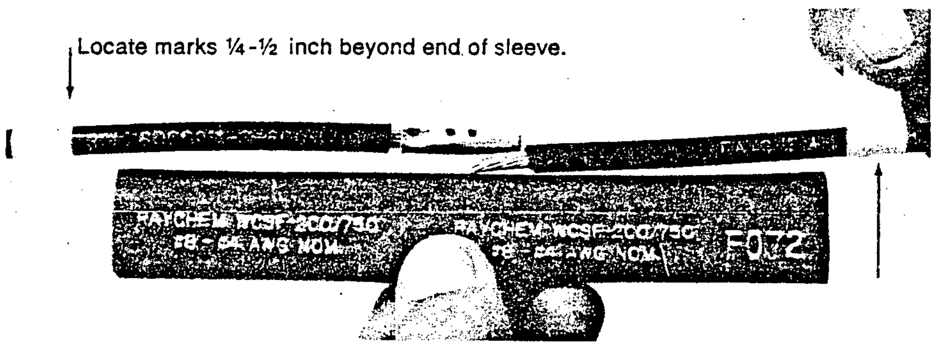
To select and install WCSF sleeves for installation in containment applications or other applications requiring the highest degree of reliability, two essential steps are required:

1. Selection of correct type and size. See Raychem Selection Guide.

2. Proper preparation and shrinking as shown here.

Prepare cable ends, crimping one end and locate heat-shrinkable sleeve to approximate centering. Mark cable with any type of tape or cable marker. Use area between marks to define surface to be cleaned and in centering of sleeve during shrinking operation.

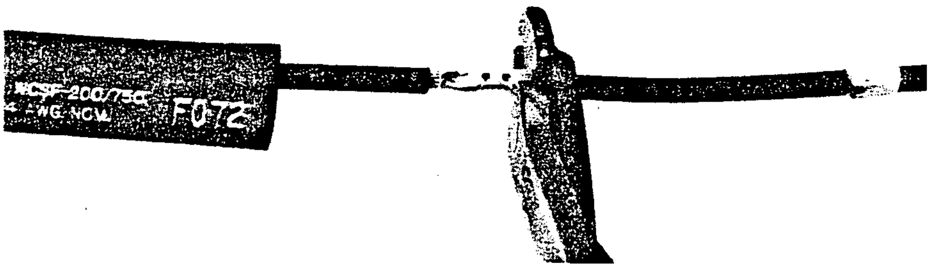
Note: Marks should be located approximately ¼″ to ½″ past end of sleeve. Verify that sleeve has 2″ minimum seal area at each end.



Abrade cable, if required, per cable manufacturer's or engineering recommendation.

Clean all surfaces thoroughly, using a good commercial cable cleaning solvent or 1.1.1. Trichlorothane.

Position sleeve onto cable and then complete crimping operation.

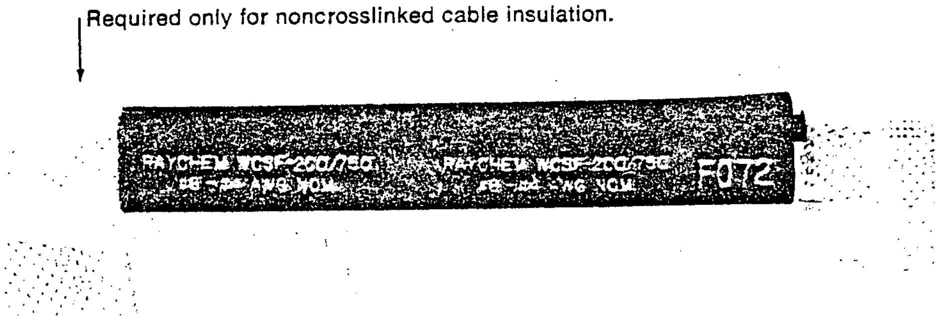


Locate sleeve, centering on previously installed tape or other locating marks.

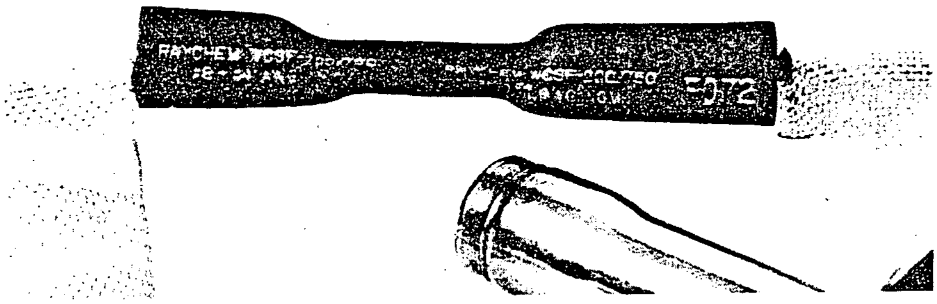
FIGURE I-2

Position glass heat shield cloth over exposed cable when shrinking onto noncrosslinked on nonvulcanized insulating material.

Note: If cable construction is dual type (i.e., the outer layer is cross-linked but the inner is not), then heat shields are **not** required.



Shrink sleeve by starting shrinking action at approximate center of sleeve. Work heat gun or torch from center towards each end, using a waving action of the tool. This back and forth motion helps ensure reliable installation.
Note: Heat should be applied to all sides. Where access to all sides is not feasible, installation with a heat reflector attachment will allow heating of all sides with heat applied from one position.



Continue shrink action until:

1. Sleeve is smoothly shrunk onto cable surface.

2. A visible flow of adhesive is evident from each end of the sleeve.

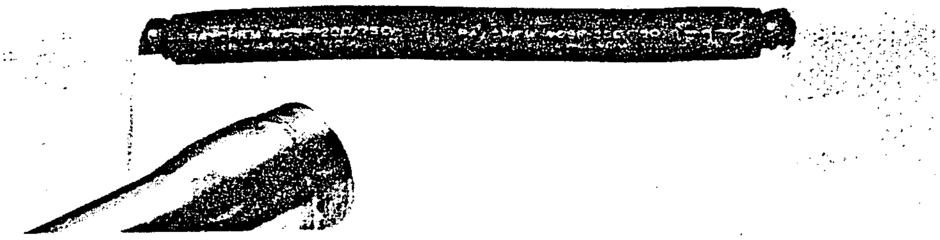


Photo shows typical adhesive flow that should be present at each end of the sleeve.

Completed splice with a properly installed sleeve showing:

1. Positive indication of adhesive flow at each end of the heat-shrinkable sleeve.

2. Intimate surface contact is made along the length of the cable splice. The sleeve should show smooth contact with no surface wrinkles along the contact area of the cable jacket.

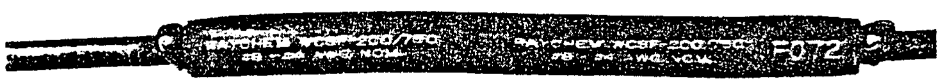


FIGURE I-3

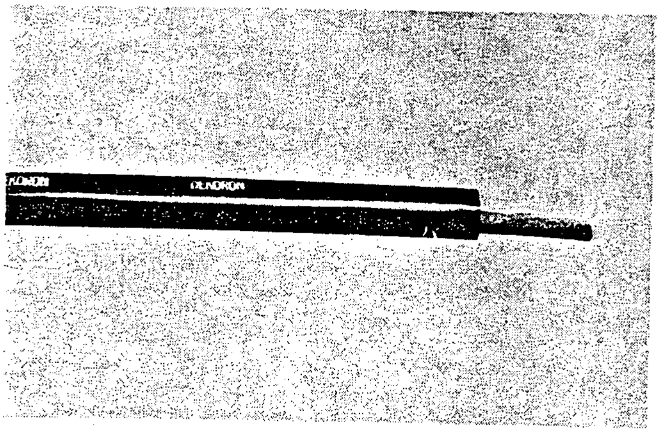
Thick Wall In-Line
Multicomponent Splices

Installation Guide HS-01

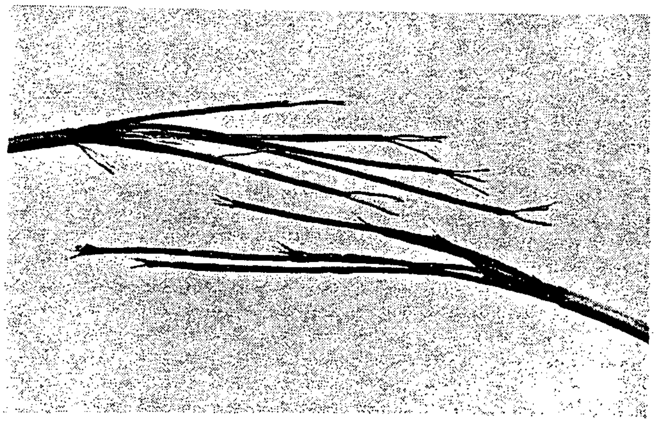
Dekoron®

Introduction
Reliable splicing of multiconductors is practical in a quick and easy manner using prepared Dekoron splice kits. Following the correct procedure will result in a splice that is equal to or better than the original cable insulation. Each individual splice kit as supplied to you has the necessary components for each specific application.

Procedure:

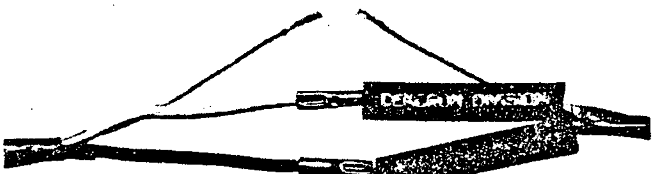


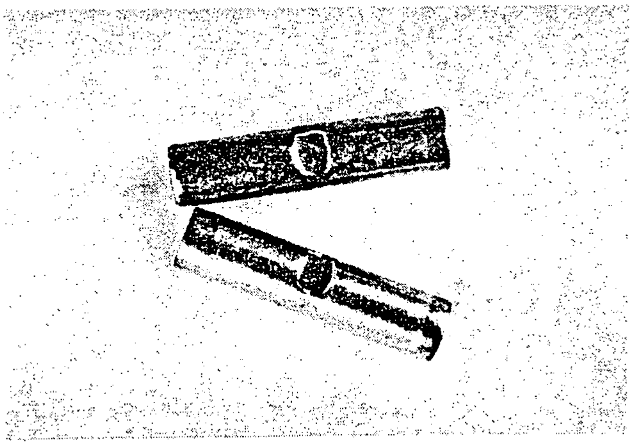
1. Slide the heat shrink outer jacket splice over one end of the cable to be spliced.



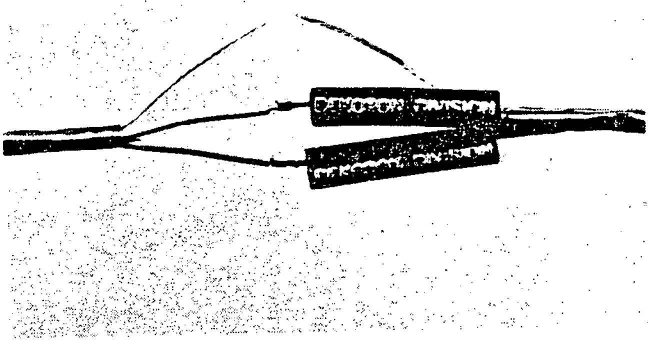
2. Strip back two inches of cable jacket for each contained component, i.e.: Eight components (8 twisted pairs) equal sixteen inches of jacket removal per cable end.
3. Remove all binder tapes and/or shield from bundle, carefully exposing internal components, leaving individual shields and isolation tapes intact. Note: fire barrier tapes will also be removed and need not be reinstalled.
4. Apply one continuous length of tape (supplied in kit) longitudinally to each individual shielded pair. This will prevent shield unraveling and shield to shield shorts once the splice is completed.
5. Cut the first component two inches from cable jacket, then cut each successive component at two inch intervals, only on one cable end. (See photo in step 2.)
6. Strip each component shield back two inches to permit identification of component, and exposure of insulated conductors and bare drain wire.
7. Cut each component of the second cable end to mate with the similarly identified component on the previously prepared cable end. This is done in such a manner that the components shall be staggered and the total splice length shall be that originally cut back on one cable end. (See photo in step 2.)
8. Strip all remaining component shields back one inch from component ends. Then strip each conductor insulation back 1/4". (See photo in step 2.)
9. Slide conductor splice sleeves over each insulated conductor and drain wire.

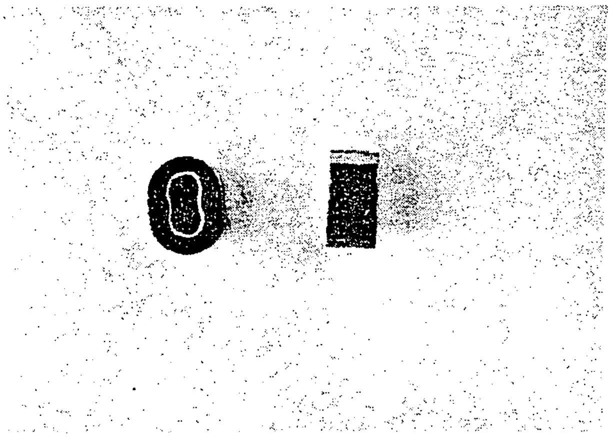
FIGURE I-4





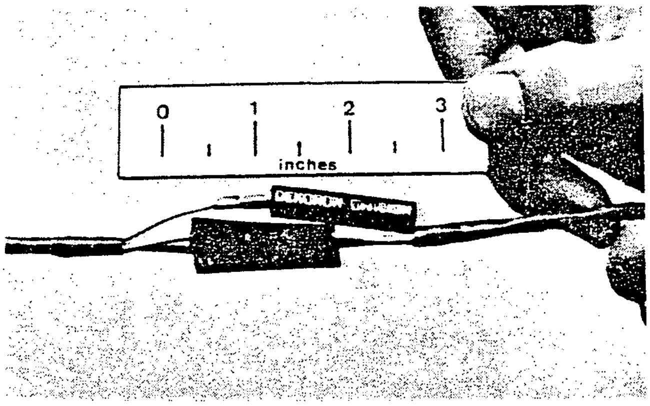
10a. Splice instrument wires (copper conductors) and drain wires using in-line crimp connectors supplied in kit.

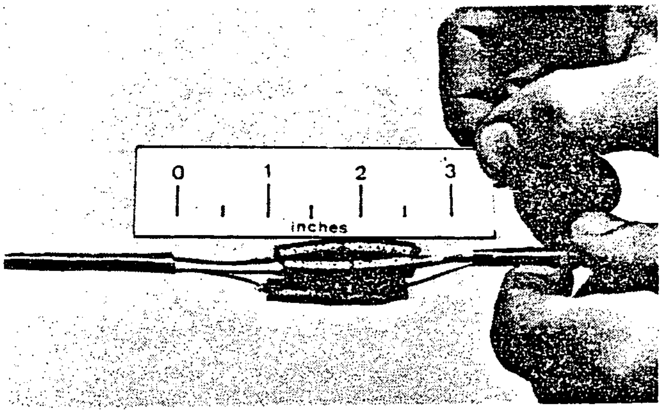




10b. Splice thermocouple extension wires with swage connectors supplied in kit. (Requires special tool - not supplied.)

FIGURE I-5



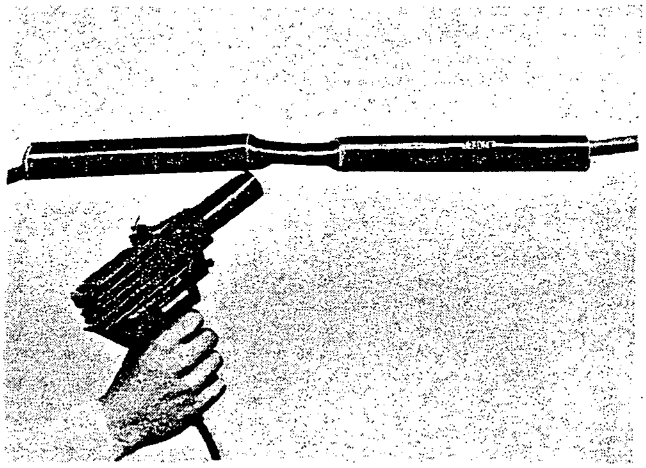


11. Center conductor and drain wire splice sleeves over individual splices and shrink using hot air gun (not supplied). Each splice sleeve must be shrunk from the center outwards towards each end, keeping the gun in motion to avoid scorching the sleeve. When adhesive appears at each end uniformly, shrinking is complete.

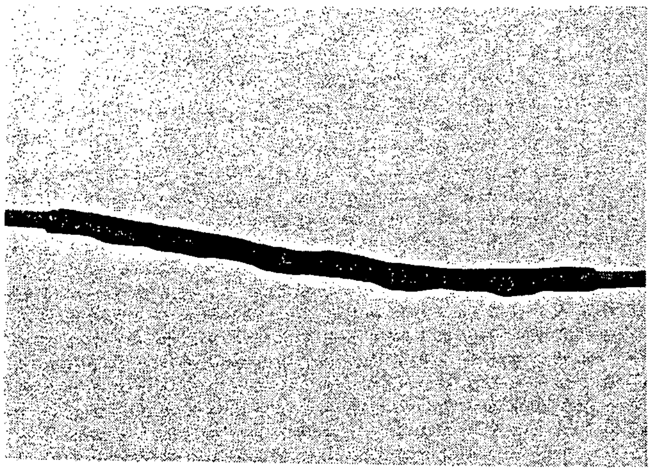
13. Cut each cable jacket back an additional one-half inch, leaving overall shield exposed.
14. Apply supplied shielding tape spirally securing with tape, aluminum side out, leaving overall drain wire outside.
15. Splice overall drain wire without shrink sleeve, using in-line crimp connector.
16. Abrade and clean overall cable jacket with a good commercial cable cleaning solvent.

12. Continue the above procedure through each consecutive component, staggering splices as per previously established cuts. When finished, tightly wrap splice assembly with tape.

FIGURE I-6



17. Center overall jacket splice over splice assembly insuring a minimum of two inch overlap over cable jacket at each end.



18. Shrink overall jacket splice starting at center and moving gradually outward to ends (use high wattage heat gun). When adhesive appears at each end uniformly, shrinking is complete.

FIGURE I-7

DATA SHEET C3.051
Switchboard Wire
1-80

ANACONDA Industries
Wire and Cable Division
Continental Wire & Cable

Switchboard and Control Wire

Flame-Retardant EP Insulation   Type NSIS
Copper Conductor **600 Volts** 90C

Description

CONDUCTOR

Coated, annealed copper conductor; solid or stranded per ASTM B8 and B33:

Solid Sizes: 18 AWG—10 AWG
Stranded Sizes: 18 AWG—6 AWG
(Both 7 strand and flexible strand)

SEPARATOR

Separator is applied between insulation and conductor.

INSULATION

FR-EP (Flame-retardant ethylene propylene) possesses unique flame retardant properties in addition to high compressive cut and crush resistance, low deformation and excellent electrical performance.

Application

For general purpose use as internal wiring for switchboards and control apparatus. Designed for use at 600 Volts 90C maximum operation in wet or dry locations.

Limited to dry locations only when used in accordance with Article 384 of the National Electrical Code.

For a specific recommendation for your application, please consult your Anaconda/Continental Representative.

Features and Benefits

Accepted for use in OSHA regulated installations.

Sizes 14 and larger UL listed for switchboard and control panel wiring.

Recognized by NEMA for internal switchgear wiring.

FR-EP insulation meets or exceeds the requirements of ICEA S-68-516 Type II and UL44, Class XL.

RADIATION RESISTANT, meets stringent LOCA test requirements for nuclear generating stations per IEEE 383.

FLAME-RESISTANT, insulated conductors comply with all ICEA and UL single conductor horizontal and vertical flame tests including VW-1 (FR-1)

Temperature Rating:
Normal 90C

FR-EP (flame retardant ethylene propylene) insulation offers these advantages:

Excellent electrical, thermal and physical properties.
Excellent resistance to moisture.
Excellent resistance to crush compression cuts and heat deformation.
Excellent flame resistance.
Excellent low temperature cold bend characteristics.

Fully pigmented insulation yields a wide range of easily distinguishable colors.

How to Specify

Specify by Anaconda/Continental Type NSIS, size, stranding, color and voltage.

A complete, detailed guide for developing a specification to meet your specific needs is available from your Anaconda/Continental Representative.

How to Order

Order by Anaconda/Continental, product name, quantity required, size, stranding, color and voltage.

Number of specific lengths required and packaging.

EXAMPLE

Anaconda/Continental Switchboard Wire Type NSIS

5000 feet, 12 AWG, solid, Gray, 600 Volts.

2-2500 foot lengths on non-returnable reels.

FIGURE I-8

ANACONDA Industries
Wire and Cable Division
Continental Wire & Cable

Switchboard and Control Wire

Flame-Retardant EP Insulation Type NSIS

Copper Conductor **600 Volts** 90C

Flame-Retardant EP Insulation

Size AWG	Number of Strands	Insulation Thickness Inch	Insulation Thickness mm	Overall Diameter Inch	Overall Diameter mm	Net Weight Lbs./MFT	Net Weight kg/km	Size AWG
Solid Conductor								600 Volts
18	Solid	.031	.79	.11	2.8	10	15	18
16	Solid	.031	.79	.12	3.0	14	21	16
14	Solid	.031	.79	.13	3.4	19	28	14
12	Solid	.031	.79	.15	3.8	28	42	12
10	Solid	.031	.79	.17	4.3	41	61	10
Stranded Conductor								600 Volts
18	7	.031	.79	.11	2.9	11	16	18
16	7	.031	.79	.13	3.2	15	22	16
14	7	.031	.79	.14	3.6	20	30	14
12	7	.031	.79	.16	4.1	28	42	12
10	7	.031	.79	.19	4.6	42	62	10
8	7	.047	1.19	.25	6.3	70	104	8
6	7	.062	1.57	.32	8.1	113	168	6
Flexible Conductor								600 Volts
18	16	.031	.79	.12	3.0	11	16	18
16 Ⓢ	26	.031	.79	.13	3.3	15	22	16
14 Ⓢ	41	.031	.79	.15	3.7	20	30	14
12 Ⓢ	65	.031	.79	.17	4.2	28	42	12
10 Ⓢ	105	.031	.79	.19	4.9	43	64	10
8	133	.047	1.19	.27	6.8	75	112	8
6	133	.062	1.57	.34	8.7	119	177	6

NATIONAL ELECTRICAL CODE

AMPACITY REFERENCES
Ampacities: Article 310-15

INSTALLATION REFERENCES:
Wiring Methods: Article 300-A

Sizes 14 and larger are UL listed as Type SIS.

Ⓢ AUTHORIZED STOCK ITEMS

Stock items are available in 2500 foot reels, (Gray), subject to a tolerance of plus or minus 5%.

Standard lengths, multiples of 500 feet, are subject to a tolerance of plus or minus 10%.

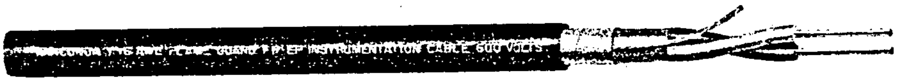
Dimensions and weights are shown subject to standard industry tolerances.

FIGURE I-9

ANACONDA

Flame-Guard® FR-EP Instrumentation Cable

Flame-Retardant EP Insulation CPE Jacket
Multiple Copper Conductors 600 Volts 90C



Description

CONDUCTORS

Coated annealed, copper conductors, Class B strand per ASTM B8 and B33;
Sizes: 20 AWG—16 AWG

INSULATION

FR-EP (flame-retardant ethylene propylene) possesses unique flame retardant properties in addition to high compressive cut and crush resistance, low deformation and excellent electrical performance.

FILLERS AND BINDER TAPE

Insulated conductors cabled with suitable fillers, when necessary to assure roundness. Flame resistant binder tape over core.

SHIELDING TAPE (Optional)

Aluminum/polyester laminated shielding tape with tinned copper drain wire applied helically over core and/or over twisted pairs, triads or quads.

JACKET OVERALL

CPE (chlorinated polyethylene) jacket is formulated for maximum flame retardancy. The CPE jacket possesses low heat deformation, excellent resistance to compresssion cutting or crush and highly desirable installation characteristics.

Application

Flame-Guard FR-EP Instrumentation Cable is designed for a wide variety of utility and industrial applications where high reliability is essential and installation considerations, including cable tray fill, are important. The cable offers excellent flame and radiation resistance, and fully meets current requirements for application in nuclear generating stations.

Flame-Guard FR-EP may be installed in free air, all raceways (including cable trays), or direct burial.

For a specific recommendation for your application, consult your Anaconda Representative.

Features and Benefits

FR-EP insulation meets or exceeds the requirements of IPCEA S-68-516, Type II, and UL 44, Class EPCV.

RADIATION RESISTANT, meets stringent LOCA test requirements for nuclear generating stations per IEEE 383.

FLAME-RESISTANT, meets requirements of IEEE 383 and UL 1277 vertical cable flame tests, including 70,000 and 210,000 BTU/HR.

Temperature ratings:

Normal	90C
Emergency	130C

Reduced cable diameters provides more fill capacity.

Excellent balance of physical properties contributes to ease of installation.

FR-EP (flame-retardant ethylene propylene) insulation offers these advantages:

- No conductor jacket needed — smaller cable O.D.
- Excellent electrical, thermal and physical properties.
- Excellent resistance to moisture.
- Excellent resistance to crush compression cuts and heat deformation.
- Excellent flame resistance.
- Excellent low temperature cold bend characteristics.
- Pigmented color codes with tracers per IPCEA S-19-81.

CPE (chlorinated polyethylene) jacket offers the following:

- Excellent flame resistance — burns to an ash — does not exhibit "Thermoplastic drip".
- Low coefficient of friction — easy pulling.
- Excellent thermal and mechanical characteristics.
- Excellent low temperature cold bend characteristics.

How to Specify

Specify by AP number (Anaconda Product Number), product name, arrangement of conductors, size, copper, insulation, shielding option, jacket, voltage.

AP numbers are shown at the top of all construction data tables.

A complete, detailed guide for developing a specification to meet your specific needs is available from your Anaconda Representative.

How to Order

Order by Anaconda AP number, product name, quantity required, arrangement of conductors, size, copper, insulation, shielding option, jacket, voltage.

Number of specific lengths required and packaging.

EXAMPLE

Anaconda AP 63040
Flame-Guard FR-EP,

10000 feet, 2 Pair, 16 AWG, copper, FR-EP insulation, Pairs shielded and overall shield, CPE jacket, 600 volts.

5—2000 foot lengths on non-returnable wood reels.

FIGURE I-10

DATA SECTION **8 322**
Instrumentation Cable
11-78

ANACONDA

Flame-Guard® FR-EP Instrumentation Cable

Flame-Retardant EP Insulation CPE Jacket
Multiple Copper Conductors **600 Volts** 90C

FR-EP Flame-Retardant Ethylene Propylene Insulation CPE Chlorinated Polyethylene Jacket

Number of Conductor Pairs	Insulation Thickness Inch	mm	Overall Jacket Thickness Inch	mm	Overall Diameter Inch	mm	Net Weight Lbs/MFT	kg/km	Number of Conductor Pairs
20 AWG	**Non-Shielded Pairs with Overall Shield**								**AP 63040**
1	.025	.64	.045	1.14	.30	7.6	51	76	1
2	.025	.64	.045	1.14	.44	11.1	88	131	2
3	.025	.64	.045	1.14	.46	11.7	103	153	3
4	.025	.64	.045	1.14	.50	12.7	118	176	4
5	.025	.64	.060	1.52	.58	14.7	156	232	5
7	.025	.64	.060	1.52	.60	15.2	182	271	7
10	.025	.64	.060	1.52	.74	18.8	242	361	10
15	.025	.64	.080	2.03	.82	20.8	320	477	15
19	.025	.64	.080	2.03	.91	23.1	418	623	19
37	.025	.64	.080	2.03	1.19	30.2	710	1058	37
18 AWG	**Non-Shielded Pairs with Overall Shield**								**AP 63040**
1	.025	.64	.045	1.14	.31	7.9	57	85	1
2	.025	.64	.045	1.14	.47	11.9	101	150	2
3	.025	.64	.045	1.14	.49	12.4	118	176	3
4	.025	.64	.045	1.14	.56	14.2	155	231	4
5	.025	.64	.060	1.52	.62	15.7	184	274	5
7	.025	.64	.060	1.52	.64	16.3	218	325	7
10	.025	.64	.060	1.52	.79	20.0	292	435	10
15	.025	.64	.080	2.03	.92	23.4	427	636	15
19	.025	.64	.080	2.03	.98	24.9	510	760	19
37	.025	.64	.080	2.03	1.27	32.3	865	1289	37
16 AWG	**Non-Shielded Pairs with Overall Shield**								**AP 63040**
1	.025	.64	.045	1.14	.34	8.6	71	106	1
2	.025	.64	.045	1.14	.55	14.0	141	210	2
3	.025	.64	.060	1.52	.57	14.5	163	243	3
4	.025	.64	.060	1.52	.61	15.5	202	301	4
5	.025	.64	.060	1.52	.68	17.3	237	353	5
7	.025	.64	.060	1.52	.70	17.8	286	426	7
10	.025	.64	.080	2.03	.91	23.1	426	635	10
15	.025	.64	.080	2.03	1.01	25.7	562	837	15
19	.025	.64	.080	2.03	1.07	27.2	678	1010	19
37	.025	.64	.080	2.03	1.41	35.8	1192	1776	37

Standard lengths, multiples of 500 feet, are subject to a tolerance of plus or minus 10%.

Specified cut lengths are subject to a tolerance of plus 10% minus 0%.

Dimensions and weights shown are nominal, subject to standard industry tolerances.

FIGURE I-11

ANACONDA

Flame-Guard® FR-EP Instrumentation Cable

Flame-Retardant EP Insulation CPE Jacket
Multiple Copper Conductors **600 Volts** 90C

FR-EP Flame Retardant Ethylene Propylene Insulation CPE Chlorinated Polyethylene Jacket

Number of Conductor Pairs	Insulation Thickness Inch	Insulation Thickness mm	Overall Jacket Thickness Inch	Overall Jacket Thickness mm	Overall Diameter Inch	Overall Diameter mm	Net Weight Lbs/MFT	Net Weight kg/km	Number of Conductor Pairs
20 AWG	**Shielded Pairs with Overall Shield**								**AP 63040**
1	.025	.64	.045	1.14	.30	7.6	51	76	1
2	.025	.64	.045	1.14	.46	11.7	113	168	2
3	.025	.64	.045	1.14	.49	12.4	126	188	3
4	.025	.64	.060	1.52	.57	14.4	164	244	4
5	.025	.64	.060	1.52	.62	15.7	198	295	5
7	.025	.64	.060	1.52	.67	17.0	234	349	7
10	.025	.64	.080	2.03	.88	22.4	350	522	10
15	.025	.64	.080	2.03	1.01	25.7	475	708	15
19	.025	.64	.080	2.03	1.06	26.9	554	825	19
37	.025	.64	.080	2.03	1.41	35.8	960	1430	37
18 AWG	**Shielded Pairs with Overall Shield**								**AP 63040**
1	.025	.64	.045	1.14	.31	7.9	57	85	1
2	.025	.64	.045	1.14	.49	12.4	129	192	2
3	.025	.64	.060	1.52	.55	14.0	162	241	3
4	.025	.64	.060	1.52	.60	15.2	188	280	4
5	.025	.64	.060	1.52	.65	16.5	226	337	5
7	.025	.64	.060	1.52	.71	18.0	268	399	7
10	.025	.64	.080	2.03	.94	23.9	403	600	10
15	.025	.64	.080	2.03	1.07	27.2	546	814	15
19	.025	.64	.080	2.03	1.13	28.7	642	957	19
37	.025	.64	.080	2.03	1.51	38.4	1126	1678	37
16 AWG	**Shielded Pairs with Overall Shield**								**AP 63040**
1	.025	.64	.045	1.14	.34	8.6	71	106	1
2	.025	.64	.060	1.52	.57	14.5	175	261	2
3	.025	.64	.060	1.52	.60	15.2	203	302	3
4	.025	.64	.060	1.52	.65	16.5	241	359	4
5	.025	.64	.060	1.52	.71	18.0	292	435	5
7	.025	.64	.060	1.52	.78	19.8	351	522	7
10	.025	.64	.080	2.03	1.03	26.2	519	773	10
15	.025	.64	.080	2.03	1.18	30.0	718	1070	15
19	.025	.64	.080	2.03	1.24	31.5	839	1250	19
37	.025	.64	.110	2.79	1.72	43.7	1607	2394	37

Standard lengths, multiples of 500 feet, are subject to a tolerance of plus or minus 10%.

Specified cut lengths are subject to a tolerance of plus 10% minus 0%.

Dimensions and weights shown are nominal, subject to standard industry tolerances.

FIGURE I-12

ANACONDA

Flame-Guard® FR-EP Instrumentation Cable

Flame-Retardant EP Insulation CPE Jacket
Multiple Copper Conductors 600 Volts 90C

FR-EP Flame-Retardant Ethylene Propylene Insulation CPE Chlorinated Polyethylene Jacket

Number of Conductors	Insulation Thickness Inch	Insulation Thickness mm	Overall Jacket Thickness Inch	Overall Jacket Thickness mm	Overall Diameter Inch	Overall Diameter mm	Net Weight Lbs./MFT	Net Weight kg/km	Number of Conductors
20 AWG	**Overall Shield**								**AP 63040**
2	.025	.64	.045	1.14	.30	7.6	51	76	2
3	.025	.64	.045	1.14	.31	7.9	54	80	3
4	.025	.64	.045	1.14	.33	8.4	62	92	4
5	.025	.64	.045	1.14	.36	9.1	72	107	5
7	.025	.64	.045	1.14	.39	9.9	87	129	7
9	.025	.64	.045	1.14	.44	11.2	107	159	9
12	.025	.64	.045	1.14	.49	12.4	131	194	12
15	.025	.64	.060	1.52	.54	13.7	166	246	15
19	.025	.64	.060	1.52	.64	16.3	221	327	19
37	.025	.64	.060	1.52	.82	20.8	371	550	37
18 AWG	**Overall Shield**								**AP 63040**
2	.025	.64	.045	1.14	.31	7.9	57	85	2
3	.025	.64	.045	1.14	.33	8.4	63	93	3
4	.025	.64	.045	1.14	.35	8.9	73	108	4
5	.025	.64	.045	1.14	.38	9.7	86	127	5
7	.025	.64	.045	1.14	.41	10.4	105	156	7
9	.025	.64	.045	1.14	.47	11.9	130	193	9
12	.025	.64	.045	1.14	.53	13.5	160	237	12
15	.025	.64	.060	1.52	.58	14.7	203	301	15
19	.025	.64	.060	1.52	.64	16.3	246	364	19
37	.025	.64	.080	2.03	.88	22.4	458	679	37
16 AWG	**Overall Shield**								**AP 63040**
2	.025	.64	.045	1.14	.34	8.6	71	106	2
3	.025	.64	.045	1.14	.35	8.9	78	116	3
4	.025	.64	.045	1.14	.38	9.7	92	136	4
5	.025	.64	.045	1.14	.41	10.4	106	157	5
7	.025	.64	.045	1.14	.48	12.2	135	200	7
9	.025	.64	.045	1.14	.52	13.2	169	250	9
12	.025	.64	.060	1.52	.61	15.5	226	335	12
15	.025	.64	.060	1.52	.64	16.3	266	394	15
19	.025	.64	.060	1.52	.70	17.8	313	464	19
37	.025	.64	.080	2.03	.96	24.4	610	904	37

Standard lengths, multiples of 500 feet, are subject to a tolerance of plus or minus 10%.

Specified cut lengths are subject to a tolerance of plus 10% minus 0%.

Dimensions and weights shown are nominal, subject to standard industry tolerances.

FIGURE I-13

F. SEMICON REMOVAL

SPECIAL INFORMATION FOR THE SPLICER

READ AND FOLLOW THESE INSTRUCTIONS WHEN SPLICING OR TERMINATING MEDIUM VOLTAGE CABLES.

To provide medium voltage cables with the highest electrical integrity and reliability they are provided with an electrically conducting stress relieving covering (semicon) over the insualtion surface.

TAPE SHIELD – UNIBLEND™ – If the cable has copper-tape shields, between these tapes and the insulation surface will be a layer of electrically conducting rubber-like material and/or an electrically conducting paint.

WIRE SHIELD – UNISHIELD™ – URD – If the cable shield consists of longitudinally applied wires embedded in the cable jacket, that jacket is electrically conducting. If the cable shield consists of wires wrapped around a cable jacket, that jacket is electrically conducting. These conducting jackets adhere tightly to the cable insulation.

It is essential that all traces of conducting jackets and conducting paint be removed from the surface of the insulation whenever the cable shielding system is cut back in preparation for splicing and termination.

CABLE CLEANING

Insulation without conducting layer is lighter in color, its surface resistance is higher. Remember that synthetic rubber (EPR) has carbon black as a constituent, so it will always discolor a solvent-dampened cloth.

Follow the solvent manufacturer's handling precautions. Use minimum solvents and buffing on the "creepage" area. The 1/2 inch of insulation adjoining the shield cut-off need not be perfectly clean, since this area is reshielded during the splice or termination installation.

After the shield has been cut back the prescribed distance:

1. Loosen the conducting layer with a solvent-dampened nylon scratch pad backed with a cloth. Wipe with another clean cloth several times.
2. Buff circumferentially with a 240 grit aluminum-oxide coated abrasive cloth.
3. Wipe with a clean, lint-free cloth dampened with solvent and let dry.

FIGURE I-14

F. SEMICON REMOVAL (Cont'd)

CLEANING SOLVENTS FOR ELECTRICAL CABLES

Follow the solvent manufacturer's precautions and instructions!

Consult the current Occupational Safety and Health Standards for allowable concentrations, required ventilation, etc. (Especially §1910.93, §1910.94.)

The following solvents are frequently used to clean cables. Anaconda has tested these only with regard to their relative cleaning ability on Anaconda's Medium Voltage Insulations – EPR, XLP and PE.

Solvent	Evaporation	Cleaning
Low Toxicity and non-flammable		
Freon TF (1,1,2-trichloro-1,2,2 trifluoroethane)	Very Fast	Poor
Methylene chloride	Very fast	Fair
1,1,1-trichlorethane	Fast	Excellent
CRC-"Cable Clean"	Fast	Excellent
Dow-"Chlorothene Nu"	Fast	Good
3M-"Cable Preparation Kit"	Fast	Excellent
West – "Westsafe"	Fast	Good
More Hazardous		
Acetone	Fast	Good
Gasoline, white	Fast	Good
Petroleum Naptha	Slow	Good
Toulene	Slow	Good
Xylene	Slow	Good
Stoddard (mineral-spirits)	Very Slow	Fair
Lacquer thinner	Slow	Good
Tirpolene	Slow	Good
West – "Electrosolve"	Slow	Good

GENERAL COMMENTS

EXERCISE CAUTION WHEN USING SOLVENTS. PROVIDE ADEQUATE VENTILATION. AVOID BREATHING VAPORS. AVOID SKIN CONTACT. PROTECT EYES. DO NOT ALLOW SMOKING, OPEN FLAMES, OR HOT METAL IN AREA.

Regard all cleaning solvents as hazardous. Most are toxic or will decompose into toxic gases at high temperatures. Some are also flammable. Use minimum quantities. Do not permit solvents to contact insulation shielding components.

Data and recommendations are based on information currently available and believed to be reliable. The Anaconda Company makes no guarantee of results and assumes no obligation or liability whatsoever in connection with this information.

Terminals and Splices for Special Applications

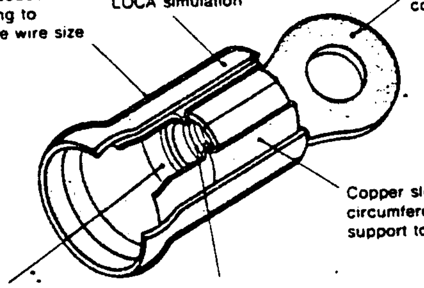
Radiation Resistant/150°C Pre-insulated Terminals and Splices

Features

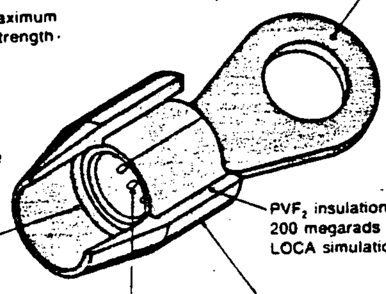
- Designed to meet the requirements of MIL-T-7928
- Insulation of Polvinylidene Fluoride (PVF_2) for high radiation resistance (to 200 megarads)
- Withstands 4 days steam/chemical spray washdown which simulates LOCA (loss of coolant accident) conditions
- Temperature Range −65°C to +150°C
- Uses standard PIDG & TERMINYL terminal tooling
- Color coded for easy wire and tool match
- Covers wide range of wire sizes—AWG 26-8
- Available in gold or tin plated versions for AWG 26-2 sizes
- Butt splice for wire sizes AWG 22-16

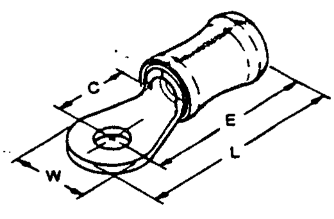
FIGURE I-15

PIDG Terminal Style



TERMINYL Terminal Style





PIDG Terminal Style

Materials:
Terminal Body—Copper per QQ-C-576; Pl is Gold (.00005" min.) per MIL-G-45204 Nickel (.00003" min.) per QQ-N-290 or per MIL-T-10727.
Insulation Support Sleeve—Copper per QQ-C-476; Plating is Tin per MIL-T-107
Insulation Sleeve—PVF_2, Natural Color

Wire Range 26-24

Wire Insulation Diameter
.082" Max.
Terminal Tongue Material Thickness:
.027" ±.002"
Stripe Color Code: Yellow
Tooling: 22-16
PIDG Tooling (Red Coding)

Stud Size	C Min.	W	E Max.	L Max.	Part T… Lo…
2	.211	.203	.632	.736	5
4	.211	.203	.632	.738	5
6	.243	.250	.664	.792	5
8	.250	.281	.671	.814	5

Wire Range 22-16

Wire Insulation Diameter:
.125" Max.
Terminal Tongue Material Thickness:
.031" ±.002"
Stripe Color Code: Red

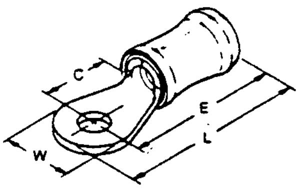
Stud Size	C Min.	W	E Max.	L Max.
6	.156	.218	.560	.672
6	.250	.250	.654	.782
8	.281	.312	.685	.844
10	.281	.312	.685	.844
5/16	.437	.469	.841	1.078
1/2	.530	.713	.934	1.293

★ Normally shipped within 7 days ARO.

Note:

Terminals and Splices for Special Applications

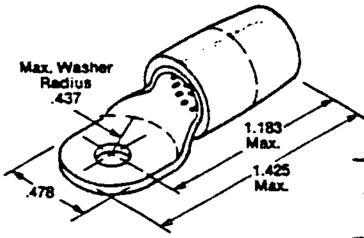
Radiation Resistant/150°C Pre-insulated Terminals and Splices (Cont'd.)



PIDG Terminal Style

Wire Range 16-14	Stud Size	C Min.	W	E Max.	L Max.	Part Numbers Tin Plate Tape Form	Part Numbers Tin Plate Loose Piece
Wire Insulation Diameter: .150" Max.	4	.171	.250	.575	.703		53414-1
Terminal Tongue Material Thickness: .031" ± .002"	6	.171	.250	.575	.703		53415-1 ★
Stripe Color Code: Blue	6	.281	.312	.685	.844	53417-2	53416-1
	8	.281	.312	.685	.844		53417-1
	10	.281	.312	.685	.844		53418-1 ★
	1/4	.437	.469	.841	1.078		53419-1
	5/16	.437	.469	.841	1.078		53420-1
	3/8	.546	.531	.950	1.218		53421-1

Wire Range 12-10	Stud Size	C Min.	W	E Max.	L Max.	Part Numbers Tin Plate Tape Form	Part Numbers Tin Plate Loose Piece
Wire Insulation Diameter: .230" Max.	6	.302	.375	.893	1.083		53423-1
Terminal Tongue Material Thickness: .040" ± .002"	8	.302	.375	.893	1.083	53424-2	53424-1 ★
Stripe Color Code: Yellow	10	.302	.375	.893	1.083		53425-1 ★
	1/4	.468	.531	1.054	1.322		53426-1 ★
	5/16	.468	.531	1.054	1.322		53427-1
	3/8	.531	.593	1.115	1.414		53428-1

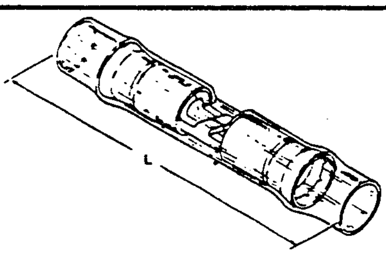


TERMINYL Terminal Style

Materials:
Terminal Body—Copper per QQ-C-576; Plating is Gold (.00005" min.) per MIL-G-45204 over Nickel (.00003" min.) per QQ-N-290 or Tin per MIL-T-10727.

Insulation Sleeve—PVF_2, Natural Color

Wire Size	Stripe Color Code	Wire Ins. Dia. Max.	Tongue Thickness	Stud Size	Loose Piece Part No. Tin
8	Red	.257	.040 ± .003	¼	53505-2



PIDG Butt Splice Style

Materials:
Splice Body—Copper per QQ-C-576; Plating is Tin per MIL-T-10727.

Insulation Support Sleeve—Copper per QQ-C-576; Plating is Tin per MIL-T-10727

Insulation Sleeve—PVF_2, Natural Color

Wire Range	Stripe Color Code	Wire Ins. Dia. Max.	L Max.	Part Number
22-16	Red	.125	1.265	53548-1

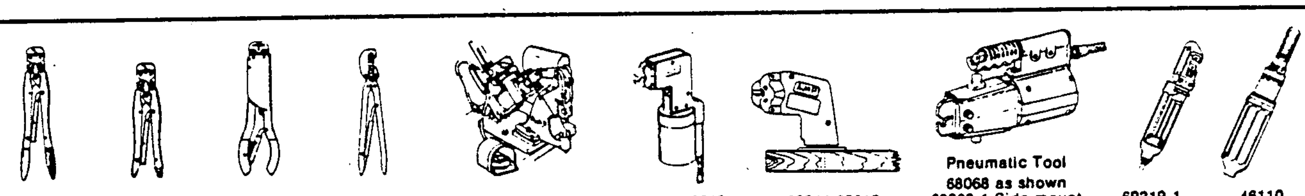
FIGURE I-16

Selection of Proper Tooling

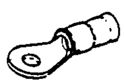
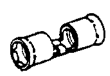
AMP application tools are designed to produce a carefully controlled, uniform pressure crimp whether manually or pneumatically powered. All tools feature matching dies that fully "bottom" at the completion of the crimp, thereby assuring proper crimp height. In the hand tools, this is accomplished by the AMP CERTI-CRIMP ratchet device located between the tool handles; bottoming is part of the automatic crimping cycle of pneumatic tools. To aid in matching tool to wire size, AMP has provided positive identification in the form of color-coded dots on the crimping dies and color-keyed, insulated handles. All the tools shown on these pages are specifically designed for AMP Products and are precision machined for AMP's exclusive one-crimp termination of terminals or splices.

★ Normally shipped within 7 days ARO.

Insulated and Un-insulated Terminal and Splice Tooling 30 to 10 AWG Wire Range



Long Handle Tool — Short Handle Tool — T-Head Tool — Heavy Head Tool — 69004 Pneumatic Tool — 69005 69010 Pneumatic Tool — 69011 69012 AMPLI-PRESS — Pneumatic Tool 68068 as shown 68068-1 Side mount handle 68068-3 can be bench mounted — foot pedal actuated — 69319-1 Pneumatic Tool — 48110 Pneumatic Tool

Description	AMP Wire Size	Hand Tools	"T" Head Tools	Dies for 69004	Heads for 69005	Heads for 69010
		LOOSE PIECE TOOLING				
PIDG Terminals and Splices 	30-26	69163• (crimps 26-22 PIDG terms. on 30-26 wire)				
	26-22	47304• ● 46121▲ 48518•	59275•	48438 (terms. only)	47469	
	24-20	47907-1▲ 47907•	59275• 59300▲		69957	
PLASTI-GRIP Terminals 	22-16	47386▲ 47386-2• 69151-1▲●	69961▲ 59300▲, 59170• 59250▲	47451	47516	46282
	16-14	47387▲ 47387-2• 69152-1▲●	69960▲ PIDG only 59170• 59250▲	47452	47517	46284
	12-10 16-14 H.D.	59239-4○ (.230 & .250 exp.) 59287-2○ (.275 & .300 exp.) 69150-1○● (.230 exp.)		47453		47518-1 48237 (lg. exp. for terms. only)
PLASTI-GRIP Splices & Flag Terminals  FIGURE I-17	26-22	46121▲ (butt splices only) 48518•				
	22-16	45160▲ (butt splices only) 45449▲ (parallel splice only)			45161 (butt splices) 45451 (parallel splices only)	
	16-14	45575-1▲ (butt splices only) 45450▲ (parallel splice only)			45162 (butt splices) 45452 (parallel splices only)	
	12-10	59489○ (butt splices only) 59287-1○ (lg. exp.) 59270○ (parallel splice only) 48049• (flag only) 68142-1▲ (.285-.320 flag only)		68057 (butt splices only)		45163-1 (butt splices only)
DIAMOND GRIP Terminals and Splices  	26-22	48070• 48070-1• ●			49999	
	22-16	49512▲ 49915• 47110▲ ● (terms. only) 49885-1▲ (flag only)			47640● 38084	48494
	16-14	49513▲ 49916•			38083	
	12-10	59054○ 59054-2○● 59173○ (lg exp.)				38675 38675-2●
SOLISTRAND Terminals and Splices  	26-22	69363▲				68159-1
	22-16	49935▲ 49936• (no ratchet) 49900•		49312	300869 300454	300583
	16-14	49935▲ 49936• (no ratchet) 49900.•		49313	300454 300856 69749 (para. only)	300583
	14-12	49592▲			38328	
	12-10	49935▲ 49936 (no ratchet) 49900•		49249	300454 38415	300583 38406 68157-1 (parallel splices only)
BUDGET Terminals 	22-16	49379▲ (no ratchet), 49834				
	16-14	49379▲ (no ratchet), 49834 49608▲				
	12-10	49656▲				

▲Long Handle ○Heavy Head ● Tight Insulation Support • Short Handle ■Terminals Only △Foot Pedal Operation only

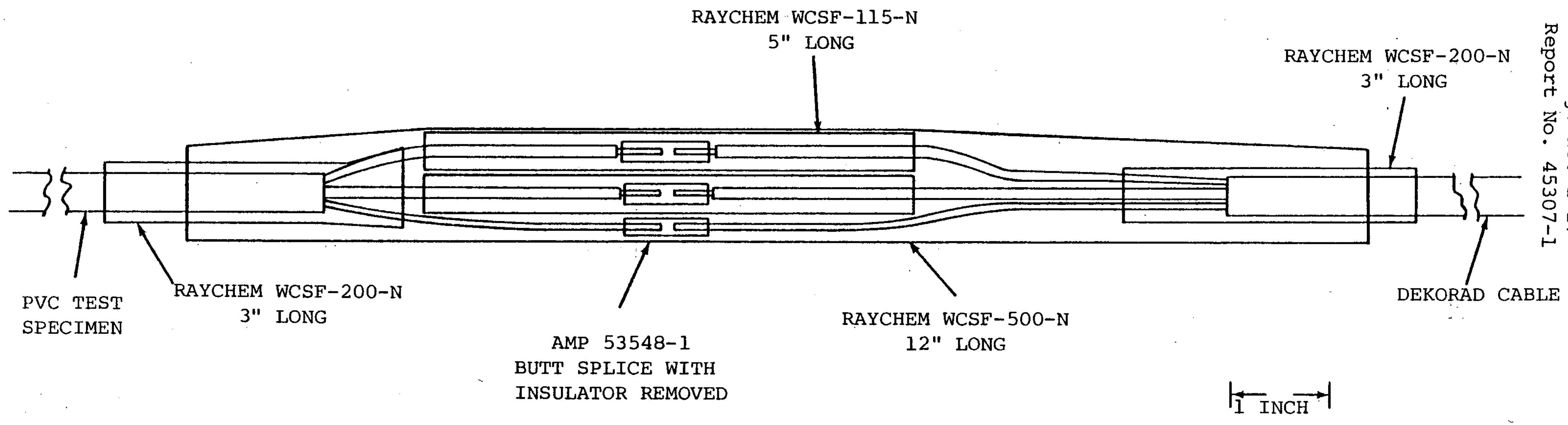


FIGURE I-18

SPLICE CONFIGURATION NO. 1
RAYCHEM SPLICE PROCEDURE

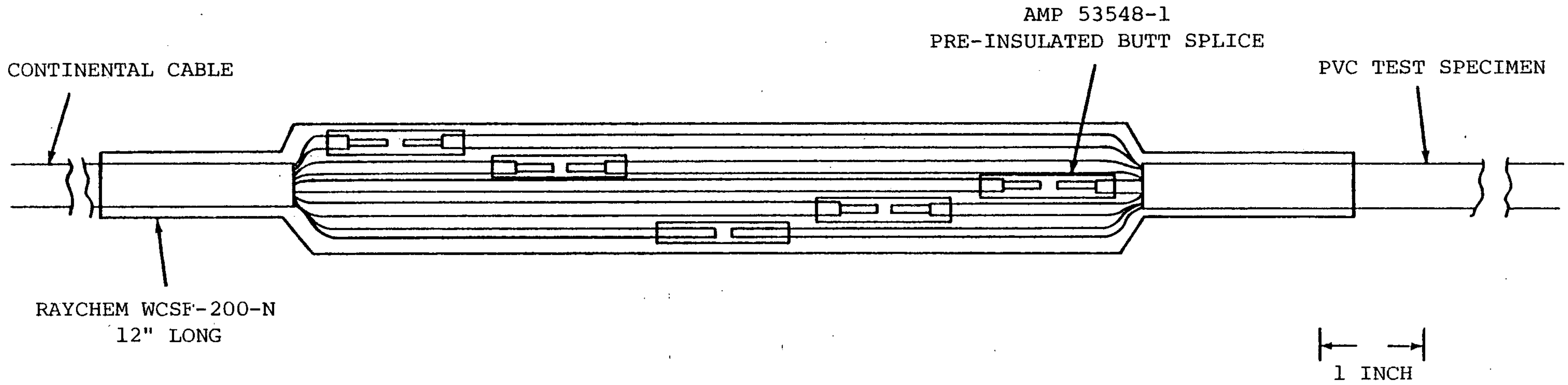


FIGURE I-19

SPLICE CONFIGURATION NO. 2
CP&L SPLICE PROCEDURE

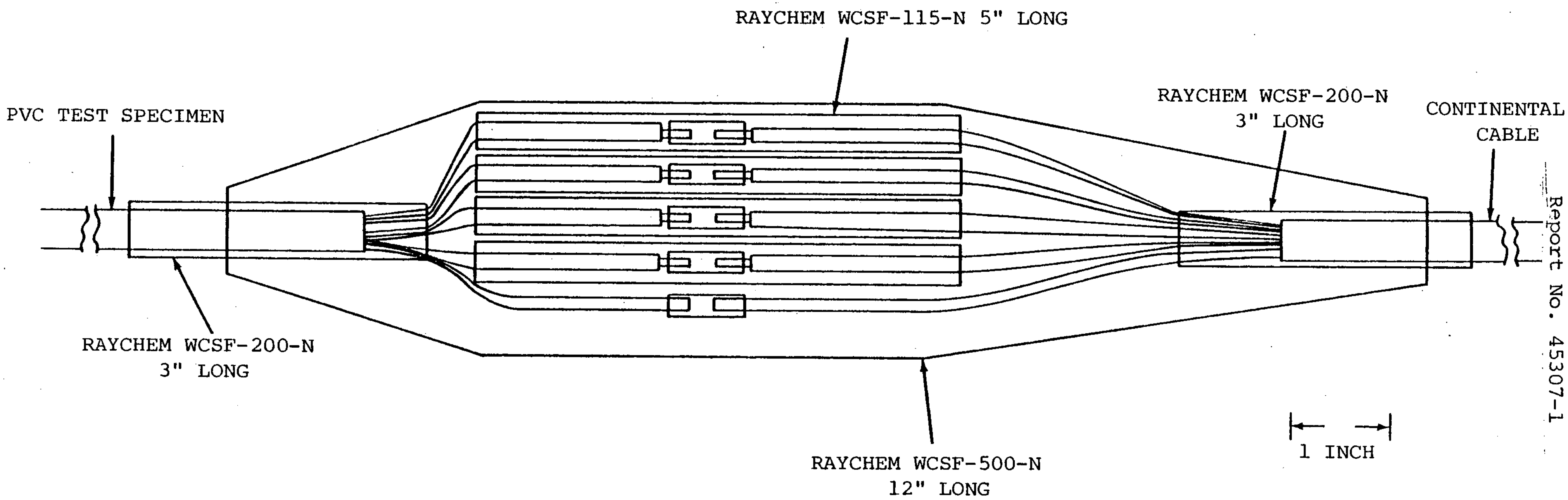


FIGURE I-20

SPLICE CONFIGURATION NO. 3
RAYCHEM SPLICE PROCEDURE

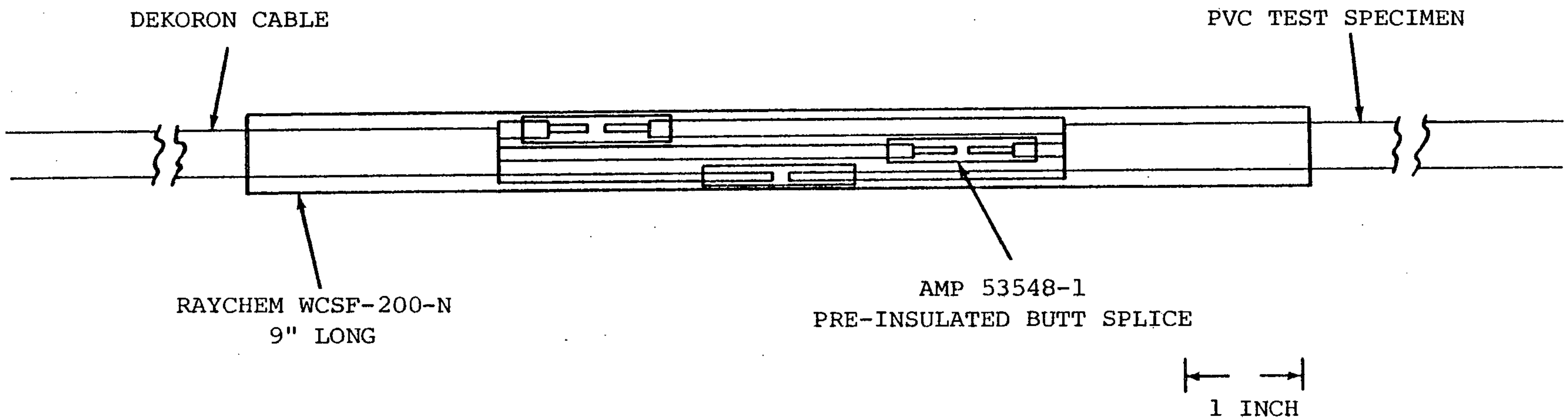


FIGURE I-21

SPLICE CONFIGURATION NO. 4
CP&L SPLICE PROCEDURE

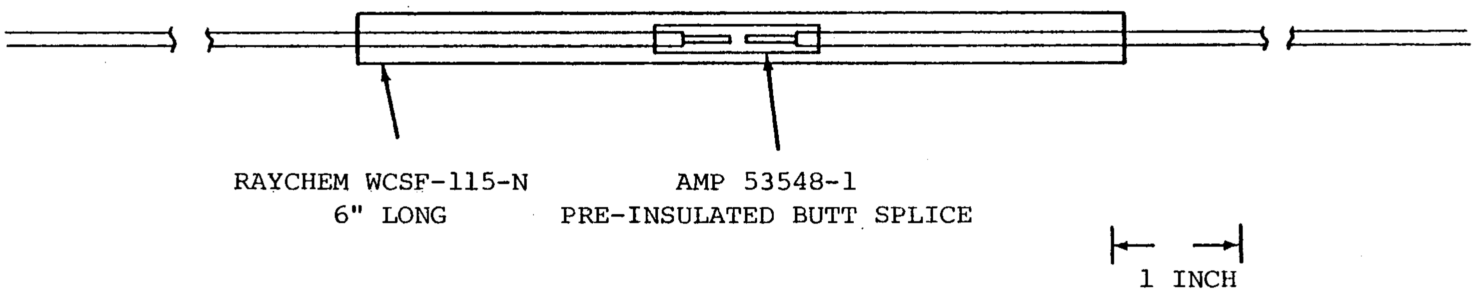


FIGURE I-22

SPLICE CONFIGURATION NO. 5
CP&L SPLICE PROCEDURE

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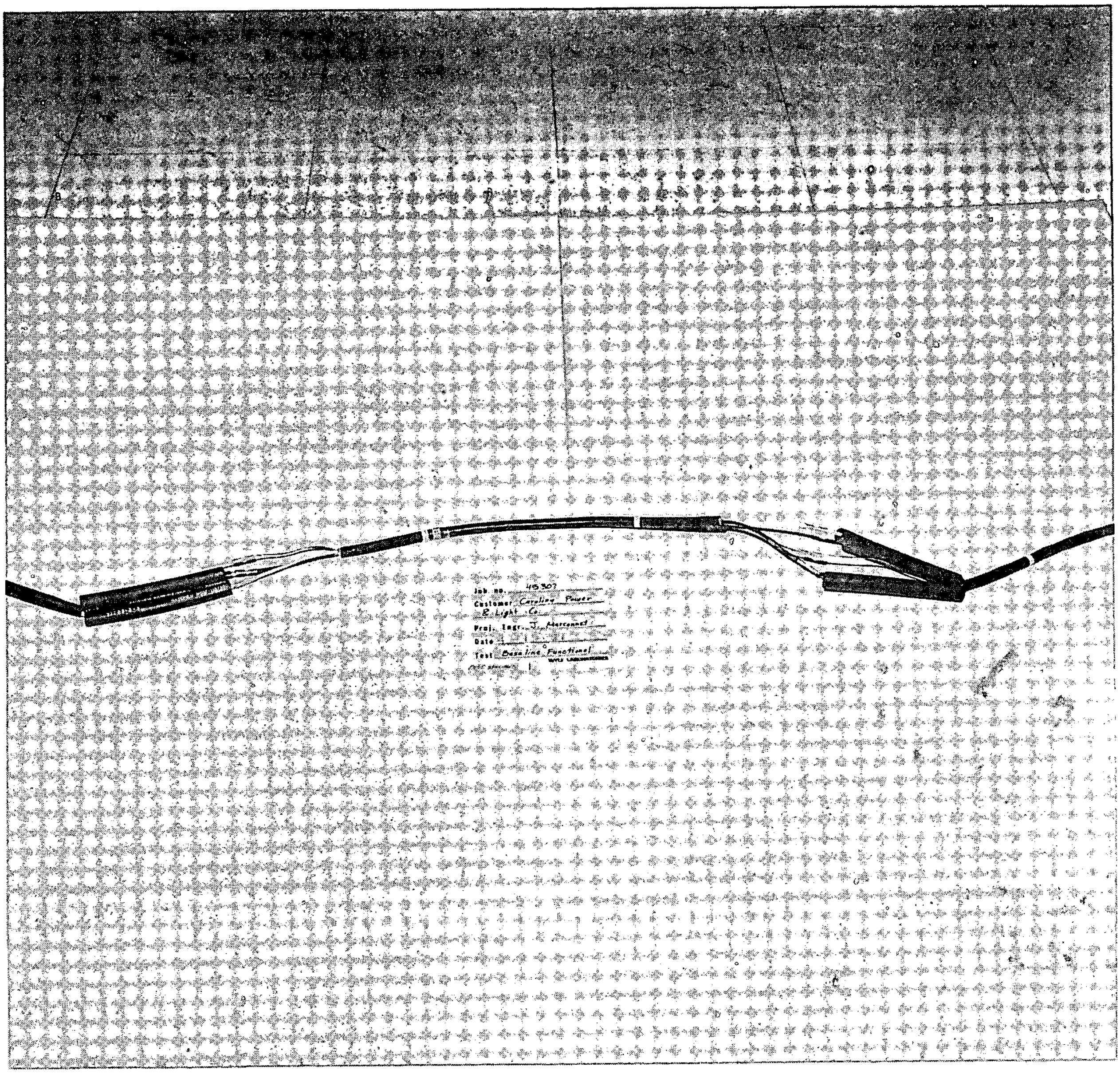
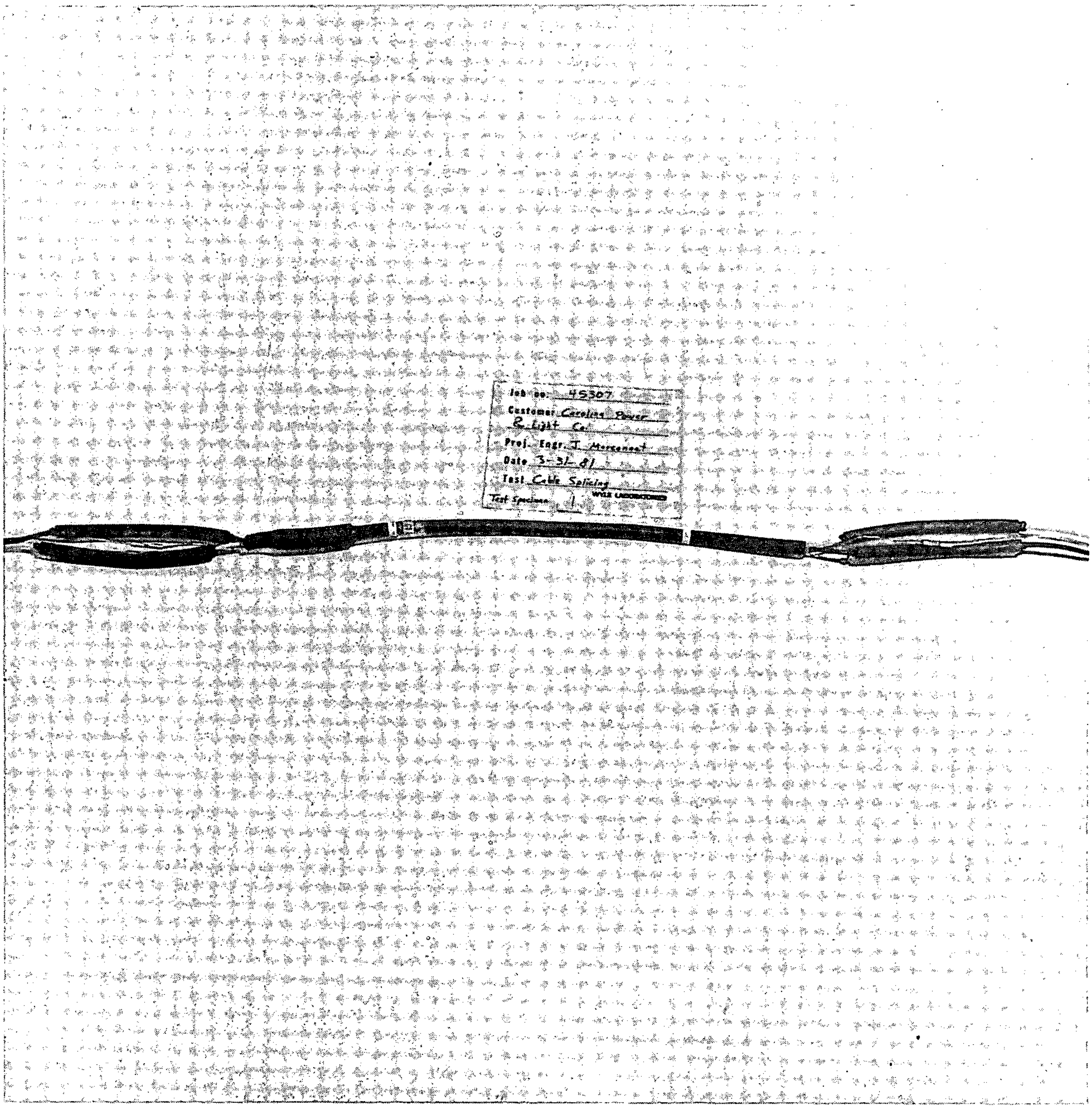
APPENDIX II

PHOTOGRAPHS



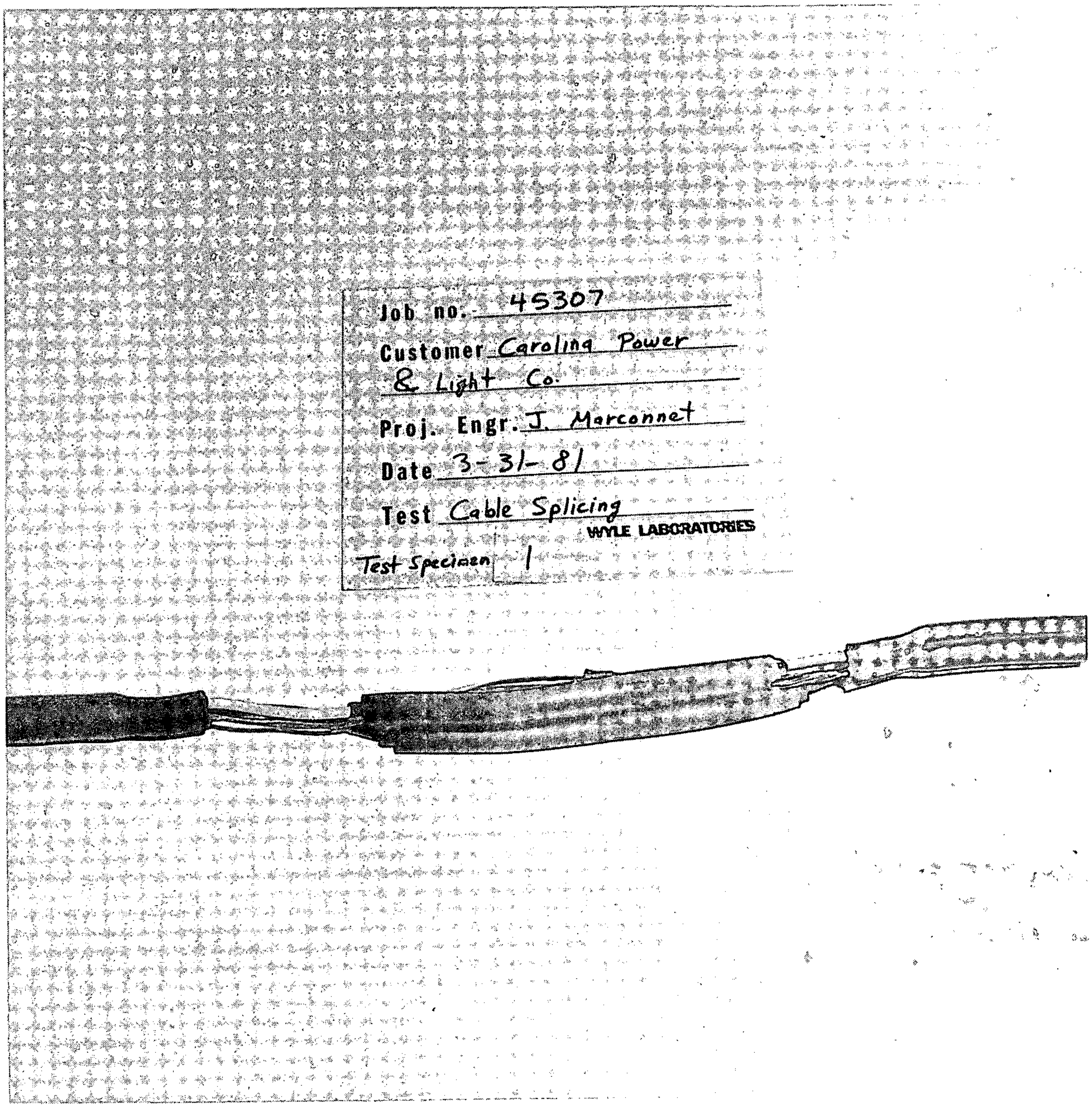
PHOTOGRAPH I-1

TEST SPECIMEN NO. 1 AFTER STEP NO. 17
OF THE CABLE SPLICE CHECKLIST



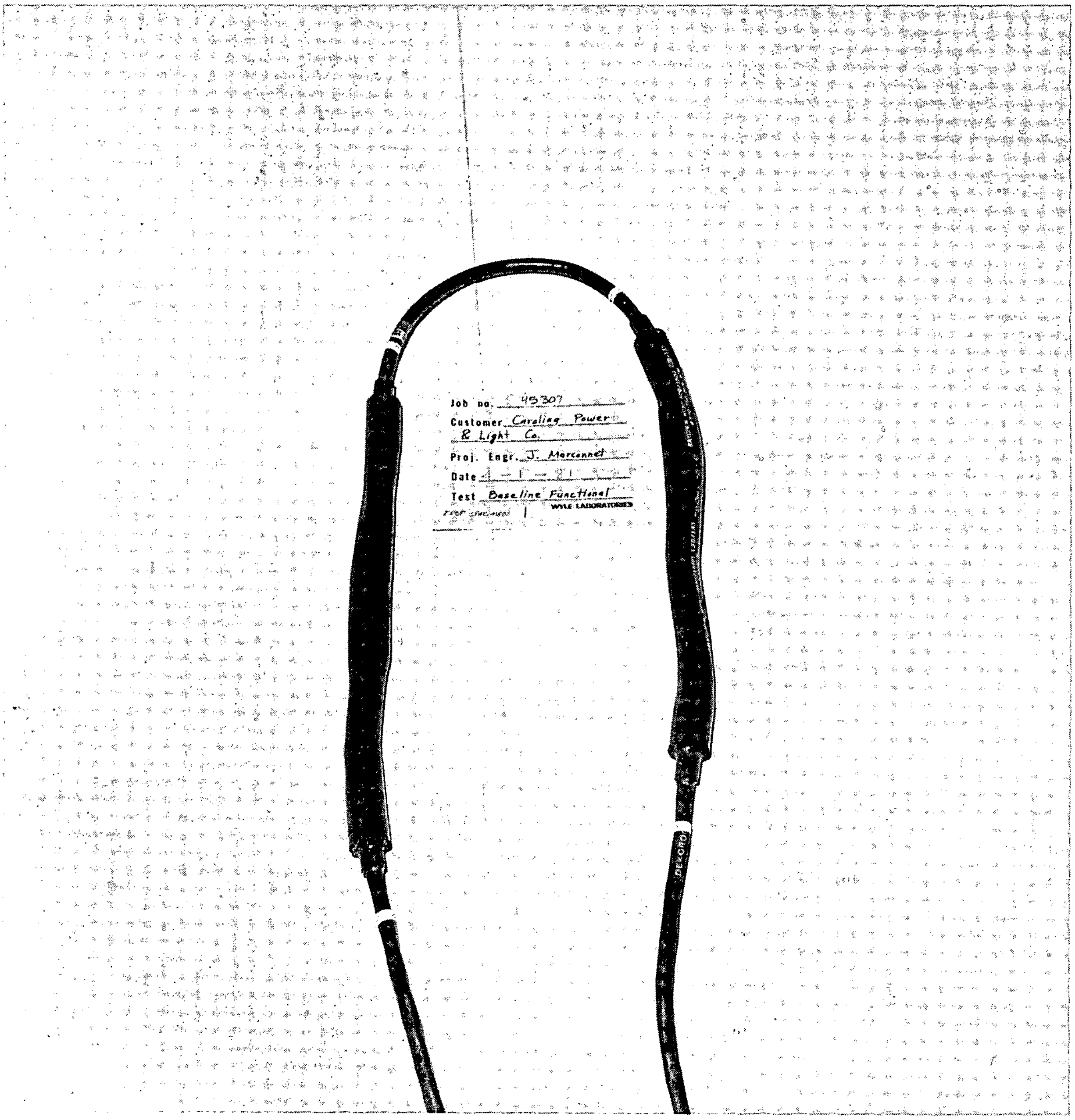
PHOTOGRAPH I-2

TEST SPECIMEN NO. (VIEW 1)
AFTER STEP NO. 21
OF THE CABLE SPLICE CHECKLIST



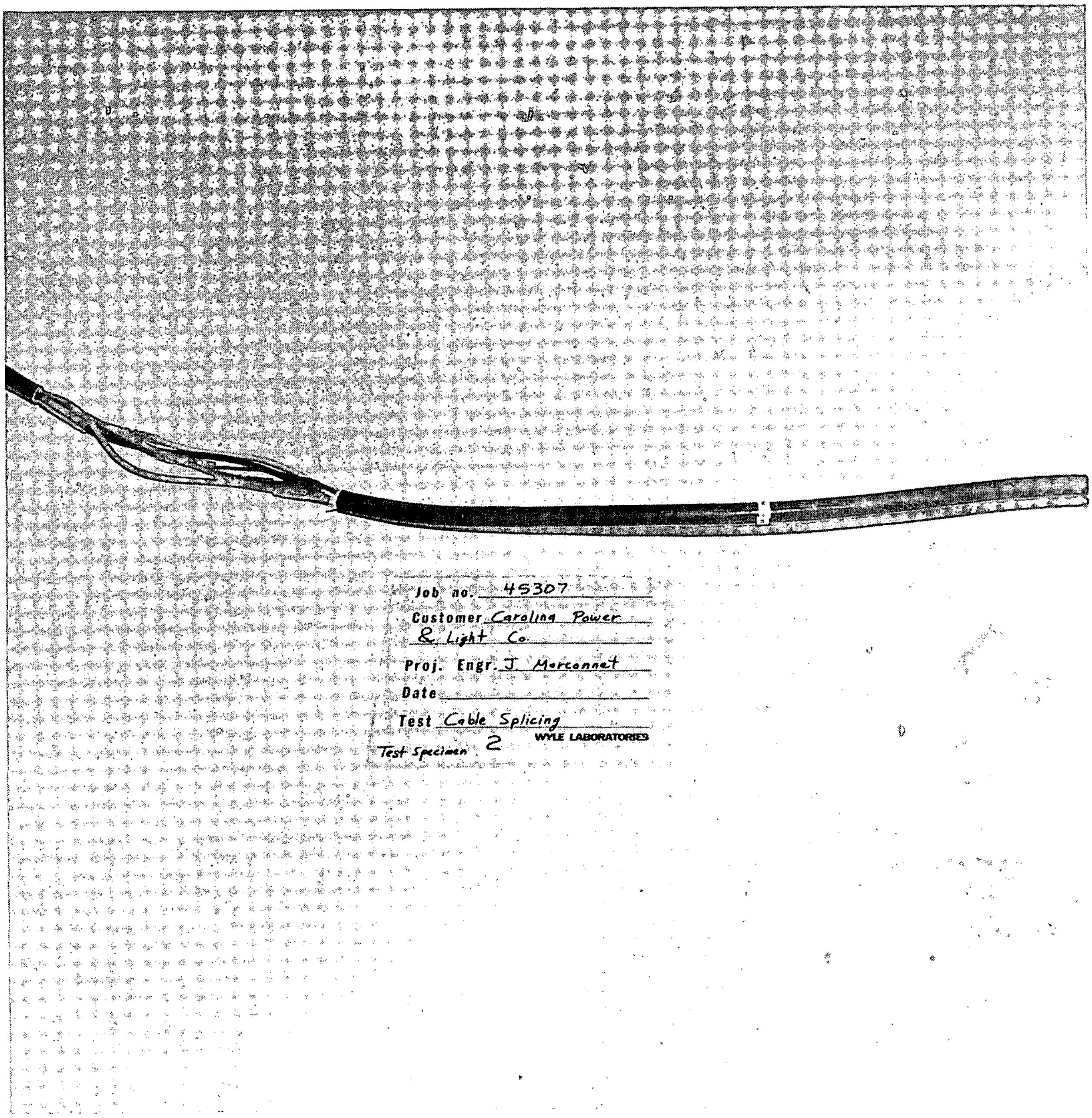
PHOTOGRAPH I-3

TEST SPECIMEN NO. 1 (VIEW 2)
AFTER STEP NO. 21
OF THE CABLE SPLICE CHECKLIST



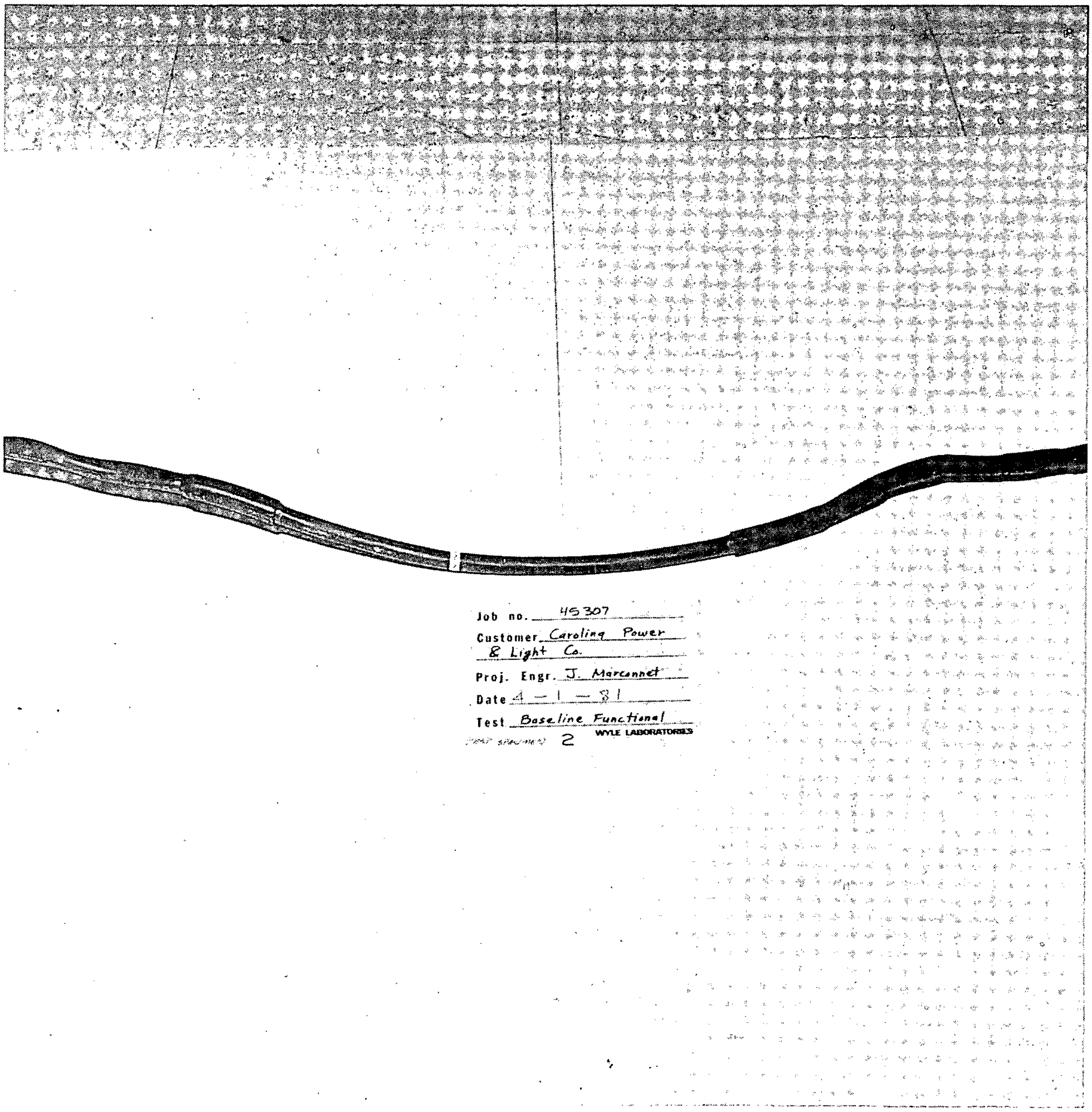
PHOTOGRAPH I-4

TEST SPECIMEN NO. 1-COMPLETED
CABLE SPLICE ASSEMBLY
(RAYCHEM SPLICE PROCEDURE)



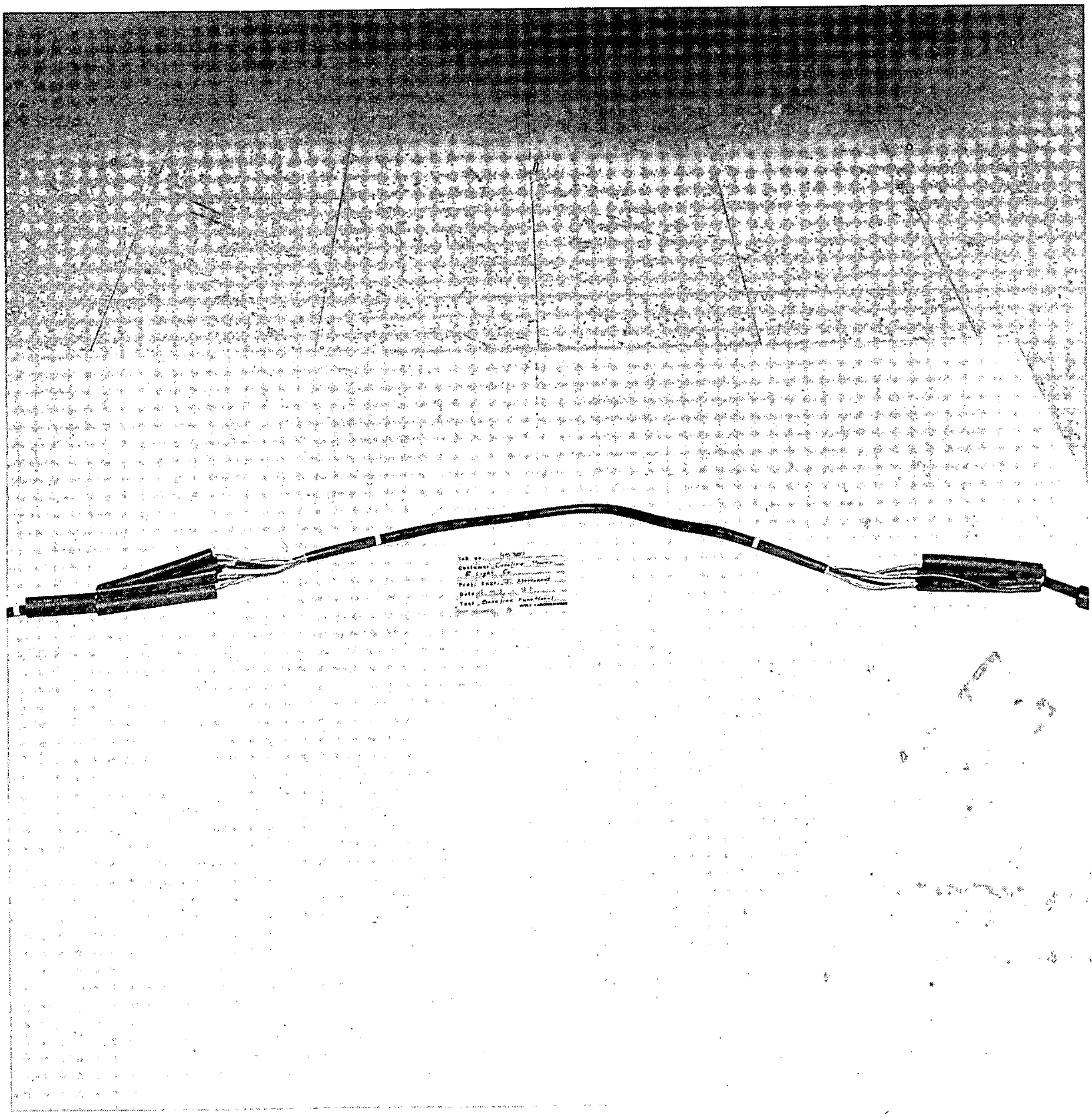
PHOTOGRAPH I-5

TEST SPECIMEN NO. 2 AFTER STEP NO. 9
OF THE CABLE SPLICE CHECKLIST



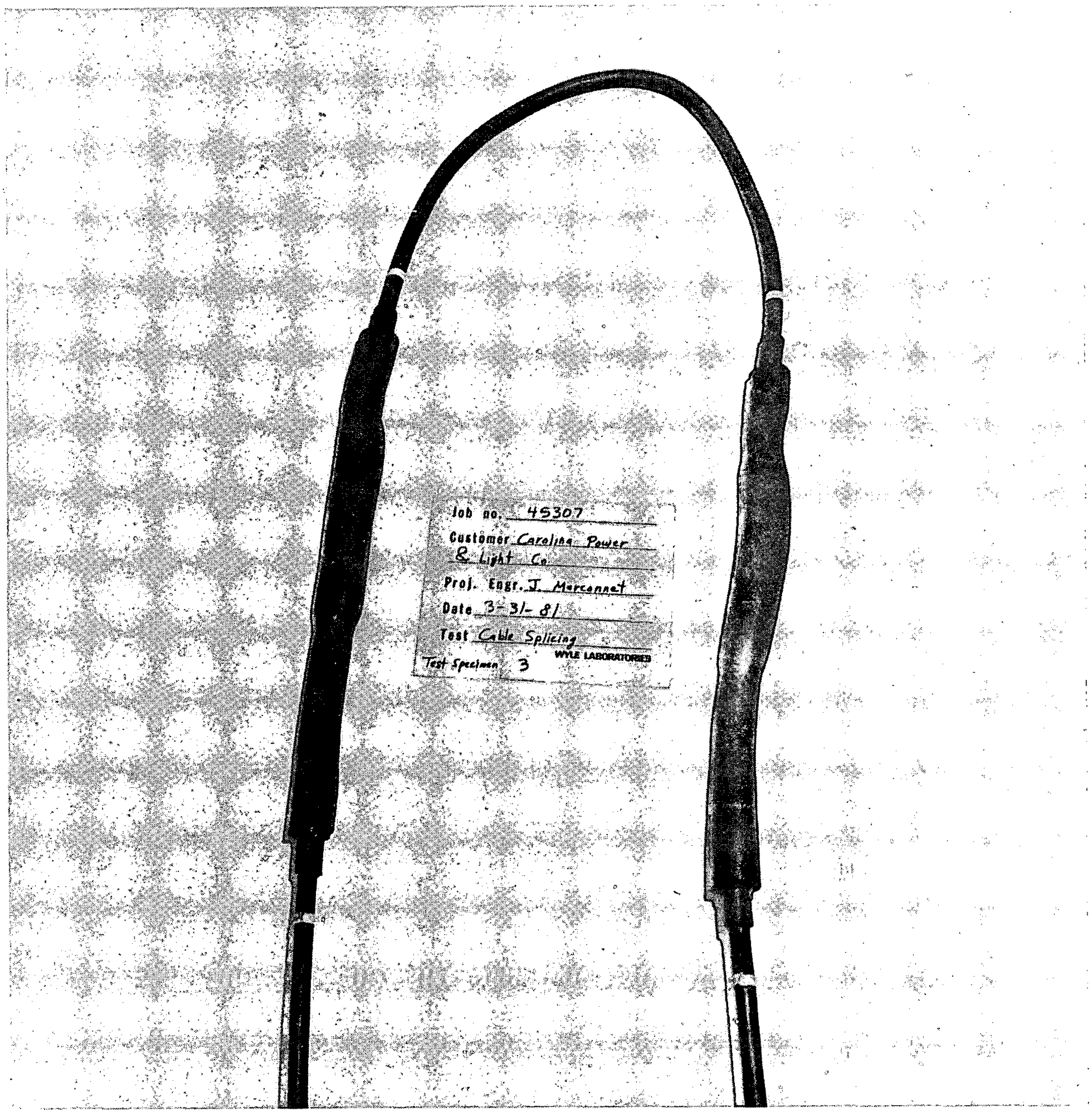
PHOTOGRAPH I-6

TEST SPECIMEN NO. 2-COMPLETED
CABLE SPLICE ASSEMBLY
(CP&L SPLICE PROCEDURE)



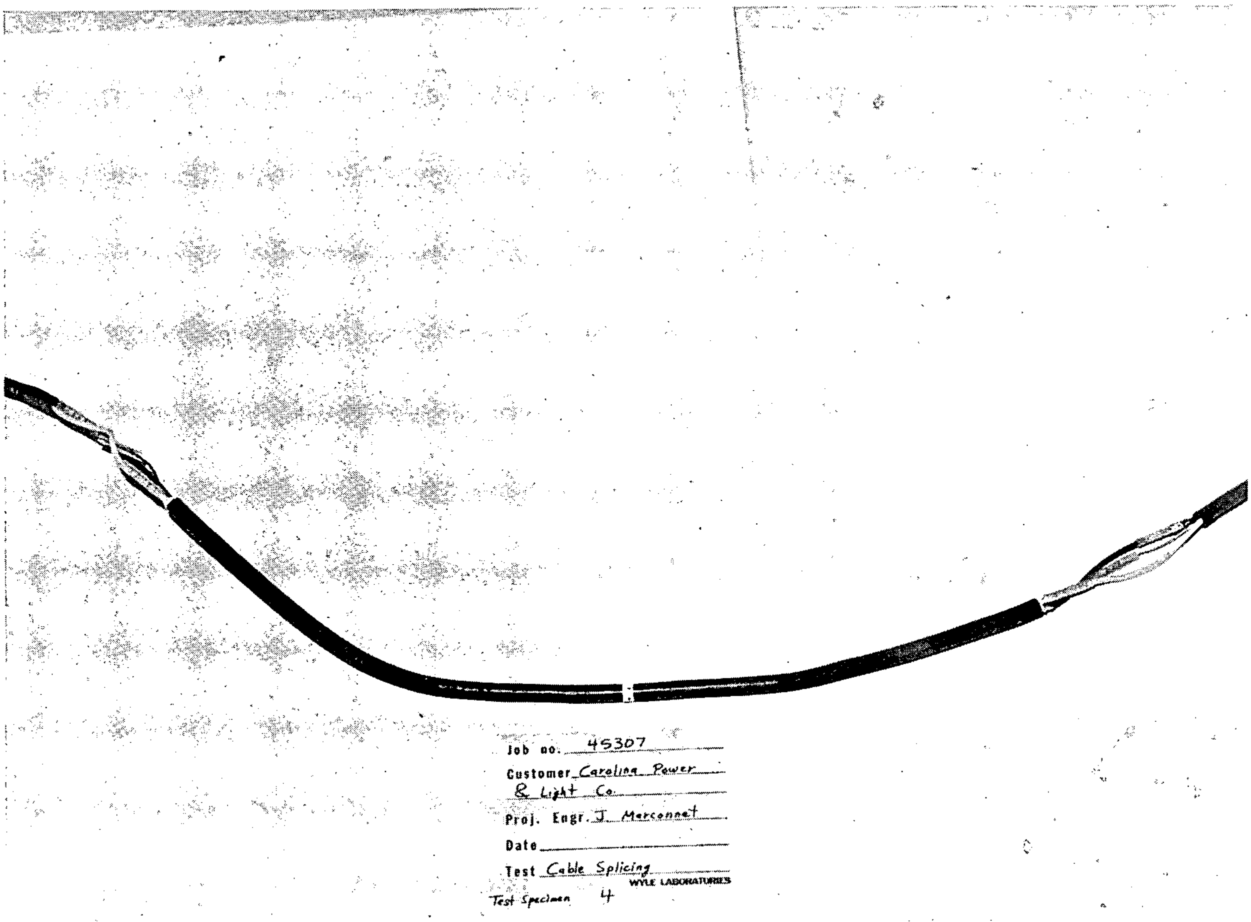
PHOTOGRAPH I-7

TEST SPECIMEN NO. 3 AFTER STEP NO. 17
OF THE CABLE SPLICE CHECKLIST



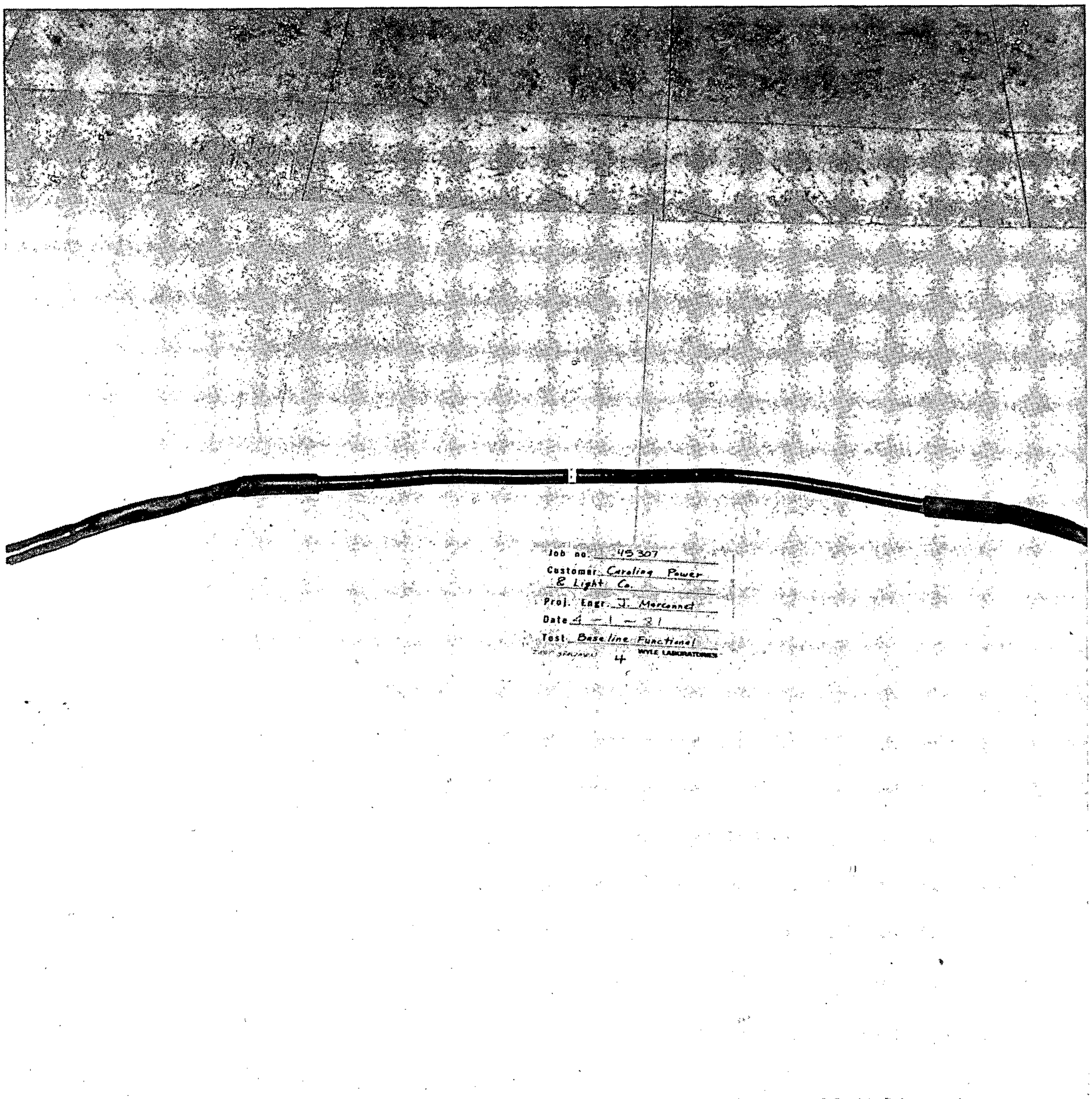
PHOTOGRAPH I-8

TEST SPECIMEN NO. 3-COMPLETED
CABLE SPLICE ASSEMBLY
(RAYCHEM SPLICE PROCEDURE)



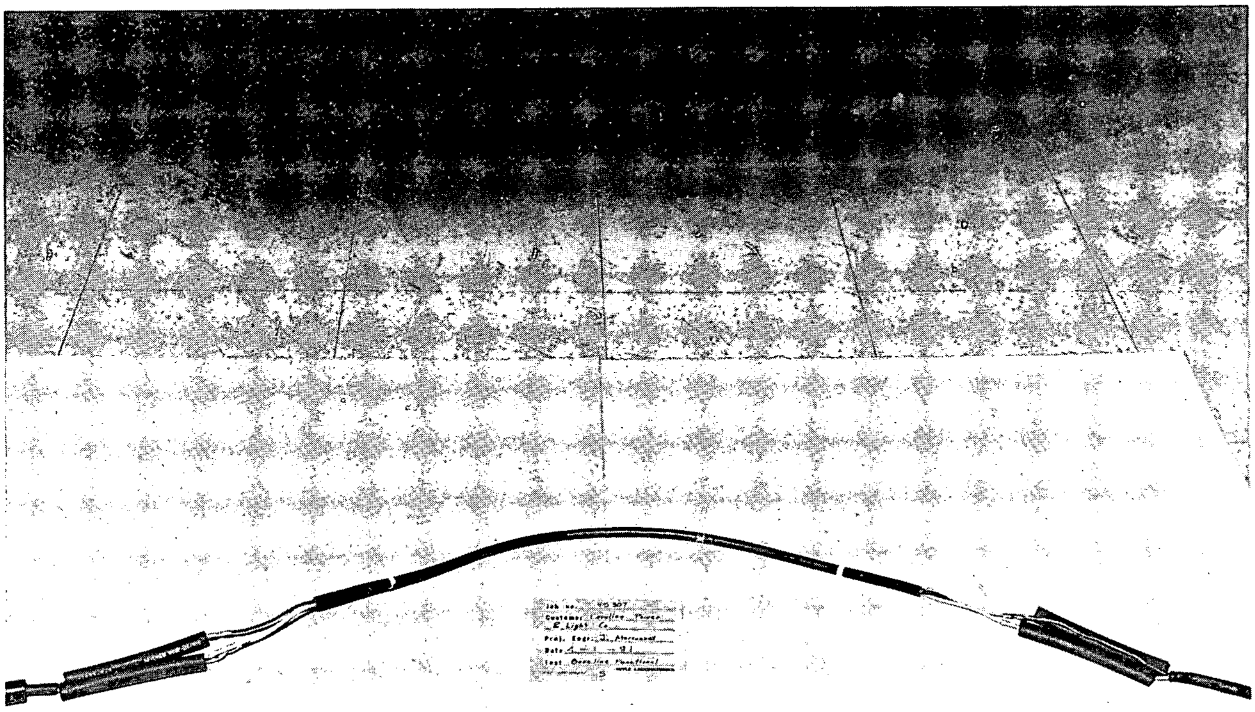
PHOTOGRAPH I-9

TEST SPECIMEN NO. 4 AFTER STEP NO. 8
OF THE CABLE SPLICE CHECKLIST



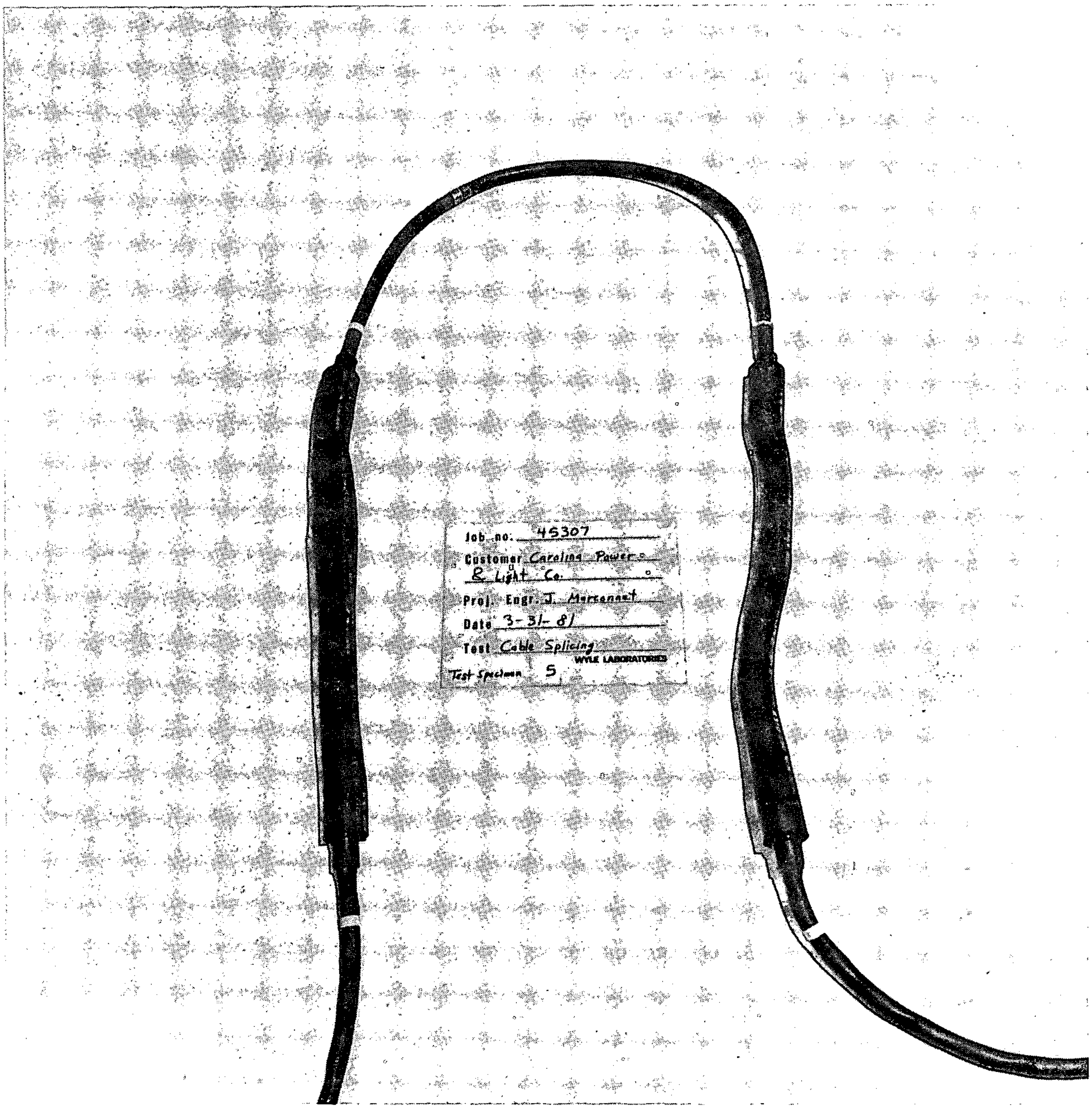
PHOTOGRAPH I-10

TEST SPECIMEN NO. 4-COMPLETED
CABLE SPLICE ASSEMBLY
(CP&L SPLICE PROCEDURE)



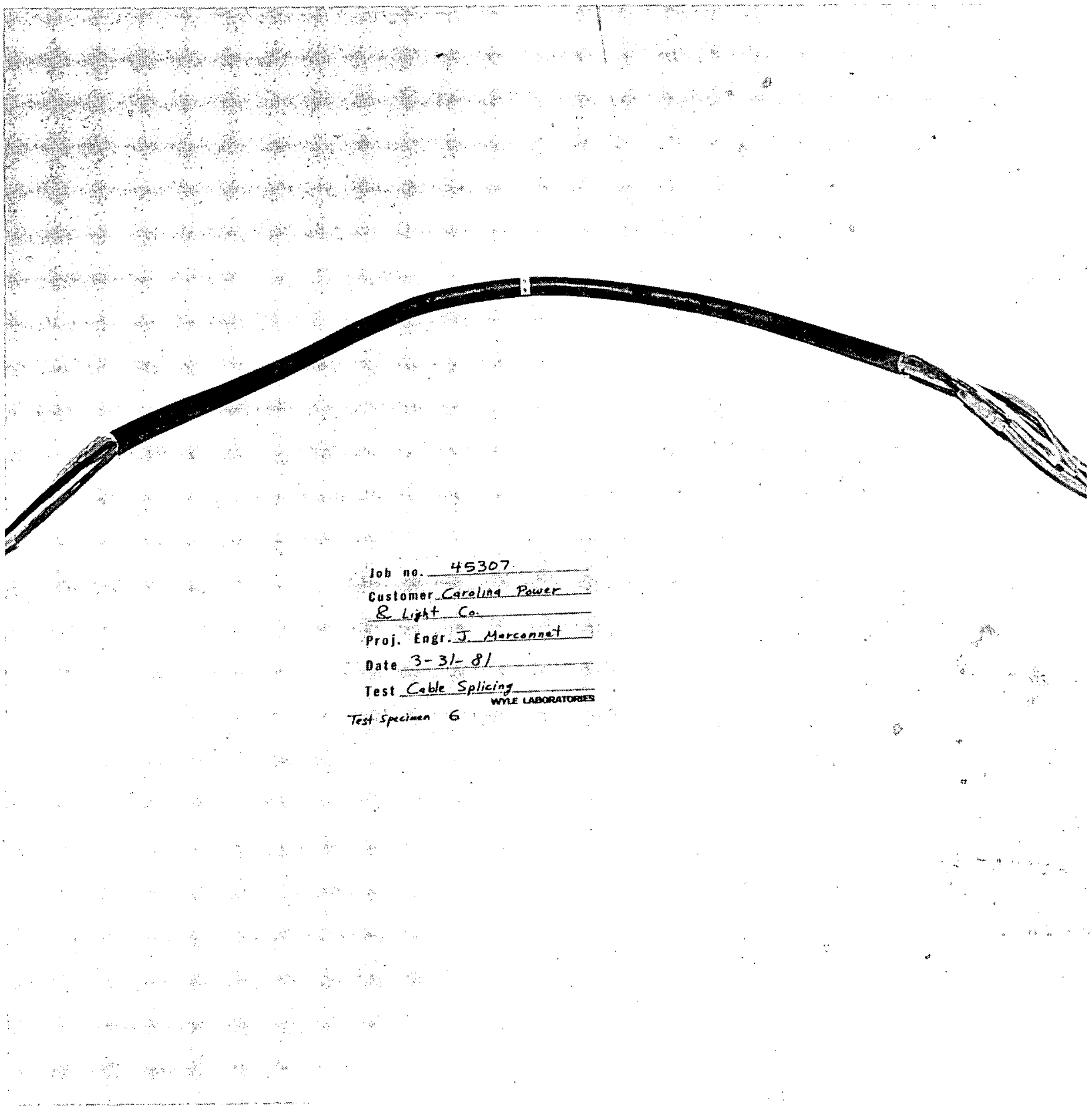
PHOTOGRAPH I-11

TEST SPECIMEN NO. 5 AFTER STEP NO. 17
OF THE CABLE SPLICE CHECKLIST



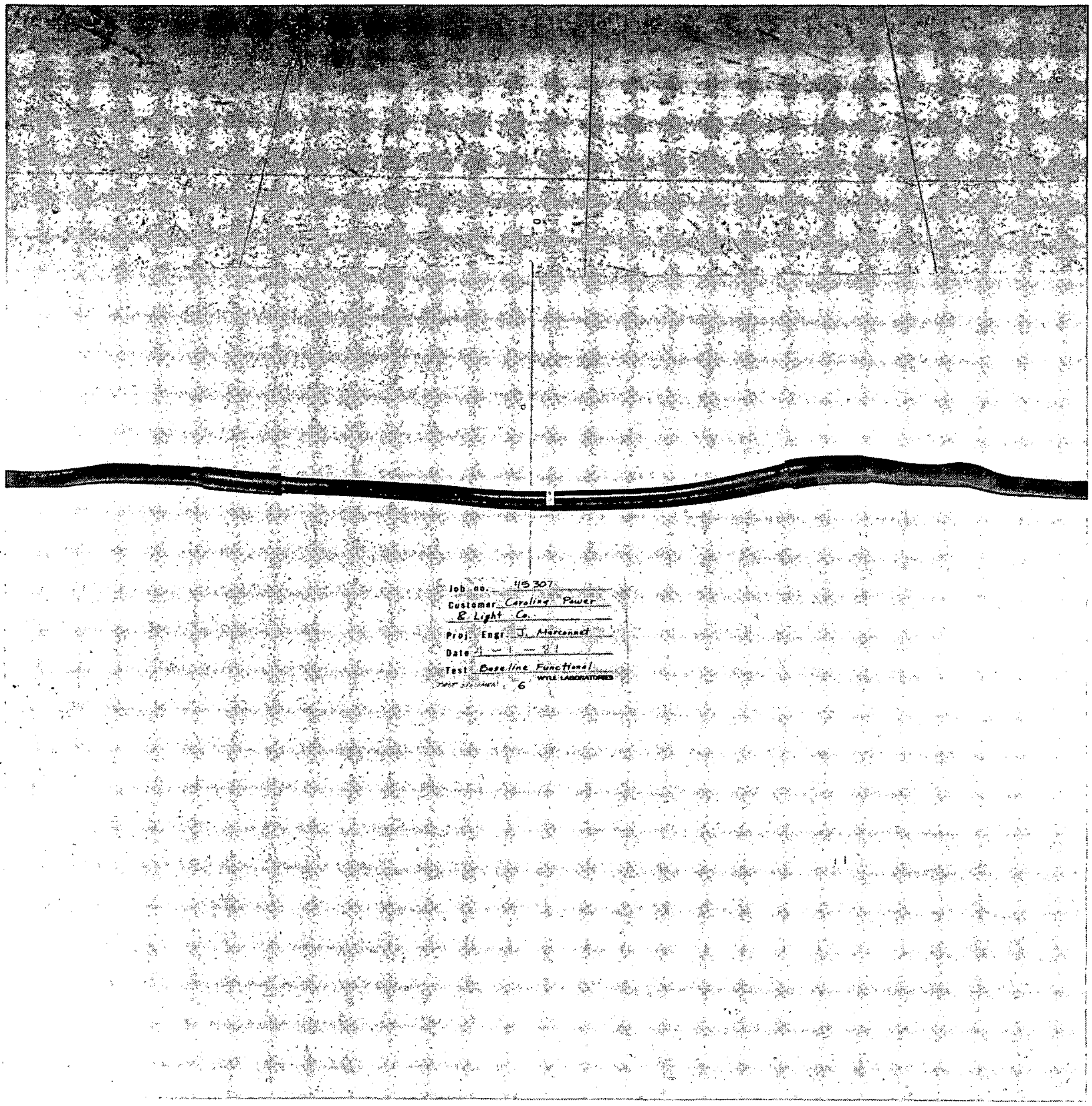
PHOTOGRAPH I-12

TEST SPECIMEN NO. 5-COMPLETED
CABLE SPLICE ASSEMBLY
(RAYCHEM SPLICE PROCEDURE)



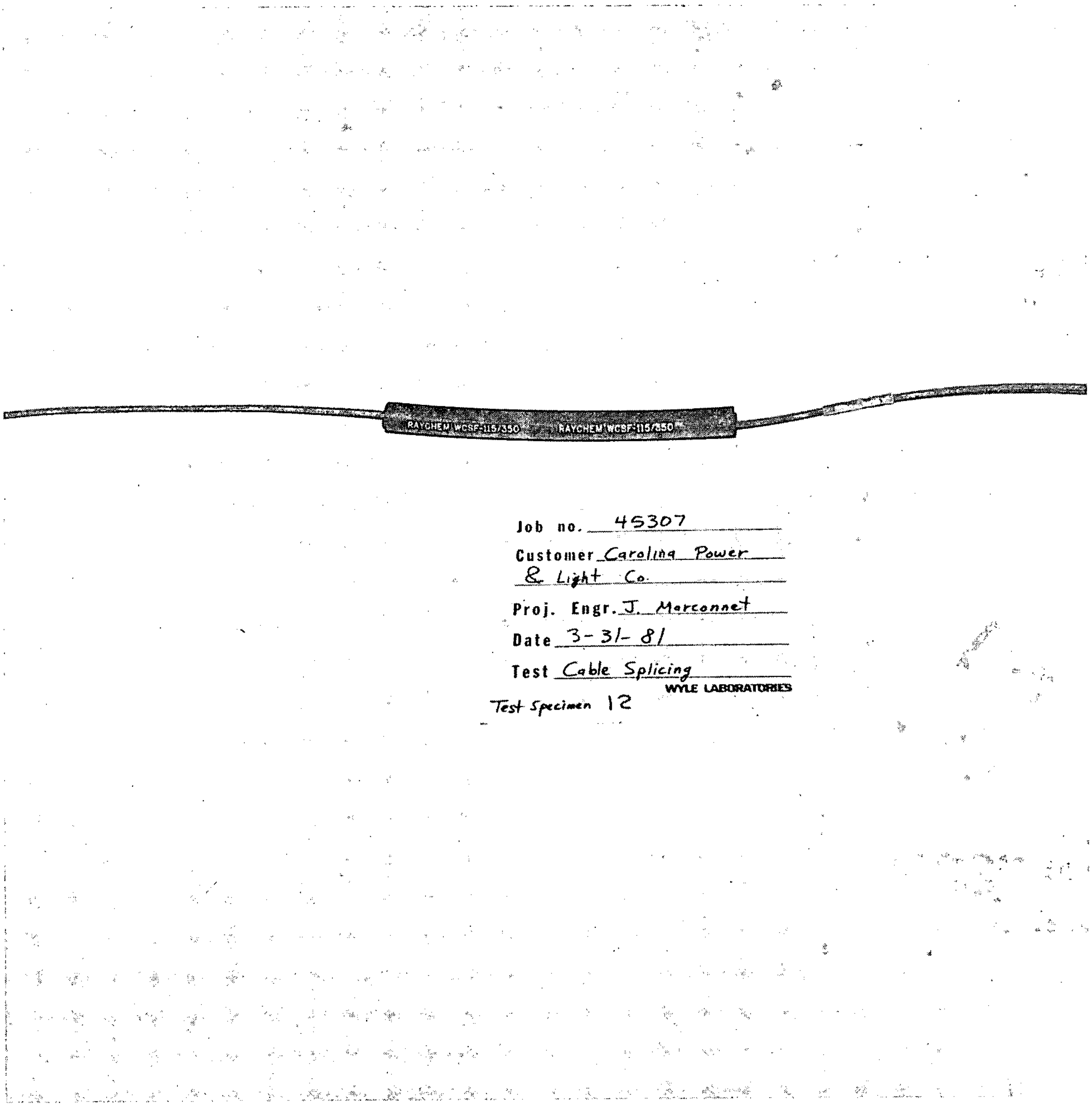
PHOTOGRAPH I-13

TEST SPECIMEN NO. 6 AFTER STEP NO. 8
OF THE CABLE SPLICE CHECKLIST



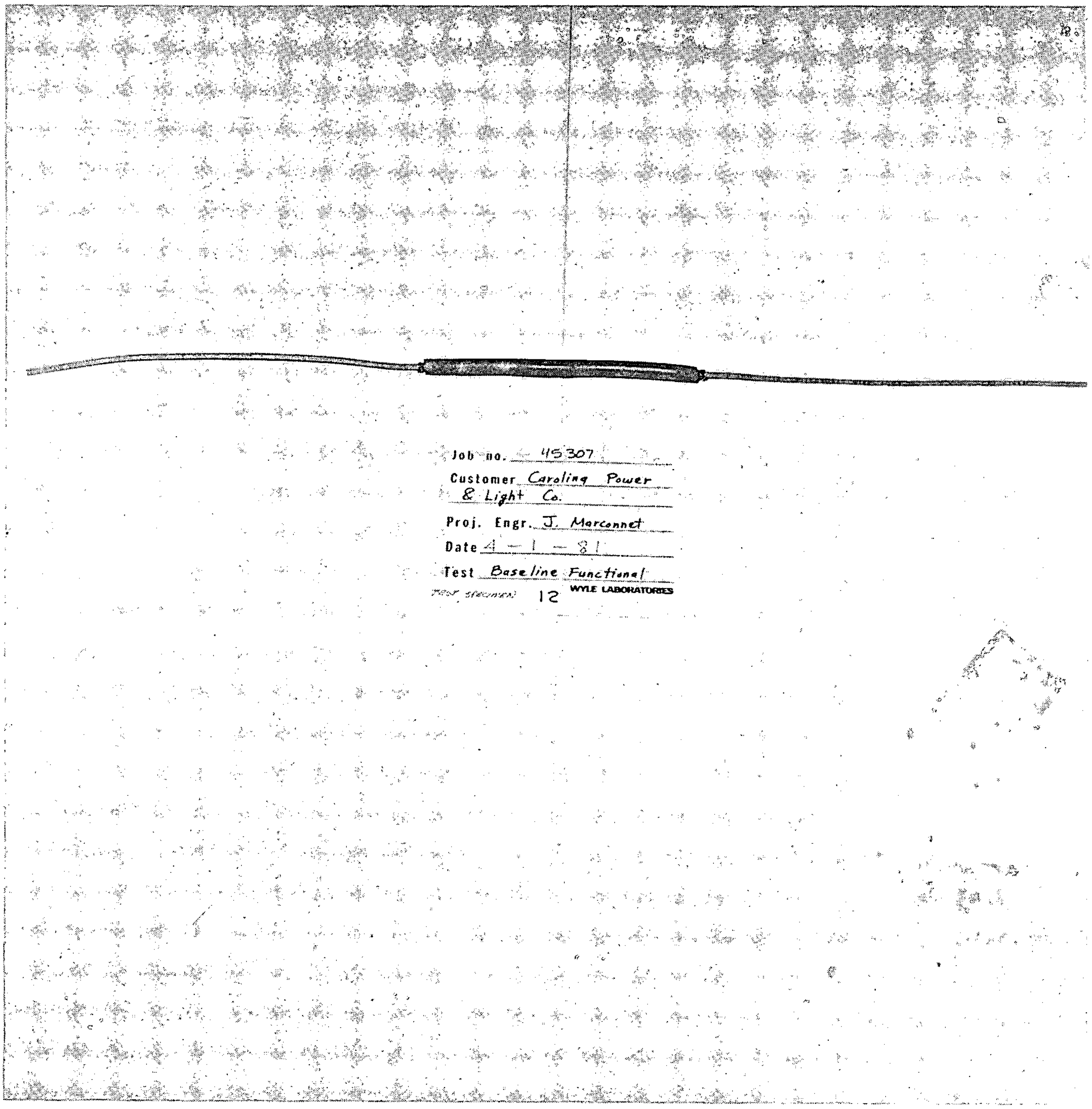
PHOTOGRAPH I-14

TEST SPECIMEN NO. 6-COMPLETED
CABLE SPLICE ASSEMBLY
(CP&L SPLICE PROCEDURE)



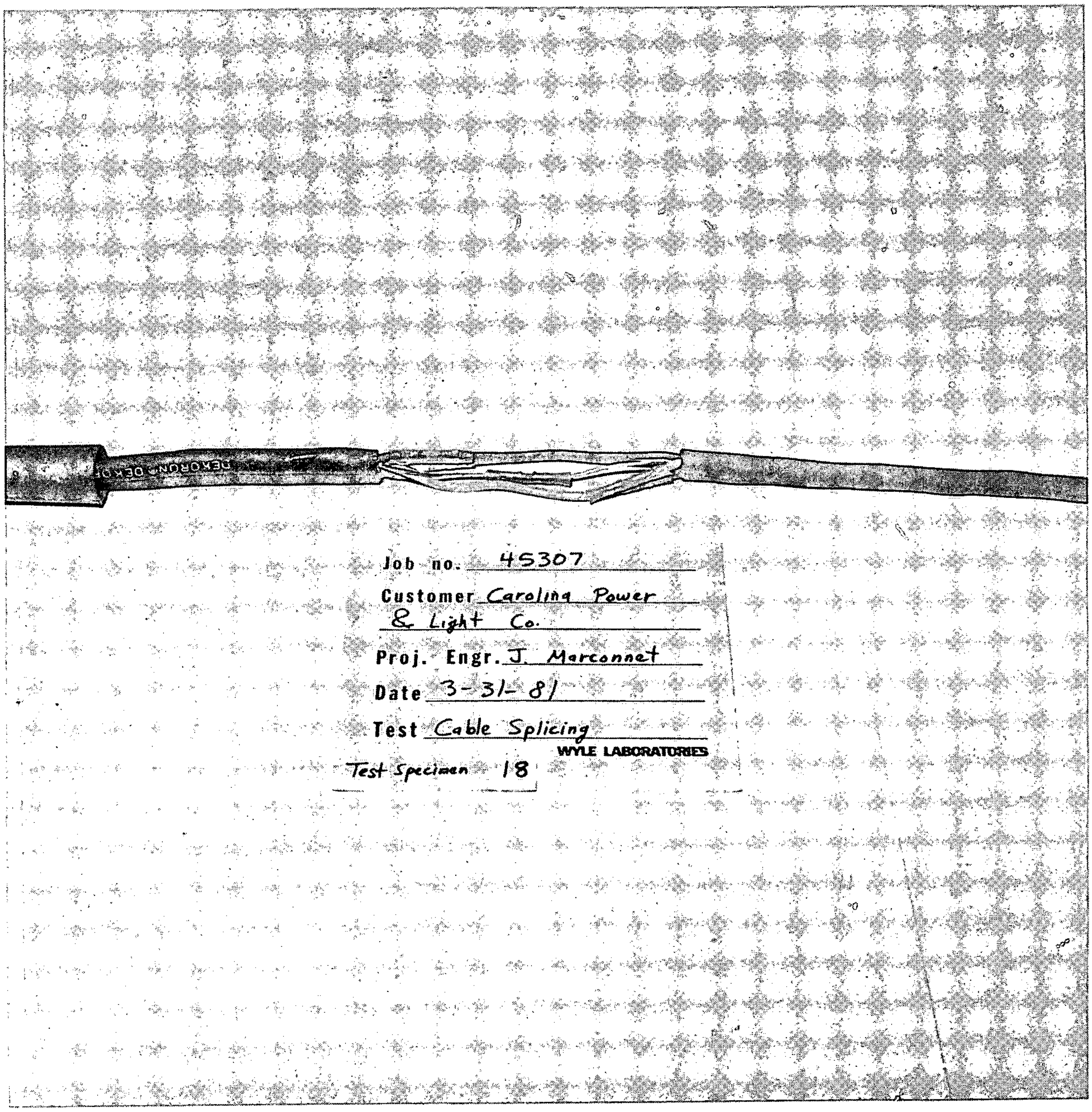
PHOTOGRAPH I-15

TEST SPECIMEN NO. 12 AFTER STEP NO. 9
OF THE CABLE SPLICE CHECKLIST



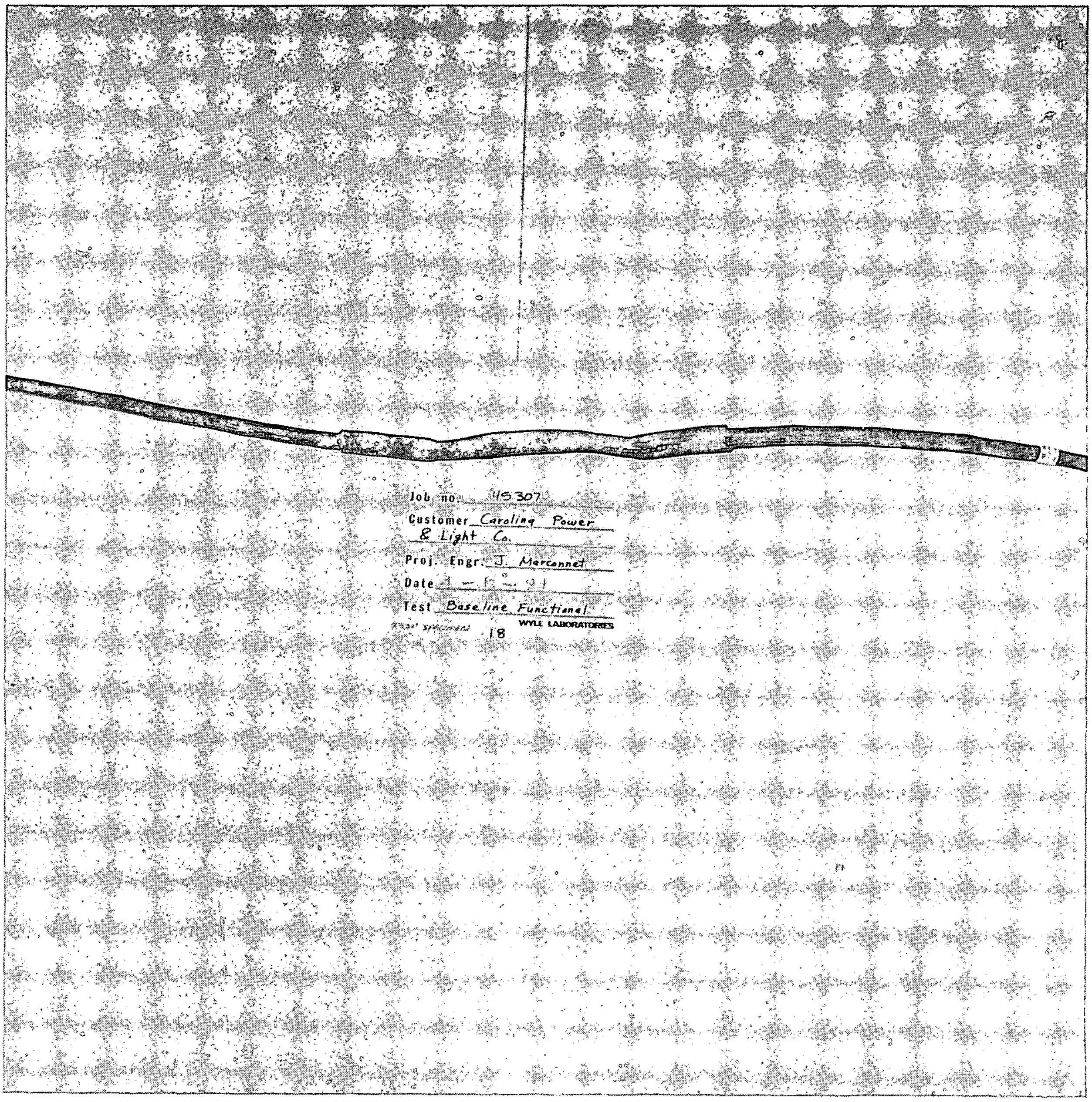
PHOTOGRAPH I-16

TEST SPECIMEN NO. 12-COMPLETED
CABLE SPLICE ASSEMBLY
(CP&L SPLICE PROCEDURE)



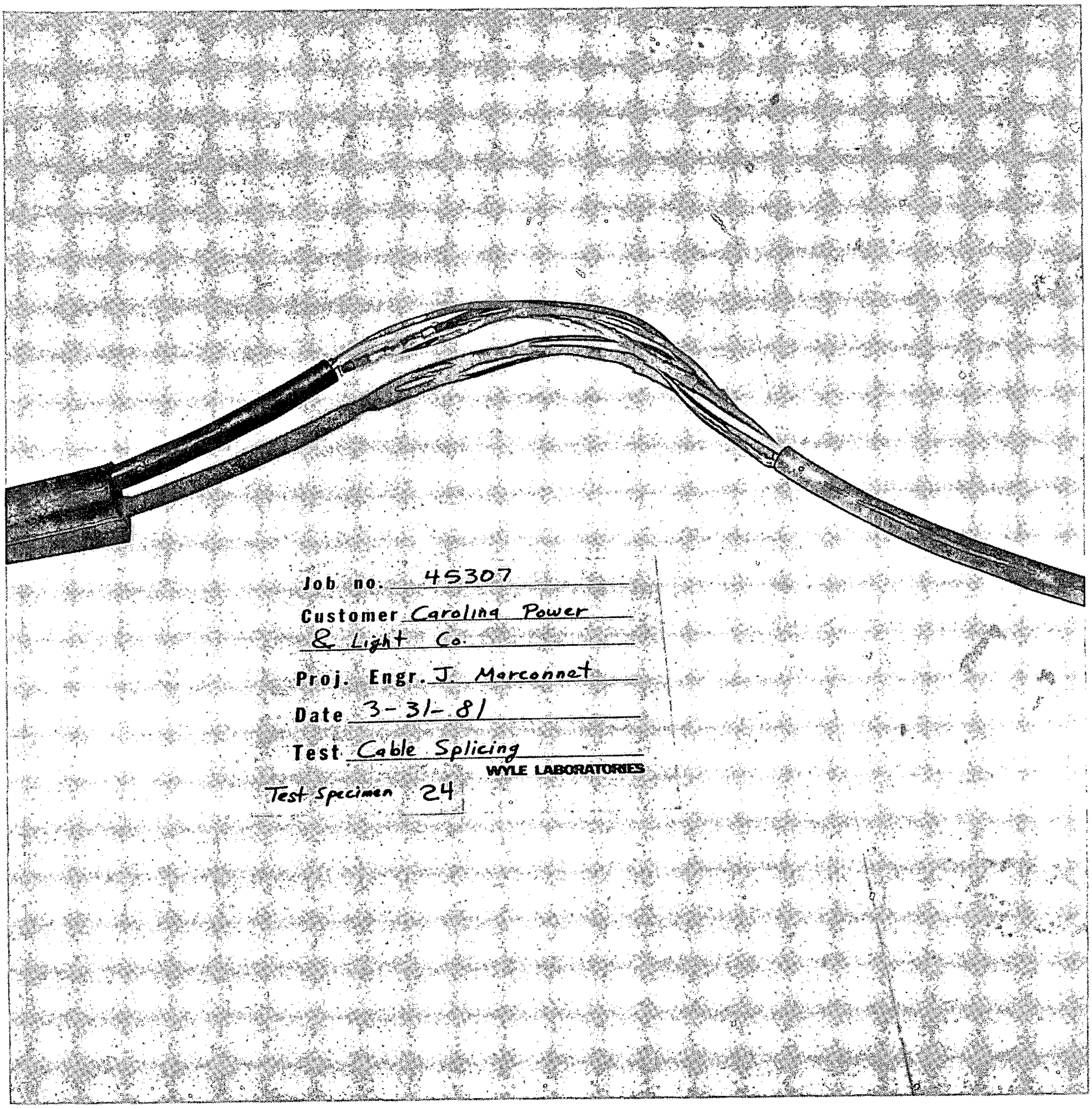
PHOTOGRAPH I-17

TEST SPECIMEN NO. 18 AFTER STEP NO. 5
OF THE CABLE SPLICE CHECKLIST



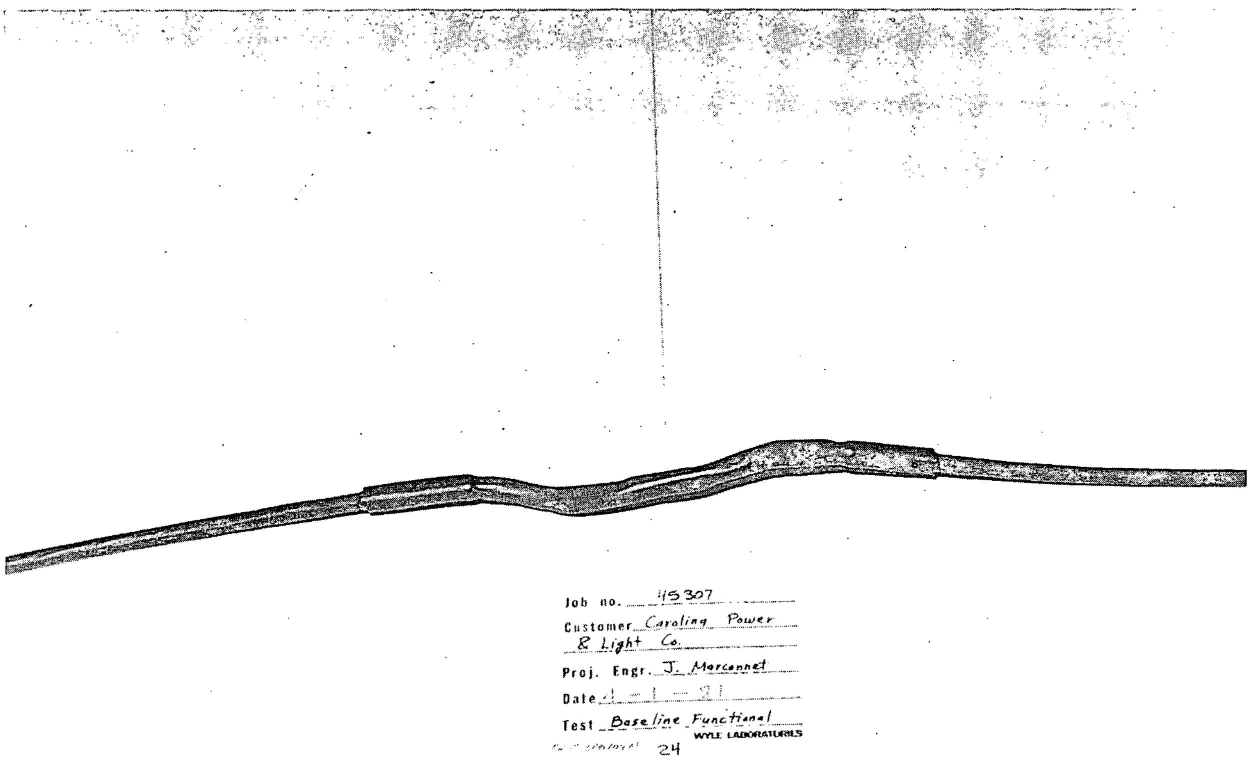
PHOTOGRAPH I-18

TEST SPECIMEN NO. 18-COMPLETED
CABLE SPLICE ASSEMBLY
(CP&L SPLICE PROCEDURE)



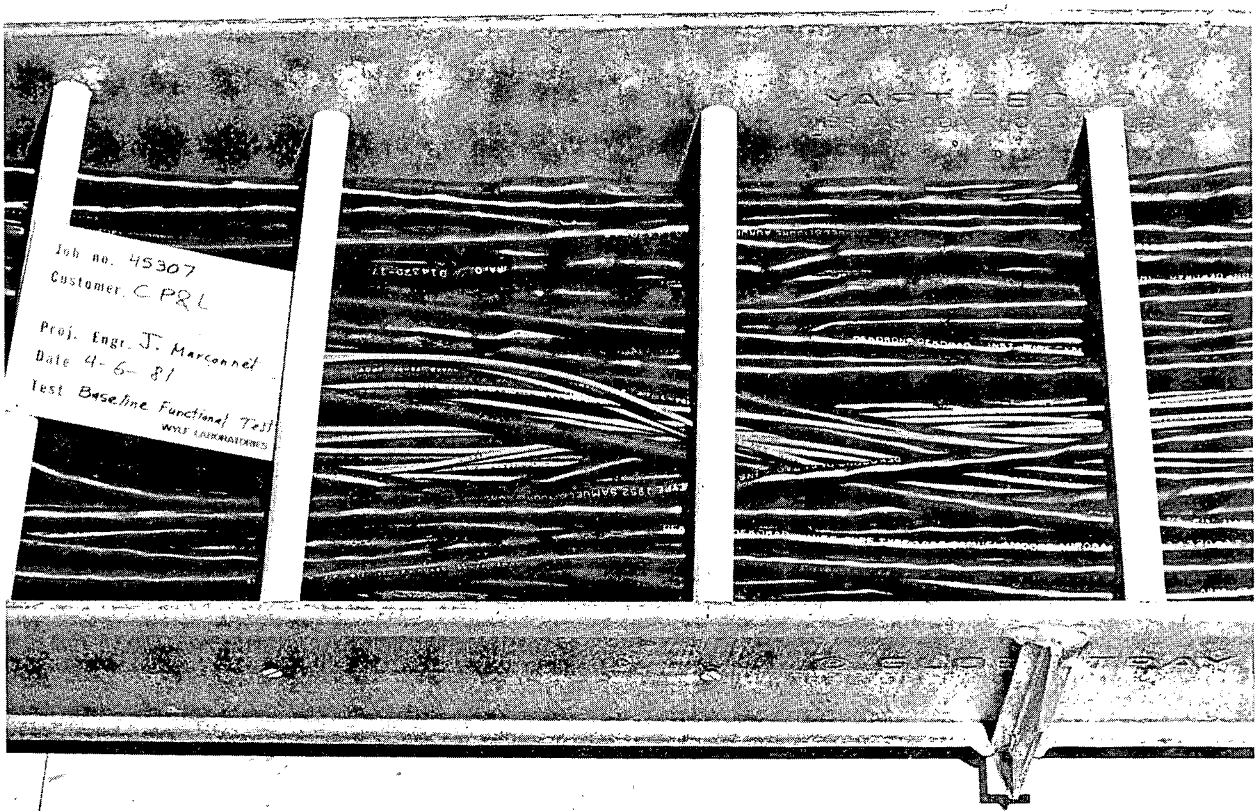
PHOTOGRAPH I-19

TEST SPECIMEN NO. 24 AFTER STEP NO. 5
OF THE CABLE SPLICE CHECKLIST



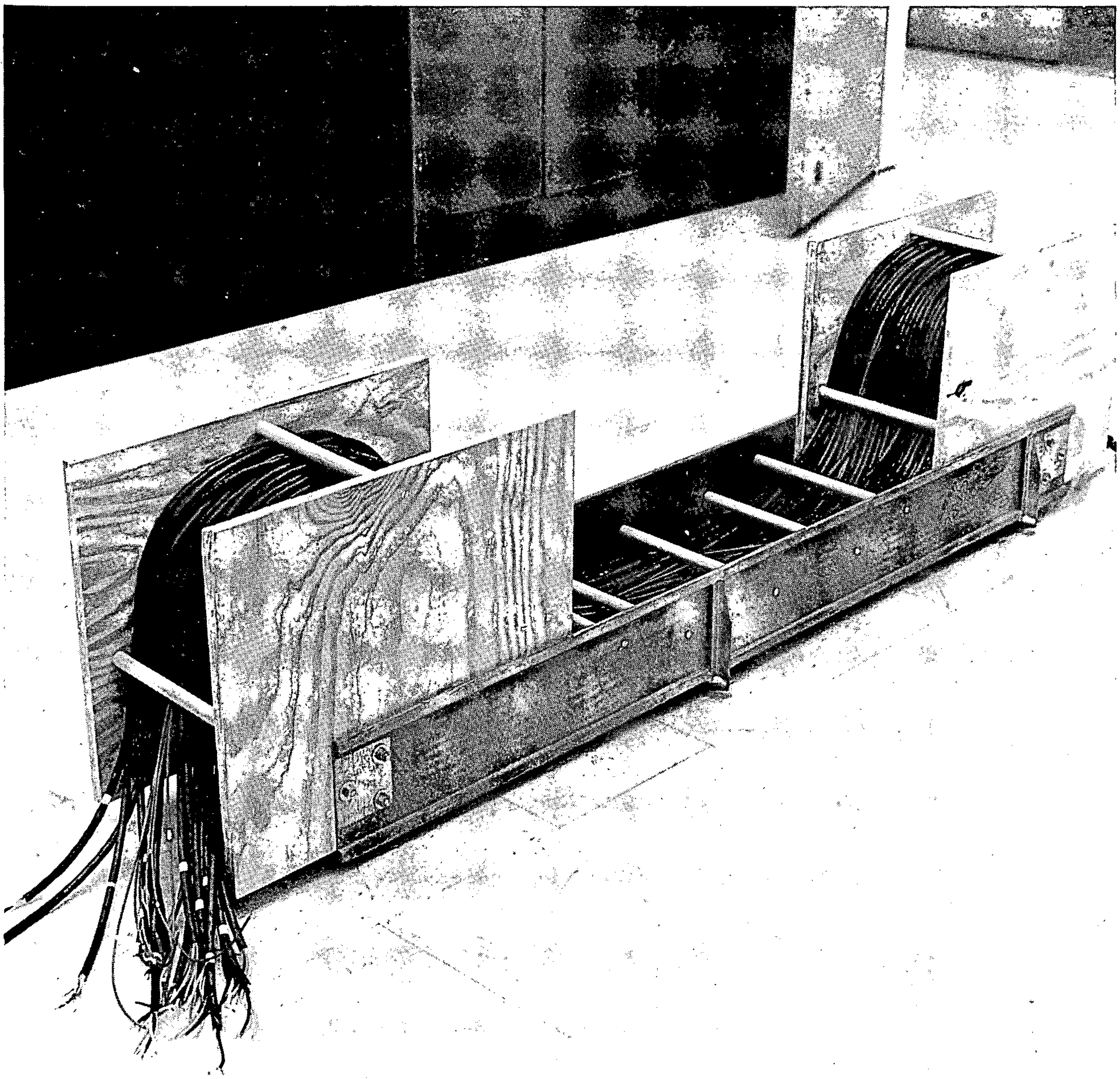
PHOTOGRAPH I-20

TEST SPECIMEN NO. 24-COMPLETED
CABLE SPLICE ASSEMBLY
(CP&L SPLICE PROCEDURE)



PHOTOGRAPH I-21

CABLE SPLICE ASSEMBLIES IN
CABLE TRAY (VIEW 1)



PHOTOGRAPH I-22

CABLE SPLICE ASSEMBLIES IN
CABLE TRAY (VIEW 2)

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APPENDIX III

CABLE SPLICE CHECKLISTS

WYLE LABORATORIES
CHECKLIST/DATA SHEET

CUSTOMER: Carolina Power & Light Co. Job No.: 45307
Specimen: Cable Splice Assembly START DATE: 3-31-81
S/N: 1 END DATE: 3-31-81
Test Title: Cable Splicing of 2-Conductor Shielded PVC Cable onto Extension Cables Using the Raychem Splice Procedure

STEP NO.	DESCRIPTION	RESULTS/REMARKS	✓	NOA
1.	Cut two 12-ft lengths of Dekoron 2-conductor shielded instrument cable, Type 1952.		✓	
2.	Select a 2-conductor PVC test specimen cable.		✓	
3.	Inspect the test specimen.		✓	
4.	Strip the test specimen and Dekoron cables per Splice Configuration No. 1.		✓	
5.	Mark each of the Dekoron cables and the test specimen with tapes or cable markers 3" from the end of the jacket to define the surface to be cleaned. Use 1,1,1, trichlorethane as the solvent during Steps 6 through 9.		✓	
6.	Scrub each of the cable jackets and wire insulations with a solvent - dampened nylon scratch pad backed with a cloth.		✓	
7.	Wipe the cable jackets and wire insulations with another clean cloth several times.		✓	

TESTED BY: Man Sung Lee DATE: 3-31-81
SHEET NO.: 1 OF 5
APPROVED: James Marconnet

WYLE LABORATORIES
CHECKLIST/DATA SHEET

CUSTOMER: Carolina Power & Light Co. Job No.: 45307
Specimen: Cable Splice Assembly START DATE: 3-31-81
S/N: 1 END DATE: 3-31-81
Test Title: Cable Splicing of 2-Conductor Shielded PVC Cable onto Extension Cables Using the Raychem Splice Procedure

STEP NO.	DESCRIPTION	RESULTS/REMARKS	✓	NOA
8.	Buff the cable jackets and wire insulations circumferentially with a 240 grit aluminum-oxide coated abrasive cloth.		✓	
9.	Wipe the cable jackets and wire insulations with a clean, lint-free cloth dampened with solvent.		✓	
10.	Allow the cables to air dry for at least 10 minutes.		✓	
11.	Slide one piece of Raychem WCSF-200-N 3" long over each of the two Dekoron cables.		✓	
12.	Slide one piece of Raychem WCSF-500-N 12" long over each of the two Dekoron cables.		✓	
13.	Slide one piece of Raychem WCSF-115-N 5" long over each of the four Dekoron cable insulated wires.		✓	
14.	Remove the insulation from 6 Amp 53548-1 pre-insulated butt splices.		✓	
	Crimp procedure for Step 15:			
	A. Slide the non-insulated butt splice into the holding jaw of the blue-color-coded die of the Amp 59250 T-Head hand crimp tool.		✓	

TESTED BY: James K. Perdue DATE: 3-31-81
SHEET NO.: 2 OF 5
APPROVED: James Marconnet

WYLE LABORATORIES
CHECKLIST/DATA SHEET

CUSTOMER: Carolina Power & Light Co. Job No.: 45307
Specimen: Cable Splice Assembly START DATE: 3-31-81
S/N: 1 END DATE: 3-31-81
Test Title: Cable Splicing of 2-Conductor Shielded PVC Cable onto Extension Cables Using the Raychem Splice Procedure

STEP NO.	DESCRIPTION	RESULTS/REMARKS	✓	NOA
14.	(Continued)		✓	
	B. Insert the wire fully into the splice		✓	
	C. Crimp the splice. The tool will not reverse until a full crimp is completed.		✓	
15.	Crimp a butt splice onto each of the six wires of the test specimen.		✓	
	Crimp procedure for Steps 16 and 17:			
	A. Slide the uncrimped end of the butt splice into the holding jaw of the blue-color-coded die of the Amp 59250 T-Head hand crimp tool.		✓	
	B. Insert the wire fully into the butt splice.		✓	
	C. Crimp the splice. The tool will not reverse until a full crimp has been completed.		✓	
16.	Crimp one of the Dekoron cables onto one end of the test specimen, matching color for color.		✓	
17.	Crimp the other Continental cable onto the other end of the test specimen, matching color for color.		✓	

TESTED BY: Ivan Sungler DATE: 3-31-81
SHEET NO.: 3 OF 5
APPROVED: James Marconnet

WYLE LABORATORIES
CHECKLIST/DATA SHEET

CUSTOMER: Carolina Power & Light Co. Job No.: 45307
Specimen: Cable Splice Assembly START DATE: 4-1-91
S/N: 1 END DATE: 4-1-91
Test Title: Cable Splicing of 2-Conductor Shielded PVC Cable onto Extension Cables Using the Raychem Splice Procedure

STEP NO.	DESCRIPTION	RESULTS/REMARKS	✓	NOA
18.	Photograph the cable splice assembly.		✓	
19.	Center the four pieces of shrink tubing over the crimp splices.		✓	
	Shrink procedure for Steps 20 and 23: Use a heat gun as a heat source. Shrink the tubing by starting the shrinking action at the approximate center of the sleeve. Work the heat gun from the center toward each end, using a waving action of the tool. Continue until the sleeve is smoothly shrunk onto the cable surface and a visible flow of adhesive is evident from each end of the sleeve.			
20.	Shrink each of the four pieces of shrink tubing.		✓	
21.	Photograph the cable splice assembly.		✓	
22.	Position the four 3" pieces of shrink tubing to cover 2.2" of each cable jacket.		✓	
23.	Shrink the shrink tubing over the cable jackets.		✓	
24.	Photograph the completed cable splice assembly.		✓	

TESTED BY: Man Sung Lee DATE: 4-1-91
SHEET NO.: 4 OF 5
APPROVED: James Marconnet

WYLE LABORATORIES
CHECKLIST/DATA SHEET

CUSTOMER: Carolina Power & Light Co.

Job No.: 45307

Specimen: Cable Splice Assembly

START DATE: 4-1-81

S/N: 1

END DATE: 4-1-81

Test Title: Cable Splicing of 2-Conductor Shielded PVC Cable onto Extension Cables Using the Raychem Splice Procedure

STEP NO.	DESCRIPTION	RESULTS/REMARKS	✓	NOA
25.	Insert the completed cable splice assembly into the cable tray.		✓	

TESTED BY: [illegible signature] DATE: 4-1-81

SHEET NO.: 5 OF 5

APPROVED: James Marconnet

WYLE LABORATORIES
CHECKLIST/DATA SHEET

CUSTOMER: Carolina Power & Light Co.
Job No.: 45307
Specimen: Cable Splice Assembly
START DATE: 3-30-81
S/N: 2
END DATE: 3-30-81
Test Title: Cable Splicing of 4-Conductor Shielded PVC Cable onto Extension Cables Using the CP&L Splice Procedure

STEP NO.	DESCRIPTION	RESULTS/REMARKS	✓	NOA
1.	Cut two 12-ft lengths of Continental ERCP-S600-16-4S 4-conductor, shielded instrument cable.		✓	
2.	Select a 4-conductor PVC test specimen cable.		✓	
3.	Inspect the test specimen.		✓	
4.	Strip the test specimen and Continental cables per Splice Configuration No. 2.		✓	
5.	Slide one piece of Raychem WCSF-200-N 12" long over each of the two Continental cables.		✓	
	Crimp procedure for Step 6.			
	A. Slide one Amp 53548-1 pre-insulated butt splice into the holding jaw of the blue-color-coded die of the Amp 59250 T-Head hand crimp tool.		✓	
	B. Insert the wire fully into the butt splice.		✓	
	C. Crimp the splice. The tool will not reverse until a full crimp is completed.		✓	
6.	Crimp a butt splice onto each of the ten wires of the test specimen.		✓	

TESTED BY: Don Songlee DATE: 3-30-81
SHEET NO.: 1 OF 3
APPROVED: James Marconnot

WYLE LABORATORIES
CHECKLIST/DATA SHEET

CUSTOMER: Carolina Power & Light Co.　　Job No.: 45307
Specimen: Cable Splice Assembly　　START DATE: 3-30-81
S/N: 2　　END DATE: 3-31-81
Test Title: Cable Splicing of 4-Conductor Shielded PVC Cable onto Extension Cables Using the CP&L Splice Procedure

STEP NO.	DESCRIPTION	RESULTS/REMARKS	✓	NOA
6.	(Continued) Crimp procedure for Steps 7 and 8:			
	A. Slide the uncrimped end of the butt splice into the holding jaw of the blue-color-coded die of the Amp 59250 T-Head hand crimp tool.		✓	
	B. Insert the wire fully into the pre-insulated butt splice.		✓	
	C. Crimp the splice. The tool will not reverse until a full crimp is completed.		✓	
7.	Crimp one of the Continental cables onto one end of the test specimen, matching color for color.		✓	
8.	Crimp the other Continental cable onto the other end of the test specimen, matching color for color.		✓	
9.	Photograph the cable splice assembly.		✓	
10.	Center the Raychem shrink tubings over each of the splices.		✓	
11.	Using a heat gun for a heat source, cure each shrink tubing. The cure must be started from the center of the splice and		✓	

TESTED BY: Man Sing Lee　DATE: 3-31-81
SHEET NO.: 2 OF 3
APPROVED: James Marconnet

WYLE LABORATORIES
CHECKLIST/DATA SHEET

CUSTOMER: Carolina Power & Light Co.
Job No.: 45307
Specimen: Cable Splice Assembly
START DATE: 3-31-81
S/N: 2
END DATE: 3-31-81
Test Title: Cable Splicing of 4-Conductor Shielded PVC Cable onto Extension Cables Using the CP&L Splice Procedure

STEP NO.	DESCRIPTION	RESULTS/REMARKS	✓	NOA
11.	(Continued) worked out to one end. Return to the center of the splice and work out to the other end. Using this method, no air pockets shall be trapped within the splice.			
12.	Insert the completed cable splice assembly into the cable tray.		✓	

TESTED BY: Man Sung Lee DATE: 3-31-81
SHEET NO.: 3 OF 3
APPROVED: James Marconnet

WYLE LABORATORIES
CHECKLIST/DATA SHEET

CUSTOMER: Carolina Power & Light Co.
Job No.: 45307
Specimen: Cable Splice Assembly
START DATE: 3-31-81
S/N: 3
END DATE: 3-31-81
Test Title: Cable Splicing of 4-Conductor Shielded PVC Cable onto Extension Cables Using the Raychem Splice Procedure

STEP NO.	DESCRIPTION	RESULTS/REMARKS	✓	NOA
1.	Cut two 12-ft lengths of Continental 4-conductor shielded instrument cable ERCP-S600-16-4S.		✓	
2.	Select a 4-conductor PVC test specimen cable.		✓	
3.	Inspect the test specimen.		✓	
4.	Strip the test specimen and Continental cables per Splice Configuration No. 3.		✓	
5.	Mark each of the Continental cables and the test specimen with tapes or cable markers 3" from the end of the jacket to define the surface to be cleaned. Use 1,1,1, trichlorethane as the solvent during Steps 6 through 9.		✓	
6.	Scrub each of the cable jackets and wire insulations with a solvent - dampened nylon scratch pad backed with a cloth.		✓	
7.	Wipe the cable jackets and wire insulations with another clean cloth several times.		✓	

TESTED BY: ~~3-31-8~~ JKP James K. Perdue DATE: 3-31-81
SHEET NO.: 1 OF 5
APPROVED: James Marconnet

WYLE LABORATORIES
CHECKLIST/DATA SHEET

CUSTOMER: Carolina Power & Light Co. Job No.: 45307

Specimen: Cable Splice Assembly START DATE: 3-31-81

S/N: 3 END DATE: 3-31-81

Test Title: Cable Splicing of 4-Conductor Shielded PVC Cable onto Extension Cables Using the Raychem Splice Procedure

STEP NO.	DESCRIPTION	RESULTS/REMARKS	✓	NOA
8.	Buff the cable jackets and wire insulations circumferentially with a 240 grit aluminum-oxide coated abrasive cloth.		✓	
9.	Wipe the cable jackets and wire insulations with a clean, lint-free cloth dampened with solvent.		✓	
10.	Allow the cables to air dry for at least ten minutes.		✓	
11.	Slide one piece of Raychem WCSF-200-N 3" long over each of the two Continental cables.		✓	
12.	Slide one piece of Raychem WCSF-500-N 12" long over each of the two Continental cables.		✓	
13.	Slide one piece of Raychem WCSF-115-N 5" long over each of the four Continental cable insulated wires.		✓	
14.	Remove the insulation from 6 Amp 53548-1 pre-insulated butt splices.		✓	
	Crimp procedure for Step 15:			
	A. Slide the non-insulated butt splice into the holding jaw of the blue-color-coded die of the Amp 59250 T-Head hand crimp tool.		✓	

TESTED BY: James R. Perdue DATE: 3-31-81

SHEET NO.: 2 OF 5

APPROVED: James Marconnet

WYLE LABORATORIES
CHECKLIST/DATA SHEET

CUSTOMER: Carolina Power & Light Co.
Specimen: Cable Splice Assembly
S/N: 3

Job No.: 45307
START DATE: 3-31-81
END DATE: 3-31-81

Test Title: Cable Splicing of 4-Conductor Shielded PVC Cable onto Extension Cables Using the Raychem Splice Procedure

STEP NO.	DESCRIPTION	RESULTS/REMARKS	✓	NOA
14.	(Continued)			
	B. Insert the wire fully into the splice.		✓	
	C. Crimp the splice. The tool will not reverse until a full crimp is completed.		✓	
15.	Crimp a butt splice onto each of the six wires of the test specimen.		✓	
	Crimp procedure for Steps 16 and 17:			
	A. Slide the uncrimped end of the butt splice into the holding jaw of the blue-color-coded die of the Amp 59250 T-Head hand crimp tool.		✓	
	B. Insert the wire fully into the butt splice.		✓	
	C. Crimp the splice. The tool will not reverse until a full crimp has been completed.		✓	
16.	Crimp one of the Continental cables onto one end of the test specimen, matching color for color.		✓	
17.	Crimp the other Continental cable onto the other end of the test specimen, matching color for color.		✓	

TESTED BY: James R. Perdue DATE: 3-31-81
SHEET NO.: 3 OF 5
APPROVED: James Marcomet

WYLE LABORATORIES
CHECKLIST/DATA SHEET

CUSTOMER: Carolina Power & Light Co. Job No.: 45307
Specimen: Cable Splice Assembly START DATE: 4-1-81
S/N: 3 END DATE: 4-1-81

Test Title: Cable Splicing of 4-Conductor Shielded PVC Cable onto Extension Cables Using the Raychem Splice Procedure

STEP NO.	DESCRIPTION	RESULTS/REMARKS	✓	NOA
18.	Photograph the cable splice assembly.		✓	
19.	Center the four pieces of shrink tubing of each splice assembly over the crimp splices.		✓	
	Shrink procedure for Steps 20 and 23: Use a heat gun as a heat source. Shrink the tubing by starting the shrinking action at the approximate center of the sleeve. Work the heat gun from the center toward each end, using a waving action of the tool. Continue until the sleeve is smoothly shrunk onto the cable surface and a visible flow of adhesive is evident from each end of the sleeve.			
20.	Shrink each of the four pieces of shrink tubing.		✓	
21.	Photograph the cable splice assembly.	PHOTO NOT TAKEN.		
22.	Position the four 3" pieces of shrink tubing to cover 2.2" of each cable jacket.		✓	
23.	Shrink the shrink tubing over the cable jackets.		✓	

TESTED BY: [illegible signature] DATE: 4-1-81
SHEET NO.: 4 OF 5
APPROVED: James Marconnet

WYLE LABORATORIES
CHECKLIST/DATA SHEET

CUSTOMER: Carolina Power & Light Co.
Specimen: Cable Splice Assembly
S/N: 3
Job No.: 45307
START DATE: 4-1-81
END DATE: 4-1-81

Test Title: Cable Splicing of 4-Conductor Shielded PVC Cable onto Extension Cables Using the Raychem Splice Procedure

STEP NO.	DESCRIPTION	RESULTS/REMARKS	✓	NOA
24.	Photograph the completed cable splice assembly.		✓	
25.	Insert the completed cable splice assembly into the cable tray.		✓	

TESTED BY: [illegible] DATE: 4-1-81
SHEET NO.: 5 OF 5
APPROVED: James Marconnet

WYLE LABORATORIES
CHECKLIST/DATA SHEET

CUSTOMER: Carolina Power & Light Co. Job No.: 45307

Specimen: Cable Splice Assembly START DATE: 3-30-81

S/N: 4 END DATE: 3-30-81

Test Title: Cable Splicing of 2-Conductor Shielded PVC Cable onto Extension Cables Using the CP&L Splice Procedure

STEP NO.	DESCRIPTION	RESULTS/REMARKS	✓	NOA
1.	Cut two 12-ft lengths of Dekoron 2-conductor shielded instrument cable Type 1952.		✓	
2.	Select a 2-conductor PVC test specimen cable.		✓	
3.	Inspect the test specimen.		✓	
4.	Strip the test specimen and Dekoron cables per Splice Configuration No. 4.		✓	
5.	Slide one piece of Raychem WCSF-200-N 9" long over each of the two Dekoron cables.		✓	
	Crimp procedure for Step 6:			
	A. Slide one Amp 53548-1 pre-insulated butt splice into the holding jaw of the blue-color-coded die of the Amp 59250 T-Head hand crimp tool.		✓	
	B. Insert the wire fully into the butt splice.		✓	
	C. Crimp the splice. The tool will not reverse until a full crimp is completed.		✓	

TESTED BY: Man Sung Lee DATE: 3-30-81

SHEET NO.: 1 OF 3

APPROVED: James Marcomet

WYLE LABORATORIES
CHECKLIST/DATA SHEET

CUSTOMER: Carolina Power & Light Co.
Specimen: Cable Splice Assembly
S/N: 4
Job No.: 45307
START DATE: 3-30-81
END DATE: 3-31-81

Test Title: Cable Splicing of 2-Conductor Shielded PVC Cable onto Extension Cables Using the CP&L Splice Procedure

STEP NO.	DESCRIPTION	RESULTS/REMARKS	✓	NOA
6.	Crimp a butt splice onto each of the six wires of the test specimen.		✓	
	Crimp procedure for Steps 7 and 8:		✓	
	A. Slide the uncrimped end of the butt splice into the holding jaw of the blue-color-coded die of the Amp 59250 T-Head hand crimp tool.		✓	
	B. Insert the wire fully into the pre-insulated butt splice.		✓	
	C. Crimp the splice. The tool will not reverse until a full crimp is completed.		✓	
7.	Crimp one of the Dekoron cables onto one end of the test specimen, matching color for color.		✓	
8.	Crimp the other Dekoron cable onto the other end of the test specimen, matching color for color.		✓	
9.	Photograph the cable splice assembly.		✓	
10.	Center the Raychem shrink tubings over each of the splices.		✓	

TESTED BY: James K Perdue DATE: 3-31-81
SHEET NO.: 2 OF 3
APPROVED: James Marcomet

WYLE LABORATORIES
CHECKLIST/DATA SHEET

CUSTOMER: Carolina Power & Light Co.
Job No.: 45307
Specimen: Cable Splice Assembly
START DATE: 3-30-81
S/N: 4
END DATE: 3-31-81
Test Title: Cable Splicing of 2-Conductor Shielded PVC Cable onto Extension Cables Using the CP&L Splice Procedure

STEP NO.	DESCRIPTION	RESULTS/REMARKS	✓	NOA
11.	Using a heat gun for a heat source, cure each shrink tubing. The cure must be started from the center of the splice and worked out to one end. Return to the center of the splice and work out the other end. Using this method, no air pockets shall be trapped within the splice.		✓	
12.	Insert the completed cable splice assembly into the cable tray.		✓	

TESTED BY: James K Pordue DATE: 3-31-81
SHEET NO.: 3 OF 3
APPROVED: James Marcomet

WYLE LABORATORIES
CHECKLIST/DATA SHEET

CUSTOMER: Carolina Power & Light Co.
Job No.: 45307
Specimen: Cable Splice Assembly
START DATE: 3-31-81
S/N: 5
END DATE: 3-31-81
Test Title: Cable Splicing of 2-Conductor Shielded PVC Cable onto Extension Cables Using the Raychem Splice Procedure

STEP NO.	DESCRIPTION	RESULTS/REMARKS	✓	NOA
1.	Cut two 12-ft lengths of Dekoron 2-conductor shielded instrument cable, Type 1952.		✓	
2.	Select a 2-conductor PVC test specimen cable.		✓	
3.	Inspect the test specimen.		✓	
4.	Strip the test specimen and Dekoron cables per Splice Configuration No. 1.		✓	
5.	Mark each of the Dekoron cables and the test specimen with tapes or cable markers 3" from the end of the jacket to define the surface to be cleaned. Use 1,1,1, trichlorethane as the solvent during Steps 6 through 9.		✓	
6.	Scrub each of the cable jackets and wire insulations with a solvent - dampened nylon scratch pad backed with a cloth.		✓	
7.	Wipe the cable jackets and wire insulations with another clean cloth several times.		✓	

TESTED BY: James K Perlak DATE: 3-31-81
SHEET NO.: 1 OF 5
APPROVED: James Marcomet

WYLE LABORATORIES
CHECKLIST/DATA SHEET

CUSTOMER: Carolina Power & Light Co. Job No.: 45307
Specimen: Cable Splice Assembly START DATE: 3-31-81
S/N: 5 END DATE: 3-31-81
Test Title: Cable Splicing of 2-Conductor Shielded PVC Cable onto Extension Cables Using the Raychem Splice Procedure

STEP NO.	DESCRIPTION	RESULTS/REMARKS	✓	NOA
8.	Buff the cable jackets and wire insulations circumferentially with a 240 grit aluminum-oxide coated abrasive cloth.		✓	
9.	Wipe the cable jackets and wire insulations with a clean, lint-free cloth dampened with solvent.		✓	
10.	Allow the cables to air dry for at least 10 minutes.		✓	
11.	Slide one piece of Raychem WCSF-200-N 3" long over each of the two Dekoron cables.		✓	
12.	Slide one piece of Raychem WCSF-500-N 12" long over each of the two Dekoron cables.		✓	
13.	Slide one piece of Raychem WCSF-115-N 5" long over each of the four Dekoron cable insulated wires.		✓	
14.	Remove the insulation from 6 Amp 53548-1 pre-insulated butt splices.		✓	
	Crimp procedure for Step 15:			
	A. Slide the non-insulated butt splice into the holding jaw of the blue-color-coded die of the Amp 59250 T-Head hand crimp tool.		✓	

TESTED BY: James K Pirtle DATE: 3-31-81
SHEET NO.: 2 OF 5
APPROVED: James Marconnet

WYLE LABORATORIES
CHECKLIST/DATA SHEET

CUSTOMER: Carolina Power & Light Co.
Job No.: 45307
Specimen: Cable Splice Assembly
START DATE: 3-31-81
S/N: 5
END DATE: 3-31-81
Test Title: Cable Splicing of 2-Conductor Shielded PVC Cable onto Extension Cables Using the Raychem Splice Procedure

STEP NO.	DESCRIPTION	RESULTS/REMARKS	✓	NOA
14.	(Continued) B. Insert the wire fully into the splice C. Crimp the splice. The tool will not reverse until a full crimp is completed.			
15.	Crimp a butt splice onto each of the six wires of the test specimen. Crimp procedure for Steps 16 and 17: A. Slide the uncrimped end of the butt splice into the holding jaw of the blue-color-coded die of the Amp 59250 T-Head hand crimp tool. B. Insert the wire fully into the butt splice. C. Crimp the splice. The tool will not reverse until a full crimp has been completed.		✓	
16.	Crimp one of the Dekoron cables onto one end of the test specimen, matching color for color.		✓	
17.	Crimp the other Continental cable onto the other end of the test specimen, matching color for color.		✓	

TESTED BY: James K. [signature] DATE: 3-31-81
SHEET NO.: 3 OF 5
APPROVED: James Marconnet

WYLE LABORATORIES
CHECKLIST/DATA SHEET

CUSTOMER: Carolina Power & Light Co.
Job No.: 45307
Specimen: Cable Splice Assembly
START DATE: 4-1-81
S/N: 5
END DATE: 4-1-81
Test Title: Cable Splicing of 2-Conductor Shielded PVC Cable onto Extension Cables Using the Raychem Splice Procedure

STEP NO.	DESCRIPTION	RESULTS/REMARKS	✓	NOA
18.	Photograph the cable splice assembly.		✓	
19.	Center the four pieces of shrink tubing over the crimp splices.		✓	
	Shrink procedure for Steps 20 and 23: Use a heat gun as a heat source. Shrink the tubing by starting the shrinking action at the approximate center of the sleeve. Work the heat gun from the center toward each end, using a waving action of the tool. Continue until the sleeve is smoothly shrunk onto the cable surface and a visible flow of adhesive is evident from each end of the sleeve.			
20.	Shrink each of the four pieces of shrink tubing.		✓	
21.	Photograph the cable splice assembly.	PHOTO NOT TAKEN.		
22.	Position the four 3" pieces of shrink tubing to cover 2.2" of each cable jacket.		✓	
23.	Shrink the shrink tubing over the cable jackets.		✓	
24.	Photograph the completed cable splice assembly.		✓	

TESTED BY: [signature] DATE: 4-1-81
SHEET NO.: 4 OF 5
APPROVED: James Marcomet

WYLE LABORATORIES
CHECKLIST/DATA SHEET

CUSTOMER: Carolina Power & Light Co.
Specimen: Cable Splice Assembly
S/N: 5
Job No.: 45307
START DATE: 4-1-81
END DATE: 4-1-81
Test Title: Cable Splicing of 2-Conductor Shielded PVC Cable onto Extension Cables Using the Raychem Splice Procedure

STEP NO.	DESCRIPTION	RESULTS/REMARKS	✓	NOA
25.	Insert the completed cable splice assembly into the cable tray.		✓	

TESTED BY: [signature] DATE: 4-1-81
SHEET NO.: 5 OF 5
APPROVED: James Marcomet

WYLE LABORATORIES
CHECKLIST/DATA SHEET

CUSTOMER: Carolina Power & Light Co. Job No.: 45307
Specimen: Cable Splice Assembly START DATE: 3-30-81
S/N: 6 END DATE: 3-30-81
Test Title: Cable Splicing of 4-Conductor Shielded PVC Cable onto Extension Cables Using the CP&L Splice Procedure

STEP NO.	DESCRIPTION	RESULTS/REMARKS	✓	NOA
1.	Cut two 12-ft lengths of Continental ERCP-S600-16-4S 4-conductor, shielded instrument cable.		✓	
2.	Select a 4-conductor PVC test specimen cable.		✓	
3.	Inspect the test specimen.		✓	
4.	Strip the test specimen and Continental cables per Splice Configuration No. 2.		✓	
5.	Slide one piece of Raychem WCSF-200-N 12" long over each of the two Continental cables.		✓	
	Crimp procedure for Step 6.			
	A. Slide one Amp 53548-1 pre-insulated butt splice into the holding jaw of the blue-color-coded die of the Amp 59250 T-Head hand crimp tool.		✓	
	B. Insert the wire fully into the butt splice.		✓	
	C. Crimp the splice. The tool will not reverse until a full crimp is completed.		✓	
6.	Crimp a butt splice onto each of the ten wires of the test specimen.		✓	

TESTED BY: Man Sung Lee DATE: 3-30-81
SHEET NO.: 1 OF 3
APPROVED: James Marcomet

WYLE LABORATORIES
CHECKLIST/DATA SHEET

CUSTOMER: Carolina Power & Light Co. Job No.: 45307
Specimen: Cable Splice Assembly START DATE: 3-30-81
S/N: 6 END DATE: 3-31-81
Test Title: Cable Splicing of 4-Conductor Shielded PVC Cable onto Extension Cables Using the CP&L Splice Procedure

STEP NO.	DESCRIPTION	RESULTS/REMARKS	✓	NOA
6.	(Continued)		✓	
	Crimp procedure for Steps 7 and 8:		✓	
	A. Slide the uncrimped end of the butt splice into the holding jaw of the blue-color-coded die of the Amp 59250 T-Head hand crimp tool.		✓	
	B. Insert the wire fully into the pre-insulated butt splice.		✓	
	C. Crimp the splice. The tool will not reverse until a full crimp is completed.		✓	
7.	Crimp one of the Continental cables onto one end of the test specimen, matching color for color.		✓	
8.	Crimp the other Continental cable onto the other end of the test specimen, matching color for color.		✓	
9.	Photograph the cable splice assembly.		✓	
10.	Center the Raychem shrink tubings over each of the splices.		✓	
11.	Using a heat gun for a heat source, cure each shrink tubing. The cure must be started from the center of the splice and		✓	

TESTED BY: James K Perdue DATE: 3-31-81
SHEET NO.: 2 OF 3
APPROVED: James Marcomet

WYLE LABORATORIES
CHECKLIST/DATA SHEET

CUSTOMER: Carolina Power & Light Co.
Job No.: 45307
Specimen: Cable Splice Assembly
START DATE: 4-1-81
S/N: 6
END DATE: 4-1-81

Test Title: Cable Splicing of 4-Conductor Shielded PVC Cable onto Extension Cables Using the CP&L Splice Procedure

STEP NO.	DESCRIPTION	RESULTS/REMARKS	✓	NOA
11.	(Continued) worked out to one end. Return to the center of the splice and work out to the other end. Using this method, no air pockets shall be trapped within the splice.		✓	
12.	Insert the completed cable splice assembly into the cable tray.		✓	

TESTED BY: Manbing Lee DATE: 4-1-81
SHEET NO.: 3 OF 3
APPROVED: James Marcomet

WYLE LABORATORIES
CHECKLIST/DATA SHEET

CUSTOMER: Carolina Power & Light Co.
Specimen: Cable Splice Assembly
S/N: 7
Job No.: 45307
START DATE: 3-30-81
END DATE: 3-30-81
Test Title: Splicing 1-Conductor Wires Together Using the CP&L Splice Procedure

STEP NO.	DESCRIPTION	RESULTS/REMARKS	✓	NOA
1.	Cut two 13-ft lengths of 1-conductor wire.		✓	
2.	Strip the wires per Splice Configuration No. 5.		✓	
3.	Slide a piece of Raychem WCSF-115-N 6" long over one of the wires.		✓	
4.	Slide one Amp 53548-1 pre-insulated butt splice into the holding jaw of the blue-color-coded die of the Amp 59250 T-Head hand crimp tool.		✓	
5.	Insert one wire fully into the butt splice.		✓	
6.	Crimp the splice. The tool will not reverse until a full crimp is completed.		✓	
7.	Slide the uncrimped side of the butt splice into the holding jaw of the crimp tool.		✓	
8.	Insert the other wire into the butt splice.			

TESTED BY: Iman Suyo Lee DATE: 3-30-81
SHEET NO.: 1 OF 2
APPROVED: James Marcomet

WYLE LABORATORIES
CHECKLIST/DATA SHEET

CUSTOMER: Carolina Power & Light Co.
Job No.: 45307
Specimen: Cable Splice Assembly
START DATE: 3-30-81
S/N: 7
END DATE: 3-30-81
Test Title: Splicing 1-Conductor Wires Together Using the CP&L Splice Procedure.

STEP NO.	DESCRIPTION	RESULTS/REMARKS	✓	NOA
9.	Crimp the splice. The tool will not reverse until a full crimp is completed.		✓	
10.	Center the Raychem shrink tubing over the splice.		✓	
11.	Using a heat gun as a heat source, shrink the tubing by starting the shrinking action at the approximate center of the sleeve. Work the heat gun from the center toward each end, using a waving action of the tool. Continue until the sleeve is smoothly shrunk onto the cable surface and a visible flow of adhesive is evident from each end of the sleeve.		✓	
12.	Insert the completed cable splice assembly into the cable tray.		✓	

TESTED BY: [illegible signature] DATE: 3-30-81
SHEET NO.: 2 OF 2
APPROVED: James Marconnet

WYLE LABORATORIES
CHECKLIST/DATA SHEET

CUSTOMER: Carolina Power & Light Co.
Job No.: 45307
Specimen: Cable Splice Assembly
START DATE: 3-30-81
S/N: 8
END DATE: 3-30-81
Test Title: Splicing 1-Conductor Wires Together Using the CP&L Splice Procedure

STEP NO.	DESCRIPTION	RESULTS/REMARKS	✓	NOA
1.	Cut two 13-ft lengths of 1-conductor wire.		✓	
2.	Strip the wires per Splice Configuration No. 5.		✓	
3.	Slide a piece of Raychem WCSF-115-N 6" long over one of the wires.		✓	
4.	Slide one Amp 53548-1 pre-insulated butt splice into the holding jaw of the blue-color-coded die of the Amp 59250 T-Head hand crimp tool.		✓	
5.	Insert one wire fully into the butt splice.		✓	
6.	Crimp the splice. The tool will not reverse until a full crimp is completed.		✓	
7.	Slide the uncrimped side of the butt splice into the holding jaw of the crimp tool.		✓	
8.	Insert the other wire into the butt splice.		✓	

TESTED BY: [illegible signature] DATE: 3-30-81
SHEET NO.: 1 OF 2
APPROVED: James Marcomet

WYLE LABORATORIES
CHECKLIST/DATA SHEET

CUSTOMER: Carolina Power & Light Co.
Job No.: 45307
Specimen: Cable Splice Assembly
START DATE: 3-30-81
S/N: 8
END DATE: 3-30-81
Test Title: Splicing 1-Conductor Wires Together Using the CP&L Splice Procedure.

STEP NO.	DESCRIPTION	RESULTS/REMARKS	✓	NOA
9.	Crimp the splice. The tool will not reverse until a full crimp is completed.		✓	
10.	Center the Raychem shrink tubing over the splice.		✓	
11.	Using a heat gun as a heat source, shrink the tubing by starting the shrinking action at the approximate center of the sleeve. Work the heat gun from the center toward each end, using a waving action of the tool. Continue until the sleeve is smoothly shrunk onto the cable surface and a visible flow of adhesive is evident from each end of the sleeve.		✓	
12.	Insert the completed cable splice assembly into the cable tray.		✓	

TESTED BY: [illegible signature] DATE: 3-30-81
SHEET NO.: 2 OF 2
APPROVED: James Marconnet

WYLE LABORATORIES
CHECKLIST/DATA SHEET

CUSTOMER: Carolina Power & Light Co.
Job No.: 45307
Specimen: Cable Splice Assembly
START DATE: 3-30-81
S/N: 9
END DATE: 3-30-81
Test Title: Splicing 1-Conductor Wires Together Using the CP&L Splice Procedure

STEP NO.	DESCRIPTION	RESULTS/REMARKS	✓	NOA
1.	Cut two 13-ft lengths of 1-conductor wire.		✓	
2.	Strip the wires per Splice Configuration No. 5.		✓	
3.	Slide a piece of Raychem WCSF-115-N 6" long over one of the wires.		✓	
4.	Slide one Amp 53548-1 pre-insulated butt splice into the holding jaw of the blue-color-coded die of the Amp 59250 T-Head hand crimp tool.		✓	
5.	Insert one wire fully into the butt splice.		✓	
6.	Crimp the splice. The tool will not reverse until a full crimp is completed.		✓	
7.	Slide the uncrimped side of the butt splice into the holding jaw of the crimp tool.		✓	
8.	Insert the other wire into the butt splice.		✓	

TESTED BY: [illegible] DATE: 3-30-81
SHEET NO.: 1 OF 2
APPROVED: James Marcomet

WYLE LABORATORIES
CHECKLIST/DATA SHEET

CUSTOMER: Carolina Power & Light Co. Job No.: 45307

Specimen: Cable Splice Assembly START DATE: 3-30-81

S/N: 9 END DATE: 3-30-81

Test Title: Splicing 1-Conductor Wires Together Using the CP&L Splice Procedure.

STEP NO.	DESCRIPTION	RESULTS/REMARKS	✓	NOA
9.	Crimp the splice. The tool will not reverse until a full crimp is completed.		✓	
10.	Center the Raychem shrink tubing over the splice.		✓	
11.	Using a heat gun as a heat source, shrink the tubing by starting the shrinking action at the approximate center of the sleeve. Work the heat gun from the center toward each end, using a waving action of the tool. Continue until the sleeve is smoothly shrunk onto the cable surface and a visible flow of adhesive is evident from each end of the sleeve.		✓ ✓	
12.	Insert the completed cable splice assembly into the cable tray.		✓	

TESTED BY: [illegible signature] DATE: 3-30-81

SHEET NO.: 2 OF 2

APPROVED: James Marconnet

WYLE LABORATORIES
CHECKLIST/DATA SHEET

CUSTOMER: Carolina Power & Light Co.
Specimen: Cable Splice Assembly
S/N: 10
Job No.: 45307
START DATE: 3-30-81
END DATE: 3-30-81
Test Title: Splicing 1-Conductor Wires Together Using the CP&L Splice Procedure

STEP NO.	DESCRIPTION	RESULTS/REMARKS	✓	NOA
1.	Cut two 13-ft lengths of 1-conductor wire.		✓	
2.	Strip the wires per Splice Configuration No. 5.		✓	
3.	Slide a piece of Raychem WCSF-115-N 6" long over one of the wires.		✓	
4.	Slide one Amp 53548-1 pre-insulated butt splice into the holding jaw of the blue-color-coded die of the Amp 59250 T-Head hand crimp tool.		✓	
5.	Insert one wire fully into the butt splice.		✓	
6.	Crimp the splice. The tool will not reverse until a full crimp is completed.		✓	
7.	Slide the uncrimped side of the butt splice into the holding jaw of the crimp tool.		✓	
8.	Insert the other wire into the butt splice.		✓	

TESTED BY: [illegible signature] DATE: 3-30-81
SHEET NO.: 1 OF 2
APPROVED: James Marconnet

WYLE LABORATORIES
CHECKLIST/DATA SHEET

CUSTOMER: Carolina Power & Light Co. Job No.: 45307

Specimen: Cable Splice Assembly START DATE: 3-30-81

S/N: 10 END DATE: 3-30-81

Test Title: Splicing 1-Conductor Wires Together Using the CP&L Splice Procedure.

STEP NO.	DESCRIPTION	RESULTS/REMARKS	✓	NOA
9.	Crimp the splice. The tool will not reverse until a full crimp is completed.		✓	
10.	Center the Raychem shrink tubing over the splice.		✓	
11.	Using a heat gun as a heat source, shrink the tubing by starting the shrinking action at the approximate center of the sleeve. Work the heat gun from the center toward each end, using a waving action of the tool. Continue until the sleeve is smoothly shrunk onto the cable surface and a visible flow of adhesive is evident from each end of the sleeve.		✓	
12.	Insert the completed cable splice assembly into the cable tray.		✓	

TESTED BY: Max Gunzalee DATE: 3-30-81

SHEET NO.: 2 OF 2

APPROVED: James Marcomet

WYLE LABORATORIES
CHECKLIST/DATA SHEET

CUSTOMER: Carolina Power & Light Co.
Job No.: 45307
Specimen: Cable Splice Assembly
START DATE: 3-30-81
S/N: 11
END DATE: 3-30-81
Test Title: Splicing 1-Conductor Wires Together Using the CP&L Splice Procedure

STEP NO.	DESCRIPTION	RESULTS/REMARKS	✓	NOA
1.	Cut two 13-ft lengths of 1-conductor wire.		✓	
2.	Strip the wires per Splice Configuration No. 5.		✓	
3.	Slide a piece of Raychem WCSF-115-N 6" long over one of the wires.		✓	
4.	Slide one Amp 53548-1 pre-insulated butt splice into the holding jaw of the blue-color-coded die of the Amp 59250 T-Head hand crimp tool.		✓	
5.	Insert one wire fully into the butt splice.		✓	
6.	Crimp the splice. The tool will not reverse until a full crimp is completed.		✓	
7.	Slide the uncrimped side of the butt splice into the holding jaw of the crimp tool.		✓	
8.	Insert the other wire into the butt splice.		✓	

TESTED BY: Man Sung Lee DATE: 3-30-81
SHEET NO.: 1 OF 2
APPROVED: James Marcomet

WYLE LABORATORIES
CHECKLIST/DATA SHEET

CUSTOMER: Carolina Power & Light Co.
Specimen: Cable Splice Assembly
S/N: 11
Job No.: 45307
START DATE: 3-30-81
END DATE: 3-30-81
Test Title: Splicing 1-Conductor Wires Together Using the CP&L Splice Procedure.

STEP NO.	DESCRIPTION	RESULTS/REMARKS	✓	NOA
9.	Crimp the splice. The tool will not reverse until a full crimp is completed.		✓	
10.	Center the Raychem shrink tubing over the splice.		✓	
11.	Using a heat gun as a heat source, shrink the tubing by starting the shrinking action at the approximate center of the sleeve. Work the heat gun from the center toward each end, using a waving action of the tool. Continue until the sleeve is smoothly shrunk onto the cable surface and a visible flow of adhesive is evident from each end of the sleeve.		✓	
12.	Insert the completed cable splice assembly into the cable tray.		✓	

TESTED BY: [illegible signature] DATE: 3-30-81
SHEET NO.: 2 OF 2
APPROVED: James Marcomet

WYLE LABORATORIES
CHECKLIST/DATA SHEET

CUSTOMER: Carolina Power & Light Co. Job No.: 45307
Specimen: Cable Splice Assembly START DATE: 3-30-81
S/N: 12 END DATE: 3-30-81
Test Title: Splicing 1-Conductor Wires Together Using the CP&L Splice Procedure

STEP NO.	DESCRIPTION	RESULTS/REMARKS	✓	NOA
1.	Cut two 13-ft lengths of 1-conductor wire.		✓	
2.	Strip the wires per Splice Configuration No. 5.		✓	
3.	Slide a piece of Raychem WCSF-115-N 6" long over one of the wires.		✓	
4.	Slide one Amp 53548-1 pre-insulated butt splice into the holding jaw of the blue-color-coded die of the Amp 59250 T-Head hand crimp tool.		✓	
5.	Insert one wire fully into the butt splice.		✓	
6.	Crimp the splice. The tool will not reverse until a full crimp is completed.		✓	
7.	Slide the uncrimped side of the butt splice into the holding jaw of the crimp tool.		✓	
8.	Insert the other wire into the butt splice.		✓	

TESTED BY: Man Sing Lee DATE: 3-30-81
SHEET NO.: 1 OF 2
APPROVED: James Marcomet

WYLE LABORATORIES
CHECKLIST/DATA SHEET

CUSTOMER: Carolina Power & Light Co. Job No.: 45307
Specimen: Cable Splice Assembly START DATE: 3-30-81
S/N: 12 END DATE: 4-1-81
Test Title: Splicing 1-Conductor Wires Together Using the CP&L Splice Procedure.

STEP NO.	DESCRIPTION	RESULTS/REMARKS	✓	NOA
9.	Crimp the splice. The tool will not reverse until a full crimp is completed.	photograph	✓	
10.	Center the Raychem shrink tubing over the splice.			
11.	Using a heat gun as a heat source, shrink the tubing by starting the shrinking action at the approximate center of the sleeve. Work the heat gun from the center toward each end, using a waving action of the tool. Continue until the sleeve is smoothly shrunk onto the cable surface and a visible flow of adhesive is evident from each end of the sleeve.	photograph	✓	
12.	Insert the completed cable splice assembly into the cable tray.		✓	

TESTED BY: [illegible signature] DATE: 4-1-81
SHEET NO.: 2 OF 2
APPROVED: James Marcomet

WYLE LABORATORIES
CHECKLIST/DATA SHEET

CUSTOMER: Carolina Power & Light Co.
Specimen: Cable Splice Assembly
S/N: 13
Job No.: 45307
START DATE: 3-27-81
END DATE: 3-27-81
Test Title: Cable Splicing of 2-Conductor Shielded Cables Using the CP&L Splice Procedure

STEP NO.	DESCRIPTION	RESULTS/REMARKS	✓	NOA
1.	Cut two 13-ft lengths of Dekoron 2-conductor shielded instrument cable, Type 1952.		✓	
2.	Strip the cables per Splice Configuration No. 4.		✓	
3.	Slide one piece of Raychem WCSF-200-N 9" long over one of the cables.		✓	
	Crimp procedure for Step 4:		✓	
	A. Slide one Amp 53548-1 pre-insulated butt splice into the holding jaw of the blue-color-coded die of the Amp 59250 T-Head hand crimp tool.		✓	
	B. Insert the wire fully into the butt splice.			
	C. Crimp the splice. The tool will not reverse until a full crimp is completed.		✓	
4.	Crimp a butt splice onto each of the three wires of one of the cables.		✓	
	Crimp procedure for Step 5:			
	A. Slide the uncrimped end of the butt splice into the holding jaw of the blue-color-coded die of the crimp tool.		✓	

TESTED BY: [signature] DATE: 3-27-81
SHEET NO.: 1 OF 2
APPROVED: James Marconnet

WYLE LABORATORIES
CHECKLIST/DATA SHEET

CUSTOMER: Carolina Power & Light Co.
Job No.: 45307
Specimen: Cable Splice Assembly
START DATE: 3-27-81
S/N: 13
END DATE: 3-27-81
Test Title: Cable Splicing of 2-Conductor Shielded Cables Using the CP&L Splice Procedure

STEP NO.	DESCRIPTION	RESULTS/REMARKS	✓	NOA
4.	(Continued)			
	B. Insert the wire fully into the butt splice.		✓	
	C. Crimp the splice. The tool will not reverse until a full crimp is completed.		✓	
5.	Crimp the second cable onto the first cable, matching color for color.		✓	
6.	Center the shrink tubing over the splice.		✓	
7.	Using a heat gun for a heat source, cure the shrink tubing. The cure must be started from the center of the splice and worked out to the other end. Using this method, no air pockets shall be trapped within the splice.		✓	
8.	Insert the completed cable splice assembly into the cable tray.		✓	

TESTED BY: Kuan Sing Lee DATE: 3-27-81
SHEET NO.: 2 OF 2
APPROVED: James Marcomet

WYLE LABORATORIES
CHECKLIST/DATA SHEET

CUSTOMER: Carolina Power & Light Co.
Job No.: 45307
Specimen: Cable Splice Assembly
START DATE: 3-27-81
S/N: 14
END DATE: 3-27-81
Test Title: Cable Splicing of 2-Conductor Shielded Cables Using the CP&L Splice Procedure

STEP NO.	DESCRIPTION	RESULTS/REMARKS	✓	NOA
1.	Cut two 13-ft lengths of Dekoron 2-conductor shielded instrument cable, Type 1952.		✓	
2.	Strip the cables per Splice Configuration No. 4.		✓	
3.	Slide one piece of Raychem WCSF-200-N 9" long over one of the cables.		✓	
	Crimp procedure for Step 4:			
	A. Slide one Amp 53548-1 pre-insulated butt splice into the holding jaw of the blue-color-coded die of the Amp 59250 T-Head hand crimp tool.		✓	
	B. Insert the wire fully into the butt splice.		✓	
	C. Crimp the splice. The tool will not reverse until a full crimp is completed.		✓	
4.	Crimp a butt splice onto each of the three wires of one of the cables.		✓	
	Crimp procedure for Step 5:			
	A. Slide the uncrimped end of the butt splice into the holding jaw of the blue-color-coded die of the crimp tool.		✓	

TESTED BY: [illegible signature] DATE: 3-27-81
SHEET NO.: 1 OF 2
APPROVED: James Marconnet

WYLE LABORATORIES
CHECKLIST/DATA SHEET

CUSTOMER: Carolina Power & Light Co. Job No.: 45307
Specimen: Cable Splice Assembly START DATE: 3-27-81
S/N: 14 END DATE: 3-27-81
Test Title: Cable Splicing of 2-Conductor Shielded Cables Using the CP&L Splice Procedure

STEP NO.	DESCRIPTION	RESULTS/REMARKS	✓	NOA
4.	(Continued)			
	B. Insert the wire fully into the butt splice.		✓	
	C. Crimp the splice. The tool will not reverse until a full crimp is completed.		✓	
5.	Crimp the second cable onto the first cable, matching color for color.		✓	
6.	Center the shrink tubing over the splice.		✓	
7.	Using a heat gun for a heat source, cure the shrink tubing. The cure must be started from the center of the splice and worked out to the other end. Using this method, no air pockets shall be trapped within the splice.		✓	
8.	Insert the completed cable splice assembly into the cable tray.		✓	

TESTED BY: Man Sung Lee DATE: 3-27-81
SHEET NO.: 2 OF 2
APPROVED: James Marconnet

WYLE LABORATORIES
CHECKLIST/DATA SHEET

CUSTOMER: Carolina Power & Light Co. Job No.: 45307
Specimen: Cable Splice Assembly START DATE: 3-21-81
S/N: 15 END DATE: 3-27-81
Test Title: Cable Splicing of 2-Conductor Shielded Cables Using the CP&L Splice Procedure

STEP NO.	DESCRIPTION	RESULTS/REMARKS	✓	NOA
1.	Cut two 13-ft lengths of Dekoron 2-conductor shielded instrument cable, Type 1952.		✓	
2.	Strip the cables per Splice Configuration No. 4.		✓	
3.	Slide one piece of Raychem WCSF-200-N 9" long over one of the cables.		✓	
	Crimp procedure for Step 4:			
	A. Slide one Amp 53548-1 pre-insulated butt splice into the holding jaw of the blue-color-coded die of the Amp 59250 T-Head hand crimp tool.		✓	
	B. Insert the wire fully into the butt splice.		✓	
	C. Crimp the splice. The tool will not reverse until a full crimp is completed.		✓	
4.	Crimp a butt splice onto each of the three wires of one of the cables.		✓	
	Crimp procedure for Step 5:			
	A. Slide the uncrimped end of the butt splice into the holding jaw of the blue-color-coded die of the crimp tool.		✓	

TESTED BY: Man Sung Lee DATE: 3-27-81
SHEET NO.: 1 OF 2
APPROVED: James Marconnet

WYLE LABORATORIES
CHECKLIST/DATA SHEET

CUSTOMER: Carolina Power & Light Co. Job No.: 45307
Specimen: Cable Splice Assembly START DATE: 3-27-81
S/N: 15 END DATE: 3-27-81
Test Title: Cable Splicing of 2-Conductor Shielded Cables Using the CP&L Splice Procedure

STEP NO.	DESCRIPTION	RESULTS/REMARKS	✓	NOA
4.	(Continued)			
	B. Insert the wire fully into the butt splice.		✓	
	C. Crimp the splice. The tool will not reverse until a full crimp is completed.		✓	
5.	Crimp the second cable onto the first cable, matching color for color.		✓	
6.	Center the shrink tubing over the splice.		✓	
7.	Using a heat gun for a heat source, cure the shrink tubing. The cure must be started from the center of the splice and worked out to the other end. Using this method, no air pockets shall be trapped within the splice.		✓	
8.	Insert the completed cable splice assembly into the cable tray.		✓	

TESTED BY: [illegible] DATE: 3-27-81
SHEET NO.: 2 OF 2
APPROVED: James Marconnet

WYLE LABORATORIES
CHECKLIST/DATA SHEET

CUSTOMER: Carolina Power & Light Co.
Specimen: Cable Splice Assembly
S/N: 16
Job No.: 45307
START DATE: 3-27-81
END DATE: 3-27-81
Test Title: Cable Splicing of 2-Conductor Shielded Cables Using the CP&L Splice Procedure

STEP NO.	DESCRIPTION	RESULTS/REMARKS	✓	NOA
1.	Cut two 13-ft lengths of Dekoron 2-conductor shielded instrument cable, Type 1952.		✓	
2.	Strip the cables per Splice Configuration No. 4.		✓	
3.	Slide one piece of Raychem WCSF-200-N 9" long over one of the cables.		✓	
	Crimp procedure for Step 4:			
	A. Slide one Amp 53548-1 pre-insulated butt splice into the holding jaw of the blue-color-coded die of the Amp 59250 T-Head hand crimp tool.		✓	
	B. Insert the wire fully into the butt splice.		✓	
	C. Crimp the splice. The tool will not reverse until a full crimp is completed.		✓	
4.	Crimp a butt splice onto each of the three wires of one of the cables.		✓	
	Crimp procedure for Step 5:			
	A. Slide the uncrimped end of the butt splice into the holding jaw of the blue-color-coded die of the crimp tool.		✓	

TESTED BY: [illegible signature] DATE: 3-27-81
SHEET NO.: 1 OF 2
APPROVED: James Marcomet

WYLE LABORATORIES
CHECKLIST/DATA SHEET

CUSTOMER: Carolina Power & Light Co.   Job No.: 45307
Specimen: Cable Splice Assembly   START DATE: 3-27-81
S/N: 16   END DATE: 3-27-81
Test Title: Cable Splicing of 2-Conductor Shielded Cables Using the CP&L Splice Procedure

STEP NO.	DESCRIPTION	RESULTS/REMARKS	✓	NOA
4.	(Continued)			
	B. Insert the wire fully into the butt splice.		✓	
	C. Crimp the splice. The tool will not reverse until a full crimp is completed.		✓	
5.	Crimp the second cable onto the first cable, matching color for color.		✓	
6.	Center the shrink tubing over the splice.		✓	
7.	Using a heat gun for a heat source, cure the shrink tubing. The cure must be started from the center of the splice and worked out to the other end. Using this method, no air pockets shall be trapped within the splice.		✓	
8.	Insert the completed cable splice assembly into the cable tray.		✓	

TESTED BY: Man Sung Lee DATE: 3-27-81
SHEET NO.: 2 OF 2
APPROVED: James Marcomet

WYLE LABORATORIES
CHECKLIST/DATA SHEET

CUSTOMER: Carolina Power & Light Co.
Job No.: 45307
Specimen: Cable Splice Assembly
START DATE: 3-27-81
S/N: 17
END DATE: 3-27-81
Test Title: Cable Splicing of 2-Conductor Shielded Cables Using the CP&L Splice Procedure

STEP NO.	DESCRIPTION	RESULTS/REMARKS	✓	NOA
1.	Cut two 13-ft lengths of Dekoron 2-conductor shielded instrument cable, Type 1952.		✓	
2.	Strip the cables per Splice Configuration No. 4.		✓	
3.	Slide one piece of Raychem WCSF-200-N 9" long over one of the cables.		✓	
	Crimp procedure for Step 4:			
	A. Slide one Amp 53548-1 pre-insulated butt splice into the holding jaw of the blue-color-coded die of the Amp 59250 T-Head hand crimp tool.		✓	
	B. Insert the wire fully into the butt splice.		✓	
	C. Crimp the splice. The tool will not reverse until a full crimp is completed.		✓	
4.	Crimp a butt splice onto each of the three wires of one of the cables.		✓	
	Crimp procedure for Step 5:			
	A. Slide the uncrimped end of the butt splice into the holding jaw of the blue-color-coded die of the crimp tool.		✓	

TESTED BY: [illegible] DATE: 3-27-81
SHEET NO.: 1 OF 2
APPROVED: James Marconnet

WYLE LABORATORIES
CHECKLIST/DATA SHEET

CUSTOMER: Carolina Power & Light Co. Job No.: 45307

Specimen: Cable Splice Assembly START DATE: 3-27-81

S/N: 17 END DATE: 3-27-81

Test Title: Cable Splicing of 2-Conductor Shielded Cables Using the CP&L Splice Procedure

STEP NO.	DESCRIPTION	RESULTS/REMARKS	✓	NOA
4.	(Continued)			
	B. Insert the wire fully into the butt splice.		✓	
	C. Crimp the splice. The tool will not reverse until a full crimp is completed.		✓	
5.	Crimp the second cable onto the first cable, matching color for color.		✓	
6.	Center the shrink tubing over the splice.		✓	
7.	Using a heat gun for a heat source, cure the shrink tubing. The cure must be started from the center of the splice and worked out to the other end. Using this method, no air pockets shall be trapped within the splice.		✓	
8.	Insert the completed cable splice assembly into the cable tray.		✓	

TESTED BY: Mon Hung Lee DATE: 3-27-81

SHEET NO.: 2 OF 2

APPROVED: James Marconnet

WYLE LABORATORIES

CHECKLIST/DATA SHEET

CUSTOMER: Carolina Power & Light Co. Job No.: 45307

Specimen: Cable Splice Assembly START DATE: 3-27-81

S/N: 18 END DATE: 3-27-81

Test Title: Cable Splicing of 2-Conductor Shielded Cables Using the CP&L Splice Procedure

STEP NO.	DESCRIPTION	RESULTS/REMARKS	✓	NOA
1.	Cut two 13-ft lengths of Dekoron 2-conductor shielded instrument cable, Type 1952.		✓	
2.	Strip the cables per Splice Configuration No. 4.		✓	
3.	Slide one piece of Raychem WCSF-200-N 9" long over one of the cables.		✓	
	Crimp procedure for Step 4:			
	A. Slide one Amp 53548-1 pre-insulated butt splice into the holding jaw of the blue-color-coded die of the Amp 59250 T-Head hand crimp tool.		✓ ✓	
	B. Insert the wire fully into the butt splice.			
	C. Crimp the splice. The tool will not reverse until a full crimp is completed.		✓	
4.	Crimp a butt splice onto each of the three wires of one of the cables.		✓	
	Crimp procedure for Step 5:			
	A. Slide the uncrimped end of the butt splice into the holding jaw of the blue-color-coded die of the crimp tool.		✓	

TESTED BY: [signature] DATE: 3-27-81

SHEET NO.: 1 OF 2

APPROVED: James Marcomet

WYLE LABORATORIES
CHECKLIST/DATA SHEET

CUSTOMER: Carolina Power & Light Co. Job No.: 45307
Specimen: Cable Splice Assembly START DATE: 3-27-81
S/N: 18 END DATE: 3-27-81
Test Title: Cable Splicing of 2-Conductor Shielded Cables Using the CP&L Splice Procedure

STEP NO.	DESCRIPTION	RESULTS/REMARKS	✓	NOA
4.	(Continued)			
	B. Insert the wire fully into the butt splice.		✓	
	C. Crimp the splice. The tool will not reverse until a full crimp is completed.		✓	
5.	Crimp the second cable onto the first cable, matching color for color.	photograph	✓	
6.	Center the shrink tubing over the splice.		✓	
7.	Using a heat gun for a heat source, cure the shrink tubing. The cure must be started from the center of the splice and worked out to the other end. Using this method, no air pockets shall be trapped within the splice.	photograph		
8.	Insert the completed cable splice assembly into the cable tray.		✓	

TESTED BY: [signature] DATE: 3-27-81
SHEET NO.: 2 OF 2
APPROVED: James Marconnet

WYLE. LABORATORIES
CHECKLIST/DATA SHEET

CUSTOMER: Carolina Power & Light Co. Job No.: 45307
Specimen: Cable Splice Assembly START DATE: 3-27-81
S/N: 19 END DATE: 3-27-81
Test Title: Cable Splicing of 4-Conductor Shielded Cables Using the CP&L Splice Procedure

STEP NO.	DESCRIPTION	RESULTS/REMARKS	✓	NOA
1.	Cut two 13-ft lengths of Continental 4-conductor shielded instrument cable ECRP-S600-16-4S.		✓	
			✓	
2.	Strip the cables per Splice Configuration No. 2.			
3.	Slide one piece of Raychem WCSF-200-N 9" long over one of the cables.	used 12" long Raychem piece per splice configuration #2	✓	
	Crimp procedure for Step 4:			
	A. Slide one Amp 53548-1 pre-insulated butt splice into the holding jaw of the blue-color-coded die of the Amp 59250 T-Head hand crimp tool.		✓	
	B. Insert the wire fully into the butt splice.		✓	
	C. Crimp the splice. The tool will not reverse until a full crimp is completed.		✓	
4.	Crimp a butt splice onto each of the five wires of one of the cables.		✓	
	Crimp procedure for Step 5:			
	A. Slide the uncrimped end of the butt splice into the holding jaw of the blue-color-coded die of the crimp tool.		✓	

TESTED BY: [illegible] DATE: 3-27-81
SHEET NO.: 1 OF 2
APPROVED: James Marconnet

WYLE LABORATORIES
CHECKLIST/DATA SHEET

CUSTOMER: Carolina Power & Light Co.
Job No.: 45307
Specimen: Cable Splice Assembly
START DATE: 3-27-81
S/N: 19
END DATE: 3-27-81
Test Title: Cable Splicing of 4-Conductor Shielded Cables Using the CP&L Splice Procedure

STEP NO.	DESCRIPTION	RESULTS/REMARKS	✓	NOA
4.	(Continued)			
	B. Insert the wire fully into the butt splice.		✓	
	C. Crimp the splice. The tool will not reverse until a full crimp is completed.		✓	
5.	Crimp the second cable onto the first cable, matching color for color.		✓	
6.	Center the shrink tubing over the splice.		✓	
7.	Using a heat gun for a heat source, cure the shrink tubing. The cure must be started from the center of the splice and worked out to one end. Return to the center of the splice and work out to the other end. Using this method, no air pockets shall be trapped within the splice.		✓	
8.	Insert the completed cable splice assembly into the cable tray.		✓	

TESTED BY: Man Sing Lee DATE: 3-27-81
SHEET NO.: 2 OF 2
APPROVED: James Marconnet

WYLE LABORATORIES

CHECKLIST/DATA SHEET

CUSTOMER: Carolina Power & Light Co. Job No.: 45307

Specimen: Cable Splice Assembly START DATE: 3-30-81

S/N: 20 END DATE: 3-30-81

Test Title: Cable Splicing of 4-Conductor Shielded Cables Using the CP&L Splice Procedure

STEP NO.	DESCRIPTION	RESULTS/REMARKS	✓	NOA
1.	Cut two 13-ft lengths of Continental 4-conductor shielded instrument cable ECRP-S600-16-4S.		✓	
2.	Strip the cables per Splice Configuration No. 2.		✓	
3.	Slide one piece of Raychem WCSF-200-N 9" long over one of the cables.	USED 12" long RAYCHEM piece per Splice configuration #2	✓	
	Crimp procedure for Step 4:		✓	
	A. Slide one Amp 53548-1 pre-insulated butt splice into the holding jaw of the blue-color-coded die of the Amp 59250 T-Head hand crimp tool.		✓	
	B. Insert the wire fully into the butt splice.		✓	
	C. Crimp the splice. The tool will not reverse until a full crimp is completed.			
4.	Crimp a butt splice onto each of the five wires of one of the cables.		✓	
	Crimp procedure for Step 5:			
	A. Slide the uncrimped end of the butt splice into the holding jaw of the blue-color-coded die of the crimp tool.		✓	

TESTED BY: [signature] DATE: 3-30-81

SHEET NO.: 1 OF 2

APPROVED: James Marconnet

WYLE LABORATORIES
CHECKLIST/DATA SHEET

CUSTOMER: Carolina Power & Light Co.
Specimen: Cable Splice Assembly
S/N: 20
Job No.: 45307
START DATE: 3-30-81
END DATE: 3-30-81
Test Title: Cable Splicing of 4-Conductor Shielded Cables Using the CP&L Splice Procedure

STEP NO.	DESCRIPTION	RESULTS/REMARKS	✓	NOA
4.	(Continued)			
	B. Insert the wire fully into the butt splice.		✓	
	C. Crimp the splice. The tool will not reverse until a full crimp is completed.		✓	
5.	Crimp the second cable onto the first cable, matching color for color.		✓	
6.	Center the shrink tubing over the splice.		✓	
7.	Using a heat gun for a heat source, cure the shrink tubing. The cure must be started from the center of the splice and worked out to one end. Return to the center of the splice and work out to the other end. Using this method, no air pockets shall be trapped within the splice.		✓	
8.	Insert the completed cable splice assembly into the cable tray.		✓	

TESTED BY: Nam Sung Lee DATE: 3-30-81
SHEET NO.: 2 OF 2
APPROVED: James Marconnet

WYLE LABORATORIES
CHECKLIST/DATA SHEET

CUSTOMER: Carolina Power & Light Co. Job No.: 45307

Specimen: Cable Splice Assembly START DATE: 3-30-81

S/N: 21 END DATE: 3-30-81

Test Title: Cable Splicing of 4-Conductor Shielded Cables Using the CP&L Splice Procedure

STEP NO.	DESCRIPTION	RESULTS/REMARKS	✓	NOA
1.	Cut two 13-ft lengths of Continental 4-conductor shielded instrument cable ECRP-S600-16-4S.		✓	
2.	Strip the cables per Splice Configuration No. 2.		✓	
3.	Slide one piece of Raychem WCSF-200-N 9" long over one of the cables.	used 12" long Raychem piece per splice configuration #2	✓	
	Crimp procedure for Step 4:			
	A. Slide one Amp 53548-1 pre-insulated butt splice into the holding jaw of the blue-color-coded die of the Amp 59250 T-Head hand crimp tool.		✓	
	B. Insert the wire fully into the butt splice.		✓	
	C. Crimp the splice. The tool will not reverse until a full crimp is completed.		✓	
4.	Crimp a butt splice onto each of the five wires of one of the cables.		✓	
	Crimp procedure for Step 5:			
	A. Slide the uncrimped end of the butt splice into the holding jaw of the blue-color-coded die of the crimp tool.		✓	

TESTED BY: [illegible signature] DATE: 3-30-81

SHEET NO.: 1 OF 2

APPROVED: James Marconnet

WYLE LABORATORIES
CHECKLIST/DATA SHEET

CUSTOMER: Carolina Power & Light Co. Job No.: 45307

Specimen: Cable Splice Assembly START DATE: 3-30-81

S/N: 21 END DATE: 3-30-81

Test Title: Cable Splicing of 4-Conductor Shielded Cables Using the CP&L Splice Procedure

STEP NO.	DESCRIPTION	RESULTS/REMARKS	✓	NOA
4.	(Continued)			
	B. Insert the wire fully into the butt splice.		✓	
	C. Crimp the splice. The tool will not reverse until a full crimp is completed.		✓	
5.	Crimp the second cable onto the first cable, matching color for color.		✓	
6.	Center the shrink tubing over the splice.		✓	
7.	Using a heat gun for a heat source, cure the shrink tubing. The cure must be started from the center of the splice and worked out to one end. Return to the center of the splice and work out to the other end. Using this method, no air pockets shall be trapped within the splice.		✓	
8.	Insert the completed cable splice assembly into the cable tray.		✓	

TESTED BY: [illegible signature] DATE: 3-30-81

SHEET NO.: 2 OF 2

APPROVED: James Marcomet

WYLE LABORATORIES
CHECKLIST/DATA SHEET

CUSTOMER: Carolina Power & Light Co. Job No.: 45307
Specimen: Cable Splice Assembly START DATE: 3-30-81
S/N: 22 END DATE: 3-30-81
Test Title: Cable Splicing of 4-Conductor Shielded Cables Using the CP&L Splice Procedure

STEP NO.	DESCRIPTION	RESULTS/REMARKS	✓	NOA
1.	Cut two 13-ft lengths of Continental 4-conductor shielded instrument cable ECRP-S600-16-4S.		✓	
2.	Strip the cables per Splice Configuration No. 2.		✓	
3.	Slide one piece of Raychem WCSF-200-N 9" long over one of the cables.	Used 12" Long Raychem piece per splice configuration #2	✓	
	Crimp procedure for Step 4:		✓	
	A. Slide one Amp 53548-1 pre-insulated butt splice into the holding jaw of the blue-color-coded die of the Amp 59250 T-Head hand crimp tool.		✓	
	B. Insert the wire fully into the butt splice.		✓	
	C. Crimp the splice. The tool will not reverse until a full crimp is completed.		✓	
4.	Crimp a butt splice onto each of the five wires of one of the cables.		✓	
	Crimp procedure for Step 5:			
	A. Slide the uncrimped end of the butt splice into the holding jaw of the blue-color-coded die of the crimp tool.			

TESTED BY: [signature] DATE: 3-30-81
SHEET NO.: 1 OF 2
APPROVED: James Marcomet

WYLE LABORATORIES
CHECKLIST/DATA SHEET

CUSTOMER: Carolina Power & Light Co.
Job No.: 45307
Specimen: Cable Splice Assembly
START DATE: 3-30-81
S/N: 22
END DATE: 3-30-81
Test Title: Cable Splicing of 4-Conductor Shielded Cables Using the CP&L Splice Procedure

STEP NO.	DESCRIPTION	RESULTS/REMARKS	✓	NOA
4.	(Continued)			
	B. Insert the wire fully into the butt splice.		✓	
	C. Crimp the splice. The tool will not reverse until a full crimp is completed.		✓	
5.	Crimp the second cable onto the first cable, matching color for color.		✓	
6.	Center the shrink tubing over the splice.		✓	
7.	Using a heat gun for a heat source, cure the shrink tubing. The cure must be started from the center of the splice and worked out to one end. Return to the center of the splice and work out to the other end. Using this method, no air pockets shall be trapped within the splice.		✓	
8.	Insert the completed cable splice assembly into the cable tray.		✓	

TESTED BY: [illegible signature] DATE: 3-30-81
SHEET NO.: 2 OF 2
APPROVED: James Marcomet

WYLE LABORATORIES
CHECKLIST/DATA SHEET

CUSTOMER: Carolina Power & Light Co.
Specimen: Cable Splice Assembly
S/N: 23
Job No.: 45307
START DATE: 3-30-81
END DATE: 3-30-81
Test Title: Cable Splicing of 4-Conductor Shielded Cables Using the CP&L Splice Procedure

STEP NO.	DESCRIPTION	RESULTS/REMARKS	✓	NOA
1.	Cut two 13-ft lengths of Continental 4-conductor shielded instrument cable ECRP-S600-16-4S.		✓	
2.	Strip the cables per Splice Configuration No. 2.		✓	
3.	Slide one piece of Raychem WCSF-200-N 9" long over one of the cables.	used 13" long Raychem piece per splice configuration #2	✓	
	Crimp procedure for Step 4:			
	A. Slide one Amp 53548-1 pre-insulated butt splice into the holding jaw of the blue-color-coded die of the Amp 59250 T-Head hand crimp tool.		✓	
	B. Insert the wire fully into the butt splice.		✓	
	C. Crimp the splice. The tool will not reverse until a full crimp is completed.		✓	
4.	Crimp a butt splice onto each of the five wires of one of the cables.		✓	
	Crimp procedure for Step 5:			
	A. Slide the uncrimped end of the butt splice into the holding jaw of the blue-color-coded die of the crimp tool.		✓	

TESTED BY: [illegible] DATE: 3-30-81
SHEET NO.: 1 OF 2
APPROVED: James Marconnet

WYLE LABORATORIES
CHECKLIST/DATA SHEET

CUSTOMER: Carolina Power & Light Co. Job No.: 45307
Specimen: Cable Splice Assembly START DATE: 3-30-81
S/N: 23 END DATE: 3-30-81
Test Title: Cable Splicing of 4-Conductor Shielded Cables Using the CP&L Splice Procedure

STEP NO.	DESCRIPTION	RESULTS/REMARKS	✓	NOA
4.	(Continued)		✓	
	B. Insert the wire fully into the butt splice.		✓	
	C. Crimp the splice. The tool will not reverse until a full crimp is completed.		✓	
5.	Crimp the second cable onto the first cable, matching color for color.		✓	
6.	Center the shrink tubing over the splice.		✓	
7.	Using a heat gun for a heat source, cure the shrink tubing. The cure must be started from the center of the splice and worked out to one end. Return to the center of the splice and work out to the other end. Using this method, no air pockets shall be trapped within the splice.		✓	
8.	Insert the completed cable splice assembly into the cable tray.			

TESTED BY: [illegible signature] DATE: 3-30-81
SHEET NO.: 2 OF 2
APPROVED: James Marconnet

WYLE LABORATORIES
CHECKLIST/DATA SHEET

CUSTOMER: Carolina Power & Light Co. Job No.: 45307
Specimen: Cable Splice Assembly START DATE: 3-30-81
S/N: 24 END DATE: 3-30-81
Test Title: Cable Splicing of 4-Conductor Shielded Cables Using the CP&L Splice Procedure

STEP NO.	DESCRIPTION	RESULTS/REMARKS	✓	NOA
1.	Cut two 13-ft lengths of Continental 4-conductor shielded instrument cable ECRP-S600-16-4S.		✓ ✓	
2.	Strip the cables per Splice Configuration No. 2.		✓	
3.	Slide one piece of Raychem WCSF-200-N 9" long over one of the cables.	Used 12" Long Raychem piece per splice configuration #2		
	Crimp procedure for Step 4:			
	A. Slide one Amp 53548-1 pre-insulated butt splice into the holding jaw of the blue-color-coded die of the Amp 59250 T-Head hand crimp tool.		✓	
	B. Insert the wire fully into the butt splice.		✓	
	C. Crimp the splice. The tool will not reverse until a full crimp is completed.		✓	
4.	Crimp a butt splice onto each of the five wires of one of the cables.		✓	
	Crimp procedure for Step 5:			
	A. Slide the uncrimped end of the butt splice into the holding jaw of the blue-color-coded die of the crimp tool.		✓	

TESTED BY: [illegible signature] DATE: 3-30-81
SHEET NO.: 1 OF 2
APPROVED: James Marconnet

WYLE LABORATORIES
CHECKLIST/DATA SHEET

CUSTOMER: Carolina Power & Light Co. Job No.: 45307

Specimen: Cable Splice Assembly START DATE: 3-30-81

S/N: 24 END DATE: 4-1-81

Test Title: Cable Splicing of 4-Conductor Shielded Cables Using the CP&L Splice Procedure

STEP NO.	DESCRIPTION	RESULTS/REMARKS	✓	NOA
4.	(Continued)			
	B. Insert the wire fully into the butt splice.		✓	
	C. Crimp the splice. The tool will not reverse until a full crimp is completed.		✓	
5.	Crimp the second cable onto the first cable, matching color for color.	photograph	✓	
6.	Center the shrink tubing over the splice.		✓	
7.	Using a heat gun for a heat source, cure the shrink tubing. The cure must be started from the center of the splice and worked out to one end. Return to the center of the splice and work out to the other end. Using this method, no air pockets shall be trapped within the splice.	photograph	✓	
8.	Insert the completed cable splice assembly into the cable tray.		✓	

TESTED BY: [illegible signature] DATE: 4-1-81

SHEET NO.: 2 OF 2

APPROVED: James Marconnet

APPENDIX IV

DATA SHEETS

DATA SHEET

WYLE LABORATORIES

Customer: Carolina Power & Light Co.
Specimen: In-Containment Cables
Part No.: Below
Spec.: WLTP 45307-1
Para.: 4.0
S/N: ---
GSI: ---
Amb. Temp.: ---
Photo: ---
Test Med.: ---
Specimen Temp.: Ambient
Job No.: 45307
Start Date: 4-1-81

Test Title: Baseline Functional Test

Test Specimen No. 1

Visual Inspection - No Visual Defects

Insulation Resistance Tests at 500 VDC for 1 minute minimum
White to ground plane - $1.1 \times 10^{12}\ \Omega$ White to Black - $4 \times 10^{11}\ \Omega$
Black to ground plane - $1.2 \times 10^{12}\ \Omega$ White to Shield - $2.6 \times 10^{11}\ \Omega$
Shield to ground plane - $.9 \times 10^{12}\ \Omega$ Black to Shield - $2.6 \times 10^{11}\ \Omega$

Dielectric Withstand Test, all conductors to ground plane, at 1250 VAC, 60 HZ, for 1 minute - 0.19 ma

Continuity Tests with ohm meter
White wire - 106 mΩ
Black wire - 105 mΩ
Shield - 99 mΩ

Specimen Failed: —
Specimen Passed: ✓
NCA Written: —

Tested By: Man Sung Lee Date: 4-3-81
Witness: — Date: —
Sheet No. 1 of 24
Approved: James Marcomet

DATA SHEET

WYLE LABORATORIES

Customer: Carolina Power & Light Co.
Specimen: In-Containment Cables
Part No.: Below
Spec.: WLTP 45307-1
Para.: 4.0
S/N: ---
GSI: ---
Amb. Temp.: ---
Photo: ---
Test Med.: ---
Specimen Temp.: Ambient
Job No.: 45307
Start Date: 4-2-81

Test Title: Baseline Functional Test

Test Specimen No. 2

Visual Inspection - No Visual Defects

Insulation Resistance Tests at 500 VDC for 1 minute minimum

White to ground plane - 6×10^{12} Ω	White to Black - 2.4×10^{12} Ω
Black to ground plane - 3×10^{12} Ω	White to Shield - 1×10^{12} Ω
Shield to ground plane - 2.2×10^{12} Ω	Black to Shield - 1.1×10^{12} Ω
Red to ground plane - 4×10^{12} Ω	White to Red - 0.7×10^{12} Ω
Green to ground plane - 4×10^{12} Ω	White to Green - 1.2×10^{12} Ω
Red to shield - 2.2×10^{12} Ω	Red to Black - 0.8×10^{12} Ω
Green to shield - 2.4×10^{12} Ω	Black to Green - 2.4×10^{12} Ω
Green to Red - 3×10^{12} Ω	

Dielectric Withstand Test, all conductors to ground plane, at 1250 VAC, 60 HZ, for 1 minute → 0.19 ma

Continuity Tests with ohm meter

White wire - 106 mΩ	Red wire - 103 mΩ
Black wire - 104 mΩ	Green wire - 104 mΩ
Shield - 78 mΩ	

Specimen Failed: –
Specimen Passed: ✓
NOA Written: –

Tested By: Man Sung Lee Date: 4-3-81
Witness: – Date: –
Sheet No. 2 of 24
Approved: James Marconnet

DATA SHEET

Customer: Carolina Power & Light Co.
Specimen: In-Containment Cables
Part No.: Below
Spec.: WLTP 45307-1
Para.: 4.0
S/N: ---
GSI: ---
Amb. Temp.: ---
Photo: ---
Test Med.: ---
Specimen Temp.: Ambient

WYLE LABORATORIES
Job No.: 45307
Start Date: 4-2-81

Test Title: Baseline Functional Test

Test Specimen No. 3

Visual Inspection - NO VISUAL DEFECTS

Insulation Resistance Tests at 500 VDC for 1 minute minimum

White to ground plane - $1 \times 10^{12}\,\Omega$	White to Black - $1.5 \times 10^{11}\,\Omega$
Black to ground plane - $1.5 \times 10^{12}\,\Omega$	White to Shield - $3 \times 10^{11}\,\Omega$
Shield to ground plane - $0.5 \times 10^{12}\,\Omega$	Black to Shield - $3.5 \times 10^{12}\,\Omega$
Red to ground plane - $0.7 \times 10^{12}\,\Omega$	White to Red - $2 \times 10^{12}\,\Omega$
Green to ground plane - $3 \times 10^{11}\,\Omega$	White to Green - $3 \times 10^{12}\,\Omega$
Red to shield - $1.5 \times 10^{12}\,\Omega$	Red to Black - $2.4 \times 10^{12}\,\Omega$
Green to shield - $4 \times 10^{11}\,\Omega$	Black to Green - $2 \times 10^{12}\,\Omega$
Green to Red - $1.7 \times 10^{12}\,\Omega$	

Dielectric Withstand Test, all conductors to ground plane, at 1250 VAC, 60 HZ, for 1 minute - 0.19 ma

Continuity Tests with ohm meter

White wire - 112 mΩ	Red wire - 109 mΩ
Black wire - 109 mΩ	Green wire - 109 mΩ
Shield - 84 mΩ	

Specimen Failed: —
Specimen Passed: ✓
NOA Written: —

Tested By: Man Sung Lee Date: 4-3-81
Witness: — Date: —
Sheet No. 3 of 24
Approved: James Marcomet

DATA SHEET

Customer Carolina Power & Light Co.
Specimen In-Containment Cables
WYLE LABORATORIES

Part No. Below
Amb. Temp. ---
Job No. 45307
Spec. WLTP 45307-1
Photo ---
Para. 4.0
Test Med. ---
Start Date 4-2-81
S/N ---
Specimen Temp. Ambient
GSI ---

Test Title Baseline Functional Test

Test Specimen No. 4

Visual Inspection - NO VISUAL DEFECTS

Insulation Resistance Tests at 500 VDC for 1 minute minimum
White to ground plane - $2 \times 10^{11} \Omega$ White to Black - $1 \times 10^{12} \Omega$
Black to ground plane - $0.7 \times 10^{12} \Omega$ White to Shield - $3 \times 10^{11} \Omega$
Shield to ground plane - $1.5 \times 10^{11} \Omega$ Black to Shield - $0.7 \times 10^{12} \Omega$

Dielectric Withstand Test, all conductors to ground plane, at 1250 VAC, 60 HZ, for 1 minute - 0.18 ma

Continuity Tests with ohm meter
White wire - 106 mΩ
Black wire - 105 mΩ
Shield - 99 mΩ

Specimen Failed —
Specimen Passed ✓
NCA Written —

Tested By Man Sung Lee Date: 4-3-81
Witness — Date: —
Sheet No. 4 of 24
Approved James Marconnet

WH-614A

DATA SHEET

Customer: Carolina Power & Light Co.
Specimen: In-Containment Cables
Part No.: Below
Spec.: WLTP 45307-1
Para.: 4.0
S/N: ---
GSI: ---

Amb. Temp.: ---
Photo: ---
Test Med.: ---
Specimen Temp.: Ambient

WYLE LABORATORIES
Job No.: 45307
Start Date: 4-2-81

Test Title: Base line Functional Test

Test Specimen No. 5

Visual Inspection - NO VISUAL DEFECTS

Insulation Resistance Tests at 500 VDC for 1 minute minimum

White to ground plane - $0.5 \times 10^{12}\,\Omega$ White to Black - $0.5 \times 10^{12}\,\Omega$

Black to ground plane - $0.9 \times 10^{12}\,\Omega$ White to Shield - $2 \times 10^{11}\,\Omega$

Shield to ground plane - $0.6 \times 10^{12}\,\Omega$ Black to Shield - $0.5 \times 10^{12}\,\Omega$

Dielectric Withstand Test, all conductors to ground plane, at 1250 VAC, 60 HZ, for 1 minute - 0.18 ma

Continuity Tests with ohm meter

White wire - 110 mΩ

Black wire - 108 mΩ

Shield - 101 mΩ

Specimen Failed: –
Specimen Passed: ✓
NCA Written: –

Tested By: Man Sung Lee Date: 4-3-81
Witness: – Date: –
Sheet No. 5 of 24
Approved: James Marcomet

DATA SHEET

WYLE LABORATORIES

Customer: Carolina Power & Light Co.
Specimen: In-Containment Cables
Part No.: Below
Spec.: WLTP 45307-1
Para.: 4.0
S/N: ---
GSI: ---
Amb. Temp.: ---
Photo: ---
Test Med.: ---
Specimen Temp.: Ambient
Job No.: 45307
Start Date: 4-2-81

Test Title: Baseline Functional Test

Test Specimen No. 6

Visual Inspection - NO VISUAL DEFECTS

Insulation Resistance Tests at 500 VDC for 1 minute minimum

White to ground plane - $1.5 \times 10^{12} \Omega$	White to Black - $2 \times 10^{12} \Omega$
Black to ground plane - $1.7 \times 10^{12} \Omega$	White to Shield - $3 \times 10^{12} \Omega$
Shield to ground plane - $0.7 \times 10^{12} \Omega$	Black to Shield - $2.2 \times 10^{12} \Omega$
Red to ground plane - $2.6 \times 10^{12} \Omega$	White to Red - $2 \times 10^{12} \Omega$
Green to ground plane - $2.4 \times 10^{12} \Omega$	White to Green - $3 \times 10^{12} \Omega$
Red to shield - $2.6 \times 10^{12} \Omega$	Red to Black - $0.6 \times 10^{12} \Omega$
Green to shield - $3 \times 10^{12} \Omega$	Black to Green - $0.5 \times 10^{12} \Omega$
Green to Red - $2.4 \times 10^{12} \Omega$	

Dielectric Withstand Test, all conductors to ground plane, at 1250 VAC, 60 HZ, for 1 minute → 0.19 ma

Continuity Tests with ohm meter

White wire - 107 mΩ	Red wire - 106 mΩ
Black wire - 105 mΩ	Green wire - 106 mΩ
Shield - 81 mΩ	

Specimen Failed: —
Specimen Passed: ✓
NOA Written: —

Tested By: Man Sung Lee Date: 4-3-81
Witness: — Date: —
Sheet No. 6 of 24
Approved: James Marcomet

DATA SHEET

Customer: Carolina Power & Light Co.
Specimen: In-Containment Cables
Part No.: Below
Spec.: WLTP 45307-1
Para.: 4.0
S/N: ---
GSI: ---

Amb. Temp.: ---
Photo: ---
Test Med.: ---
Specimen Temp.: Ambient

WYLE LABORATORIES
Job No.: 45307
Start Date: 4-2-81

Test Title: Baseline Functional Test

Test Specimen No. 7

Visual Inspection – NO VISUAL DEFECTS

Insulation Resistance Test at 500 VDC for 1 minute minimum, wire to ground plane – $3 \times 10^{12}\ \Omega$

Dielectric Withstand Test, conductor to ground plane, at 1250 VAC, 60 Hz, for 1 minute — 0.15 ma

Continuity Test with Ohm meter – 100 m Ω

Specimen Failed: –
Specimen Passed: ✓
NOA Written: –

Tested By: Man Sung Lee Date: 4-3-81
Witness: – Date: –
Sheet No. 7 of 24
Approved: James Marcomet

DATA SHEET

WYLE LABORATORIES

Customer: Carolina Power & Light Co.
Specimen: In-Containment Cables
Part No.: Below
Spec.: WLTP 45307-1
Para.: 4.0
S/N: ---
GSI: ---

Amb. Temp.: ---
Photo: ---
Test Med.: ---
Specimen Temp.: Ambient

Job No.: 45307
Start Date: 4-2-81

Test Title: Baseline Functional Test

Test Specimen No. 8

Visual Inspection – NO VISUAL DEFECTS

Insulation Resistance Test at 500 VDC for 1 minute minimum, wire to ground plane – $7 \times 10^{12} \Omega$

Dielectric Withstand Test, conductor to ground plane, at 1250 VAC, 60 Hz, for 1 minute – 0.15 ma

Continuity Test with Ohm meter – 100 mΩ

Specimen Failed: –
Specimen Passed: ✓
NOA Written: –

Tested By: Mon Sung Lee Date: 4-3-81
Witness: – Date: –
Sheet No. 8 of 24
Approved: James Marconnet

DATA SHEET

WYLE LABORATORIES

Customer: Carolina Power & Light Co.
Specimen: In-Containment Cables
Part No.: Below
Spec.: WLTP 45307-1
Para.: 4.0
S/N: ---
GSI: ---
Amb. Temp.: ---
Photo: ---
Test Med.: ---
Specimen Temp.: Ambient
Job No.: 45307
Start Date: 4-2-81

Test Title: Baseline Functional Test

Test Specimen No. 9

Visual Inspection – NO VISUAL DEFECTS

Insulation Resistance Test at 500 VDC for 1 minute minimum, wire to ground plane – $2 \times 10^{12}\,\Omega$

Dielectric Withstand Test, conductor to ground plane, at 1250 VAC, 60 Hz, for 1 minute — 0.15 ma

Continuity Test with Ohm meter – 100 mΩ

Specimen Failed: –
Specimen Passed: ✓
NCA Written: –

Tested By: Man Sung Lee Date: 4-3-81
Witness: – Date: –
Sheet No. 9 of 24
Approved: James Marcomet

DATA SHEET

Customer Carolina Power & Light Co.

Specimen In-Containment Cables

WYLE LABORATORIES

Part No. Below

Amb. Temp. ---

Job No. 45307

Spec. WLTP 45307-1

Photo ---

Para. 4.0

Test Med. ---

Start Date 4-2-81

S/N ---

Specimen Temp. Ambient

GSI ---

Test Title Baseline Functional Test

Test Specimen No. 10

Visual Inspection – NO VISUAL DEFECTS

Insulation Resistance Test at 500 VDC for 1 minute minimum, wire to ground plane – $5 \times 10^{12} \Omega$

Dielectric Withstand Test, conductor to ground plane, at 1250 VAC, 60 HZ, for 1 minute — 0.15 ma

Continuity Test with Ohm meter – 100 mΩ

Specimen Failed –

Specimen Passed ✓

NCA Written –

Tested By Man Sung Lee Date: 4-3-81

Witness – Date: –

Sheet No. 10 of 24

Approved James Marcomet

DATA SHEET

WYLE LABORATORIES

Customer: Carolina Power & Light Co.
Specimen: In-Containment Cables
Part No.: Below
Spec.: WLTP 45307-1
Para.: 4.0
S/N: ---
GSI: ---
Amb. Temp.: ---
Photo: ---
Test Med.: ---
Specimen Temp.: Ambient
Job No.: 45307
Start Date: 4-2-81

Test Title: Base line Functional Test

Test Specimen No. 11

Visual Inspection – NO VISUAL DEFECTS

Insulation Resistance Test at 500 VDC for 1 minute minimum, wire to ground plane – $4 \times 10^{12} \Omega$

Dielectric Withstand Test, conductor to ground plane, at 1250 VAC, 60 Hz, for 1 minute — 0.15 ma

Continuity Test with Ohm meter – 100 mΩ

Specimen Failed: –
Specimen Passed: ✓
NOA Written: –

Tested By: Man Sung Lee Date: 4-3-81
Witness: – Date: –
Sheet No. 11 of 24
Approved: James Marcornet

DATA SHEET

Customer: Carolina Power & Light Co.
Specimen: In-Containment Cables
Part No.: Below
Spec.: WLTP 45307-1
Para.: 4.0
S/N: ---
GSI: ---

Amb. Temp.: ---
Photo: ---
Test Med.: ---
Specimen Temp.: Ambient

WYLE LABORATORIES
Job No.: 45307
Start Date: 4-2-81

Test Title: Baseline Functional Test

Test Specimen No. 12

Visual Inspection – NO VISUAL DEFECTS

Insulation Resistance Test at 500 VDC for 1 minute minimum, wire to ground plane – $1 \times 10^{12} \Omega$

Dielectric Withstand Test, conductor to ground plane, at 1250 VAC, 60 HZ, for 1 minute — 0.15 ma

Continuity Test With Ohm meter – 100 mΩ

Specimen Failed: –
Specimen Passed: ✓
NOA Written: –

Tested By: Nam Sung Lee Date: 4-3-81
Witness: – Date: –
Sheet No. 12 of 24
Approved: James Marconnet

DATA SHEET

WYLE LABORATORIES

Customer: Carolina Power & Light Co.
Specimen: In-Containment Cables
Part No.: Below
Spec.: WLTP 45307-1
Para.: 4.0
S/N: ---
GSI: ---
Amb. Temp.: ---
Photo: ---
Test Med.: ---
Specimen Temp.: Ambient
Job No.: 45307
Start Date: 4-2-81

Test Title: Baseline Functional Test

Test Specimen No. 13

Visual Inspection - NO VISUAL DEFECTS

Insulation Resistance Tests at 500 UDC for 1 minute minimum

White to ground plane - $0.7 \times 10^{12} \Omega$ White to Black - $1 \times 10^{12} \Omega$

Black to ground plane - $0.7 \times 10^{12} \Omega$ White to Shield - $0.7 \times 10^{12} \Omega$

Shield to ground plane - $0.5 \times 10^{12} \Omega$ Black to Shield - $0.5 \times 10^{12} \Omega$

Dielectric Withstand Test, all conductors to ground plane, at 1250 VAC, 60 HZ, for 1 minute - 0.18 ma

Continuity Tests with ohm meter

White wire - 105 mΩ

Black wire - 104 mΩ

Shield - 80 mΩ

Specimen Failed: —
Specimen Passed: ✓
NCA Written: —

Tested By: Man Sung Lee Date: 4-3-81
Witness: — Date: —
Sheet No. 13 of 24
Approved: James Marconnet

DATA SHEET

WYLE LABORATORIES

Customer: Carolina Power & Light Co.
Specimen: In-Containment Cables
Part No.: Below
Spec.: WLTP 45307-1
Para.: 4.0
S/N: ---
GSI: ---
Amb. Temp.: ---
Photo: ---
Test Med.: ---
Specimen Temp.: Ambient
Job No.: 45307
Start Date: 4-2-81

Test Title: Baseline Functional Test

Test Specimen No. 14

Visual Inspection - NO VISUAL DEFECTS

Insulation Resistance Tests at 500 VDC for 1 minute minimum

White to ground plane - $1 \times 10^{12}\,\Omega$ White to Black - $0.7 \times 10^{12}\,\Omega$

Black to ground plane - $1.2 \times 10^{12}\,\Omega$ White to Shield - $0.5 \times 10^{12}\,\Omega$

Shield to ground plane - $0.6 \times 10^{12}\,\Omega$ Black to Shield - $3 \times 10^{11}\,\Omega$

Dielectric Withstand Test, all conductors to ground plane, at 1250 VAC, 60 HZ, for 1 minute - 0.17 ma

Continuity Tests with ohm meter

White wire - 106 mΩ

Black wire - 104 mΩ

Shield - 99 mΩ

Specimen Failed: -
Specimen Passed: ✓
NCA Written: -

Tested By: Man Sung Lee Date: 4-3-81
Witness: - Date: -
Sheet No. 14 of 24
Approved: James Marcomet

DATA SHEET

WYLE LABORATORIES

Customer: Carolina Power & Light Co.
Specimen: In-Containment Cables
Part No.: Below
Spec.: WLTP 45307-1
Para.: 4.0
S/N: ---
GSI: ---
Amb. Temp.: ---
Photo: ---
Test Med.: ---
Specimen Temp.: Ambient
Job No.: 45307
Start Date: 4-2-81

Test Title: Baseline Functional Test

Test Specimen No. 15

Visual Inspection – NO VISUAL DEFECTS

Insulation Resistance Tests at 500 VDC for 1 minute minimum

White to ground plane – $1 \times 10^{12}\,\Omega$ White to Black – $4 \times 10^{11}\,\Omega$

Black to ground plane – $1 \times 10^{12}\,\Omega$ White to Shield – $0.8 \times 10^{12}\,\Omega$

Shield to ground plane – $4 \times 10^{11}\,\Omega$ Black to Shield – $3 \times 10^{11}\,\Omega$

Dielectric Withstand Test, all conductors to ground plane, at 1250 VAC, 60 HZ, for 1 minute – 0.16 ma

Continuity Tests with ohm meter

White wire – 106 mΩ

Black wire – 104 mΩ

Shield – 99 mΩ

Specimen Failed: –
Specimen Passed: ✓
NOA Written: –

Tested By: Nam Sung Lee Date: 4-3-81
Witness: – Date: –
Sheet No. 15 of 24
Approved: James Marcomet

DATA SHEET

Customer: Carolina Power & Light Co.
Specimen: In-Containment Cables
Part No.: Below
Spec.: WLTP 45307-1
Para.: 4.0
S/N: ---
GSI: ---

Amb. Temp.: ---
Photo: ---
Test Med.: ---
Specimen Temp.: Ambient

WYLE LABORATORIES
Job No.: 45307
Start Date: 4-2-81

Test Title: Baseline Functional Test

Test Specimen No. 16

Visual Inspection - NO VISUAL DEFECTS

Insulation Resistance Tests at 500 VDC for 1 minute minimum

White to ground plane - $1.2 \times 10^{12} \Omega$ White to Black - $3 \times 10^{11} \Omega$

Black to ground plane - $4 \times 10^{11} \Omega$ White to Shield - $3 \times 10^{11} \Omega$

Shield to ground plane - $0.9 \times 10^{12} \Omega$ Black to Shield - $3 \times 10^{11} \Omega$

Dielectric Withstand Test, all conductors to ground plane, at 1250 VAC, 60 HZ, for 1 minute - 0.17 ma

Continuity Tests with ohm meter

White wire - 105 mΩ

Black wire - 104 mΩ

Shield - 99 mΩ

Specimen Failed: –
Specimen Passed: ✓
NOA Written: –

Tested By: Nam Sung Lee Date: 4-3-81
Witness: – Date: –
Sheet No. 16 of 24
Approved: James Marcomet

DATA SHEET

WYLE LABORATORIES

Customer: Carolina Power & Light Co.
Specimen: In-Containment Cables
Part No.: Below
Spec.: WLTP 45307-1
Para.: 4.0
S/N: ---
GSI: ---
Amb. Temp.: ---
Photo: ---
Test Med.: ---
Specimen Temp.: Ambient
Job No.: 45307
Start Date: 4-2-81

Test Title: Baseline Functional Test

Test Specimen No. 17

Visual Inspection - NO VISUAL DEFECTS

Insulation Resistance Tests at 500 VDC for 1 minute minimum

White to ground plane - 0.9×10^{12} Ω   White to Black - 1×10^{12} Ω
Black to ground plane - 1×10^{12} Ω   White to Shield - 0.8×10^{12} Ω
Shield to ground plane - 0.6×10^{12} Ω   Black to Shield - 0.6×10^{12} Ω

Dielectric Withstand Test, all conductors to ground plane, at 1250 VAC, 60 HZ, for 1 minute - 0.19 ma

Continuity Tests with ohm meter
White wire - 106 mΩ
Black wire - 105 mΩ
Shield - 99 mΩ

Specimen Failed: –
Specimen Passed: ✓
NCA Written: –

Tested By: Man Sung Lee   Date: 4-3-81
Witness: –   Date: –
Sheet No. 17 of 24
Approved: James Marcomet

DATA SHEET

Customer: Carolina Power & Light Co.
Specimen: In-Containment Cables

WYLE LABORATORIES

Part No.: Below
Spec.: WLTP 45307-1
Para.: 4.0
S/N: ---
GSI: ---

Amb. Temp.: ---
Photo: ---
Test Med.: ---
Specimen Temp.: Ambient

Job No.: 45307
Start Date: 4-2-81

Test Title: Baseline Functional Test

Test Specimen No. 18

Visual Inspection - NO VISUAL DEFECTS

Insulation Resistance Tests at 500 VDC for 1 minute minimum

White to ground plane - $0.9 \times 10^{12}\,\Omega$ White to Black - $1.3 \times 10^{12}\,\Omega$
Black to ground plane - $1 \times 10^{12}\,\Omega$ White to Shield - $0.5 \times 10^{12}\,\Omega$
Shield to ground plane - $0.7 \times 10^{12}\,\Omega$ Black to Shield - $0.8 \times 10^{12}\,\Omega$

Dielectric Withstand Test, all conductors to ground plane, at 1250 VAC, 60 HZ, for 1 minute - 0.18 ma

Continuity Tests with ohm meter
White wire - 106 mΩ
Black wire - 104 mΩ
Shield - 98 mΩ

Specimen Failed: -
Specimen Passed: ✓
NCA Written: -

Tested By: Man Sung Lee Date: 4-3-81
Witness: - Date: -
Sheet No.: 18 of 24
Approved: James Marconnet

DATA SHEET

Customer Carolina Power & Light Co.
Specimen In-Containment Cables
Part No. Below
Spec. WLTP 45307-1
Para. 4.0
S/N ---
GSI ---

Amb. Temp. ---
Photo ---
Test Med. ---
Specimen Temp. Ambient

WYLE LABORATORIES
Job No. 45307
Start Date 4-2-81

Test Title Baseline Functional Test

Test Specimen No. 19

Visual Inspection - NO VISUAL DEFECTS

Insulation Resistance Tests at 500 VDC for 1 minute minimum

White to ground plane - $1.7 \times 10^{12}\,\Omega$	White to Black - $5 \times 10^{12}\,\Omega$
Black to ground plane - $2.4 \times 10^{12}\,\Omega$	White to Shield - $3 \times 10^{11}\,\Omega$
Shield to ground plane - $1.1 \times 10^{12}\,\Omega$	Black to Shield - $1 \times 10^{12}\,\Omega$
Red to ground plane - $3 \times 10^{12}\,\Omega$	White to Red - $15 \times 10^{12}\,\Omega$
Green to ground plane - $3 \times 10^{12}\,\Omega$	White to Green - $7 \times 10^{12}\,\Omega$
Red to shield - $7 \times 10^{12}\,\Omega$	Red to Black - $4 \times 10^{12}\,\Omega$
Green to shield - $8 \times 10^{12}\,\Omega$	Black to Green - $10 \times 10^{12}\,\Omega$
Green to Red - $6 \times 10^{12}\,\Omega$	

Dielectric Withstand Test, all conductors to ground plane, at 1250 VAC, 60 HZ, for 1 minute - 0.18 ma

Continuity Tests with ohm meter

White wire - 107 mΩ	Red wire - 105 mΩ
Black wire - 104 mΩ	Green wire - 105 mΩ
Shield - 78 mΩ	

Specimen Failed —
Specimen Passed ✓
NOA Written —

Tested By Moon Sung Lee Date: 4-3-81
Witness — Date: —
Sheet No. 19 of 24
Approved James Marcomet

DATA SHEET

WYLE LABORATORIES

Customer: Carolina Power & Light Co.
Specimen: In-Containment Cables
Part No.: Below
Spec.: WLTP 45307-1
Para.: 4.0
S/N: ---
GSI: ---
Amb. Temp.: ---
Photo: ---
Test Med.: ---
Specimen Temp.: Ambient
Job No.: 45307
Start Date: 4-2-81

Test Title: Baseline Functional Test

Test Specimen No. 20

Visual Inspection - NO VISUAL DEFECTS

Insulation Resistance Tests at 500 VDC for 1 minute minimum

White to ground plane - $3 \times 10^{12} \Omega$	White to Black - $4 \times 10^{12} \Omega$
Black to ground plane - $3 \times 10^{12} \Omega$	White to Shield - $1 \times 10^{12} \Omega$
Shield to ground plane - $1.2 \times 10^{12} \Omega$	Black to Shield - $0.7 \times 10^{12} \Omega$
Red to ground plane - $5 \times 10^{12} \Omega$	White to Red - $1.2 \times 10^{12} \Omega$
Green to ground plane - $6 \times 10^{12} \Omega$	White to Green - $10 \times 10^{12} \Omega$
Red to shield - $7 \times 10^{12} \Omega$	Red to Black - $8 \times 10^{12} \Omega$
Green to shield - $7 \times 10^{12} \Omega$	Black to Green - $10 \times 10^{12} \Omega$
Green to Red - $3 \times 10^{12} \Omega$	

Dielectric Withstand Test, all conductors to ground plane, at 1250 VAC, 60 HZ, for 1 minute → 0.19 ma

Continuity Tests with ohm meter

White wire - 107 mΩ	Red wire - 105 mΩ
Black wire - 104 mΩ	Green wire - 105 mΩ
Shield - 79 mΩ	

Specimen Failed: —
Specimen Passed: ✓
NCA Written: —

Tested By: Man Sung Lee Date: 4-3-81
Witness: — Date: —
Sheet No. 20 of 24
Approved: James Marconnet

DATA SHEET

Customer Carolina Power & Light Co.
Specimen In-Containment Cables
Part No. Below
Spec. WLTP 45307-1
Para. 4.0
S/N ---
GSI ---

Amb. Temp. ---
Photo ---
Test Med. ---
Specimen Temp. Ambient

WYLE LABORATORIES
Job No. 45307
Start Date 4-2-81

Test Title Baseline Functional Test

Test Specimen No. 21

Visual Inspection - NO VISUAL DEFECTS

Insulation Resistance Tests at 500 VDC for 1 minute minimum

White to ground plane - $2 \times 10^{12}\ \Omega$	White to Black - $6 \times 10^{12}\ \Omega$
Black to ground plane - $3 \times 10^{12}\ \Omega$	White to Shield - $1 \times 10^{12}\ \Omega$
Shield to ground plane - $1 \times 10^{12}\ \Omega$	Black to Shield - $1 \times 10^{12}\ \Omega$
Red to ground plane - $2 \times 10^{12}\ \Omega$	White to Red - $6 \times 10^{12}\ \Omega$
Green to ground plane - $4 \times 10^{12}\ \Omega$	White to Green - $10 \times 10^{12}\ \Omega$
Red to shield - $3 \times 10^{12}\ \Omega$	Red to Black - $9 \times 10^{12}\ \Omega$
Green to shield - $7 \times 10^{12}\ \Omega$	Black to Green - $8 \times 10^{12}\ \Omega$
Green to Red - $8 \times 10^{12}\ \Omega$	

Dielectric Withstand Test, all conductors to ground plane, at 1250 VAC, 60 HZ, for 1 minute - 0.18 ma

Continuity Tests with ohm meter

White wire - $107\ m\Omega$	Red wire - $105\ m\Omega$
Black wire - $104\ m\Omega$	Green wire - $105\ m\Omega$
Shield - $79\ m\Omega$	

Specimen Failed —
Specimen Passed ✓
NOA Written —

Tested By Man Sung Lee Date: 4-3-81
Witness — Date: —
Sheet No. 21 of 24
Approved James Marconnet

DATA SHEET

Customer: Carolina Power & Light Co.
Specimen: In-Containment Cables
Part No.: Below
Spec.: WLTP 45307-1
Para.: 4.0
S/N: ---
GSI: ---
Amb. Temp.: ---
Photo: ---
Test Med.: ---
Specimen Temp.: Ambient

WYLE LABORATORIES
Job No.: 45307
Start Date: 4-2-81

Test Title: Baseline Functional Test

Test Specimen No. 22

Visual Inspection - NO VISUAL DEFECTS

Insulation Resistance Tests at 500 VDC for 1 minute minimum

White to ground plane - $3 \times 10^{12} \Omega$	White to Black - $6 \times 10^{12} \Omega$
Black to ground plane - $3 \times 10^{12} \Omega$	White to Shield - $1 \times 10^{12} \Omega$
Shield to ground plane - $1 \times 10^{12} \Omega$	Black to Shield - $1 \times 10^{12} \Omega$
Red to ground plane - $5 \times 10^{12} \Omega$	White to Red - $20 \times 10^{12} \Omega$
Green to ground plane - $5 \times 10^{12} \Omega$	White to Green - $20 \times 10^{12} \Omega$
Red to shield - $10 \times 10^{12} \Omega$	Red to Black - $8 \times 10^{12} \Omega$
Green to shield - $10 \times 10^{12} \Omega$	Black to Green - $10 \times 10^{12} \Omega$
Green to Red - $6 \times 10^{12} \Omega$	

Dielectric Withstand Test, all conductors to ground plane, at 1250 VAC, 60 HZ, for 1 minute - 0.19 ma

Continuity Tests with ohm meter

White wire - 107 mΩ	Red wire - 105 mΩ
Black wire - 104 mΩ	Green wire - 105 mΩ
Shield - 80 mΩ	

Specimen Failed: —
Specimen Passed: ✓
NOA Written: —

Tested By: Man Sung Lee Date: 4-3-81
Witness: — Date: —
Sheet No. 22 of 24
Approved: James Marconnet

DATA SHEET

WYLE LABORATORIES

Customer: Carolina Power & Light Co.
Specimen: In-Containment Cables
Part No.: Below
Spec.: WLTP 45307-1
Para.: 4.0
S/N: ---
GSI: ---
Amb. Temp.: ---
Photo: ---
Test Med.: ---
Specimen Temp.: Ambient
Job No.: 45307
Start Date: 4-2-81

Test Title: Baseline Functional Test

Test Specimen No. 23

Visual Inspection – NO VISUAL DEFECTS

Insulation Resistance Tests at 500 VDC for 1 minute minimum

White to ground plane – $4 \times 10^{12}\,\Omega$	White to Black – $10 \times 10^{12}\,\Omega$
Black to ground plane – $3 \times 10^{12}\,\Omega$	White to Shield – $1 \times 10^{12}\,\Omega$
Shield to ground plane – $1.5 \times 10^{12}\,\Omega$	Black to Shield – $1.3 \times 10^{12}\,\Omega$
Red to ground plane – $8 \times 10^{12}\,\Omega$	White to Red – $2 \times 10^{12}\,\Omega$
Green to ground plane – $8 \times 10^{12}\,\Omega$	White to Green – $15 \times 10^{12}\,\Omega$
Red to shield – $9 \times 10^{12}\,\Omega$	Red to Black – $2.5 \times 10^{12}\,\Omega$
Green to shield – $7 \times 10^{12}\,\Omega$	Black to Green – $15 \times 10^{12}\,\Omega$
Green to Red – $10 \times 10^{12}\,\Omega$	

Dielectric Withstand Test, all conductors to ground plane, at 1250 VAC, 60 HZ, for 1 minute – 0.19 ma

Continuity Tests with ohm meter

White wire – $107\ m\Omega$	Red wire – $104\ m\Omega$
Black wire – $105\ m\Omega$	Green wire – $105\ m\Omega$
Shield – $79\ m\Omega$	

Specimen Failed: –
Specimen Passed: ✓
NOA Written: –

Tested By: Man Sung Lee Date: 4-3-81
Witness: – Date: –
Sheet No. 23 of 24
Approved: James Marconnet

DATA SHEET

Customer: Carolina Power & Light Co.
Specimen: In-Containment Cables
Part No.: Below
Spec.: WLTP 45307-1
Para.: 4.0
S/N: ---
GSI: ---

Amb. Temp.: ---
Photo: ---
Test Med.: ---
Specimen Temp.: Ambient

WYLE LABORATORIES
Job No.: 45307
Start Date: 4-2-81

Test Title: Baseline Functional Test

Test Specimen No. 24

Visual Inspection - NO VISUAL DEFECTS

Insulation Resistance Tests at 500 VDC for 1 minute minimum

White to ground plane - $2 \times 10^{12}\Omega$	White to Black - $3 \times 10^{12}\Omega$
Black to ground plane - $3 \times 10^{12}\Omega$	White to Shield - $0.6 \times 10^{12}\Omega$
Shield to ground plane - $0.8 \times 10^{12}\Omega$	Black to Shield - $10 \times 10^{12}\Omega$
Red to ground plane - $5 \times 10^{12}\Omega$	White to Red - $4 \times 10^{12}\Omega$
Green to ground plane - $3 \times 10^{12}\Omega$	White to Green - $7 \times 10^{12}\Omega$
Red to shield - $6 \times 10^{12}\Omega$	Red to Black - $8 \times 10^{12}\Omega$
Green to shield - $10 \times 10^{12}\Omega$	Black to Green - $6 \times 10^{12}\Omega$
Green to Red - $3 \times 10^{12}\Omega$	

Dielectric Withstand Test, all conductors to ground plane, at 1250 VAC, 60 HZ, for 1 minute - 0.19 ma

Continuity Tests with ohm meter

White wire - 107 mΩ	Red wire - 105 mΩ
Black wire - 105 mΩ	Green wire - 104 mΩ
Shield - 78 mΩ	

Specimen Failed: —
Specimen Passed: ✓
NOA Written: —

Tested By: Man Sung Lee Date: 4-3-81
Witness: — Date: —
Sheet No. 24 of 24
Approved: James Marconnet

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APPENDIX V

INSTRUMENTATION EQUIPMENT SHEET

INSTRUMENTATION EQUIPMENT SHEET

Date 4-1-81 Job No. 45307-01 Test Area Elect. Lab

Technician Perdue Customer CP+L Type Test Baseline Functional

No.	Instrument	Manufacturer	Model No.	Serial No.	Wyle or Gov't No.	Range	Accuracy	Calibration On	Calibration Due
1	Megohmmeter	Gen. Radio	1864	—	11898	MULTI	MFG Spec.	12-5-80	6-5-81
2	DIGITAL M.M.	KEITHLEY	164	—	11305	MULTI	MFG. SPEC.	10-9-80	4-9-81
3	AC HYPOT	ASSOCIATED RESEARCH	4030	416	96776	1250VAC	± 3%	3-31-81	6-31-81

J. Cramer (QA) 4-2-81 WYLE 3

Page No. I-146
Report No. 45307-1

Instrument Test Engineer DM Hooper Checked & Received By James Marconnet

WH-1029

SECTION II

RADIATION EXPOSURE

1.0 REQUIREMENTS

The radiation requirement for the cable and cable splice assemblies is the accident and normal total integrated dose of 1.54×10^7 rads (a 10% conservatism margin has been included).

The cables shall be placed in a Wyle Laboratories-supplied steel cable tray 5 feet long, 6-1/2 inches deep, and 12 inches wide. The cables shall not be stacked or restrained to the cable tray except by gravity. Placement of the cables shall be such that the cable splice assemblies are parallel to the floor of the cable tray. Following irradiation, particular care must be taken to ensure the cables are transported in the same spatial orientation as they were irradiated.

2.0 PROCEDURES

The cable tray with cable splice assemblies were crated and shipped to Parsippany, New Jersey by common carrier. The cable splice assemblies and cable tray unit were irradiated in a hot-cell facility at Isomedix, Inc., with Cobalt 60 (gamma) in a field of 9×10^5 rads per hour for 18.9 hours for a total integrated dose of 1.7×10^7 rads (air). The cable tray was rotated 180° approximately halfway through the exposure period for improved uniformity of dose. The cable tray with cable splice assemblies was recrated and shipped to Wyle Laboratories by common carrier.

3.0 RESULTS

The test items were subjected to the radiation level specified above. The test items were visualy inspected at the completion of the radiation testing and no visual degradation was noted.

A certification letter and Irradiation Data Sheet are presented in Appendix I of this section.

Photograph II-1 is presented in Appendix II of this section.

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APPENDIX I

CERTIFICATION LETTER
AND
IRRADIATION DATA SHEET

ISOMEDIX

A. Irradiation Performance:

1. Start date(s), end date(s)- April 18, 1981 - April 19, 1981

2. Cumulative dosage (air) - 15.4 Mrads

3. Irradiation geometry
   c. Dosimetry location(s) - See attached sheet

B. Nomenclature:

1. Wyle Purchase Order Number - 4-8843-S

2. Your Job or test number - 45307

3. Test Specimen description:
   a. Manufacturer: Unknown
   b. Specimen name(s) Unknown
   c. Model Number Unknown

C. Irradiation Source:

1. Type of Source
   Isotope

2. Isotope - Co-60

3. Type of Radiation
   Gamma

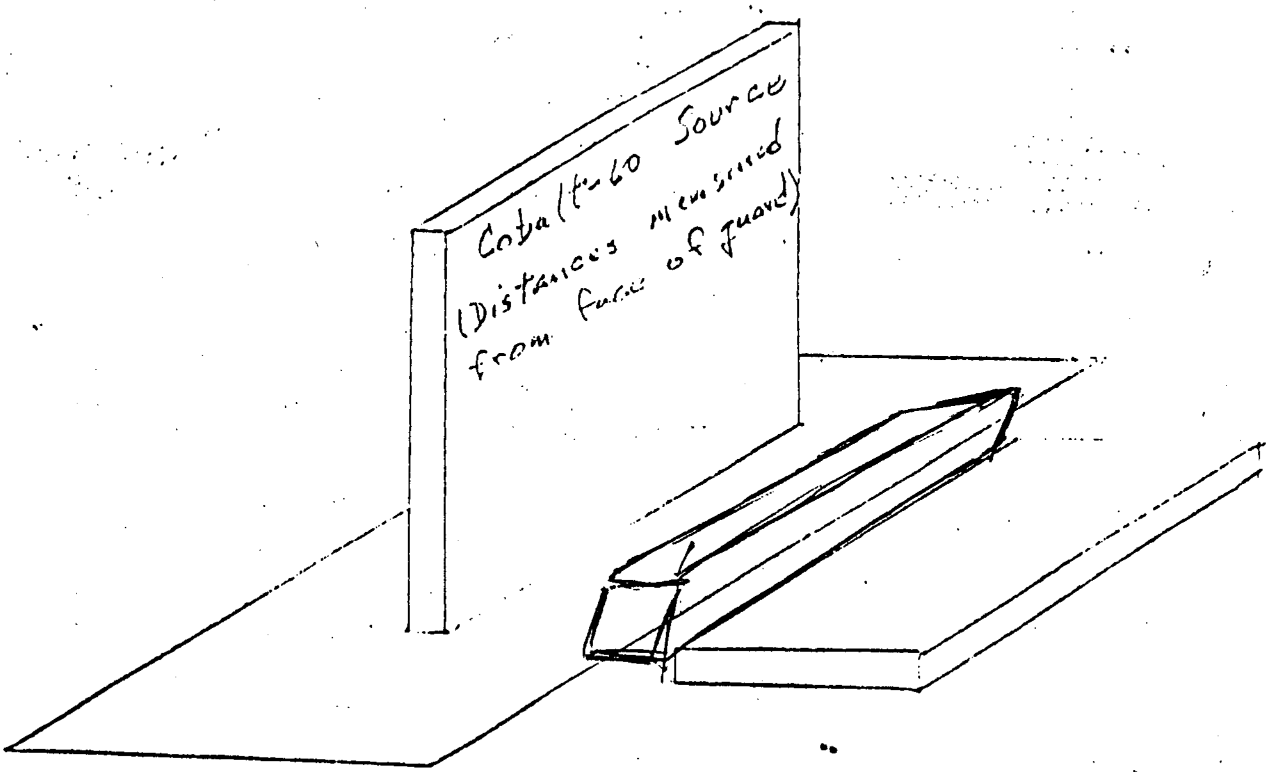
4. Energy of Radiation
   2.5 MEV/dis.

5. Source quantity or power used - 1.3Mci

ISOMEDIX

CLIENT: Wyle Labs
PURCHASE ORDER: 4-8843-S
PROJECT NO. 45307-01
TEST ITEM(S)

DATE EXPOSURE BEGAN: 4-18-81
DATE EXPOSURE COMPLETED: 4-19-81
TOTAL HOURS OF EXPOSURE: 18.9



DISTANCES: Source guard to midpoint of test item: 26 in.
Source guard to closest point of test item: 20 in.
Source guard to farthest point of test item: 32 in.

Number of times that test item was rotated for improved uniformity of dose: ONCE

DOSIMETRY RESULTS
Type:
- [x] Harwell Red
- [ ] AECL Perspex

Dosimeter No.	Distance To Guard (in)	Exposure Time (hours)	Measured Dose (Mrd)	(Calculated) Average Dose Rate (Mrd/hr)	Total Mrd
A		18.9		.9	17.0
B					
C					
D					

PREPARED BY: David Constantine DATE 6-1-81

WYLE LABORATORIES

IRRADIATION DATA SHEET

(To be returned to Wyle Laboratories)

REQUEST (To be completed by Wyle Laboratories)

Date: 3-31-81 Wyle Job No. 45307 Wyle P.O. No. 4-8843-F

Specimen: Cable Tray with Test Specimen Cables Part No. N/A

Air Equivalent Required Dose: Min. 1.54×10^7 Max. ______ Rate not to exceed 1×10^6 rads/hr

Source Type: Cobalt-60/gamma Specimen rotation required: Yes ☒ No ☐ 1 times

Sketch required: Yes ☒ No ☐

Post irradiation contamination check required: Yes ☒ No ☐

Dosimeter Locations: ☒ Standard (min. and max. expected locations) ☐ Other (sketch attached)

Comments ______

DATA (To be completed by performing lab)

Facility: Isomedix, Inc. Technician: ______

Total Dose (air): Min. 16.5 M(rads); Max. 17.5 M(rads)
Rate: 0.9 M rads/hr

Number of dosimeters used: Two

Dosimetry: Accuracy of dosimeters is ± 3%

Contamination Check Results (if required): ______

Specimen rotation description: ONCE

Comments: Specimen rotated approximately half-way through the exposure period (180°)

Sketch (if required): Please show source size, curies; distances, specimen, and dosimeter placement.

Date and Time In: April 18, 1981 Out: April 19, 1981
(18.9 hrs)

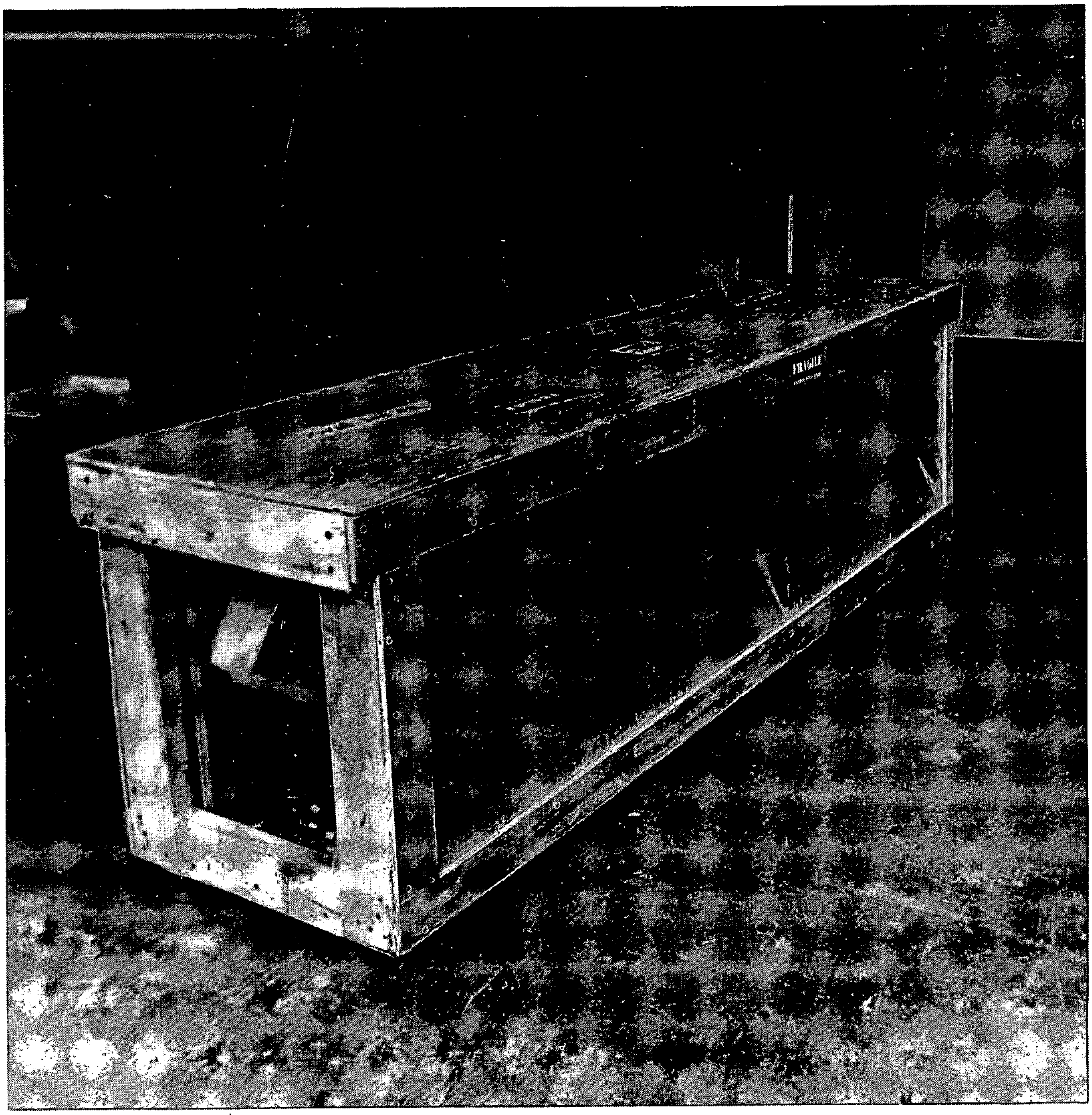
David Constantine hereby certifies that the above information is the result of complete and carefully conducted tests and is to the best of his knowledge true and correct in all respects.

Date 6-1-81 Sup'r Signature David P. Constantine Title Production Manager

Form No. W908 QA Form Approval [illegible]

APPENDIX II

PHOTOGRAPH



PHOTOGRAPH II-1

CABLE TRAY WITH CABLE SPLICE ASSEMBLIES IN SHIPPING CRATE PRIOR TO SHIPMENT TO THE IRRADIATION FACILITY

SECTION III

POST-IRRADIATION FUNCTIONAL TESTS

1.0 REQUIREMENTS

Functional tests shall be performed as specified in Paragraph 1.3 of Section I.

2.0 PROCEDURES

The test specimens were subjected to the functional tests specified in Paragraph 1.0 of this section.

3.0 RESULTS

The test specimens successfully met the requirements as specified in Paragraph 1.0 and as described in Paragraph 2.0 of this section.

Data Sheets showing the data recorded in this test sequence are presented in Appendix I of this section.

Equipment used in recording data is shown on the Instrumentation Equipment Sheet presented in Appendix II of this section.

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APPENDIX I

DATA SHEETS

DATA SHEET

Customer: Carolina Power & Light Co.
Specimen: In-Containment Cables
Part No.: Below
Spec.: WLTP 45307-1
Para.: 4.0
S/N: ---
GSI: ---
Amb. Temp.: ---
Photo: ---
Test Med.: ---
Specimen Temp.: Ambient

WYLE LABORATORIES
Job No.: 45307
Start Date: 4-29-81

Test Title: Post-Radiation Functional Test

Test Specimen No. 1

Visual Inspection - NO VISUAL DEFECT

Insulation Resistance Tests at 500 VDC for 1 minute minimum
White to ground plane - $3 \times 10^{11}\Omega$ White to Black - $2 \times 10^{11}\Omega$
Black to ground plane - $3 \times 10^{11}\Omega$ White to Shield - $2 \times 10^{11}\Omega$
Shield to ground plane - $3 \times 10^{11}\Omega$ Black to Shield - $1.5 \times 10^{11}\Omega$

Dielectric Withstand Test, all conductors to ground plane, at 1000 VAC, 60 HZ, for 1 minute - 0.16 ma

Continuity Tests with ohm meter
White wire - 106 mΩ
Black wire - 106 mΩ
Shield - 103 mΩ

Specimen Failed: —
Specimen Passed: ✓
NOA Written: —

Tested By: ManSung Lee Date: 5-1-81
Witness: — Date: —
Sheet No. 1 of 24
Approved: James Marconnet

DATA SHEET

WYLE LABORATORIES

Customer: Carolina Power & Light Co.
Specimen: In-Containment Cables
Part No.: Below
Spec.: WLTP 45307-1
Para.: 4.0
S/N: ---
GSI: ---
Amb. Temp.: ---
Photo: ---
Test Med.: ---
Specimen Temp.: Ambient
Job No.: 45307
Start Date: 4-29-81

Test Title: Post-Radiation Functional Test

Test Specimen No. 2

Visual Inspection - NO VISUAL DEFECT

Insulation Resistance Tests at 500 VDC for 1 minute minimum

White to ground plane - $3 \times 10^{11} \Omega$	White to Black - $2 \times 10^{11} \Omega$
Black to ground plane - $3 \times 10^{11} \Omega$	White to Shield - $1 \times 10^{11} \Omega$
Shield to ground plane - $1.5 \times 10^{11} \Omega$	Black to Shield - $2 \times 10^{11} \Omega$
Red to ground plane - $3 \times 10^{11} \Omega$	White to Red - $2.6 \times 10^{11} \Omega$
Green to ground plane - $4 \times 10^{11} \Omega$	White to Green - $3 \times 10^{11} \Omega$
Red to shield - $1.8 \times 10^{11} \Omega$	Red to Black - $3 \times 10^{11} \Omega$
Green to shield - $3 \times 10^{11} \Omega$	Black to Green - $3 \times 10^{11} \Omega$
Green to Red - $3 \times 10^{11} \Omega$	

Dielectric Withstand Test, all conductors to ground plane, at 1000 VAC, 60 HZ, for 1 minute - 0.15 ma

Continuity Tests with ohm meter

White wire - 106 mΩ	Red wire - 104 mΩ
Black wire - 104 mΩ	Green wire - 104 mΩ
Shield - 80 mΩ	

Specimen Failed: —
Specimen Passed: ✓
NCA Written: —

Tested By: Man Sung Lee Date: 5-1-81
Witness: — Date: —
Sheet No. 2 of 24
Approved: James Marconnet

DATA SHEET

WYLE LABORATORIES

Customer: Carolina Power & Light Co.
Specimen: In-Containment Cables
Part No.: Below
Spec.: WLTP 45307-1
Para.: 4.0
S/N: ---
GSI: ---
Amb. Temp.: ---
Photo: ---
Test Med.: ---
Specimen Temp.: Ambient
Job No.: 45307
Start Date: 4-29-81

Test Title: Post-Radiation Functional Test

Test Specimen No. 3

Visual Inspection - NO VISUAL DEFECT

Insulation Resistance Tests at 500 VDC for 1 minute minimum

White to ground plane - $2 \times 10^{11} \Omega$	White to Black - $1.5 \times 10^{11} \Omega$
Black to ground plane - $3 \times 10^{11} \Omega$	White to Shield - $1 \times 10^{11} \Omega$
Shield to ground plane - $1.5 \times 10^{11} \Omega$	Black to Shield - $2 \times 10^{11} \Omega$
Red to ground plane - $3 \times 10^{11} \Omega$	White to Red - $1.3 \times 10^{11} \Omega$
Green to ground plane - $3 \times 10^{11} \Omega$	White to Green - $1.8 \times 10^{11} \Omega$
Red to shield - $1.5 \times 10^{11} \Omega$	Red to Black - $1.5 \times 10^{11} \Omega$
Green to shield - $1.7 \times 10^{11} \Omega$	Black to Green - $1.5 \times 10^{11} \Omega$
Green to Red - $1.5 \times 10^{11} \Omega$	

Dielectric Withstand Test, all conductors to ground plane, at 1000 VAC, 60 HZ, for 1 minute - 0.16 ma

Continuity Tests with ohm meter

White wire - 113 mΩ	Red wire - 109 mΩ
Black wire - 109 mΩ	Green wire - 109 mΩ
Shield - 86 mΩ	

Specimen Failed: -
Specimen Passed: ✓
NCA Written: -

Tested By: Iman Sung Lee Date: 5-1-81
Witness: - Date: -
Sheet No. 3 of 24
Approved: James Marcomnot

DATA SHEET

Customer Carolina Power & Light Co.
Specimen In-Containment Cables
Part No. Below
Spec. WLTP 45307-1
Para. 4.0
S/N ---
GSI ---

Amb. Temp. ---
Photo ---
Test Med. ---
Specimen Temp. Ambient

WYLE LABORATORIES
Job No. 45307
Start Date 4-29-81

Test Title Post-Radiation Functional Test

Test Specimen No. 4

Visual Inspection - NO VISUAL DEFECT

Insulation Resistance Tests at 500 VDC for 1 minute minimum

White to ground plane - $3 \times 10^{11} \Omega$ White to Black - $1.5 \times 10^{11} \Omega$

Black to ground plane - $4 \times 10^{11} \Omega$ White to Shield - $2 \times 10^{11} \Omega$

Shield to ground plane - $2 \times 10^{11} \Omega$ Black to Shield - $2 \times 10^{11} \Omega$

Dielectric Withstand Test, all conductors to ground plane, at 1000 VAC, 60 HZ, for 1 minute - 0.14 ma

Continuity Tests with ohm meter

White wire - 107 $m\Omega$

Black wire - 105 $m\Omega$

Shield - 102 $m\Omega$

Specimen Failed —
Specimen Passed ✓
NCA Written —

Tested By Nam Sung Lee Date: 5-1-81
Witness — Date: —
Sheet No. 4 of 24
Approved James Marcomet

W-…1A

DATA SHEET

Customer: Carolina Power & Light Co.
Specimen: In-Containment Cables
Part No.: Below
Spec.: WLTP 45307-1
Para.: 4.0
S/N: ---
GSI: ---

Amb. Temp.: ---
Photo: ---
Test Med.: ---
Specimen Temp.: Ambient

WYLE LABORATORIES
Job No.: 45307
Start Date: 4-29-81

Test Title: Post- Radiation Functional Test

Test Specimen No. 5

Visual Inspection - NO VISUAL DEFECT

Insulation Resistance Tests at 500 VDC for 1 minute minimum

White to ground plane - $2.6 \times 10^{11}\,\Omega$ White to Black - $1 \times 10^{11}\,\Omega$
Black to ground plane - $3 \times 10^{11}\,\Omega$ White to Shield - $1.2 \times 10^{11}\,\Omega$
Shield to ground plane - $2.6 \times 10^{11}\,\Omega$ Black to Shield - $1.5 \times 10^{11}\,\Omega$

Dielectric Withstand Test, all conductors to ground plane, at 1000 VAC, 60 HZ, for 1 minute - 0.14 ma

Continuity Tests with ohm meter
White wire - 110 mΩ
Black wire - 108 mΩ
Shield - 105 mΩ

Specimen Failed: –
Specimen Passed: ✓
NOA Written: –

Tested By: ManSung Lee Date: 5-1-81
Witness: – Date: –
Sheet No. 5 of 24
Approved: James Marconnet

DATA SHEET

WYLE LABORATORIES

Customer: Carolina Power & Light Co.
Specimen: In-Containment Cables
Part No.: Below
Spec.: WLTP 45307-1
Para.: 4.0
S/N: ---
GSI: ---
Amb. Temp.: ---
Photo: ---
Test Med.: ---
Specimen Temp.: Ambient
Job No.: 45307
Start Date: 4-30-81

Test Title: Post-Radiation Functional Test

Test Specimen No. 6

Visual Inspection - NO VISUAL DEFECT

Insulation Resistance Tests at 500 VDC for 1 minute minimum

White to ground plane - $2 \times 10^{11} \Omega$	White to Black - $2 \times 10^{11} \Omega$
Black to ground plane - $3 \times 10^{11} \Omega$	White to Shield - $2 \times 10^{11} \Omega$
Shield to ground plane - $1.3 \times 10^{11} \Omega$	Black to Shield - $2 \times 10^{11} \Omega$
Red to ground plane - $3 \times 10^{11} \Omega$	White to Red - $2 \times 10^{11} \Omega$
Green to ground plane - $3 \times 10^{11} \Omega$	White to Green - $3 \times 10^{11} \Omega$
Red to shield - $2 \times 10^{11} \Omega$	Red to Black - $3 \times 10^{11} \Omega$
Green to shield - $3 \times 10^{11} \Omega$	Black to Green - $3 \times 10^{11} \Omega$
Green to Red - $3 \times 10^{11} \Omega$	

Dielectric Withstand Test, all conductors to ground plane, at 1000 VAC, 60 HZ, for 1 minute → 0.15 ma

Continuity Tests with ohm meter

White wire - 108 mΩ	Red wire - 106 mΩ
Black wire - 106 mΩ	Green wire - 106 mΩ
Shield - 82 mΩ	

Specimen Failed: –
Specimen Passed: ✓
NOA Written: –

Tested By: Man Sung Lee Date: 5-1-81
Witness: – Date: –
Sheet No. 6 of 24
Approved: James Marcomet

DATA SHEET

WYLE LABORATORIES

Customer: Carolina Power & Light Co.
Specimen: In-Containment Cables
Part No.: Below
Spec.: WLTP 45307-1
Para.: 4.0
S/N: ---
GSI: ---
Amb. Temp.: ---
Photo: ---
Test Med.: ---
Specimen Temp.: Ambient
Job No.: 45307
Start Date: 4-30-81

Test Title: Post- Radiation Functional Test

Test Specimen No. 7

Visual Inspection – NO VISUAL DEFECT

Insulation Resistance Test at 500 VDC for 1 minute minimum, wire to ground plane – $1 \times 10^{12}\ \Omega$

Dielectric Withstand Test, conductor to ground plane, at 1000 VAC, 60 HZ, for 1 minute — 0.12 ma

Continuity Test With Ohm meter – 100 mΩ

Specimen Failed: –
Specimen Passed: ✓
NOA Written: –

Tested By: ManSung Lee Date: 5-1-81
Witness: – Date: –
Sheet No. 7 of 24
Approved: James Marcomet

DATA SHEET

Customer: Carolina Power & Light Co.
Specimen: In-Containment Cables
Part No.: Below
Spec.: WLTP 45307-1
Para.: 4.0
S/N: ---
GSI: ---

Amb. Temp.: ---
Photo: ---
Test Med.: ---
Specimen Temp.: Ambient

WYLE LABORATORIES
Job No.: 45307
Start Date: 4-30-81

Test Title: Post-Radiation Functional Test

Test Specimen No. 8

Visual Inspection – NO VISUAL DEFECT

Insulation Resistance Test at 500 VDC for 1 minute minimum, wire to ground plane – $1 \times 10^{12}\,\Omega$

Dielectric Withstand Test, conductor to ground plane, at 1000 VAC, 60 Hz, for 1 minute — 0.13ma

Continuity Test with Ohm meter – 100mΩ

Specimen Failed: –
Specimen Passed: ✓
NOA Written: –

Tested By: Man Sung Lee Date: 5-1-81
Witness: – Date: –
Sheet No. 8 of 24
Approved: James Marconnet

DATA SHEET

WYLE LABORATORIES

Customer: Carolina Power & Light Co.
Specimen: In-Containment Cables
Part No.: Below
Spec.: WLTP 45307-1
Para.: 4.0
S/N: ---
GSI: ---
Amb. Temp.: ---
Photo: ---
Test Med.: ---
Specimen Temp.: Ambient
Job No.: 45307
Start Date: 4-30-81

Test Title: Post-Radiation Functional Test

Test Specimen No. 9

Visual Inspection - No VISUAL DEFECT

Insulation Resistance Test at 500 VDC for 1 minute minimum, wire to ground plane - $1 \times 10^{12}\ \Omega$

Dielectric Withstand Test, conductor to ground plane, at 1000 VAC, 60 HZ, for 1 minute - 0.13 ma

Continuity Test with Ohm meter - 100 mΩ

Specimen Failed: —
Specimen Passed: ✓
NCA Written: —

Tested By: Nam Sung Lee Date: 5-1-81
Witness: — Date: —
Sheet No. 9 of 24
Approved: James Marcomet

DATA SHEET

Customer: Carolina Power & Light Co.
Specimen: In-Containment Cables
Part No.: Below
Spec.: WLTP 45307-1
Para.: 4.0
S/N: ---
GSI: ---

Amb. Temp.: ---
Photo: ---
Test Med.: ---
Specimen Temp.: Ambient

WYLE LABORATORIES
Job No.: 45307
Start Date: 4-30-81

Test Title: Post-Radiation Functional Test

Test Specimen No. 10

Visual Inspection – NO VISUAL DEFECT

Insulation Resistance Test at 500 VDC for 1 minute minimum, wire to ground plane – $2 \times 10^{12}\ \Omega$

Dielectric Withstand Test, conductor to ground plane, at 1000 VAC, 60 HZ, for 1 minute – 0.13 ma

Continuity Test with Ohm meter – 100 mΩ

Specimen Failed: –
Specimen Passed: ✓
NCA Written: –

Tested By: Nam Sung Lee Date: 5-1-81
Witness: – Date: –
Sheet No. 10 of 24
Approved: James Marconnet

DATA SHEET

WYLE LABORATORIES

Customer: Carolina Power & Light Co.
Specimen: In-Containment Cables
Part No.: Below
Spec.: WLTP 45307-1
Para.: 4.0
S/N: ---
GSI: ---
Amb. Temp.: ---
Photo: ---
Test Med.: ---
Specimen Temp.: Ambient
Job No.: 45307
Start Date: 4-30-81

Test Title: Post-Radiation Functional Test

Test Specimen No. 11

Visual Inspection – NO VISUAL DEFECT

Insulation Resistance Test at 500 VDC for 1 minute minimum, wire to ground plane – $1 \times 10^{12} \Omega$

Dielectric Withstand Test, conductor to ground plane, at 1000 VAC, 60 Hz, for 1 minute – 0.13 ma

Continuity Test with Ohm meter – 100 mΩ

Specimen Failed: –
Specimen Passed: ✓
NCA Written: –

Tested By: Nam Sung Lee Date: 5-1-81
Witness: – Date: –
Sheet No. 11 of 24
Approved: James Marconnet

DATA SHEET

Customer Carolina Power & Light Co.

Specimen In-Containment Cables

WYLE LABORATORIES

Part No. Below

Amb. Temp. ---

Job No. 45307

Spec. WLTP 45307-1

Photo ---

Para. 4.0

Test Med. ---

Start Date 4-30-81

S/N ---

Specimen Temp. Ambient

GSI ---

Test Title Post-Radiation Functional Test

Test Specimen No. 12

Visual Inspection - NO VISUAL DEFECT

Insulation Resistance Test at 500 VDC for 1 minute minimum, wire to ground plane - $1 \times 10^{12}\Omega$

Dielectric Withstand Test, conductor to ground plane, at 1000 VAC, 60 HZ, for 1 minute — 0.12 ma

Continuity Test With Ohm meter - 100 mΩ

Specimen Failed —

Specimen Passed ✓

NCA Written —

Tested By Nam Sung Lee Date: 5-1-81

Witness — Date: —

Sheet No. 12 of 24

Approved James Marconnet

DATA SHEET

WYLE LABORATORIES

Customer: Carolina Power & Light Co.
Specimen: In-Containment Cables
Part No.: Below
Spec.: WLTP 45307-1
Para.: 4.0
S/N: ---
GSI: ---
Amb. Temp.: ---
Photo: ---
Test Med.: ---
Specimen Temp.: Ambient
Job No.: 45307
Start Date: 4-30-81

Test Title: Post-Radiation Functional Test

Test Specimen No. 13

Visual Inspection - NO VISUAL DEFECT

Insulation Resistance Tests at 500 VDC for 1 minute minimum

White to ground plane - $3 \times 10^{11} \Omega$	White to Black - $6 \times 10^{11} \Omega$
Black to ground plane - $3 \times 10^{11} \Omega$	White to Shield - $6 \times 10^{11} \Omega$
Shield to ground plane - $2 \times 10^{11} \Omega$	Black to Shield - $3 \times 10^{11} \Omega$

Dielectric Withstand Test, all conductors to ground plane, at 1000 VAC, 60 HZ, for 1 minute - 0.16 ma

Continuity Tests with ohm meter
White wire - 106 mΩ
Black wire - 104 mΩ
Shield - 103 mΩ

Specimen Failed: –
Specimen Passed: ✓
NCA Written: –

Tested By: Inam Sung Lee Date: 5-1-81
Witness: – Date: –
Sheet No. 13 of 24
Approved: James Marcomet

DATA SHEET

Customer: Carolina Power & Light Co.
Specimen: In-Containment Cables
Part No.: Below
Spec.: WLTP 45307-1
Para.: 4.0
S/N: ---
GSI: ---

Amb. Temp.: ---
Photo: ---
Test Med.: ---
Specimen Temp.: Ambient

WYLE LABORATORIES
Job No.: 45307
Start Date: 4-30-81

Test Title: Post-Radiation Functional Test

Test Specimen No. 14

Visual Inspection - NO VISUAL DEFECT

Insulation Resistance Tests at 500 VDC for 1 minute minimum
White to ground plane - $1 \times 10^{11} \Omega$ White to Black - $2.6 \times 10^{10} \Omega$
Black to ground plane - $4 \times 10^{10} \Omega$ White to Shield - $3 \times 10^{10} \Omega$
Shield to ground plane - $1 \times 10^{11} \Omega$ Black to Shield - $5 \times 10^{10} \Omega$

Dielectric Withstand Test, all conductors to ground plane, at 1000 VAC, 60 HZ, for 1 minute - 0.15 ma

Continuity Tests with ohm meter
White wire - 106 mΩ
Black wire - 105 mΩ
Shield - 104 mΩ

Specimen Failed: –
Specimen Passed: ✓
NCA Written: –

Tested By: Nam Sung Lee Date: 5-1-81
Witness: – Date: –
Sheet No. 14 of 24
Approved: James Marconnet

DATA SHEET

WYLE LABORATORIES

Customer: Carolina Power & Light Co.
Specimen: In-Containment Cables
Part No.: Below
Spec.: WLTP 45307-1
Para.: 4.0
S/N: ---
GSI: ---
Amb. Temp.: ---
Photo: ---
Test Med.: ---
Specimen Temp.: Ambient
Job No.: 45307
Start Date: 4-30-81

Test Title: Post-Radiation Functional Test

Test Specimen No. 15

Visual Inspection - NO VISUAL DEFECT

Insulation Resistance Tests at 500 VDC for 1 minute minimum

White to ground plane - $4 \times 10^{11}\,\Omega$	White to Black - $8 \times 10^{11}\,\Omega$
Black to ground plane - $5 \times 10^{11}\,\Omega$	White to Shield - $5 \times 10^{11}\,\Omega$
Shield to ground plane - $3 \times 10^{11}\,\Omega$	Black to Shield - $5 \times 10^{11}\,\Omega$

Dielectric Withstand Test, all conductors to ground plane, at 1000 VAC, 60 HZ, for 1 minute - 0.15 ma

Continuity Tests with ohm meter
White wire - 105 mΩ
Black wire - 104 mΩ
Shield - 105 mΩ

Specimen Failed: —
Specimen Passed: ✓
NCA Written: —

Tested By: Nam Sung Lee Date: 5-1-81
Witness: — Date: —
Sheet No. 15 of 24
Approved: James Marconnet

DATA SHEET

WYLE LABORATORIES

Customer Carolina Power & Light Co.
Specimen In-Containment Cables
Part No. Below
Spec. WLTP 45307-1
Para. 4.0
S/N ---
GSI ---
Amb. Temp. ---
Photo ---
Test Med. ---
Specimen Temp. Ambient
Job No. 45307
Start Date 4-30-81

Test Title Post-Radiation Functional Test

Test Specimen No. 16

Visual Inspection - NO VISUAL DEFECT

Insulation Resistance Tests at 500 VDC for 1 minute minimum
White to ground plane - $5 \times 10^{11}\ \Omega$ White to Black - $5 \times 10^{11}\ \Omega$
Black to ground plane - $5 \times 10^{11}\ \Omega$ White to Shield - $4 \times 10^{11}\ \Omega$
Shield to ground plane - $1 \times 10^{11}\ \Omega$ Black to Shield - $3 \times 10^{11}\ \Omega$

Dielectric Withstand Test, all conductors to ground plane, at 1000 VAC, 60 HZ, for 1 minute - 0.15 ma

Continuity Tests with ohm meter
White wire - 106 mΩ
Black wire - 104 mΩ
Shield - 102 mΩ

Specimen Failed —
Specimen Passed ✓
NCA Written —

Tested By Man Sung Lee Date: 5-1-81
Witness — Date: —
Sheet No. 16 of 24
Approved James Marcomet

DATA SHEET

Customer: Carolina Power & Light Co.
Specimen: In-Containment Cables

WYLE LABORATORIES

Part No.: Below
Spec.: WLTP 45307-1
Para.: 4.0
S/N: ---
GSI: ---

Amb. Temp.: ---
Photo: ---
Test Med.: ---
Specimen Temp.: Ambient

Job No.: 45307
Start Date: 4-30-81

Test Title: Post-Radiation Functional Test

Test Specimen No. 17

Visual Inspection - NO VISUAL DEFECT

Insulation Resistance Tests at 500 VDC for 1 minute minimum

White to ground plane - $3 \times 10^{11} \Omega$ White to Black - $7 \times 10^{11} \Omega$
Black to ground plane - $4 \times 10^{11} \Omega$ White to Shield - $4 \times 10^{11} \Omega$
Shield to ground plane - $2 \times 10^{11} \Omega$ Black to Shield - $4 \times 10^{11} \Omega$

Dielectric Withstand Test, all conductors to ground plane, at 1000 VAC, 60 HZ, for 1 minute - 0.17 ma

Continuity Tests with ohm meter
White wire - 106 mΩ
Black wire - 104 mΩ
Shield - 103 mΩ

Specimen Failed: -
Specimen Passed: ✓
NOA Written: -

Tested By: ManSung Lee Date: 5-1-81
Witness: - Date: -
Sheet No. 17 of 24
Approved: James Marcomet

DATA SHEET

Customer Carolina Power & Light Co.

Specimen In-Containment Cables

Part No. Below

Spec. WLTP 45307-1

Para. 4.0

S/N ---

GSI ---

Amb. Temp. ---

Photo ---

Test Med. ---

Specimen Temp. Ambient

WYLE LABORATORIES

Job No. 45307

Start Date 4-30-81

Test Title Post-Radiation Functional Test

Test Specimen No. 18

Visual Inspection - NO VISUAL DEFECT

Insulation Resistance Tests at 500 VDC for 1 minute minimum

White to ground plane - $3 \times 10^{11} \Omega$ White to Black - $5 \times 10^{11} \Omega$

Black to ground plane - $3 \times 10^{11} \Omega$ White to Shield - $5 \times 10^{11} \Omega$

Shield to ground plane - $7 \times 10^{10} \Omega$ Black to Shield - $4 \times 10^{11} \Omega$

Dielectric Withstand Test, all conductors to ground plane, at 1000 VAC, 60 HZ, for 1 minute - 0.14 ma

Continuity Tests with ohm meter

White wire - 106 mΩ

Black wire - 105 mΩ

Shield - 101 mΩ

Specimen Failed —

Specimen Passed ✓

NCA Written —

Tested By NamSung Lee Date: 5-1-81

Witness — Date: —

Sheet No. 18 of 24

Approved James Marcomet

DATA SHEET

Customer Carolina Power & Light Co.
Specimen In-Containment Cables
Part No. Below
Spec. WLTP 45307-1
Para. 4.0
S/N ---
GSI ---

Amb. Temp. ---
Photo ---
Test Med. ---
Specimen Temp. Ambient

WYLE LABORATORIES
Job No. 45307
Start Date 4-30-81

Test Title Post-Radiation Functional Test

Test Specimen No. 19

Visual Inspection - NO VISUAL DEFECT

Insulation Resistance Tests at 500 VDC for 1 minute minimum

White to ground plane - $4 \times 10^{11}\Omega$	White to Black - $8 \times 10^{11}\Omega$
Black to ground plane - $4 \times 10^{11}\Omega$	White to Shield - $1.5 \times 10^{12}\Omega$
Shield to ground plane - $1 \times 10^{11}\Omega$	Black to Shield - $1.5 \times 10^{12}\Omega$
Red to ground plane - $4 \times 10^{11}\Omega$	White to Red - $8 \times 10^{11}\Omega$
Green to ground plane - $5 \times 10^{11}\Omega$	White to Green - $9 \times 10^{11}\Omega$
Red to shield - $1 \times 10^{12}\Omega$	Red to Black - $1 \times 10^{12}\Omega$
Green to shield - $1.5 \times 10^{12}\Omega$	Black to Green - $1 \times 10^{12}\Omega$
Green to Red - $1 \times 10^{12}\Omega$	

Dielectric Withstand Test, all conductors to ground plane, at 1000 VAC, 60 HZ, for 1 minute - 0.18 ma

Continuity Tests with ohm meter

White wire - 107 mΩ	Red wire - 105 mΩ
Black wire - 105 mΩ	Green wire - 105 mΩ
Shield - 80 mΩ	

Specimen Failed –
Specimen Passed ✓
NOA Written –

Tested By MonSung Lee Date: 5-1-81
Witness – Date: –
Sheet No. 19 of 24
Approved James Marconnet

DATA SHEET

WYLE LABORATORIES

Customer: Carolina Power & Light Co.
Specimen: In-Containment Cables
Part No.: Below
Spec.: WLTP 45307-1
Para.: 4.0
S/N: ---
GSI: ---
Amb. Temp.: ---
Photo: ---
Test Med.: ---
Specimen Temp.: Ambient
Job No.: 45307
Start Date: 4-30-81

Test Title: Post-Radiation Functional Test

Test Specimen No. 20

Visual Inspection - NO VISUAL DEFECT

Insulation Resistance Tests at 500 VDC for 1 minute minimum

White to ground plane - $7 \times 10^{11} \Omega$	White to Black - $1.5 \times 10^{12} \Omega$
Black to ground plane - $7 \times 10^{11} \Omega$	White to Shield - $3 \times 10^{12} \Omega$
Shield to ground plane - $1.5 \times 10^{11} \Omega$	Black to Shield - $3 \times 10^{12} \Omega$
Red to ground plane - $8 \times 10^{11} \Omega$	White to Red - $1.5 \times 10^{12} \Omega$
Green to ground plane - $8 \times 10^{11} \Omega$	White to Green - $2 \times 10^{12} \Omega$
Red to shield - $1.5 \times 10^{12} \Omega$	Red to Black - $1.5 \times 10^{12} \Omega$
Green to shield - $2 \times 10^{12} \Omega$	Black to Green - $0.9 \times 10^{11} \Omega$
Green to Red - $1.5 \times 10^{12} \Omega$	

Dielectric Withstand Test, all conductors to ground plane, at 1000 VAC, 60HZ, for 1 minute - 0.18 ma

Continuity Tests with ohm meter

White wire - $108 m\Omega$	Red wire - $105 m\Omega$
Black wire - $104 m\Omega$	Green wire - $105 m\Omega$
Shield - $80 m\Omega$	

Specimen Failed: —
Specimen Passed: ✓
NOA Written: —

Tested By: Man Sung Lee Date: 5-1-81
Witness: — Date: —
Sheet No. 20 of 24
Approved: James Marcomet

DATA SHEET

Customer: Carolina Power & Light Co.
Specimen: In-Containment Cables
Part No.: Below
Spec.: WLTP 45307-1
Para.: 4.0
S/N: ---
GSI: ---
Amb. Temp.: ---
Photo: ---
Test Med.: ---
Specimen Temp.: Ambient

WYLE LABORATORIES
Job No.: 45307
Start Date: 4-30-81

Test Title: Post- Radiation Functional Test

Test Specimen No. 21

Visual Inspection - NO VISUAL DEFECT

Insulation Resistance Tests at 500 VDC for 1 minute minimum

White to ground plane - $4 \times 10^{11}\ \Omega$	White to Black - $2 \times 10^{12}\ \Omega$
Black to ground plane - $3 \times 10^{11}\ \Omega$	White to Shield - $4 \times 10^{12}\ \Omega$
Shield to ground plane - $1 \times 10^{10}\ \Omega$	Black to Shield - $3 \times 10^{12}\ \Omega$
Red to ground plane - $4 \times 10^{11}\ \Omega$	White to Red - $1.5 \times 10^{12}\ \Omega$
Green to ground plane - $4 \times 10^{11}\ \Omega$	White to Green - $1.5 \times 10^{12}\ \Omega$
Red to shield - $3 \times 10^{12}\ \Omega$	Red to Black - $2 \times 10^{12}\ \Omega$
Green to shield - $2 \times 10^{12}\ \Omega$	Black to Green - $2 \times 10^{12}\ \Omega$
Green to Red - $1.5 \times 10^{12}\ \Omega$	

Dielectric Withstand Test, all conductors to ground plane, at 1000 VAC, 60 HZ, for 1 minute - 0.17 ma

Continuity Tests with ohm meter

White wire - 107 mΩ	Red wire - 105 mΩ
Black wire - 104 mΩ	Green wire - 105 mΩ
Shield - 80 mΩ	

Specimen Failed: —
Specimen Passed: ✓
NOA Written: —

Tested By: Man Sung Lee Date: 5-1-81
Witness: — Date: —
Sheet No. 21 of 24
Approved: James Marconnet

DATA SHEET

Customer Carolina Power & Light Co.
Specimen In-Containment Cables

WYLE LABORATORIES

Part No. Below
Amb. Temp. ---
Job No. 45307
Spec. WLTP 45307-1
Photo ---
Para. 4.0
Test Med. ---
Start Date 4-30-81
S/N ---
Specimen Temp. Ambient
GSI ---

Test Title Post-Radiation Functional Test

Test Specimen No. 22

Visual Inspection - NO VISUAL DEFECT

Insulation Resistance Tests at 500 VDC for 1 minute minimum

White to ground plane - $8 \times 10^{11}\,\Omega$	White to Black - $3 \times 10^{12}\,\Omega$
Black to ground plane - $1 \times 10^{12}\,\Omega$	White to Shield - $4 \times 10^{12}\,\Omega$
Shield to ground plane - $2 \times 10^{11}\,\Omega$	Black to Shield - $3 \times 10^{12}\,\Omega$
Red to ground plane - $1 \times 10^{12}\,\Omega$	White to Red - $2 \times 10^{12}\,\Omega$
Green to ground plane - $1 \times 10^{12}\,\Omega$	White to Green - $2 \times 10^{12}\,\Omega$
Red to shield - $3 \times 10^{12}\,\Omega$	Red to Black - $3 \times 10^{12}\,\Omega$
Green to shield - $3 \times 10^{12}\,\Omega$	Black to Green - $3 \times 10^{12}\,\Omega$
Green to Red - $2 \times 10^{12}\,\Omega$	

Dielectric Withstand Test, all conductors to ground plane, at 1000 VAC, 60 HZ, for 1 minute → 0.15 ma

Continuity Tests with ohm meter

White wire - 107 mΩ	Red wire - 105 mΩ
Black wire - 105 mΩ	Green wire - 105 mΩ
Shield - 79 mΩ	

Specimen Failed —
Specimen Passed ✓
NOA Written —

Tested By Man Sung Lee Date: 5-1-81
Witness — Date: —
Sheet No. 22 of 24
Approved James Marcombet

DATA SHEET

WYLE LABORATORIES

Customer: Carolina Power & Light Co.
Specimen: In-Containment Cables
Part No.: Below
Spec.: WLTP 45307-1
Para.: 4.0
S/N: ---
GSI: ---
Amb. Temp.: ---
Photo: ---
Test Med.: ---
Specimen Temp.: Ambient
Job No.: 45307
Start Date: 4-30-81

Test Title: Post- Radiation Functional Test

Test Specimen No. 23

Visual Inspection – NO VISUAL DEFECT

Insulation Resistance Tests at 500 VDC for 1 minute minimum

White to ground plane – $9 \times 10^{11}\Omega$	White to Black – $3 \times 10^{12}\Omega$
Black to ground plane – $1 \times 10^{12}\Omega$	White to Shield – $4 \times 10^{12}\Omega$
Shield to ground plane – $2.6 \times 10^{11}\Omega$	Black to Shield – $4 \times 10^{12}\Omega$
Red to ground plane – $8 \times 10^{11}\Omega$	White to Red – $2 \times 10^{12}\Omega$
Green to ground plane – $1 \times 10^{12}\Omega$	White to Green – $3 \times 10^{12}\Omega$
Red to shield – $3 \times 10^{12}\Omega$	Red to Black – $2 \times 10^{12}\Omega$
Green to shield – $3 \times 10^{12}\Omega$	Black to Green – $2 \times 10^{12}\Omega$
Green to Red – $2 \times 10^{12}\Omega$	

Dielectric Withstand Test, all conductors to ground plane, at 1000 VAC, 60 HZ, for 1 minute → 0.16 ma

Continuity Tests with ohm meter

White wire – 107 mΩ	Red wire – 105 mΩ
Black wire – 104 mΩ	Green wire – 105 mΩ
Shield – 80 mΩ	

Specimen Failed: –
Specimen Passed: ✓
NOA Written: –

Tested By: Nam Sung Lee Date: 5-1-81
Witness: – Date: –
Sheet No. 23 of 24
Approved: James Marcomet

DATA SHEET

WYLE LABORATORIES

Customer: Carolina Power & Light Co.
Specimen: In-Containment Cables
Part No.: Below
Spec.: WLTP 45307-1
Para.: 4.0
S/N: ---
GSI: ---
Amb. Temp.: ---
Photo: ---
Test Med.: ---
Specimen Temp.: Ambient
Job No.: 45307
Start Date: 4-30-81

Test Title: Post-Radiation Functional Test

Test Specimen No. 24

Visual Inspection - NO VISUAL DEFECT

Insulation Resistance Tests at 500 VDC for 1 minute minimum

White to ground plane - $5 \times 10^{11} \Omega$	White to Black - $2 \times 10^{12} \Omega$
Black to ground plane - $8 \times 10^{11} \Omega$	White to Shield - $3 \times 10^{12} \Omega$
Shield to ground plane - $1 \times 10^{11} \Omega$	Black to Shield - $3 \times 10^{12} \Omega$
Red to ground plane - $8 \times 10^{11} \Omega$	White to Red - $1.5 \times 10^{12} \Omega$
Green to ground plane - $1 \times 10^{12} \Omega$	White to Green - $2 \times 10^{12} \Omega$
Red to shield - $3 \times 10^{12} \Omega$	Red to Black - $2 \times 10^{12} \Omega$
Green to shield - $3 \times 10^{12} \Omega$	Black to Green - $3 \times 10^{12} \Omega$
Green to Red - $2 \times 10^{12} \Omega$	

Dielectric Withstand Test, all conductors to ground plane, at 1000 VAC, 60 HZ, for 1 minute → 0.17 ma

Continuity Tests with ohm meter

White wire - 107 mΩ	Red wire - 104 mΩ
Black wire - 104 mΩ	Green wire - 105 mΩ
Shield - 78 mΩ	

Specimen Failed: —
Specimen Passed: ✓
NOA Written: —

Tested By: Nam Sung Lee Date: 5-1-81
Witness: — Date: —
Sheet No. 24 of 24
Approved: James Marconnet

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APPENDIX II

INSTRUMENTATION EQUIPMENT SHEET

INSTRUMENTATION EQUIPMENT SHEET

Date 4-29-81 Job No. 45307 Test Area ELECTRONIC

Technician MAN SUNG LEE Customer CAROLINA POWER & LIGHT Type Test FUNCTIONAL AFTER RADIATION

No.	Instrument	Manufacturer	Model No.	Serial No.	Wyle or Gov't No.	Range	Accuracy	Calibration On	Calibration Due
1	MEGOHMMETER	GENERAL RADIO	1864	3180	11898	.5x10^6 – 2x10^14	mfg. spec.	12-5-80	6-5-81
2	DIGITAL M.M.	KEITHLEY	164	–	11305	MULTI	mfg. spec.	4-17-81	10-17-81
3	AC HYPOT	ASSOCATED RESEA.	4030	416	96776	1250VAC	± 3%	3-31-81	6-31-81

Page No. III-30
Report No. 45307-1

Instrument Test Engineer D M Hooper Checked & Received By James Marcomet

WH-1029

SECTION IV

THERMAL AGING

1.0 REQUIREMENTS

1.1 PVC Cables

The PVC cables and cable splice assemblies shall be thermally aged to the following equivalent ages.

Test Specimen No.	Equivalent Age (years)
1	10
2	10
3	20
4	20
5	40
6	40

The PVC cables and cable splice assemblies, which require accelerated aging to 40 years, shall be thermally aged for 382 hours at 100°C with uncontrolled relative humidity.

The PVC cables and cable splice assemblies, which required accelerated aging to 20 years, shall be thermally aged for 128 hours at 100°C with uncontrolled relative humidity.

Because these cables have been in service at the H. B. Robinson Nuclear Power Plant for 10 years, the aging temperature and durations equate to the required life goal minus 10 years. For example, the cables and cable splice assemblies with a 40-year life goal are thermally aged for 382 hours at 100°C, which equates to an equivalent 30-year life. When combined with the 10 years of natural aging, a 40-year equivalent life is reached for the PVC cables.

1.2 Cables for the Optional Aging Program

The cables and cable splice assemblies, which were added to the Qualification Program to provide for potential qualification of the CP&L cable splice(s) in the event of failure of the PVC cable, require less than 100 hours at 100°C to equate to a 30-year life at the specified basleine operating temperatures. These cables and cable splice assemblies shall be thermally aged for 382 hours at 100°C. By doing this, the cable splice assembly could be utilized at an operating baseline

1.0 REQUIREMENTS (Continued)

1.2 Optional Aging Program Cables (Continued)

temperature of 152°F for 84% of its qualified life and 88°F for 16% of its qualified life. This would be significant for other applications where the heat rise in the cable could cause the baseline temperature to exceed 120°F.

2.0 PROCEDURES

Test Specimen Nos. 1 and 2 were removed from the cable tray prior to the Thermal Aging Test.

The cable tray holding the cable splice assemblies was placed in an environmentally-controlled chamber. The chamber temperature was controlled at 100°C (212°F) for 128 hours.

Test Specimen Nos. 3 and 4 were removed from the cable tray.

The chamber temperature was controlled at 100°C (212°F) for 254 hours for a total thermal aging time of 382 hours.

Test Specimen Nos. 1, 2, 3, and 4 were reinstalled in the cable tray.

3.0 RESULTS

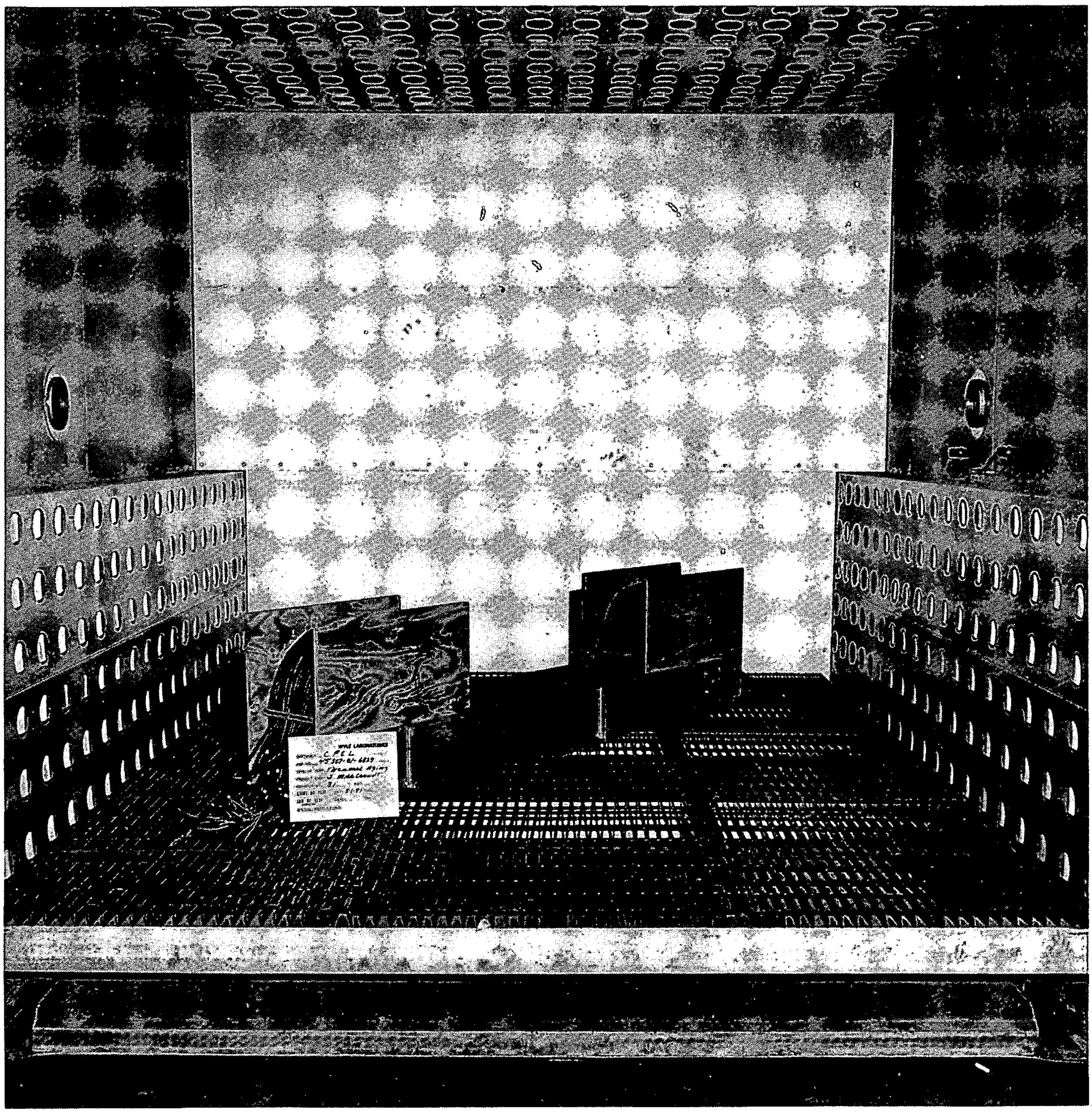
The test specimens successfully met the requirements as specified in Paragraph 1.0 and as described in Paragraph 2.0 of this section.

A photograph of the test setup is presented in Appendix I of this section.

Equipment used in recording data is shown on the Instrumentation Equipment Sheet presented in Appendix II of this section.

APPENDIX I

PHOTOGRAPH



PHOTOGRAPH IV-1

CABLE TRAY WITH CABLE SPLICE
ASSEMBLIES IN THERMAL AGING CHAMBER

APPENDIX II

INSTRUMENTATION EQUIPMENT SHEET

INSTRUMENTATION EQUIPMENT SHEET

Date 5/1/81 Job No. 45307-01-6829 Test Area EV LAB

Technician M LUTTRELL Customer CP&L Type Test THERMAL AGING

No.	Instrument	Manufacturer	Model No.	Serial No.	Wyle or Gov't No.	Range	Accuracy	Calibration On	Calibration Due
1.	CONTROLLER	R/I	639	N/A	11296	0° TO 1000°	± .5%	11-18-80	5-18-81
2.	REDUNDANT	R/I	639	N/A	11284	0° TO 1000	± .5%	2-10-81	8-10-81
3.	RECORDER	HONEYWELL	45	N/A	94781	0 TO 400°	± .5%	4-2-81	7-2-81
4.	CHAMBER	GRIEVE	WALK IN	11876	N/A	N/A	N/A	—	—

Page No. IV-6
Report No. 45307-1

Instrument Test Engineer B. Gouett Checked & Received By James Marcomet

WH-1029

SECTION V

POST-THERMAL AGING FUNCTIONAL TESTS

1.0 REQUIREMENTS

Functional tests shall be performed as specified in Paragraph 1.3 of Section I.

2.0 PROCEDURES

The test specimens were subjected to the functional tests specified in Paragraph 1.0 of this section.

3.0 RESULTS

The test specimens successfully met the requirements as specified in Paragraph 1.0 and as described in Paragraph 2.0 of this section.

Data Sheets showing the data recorded in this test sequence are presented in Appendix I of this section.

Equipment used in recording data is shown on the Instrumentation Equipment Sheet presented in Appendix II of this section.

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APPENDIX I

DATA SHEETS

DATA SHEET

WYLE LABORATORIES

Customer: Carolina Power & Light Co.
Specimen: In-Containment Cables
Part No.: Below
Spec.: WLTP 45307-1
Para.: 4.0
S/N: ---
GSI: ---
Amb. Temp.: ---
Photo: ---
Test Med.: ---
Specimen Temp.: Ambient
Job No.: 45307
Start Date: 5-18-81

Test Title: Post-Thermal Aging Functional Test

Test Specimen No. 1

Visual Inspection - NO VISUAL DEFECTS.

Insulation Resistance Tests at 500 VDC for 1 minute minimum

White to ground plane - $8 \times 10^{10}\ \Omega$ White to Black - $1.2 \times 10^{10}\ \Omega$

Black to ground plane - $1.5 \times 10^{10}\ \Omega$ White to Shield - $1.2 \times 10^{10}\ \Omega$

Shield to ground plane - $2 \times 10^{10}\ \Omega$ Black to Shield - $1.5 \times 10^{10}\ \Omega$

Dielectric Withstand Test, all conductors to ground plane, at 1000 VAC, 60 Hz, for 1 minute - 0.15 ma

Continuity Tests with ohm meter

White wire - 106 mΩ

Black wire - 110 mΩ

Shield - 103 mΩ

Specimen Failed: –
Specimen Passed: ✓
NCA Written: –

Tested By: Man Sung Lee Date: 5-20-81
Witness: – Date: –
Sheet No. 1 of 24
Approved: James Marcomet

DATA SHEET

WYLE LABORATORIES

Customer: Carolina Power & Light Co.
Specimen: In-Containment Cables
Part No.: Below
Spec.: WLTP 45307-1
Para.: 4.0
S/N: ---
GSI: ---
Amb. Temp.: ---
Photo: ---
Test Med.: ---
Specimen Temp.: Ambient
Job No.: 45307
Start Date: 5-18-81

Test Title: Post-Thermal Aging Functional Test

Test Specimen No. 2

Visual Inspection - NO VISUAL DEFECTS

Insulation Resistance Tests at 500 VDC for 1 minute minimum

White to ground plane - $1.5 \times 10^{11}\Omega$	White to Black - $3 \times 10^{10}\Omega$
Black to ground plane - $2 \times 10^{10}\Omega$	White to Shield - $1 \times 10^{11}\Omega$
Shield to ground plane - $1 \times 10^{10}\Omega$	Black to Shield - $2 \times 10^{10}\Omega$
Red to ground plane - $7 \times 10^{10}\Omega$	White to Red - $1.5 \times 10^{11}\Omega$
Green to ground plane - $8 \times 10^{10}\Omega$	White to Green - $3 \times 10^{11}\Omega$
Red to shield - $5 \times 10^{10}\Omega$	Red to Black - $2 \times 10^{10}\Omega$
Green to shield - $5 \times 10^{10}\Omega$	Black to Green - $3 \times 10^{10}\Omega$
Green to Red - $4 \times 10^{11}\Omega$	

Dielectric Withstand Test, all conductors to ground plane, at 1000 VAC, 60 HZ, for 1 minute → 0.17 ma

Continuity Tests with ohm meter

White wire - 106 mΩ	Red wire - 103 mΩ
Black wire - 104 mΩ	Green wire - 104 mΩ
Shield - 81 mΩ	

Specimen Failed: –
Specimen Passed: ✓
NOA Written: –

Tested By: Man Sung Lee Date: 5-20-81
Witness: – Date: –
Sheet No. 2 of 24
Approved: James Marcornet

DATA SHEET

Customer: Carolina Power & Light Co.
Specimen: In-Containment Cables
Part No.: Below
Spec.: WLTP 45307-1
Para.: 4.0
S/N: ---
GSI: ---
Amb. Temp.: ---
Photo: ---
Test Med.: ---
Specimen Temp.: Ambient

WYLE LABORATORIES
Job No.: 45307
Start Date: 5-19-81

Test Title: Post-Thermal Aging Functional Test

Test Specimen No. 3

Visual Inspection - NO VISUAL DEFECTS

Insulation Resistance Tests at 500 VDC for 1 minute minimum

White to ground plane - $1.2 \times 10^{11}\,\Omega$	White to Black - $1.5 \times 10^{11}\,\Omega$
Black to ground plane - $1.2 \times 10^{11}\,\Omega$	White to Shield - $5 \times 10^{10}\,\Omega$
Shield to ground plane - $1 \times 10^{10}\,\Omega$	Black to Shield - $5 \times 10^{10}\,\Omega$
Red to ground plane - $1.2 \times 10^{11}\,\Omega$	White to Red - $3 \times 10^{11}\,\Omega$
Green to ground plane - $1.2 \times 10^{11}\,\Omega$	White to Green - $3 \times 10^{11}\,\Omega$
Red to shield - $1.3 \times 10^{11}\,\Omega$	Red to Black - $3 \times 10^{11}\,\Omega$
Green to shield - $1.5 \times 10^{11}\,\Omega$	Black to Green - $4 \times 10^{11}\,\Omega$
Green to Red - $1.5 \times 10^{11}\,\Omega$	

Dielectric Withstand Test, all conductors to ground plane, at 1000 VAC, 60 HZ, for 1 minute - 0.16 ma

Continuity Tests with ohm meter

White wire - 115 mΩ	Red wire - 109 mΩ
Black wire - 110 mΩ	Green wire - 109 mΩ
Shield - 86 mΩ	

Specimen Failed: –
Specimen Passed: ✓
NOA Written: –

Tested By: Man Sung Lee Date: 5-20-81
Witness: – Date: –
Sheet No. 3 of 24
Approved: James Marcomet

DATA SHEET

Customer: Carolina Power & Light Co.
Specimen: In-Containment Cables
Part No.: Below
Spec.: WLTP 45307-1
Para.: 4.0
S/N: ---
GSI: ---

Amb. Temp.: ---
Photo: ---
Test Med.: ---
Specimen Temp.: Ambient

WYLE LABORATORIES
Job No.: 45307
Start Date: 5-19-81

Test Title: Post-Thermal Aging Functional Test

Test Specimen No. 4

Visual Inspection - NO VISUAL DEFECTS

Insulation Resistance Tests at 500 VDC for 1 minute minimum

White to ground plane - $2 \times 10^{11} \Omega$ White to Black - $3 \times 10^{11} \Omega$
Black to ground plane - $5 \times 10^{11} \Omega$ White to Shield - $3 \times 10^{11} \Omega$
Shield to ground plane - $4 \times 10^{11} \Omega$ Black to Shield - $3 \times 10^{11} \Omega$

Dielectric Withstand Test, all conductors to ground plane, at 1000 VAC, 60 HZ, for 1 minute - 0.14 ma

Continuity Tests with ohm meter
White wire - 107 mΩ
Black wire - 105 mΩ
Shield - 99 mΩ

Specimen Failed: –
Specimen Passed: ✓
NCA Written: –

Tested By: Nam Sung Lee Date: 5-20-81
Witness: – Date: –
Sheet No. 4 of 24
Approved: James Marcomet

WH-611A

DATA SHEET

WYLE LABORATORIES

Customer: Carolina Power & Light Co.
Specimen: In-Containment Cables
Part No.: Below
Spec.: WLTP 45307-1
Para.: 4.0
S/N: ---
GSI: ---
Amb. Temp.: ---
Photo: ---
Test Med.: ---
Specimen Temp.: Ambient
Job No.: 45307
Start Date: 5-19-81

Test Title: Post-Thermal Aging Functional Test

Test Specimen No. 5

Visual Inspection - NO VISUAL DEFECTS

Insulation Resistance Tests at 500 VDC for 1 minute minimum

White to ground plane - $2 \times 10^{10}\,\Omega$ White to Black - $3 \times 10^{9}\,\Omega$

Black to ground plane - $7 \times 10^{10}\,\Omega$ White to Shield - $2 \times 10^{10}\,\Omega$

Shield to ground plane - $5 \times 10^{10}\,\Omega$ Black to Shield - $3 \times 10^{10}\,\Omega$

Dielectric Withstand Test, all conductors to ground plane, at 1000 VAC, 60 Hz, for 1 minute - 0.16 ma

Continuity Tests with ohm meter

White wire - 110 mΩ

Black wire - 109 mΩ

Shield - 102 mΩ

Specimen Failed: -
Specimen Passed: ✓
NCA Written: -

Tested By: Nam Sung Lee Date: 5-20-81
Witness: - Date: -
Sheet No. 5 of 24
Approved: James Marconnet

DATA SHEET

Customer Carolina Power & Light Co.
Specimen In-Containment Cables
Part No. Below
Spec. WLTP 45307-1
Para. 4.0
S/N ---
GSI ---

Amb. Temp. ---
Photo ---
Test Med. ---
Specimen Temp. Ambient

WYLE LABORATORIES
Job No. 45307
Start Date 5-19-81

Test Title Post-Thermal Aging Functional Test

Test Specimen No. 6

Visual Inspection - NO VISUAL DEFECTS

Insulation Resistance Tests at 500 VDC for 1 minute minimum

White to ground plane - $8 \times 10^{10}\,\Omega$	White to Black - $7 \times 10^{9}\,\Omega$
Black to ground plane - $1 \times 10^{11}\,\Omega$	White to Shield - $7 \times 10^{10}\,\Omega$
Shield to ground plane - $1 \times 10^{10}\,\Omega$	Black to Shield - $3 \times 10^{10}\,\Omega$
Red to ground plane - $1 \times 10^{11}\,\Omega$	White to Red - $5 \times 10^{9}\,\Omega$
Green to ground plane - $9 \times 10^{10}\,\Omega$	White to Green - $6 \times 10^{9}\,\Omega$
Red to shield - $9 \times 10^{10}\,\Omega$	Red to Black - $5 \times 10^{9}\,\Omega$
Green to shield - $1.3 \times 10^{11}\,\Omega$	Black to Green - $4 \times 10^{9}\,\Omega$
Green to Red - $2.5 \times 10^{9}\,\Omega$	

Dielectric Withstand Test, all conductors to ground plane, at 1000 VAC, 60 HZ, for 1 minute → 0.15 ma

Continuity Tests with ohm meter

White wire - 110 mΩ	Red wire - 106 mΩ
Black wire - 106 mΩ	Green wire - 106 mΩ
Shield - 86 mΩ	

Specimen Failed -
Specimen Passed ✓
NOA Written -

Tested By Namsung Lee Date: 5-20-81
Witness - Date: -
Sheet No. 6 of 24
Approved James Marcomet

DATA SHEET

WYLE LABORATORIES

Customer: Carolina Power & Light Co.
Specimen: In-Containment Cables
Part No.: Below
Spec.: WLTP 45307-1
Para.: 4.0
S/N: ---
GSI: ---

Amb. Temp.: ---
Photo: ---
Test Med.: ---
Specimen Temp.: Ambient

Job No.: 45307
Start Date: 5-19-81

Test Title: Post-Thermal Aging Functional Test

Test Specimen No. 7

Visual Inspection – NO VISUAL DEFECTS

Insulation Resistance Test at 500 VDC for 1 minute minimum, wire to ground plane – $1 \times 10^{10} \Omega$

Dielectric Withstand Test, conductor to ground plane, at 1000 VAC, 60 HZ, for 1 minute — 0.13 ma

Continuity Test with Ohm meter – 100 mΩ

Specimen Failed: –
Specimen Passed: ✓
NCA Written: –

Tested By: Mon Sung Lee Date: 5-20-81
Witness: – Date: –
Sheet No. 7 of 24
Approved: James Marconnet

DATA SHEET

WYLE LABORATORIES

Customer Carolina Power & Light Co.
Specimen In-Containment Cables
Part No. Below
Spec. WLTP 45307-1
Para. 4.0
S/N ---
GSI ---
Amb. Temp. ---
Photo ---
Test Med. ---
Specimen Temp. Ambient
Job No. 45307
Start Date 5-19-81

Test Title Post-Thermal Aging Functional Test

Test Specimen No. 8

Visual Inspection - NO VISUAL DEFECTS

Insulation Resistance Test at 500 VDC for 1 minute minimum, wire to ground plane - $5 \times 10^{10} \Omega$

Dielectric Withstand Test, conductor to ground plane, at 1000 VAC, 60 HZ, for 1 minute — 0.13 ma

Continuity Test with Ohm meter - 100 mΩ

Specimen Failed –
Specimen Passed ✓
NOA Written –

Tested By Man Sung Lee Date: 5-20-81
Witness – Date: –
Sheet No. 8 of 24
Approved James Marconnet

DATA SHEET

Customer Carolina Power & Light Co.
Specimen In-Containment Cables
Part No. Below
Spec. WLTP 45307-1
Para. 4.0
S/N ---
GSI ---

Amb. Temp. ---
Photo ---
Test Med. ---
Specimen Temp. Ambient

WYLE LABORATORIES
Job No. 45307
Start Date 5-19-81

Test Title Post-Thermal Aging Functional Test

Test Specimen No. 9

Visual Inspection – NO VISUAL DEFECTS

Insulation Resistance Test at 500 VDC for 1 minute minimum, wire to ground plane – $1.5 \times 10^{12} \Omega$

Dielectric Withstand Test, conductor to ground plane, at 1000 VAC, 60 HZ, for 1 minute – 0.12 ma

Continuity Test With Ohm meter – 100 mΩ

Specimen Failed –
Specimen Passed ✓
NOA Written –

Tested By Nam Sung Lee Date: 5-20-81
Witness – Date: –
Sheet No. 9 of 24
Approved James Marcomet

DATA SHEET

Customer Carolina Power & Light Co.
Specimen In-Containment Cables
Part No. Below
Spec. WLTP 45307-1
Para. 4.0
S/N ---
GSI ---

Amb. Temp. ---
Photo ---
Test Med. ---
Specimen Temp. Ambient

WYLE LABORATORIES
Job No. 45307
Start Date 5-19-81

Test Title Post-Thermal Aging Functional Test

Test Specimen No. 10

Visual Inspection – NO VISUAL DEFECTS

Insulation Resistance Test at 500 VDC for 1 minute minimum, wire to ground plane – $1.5 \times 10^{12}\,\Omega$

Dielectric Withstand Test, conductor to ground plane, at 1000 VAC, 60 HZ, for 1 minute – 0.12 ma

Continuity Test with Ohm meter – 100 mΩ

Specimen Failed –
Specimen Passed √
NCA Written –

Tested By Nam Sung Lee Date: 5-20-81
Witness – Date: –
Sheet No. 10 of 24
Approved James Marconnet

DATA SHEET

Customer: Carolina Power & Light Co.
Specimen: In-Containment Cables
Part No.: Below
Spec.: WLTP 45307-1
Para.: 4.0
S/N: ---
GSI: ---

Amb. Temp.: ---
Photo: ---
Test Med.: ---
Specimen Temp.: Ambient

WYLE LABORATORIES
Job No. 45307
Start Date 5-19-81

Test Title: Post-Thermal Aging Functional Test

Test Specimen No. 11

Visual Inspection - No VISUAL DEFECTS

Insulation Resistance Test at 500 VDC for 1 minute minimum, wire to ground plane - $1 \times 10^{10}\ \Omega$

Dielectric Withstand Test, conductor to ground plane, at 1000 VAC, 60 HZ, for 1 minute — 0.12 ma

Continuity Test with Ohm meter - 100 mΩ

Specimen Failed: –
Specimen Passed: ✓
NOA Written: –

Tested By: Man Sung Lee Date: 5-20-81
Witness: – Date: –
Sheet No. 11 of 24
Approved: James Marcomet

DATA SHEET

Customer: Carolina Power & Light Co.
Specimen: In-Containment Cables
Part No.: Below
Spec.: WLTP 45307-1
Para.: 4.0
S/N: ---
GSI: ---
Amb. Temp.: ---
Photo: ---
Test Med.: ---
Specimen Temp.: Ambient

WYLE LABORATORIES
Job No.: 45307
Start Date: 5-19-81

Test Title: Post-Thermal Aging Functional Test

Test Specimen No. 12

Visual Inspection – NO VISUAL DEFECTS

Insulation Resistance Test at 500 VDC for 1 minute minimum, wire to ground plane – $1 \times 10^{10} \Omega$

Dielectric Withstand Test, conductor to ground plane, at 1000 VAC, 60 Hz, for 1 minute — 0.12 ma

Continuity Test with Ohm meter – 100 mΩ

Specimen Failed: –
Specimen Passed: ✓
NCR Written: –

Tested By: Nam Sung Lee Date: 5-21-81
Witness: – Date: –
Sheet No. 12 of 24
Approved: James Marcomet

DATA SHEET

Customer: Carolina Power & Light Co.
Specimen: In-Containment Cables
Part No.: Below
Spec.: WLTP 45307-1
Para.: 4.0
S/N: ---
GSI: ---

Amb. Temp.: ---
Photo: ---
Test Med.: ---
Specimen Temp.: Ambient

WYLE LABORATORIES
Job No.: 45307
Start Date: 5-19-81

Test Title: Post-Thermal Aging Functional Test

Test Specimen No. 13

Visual Inspection - NO VISUAL DEFECTS

Insulation Resistance Tests at 500 UDC for 1 minute minimum

White to ground plane - $4 \times 10^{10}\,\Omega$	White to Black - $3 \times 10^{10}\,\Omega$
Black to ground plane - $6 \times 10^{11}\,\Omega$	White to Shield - $4 \times 10^{10}\,\Omega$
Shield to ground plane - $1.5 \times 10^{11}\,\Omega$	Black to Shield - $1.5 \times 10^{11}\,\Omega$

Dielectric Withstand Test, all conductors to ground plane, at 1000 VAC, 60 HZ, for 1 minute - 0.15 ma

Continuity Tests with ohm meter
White wire - 105 mΩ
Black wire - 103 mΩ
Shield - 102 mΩ

Specimen Failed: —
Specimen Passed: ✓
NCA Written: —

Tested By: Nam Sung Lee Date: 5-21-81
Witness: — Date: —
Sheet No. 13 of 24
Approved: James Marcomet

DATA SHEET

WYLE LABORATORIES

Customer: Carolina Power & Light Co.
Specimen: In-Containment Cables
Part No.: Below
Spec.: WLTP 45307-1
Para.: 4.0
S/N: ---
GSI: ---
Amb. Temp.: ---
Photo: ---
Test Med.: ---
Specimen Temp.: Ambient
Job No.: 45307
Start Date: 5-19-81

Test Title: Post-Thermal Aging Functional Test

Test Specimen No. 14

Visual Inspection - NO VISUAL DEFECTS

Insulation Resistance Tests at 500 VDC for 1 minute minimum

White to ground plane - $2.5 \times 10^{10}\,\Omega$ White to Black - $2 \times 10^{10}\,\Omega$

Black to ground plane - $3 \times 10^{10}\,\Omega$ White to Shield - $2 \times 10^{10}\,\Omega$

Shield to ground plane - $5 \times 10^{10}\,\Omega$ Black to Shield - $4 \times 10^{10}\,\Omega$

Dielectric Withstand Test, all conductors to ground plane, at 1000 VAC, 60 HZ, for 1 minute - 0.14 ma

Continuity Tests with ohm meter

White wire - 105 mΩ

Black wire - 104 mΩ

Shield - 98 mΩ

Specimen Failed: –
Specimen Passed: ✓
NCA Written: –

Tested By: Nam Sung Lee Date: 5-21-81
Witness: – Date: –
Sheet No. 14 of 24
Approved: James Marcomet

DATA SHEET

WYLE LABORATORIES

Customer: Carolina Power & Light Co.
Specimen: In-Containment Cables
Part No.: Below
Spec.: WLTP 45307-1
Para.: 4.0
S/N: ---
GSI: ---
Amb. Temp.: ---
Photo: ---
Test Med.: ---
Specimen Temp.: Ambient
Job No.: 45307
Start Date: 5-19-81

Test Title: Post-Thermal Aging Functional Test

Test Specimen No. 15

Visual Inspection - NO VISUAL DEFECTS

Insulation Resistance Tests at 500 VDC for 1 minute minimum

White to ground plane - $2.4 \times 10^{10}\ \Omega$ White to Black - $5 \times 10^{10}\ \Omega$
Black to ground plane - $3.5 \times 10^{10}\ \Omega$ White to Shield - $2 \times 10^{11}\ \Omega$
Shield to ground plane - $4 \times 10^{11}\ \Omega$ Black to Shield - $2 \times 10^{11}\ \Omega$

Dielectric Withstand Test, all conductors to ground plane, at 1000 VAC, 60 HZ, for 1 minute - 0.14 ma

Continuity Tests with ohm meter
White wire - 105 mΩ
Black wire - 104 mΩ
Shield - 98 mΩ

Specimen Failed: -
Specimen Passed: ✓
NCA Written: -

Tested By: Man Sung Lee Date: 5-21-81
Witness: - Date: -
Sheet No. 15 of 24
Approved: James Marcomet

DATA SHEET

WYLE LABORATORIES

Customer: Carolina Power & Light Co.
Specimen: In-Containment Cables
Part No.: Below
Spec.: WLTP 45307-1
Para.: 4.0
S/N: ---
GSI: ---

Amb. Temp.: ---
Photo: ---
Test Med.: ---
Specimen Temp.: Ambient

Job No.: 45307
Start Date: 5-19-81

Test Title: Post-Thermal Aging Functional Test

Test Specimen No. 16

Visual Inspection - NO VISUAL DEFECTS

Insulation Resistance Tests at 500 VDC for 1 minute minimum

White to ground plane - $2 \times 10^{11} \Omega$	White to Black - $7 \times 10^{10} \Omega$
Black to ground plane - $2 \times 10^{11} \Omega$	White to Shield - $8 \times 10^{10} \Omega$
Shield to ground plane - $2 \times 10^{11} \Omega$	Black to Shield - $5 \times 10^{10} \Omega$

Dielectric Withstand Test, all conductors to ground plane, at 1000 VAC, 60 HZ, for 1 minute - 0.15 ma

Continuity Tests with ohm meter
White wire - 105 mΩ
Black wire - 104 mΩ
Shield - 98.5 mΩ

Specimen Failed: —
Specimen Passed: ✓
NCA Written: —

Tested By: Man Sung Lee Date: 5-21-81
Witness: — Date: —
Sheet No. 16 of 24
Approved: James Marcomet

DATA SHEET

Customer: Carolina Power & Light Co.
Specimen: In-Containment Cables

WYLE LABORATORIES

Part No.: Below | Amb. Temp.: --- | Job No.: 45307
Spec.: WLTP 45307-1 | Photo: ---
Para.: 4.0 | Test Med.: --- | Start Date: 5-19-81
S/N: --- | Specimen Temp.: Ambient
GSI: ---

Test Title: Post-Thermal Aging Functional Test

Test Specimen No. 17

Visual Inspection - NO VISUAL DEFECTS

Insulation Resistance Tests at 500 VDC for 1 minute minimum

White to ground plane - $5 \times 10^{10}\,\Omega$ White to Black - $7 \times 10^{10}\,\Omega$
Black to ground plane - $2 \times 10^{11}\,\Omega$ White to Shield - $8 \times 10^{10}\,\Omega$
Shield to ground plane - $1.5 \times 10^{11}\,\Omega$ Black to Shield - $9 \times 10^{10}\,\Omega$

Dielectric Withstand Test, all conductors to ground plane, at 1000 VAC, 60 HZ, for 1 minute - 0.16 ma

Continuity Tests with ohm meter
White wire - 105 mΩ
Black wire - 102 mΩ
Shield - 98 mΩ

Specimen Failed: -
Specimen Passed: ✓
NCA Written: -

Tested By: Man Sung Lee Date: 5-21-81
Witness: - Date: -
Sheet No. 17 of 24
Approved: James Marcomet

DATA SHEET

Customer: Carolina Power & Light Co.
Specimen: In-Containment Cables
Part No.: Below
Spec.: WLTP 45307-1
Para.: 4.0
S/N: ---
GSI: ---

Amb. Temp.: ---
Photo: ---
Test Med.: ---
Specimen Temp.: Ambient

WYLE LABORATORIES
Job No.: 45307
Start Date: 5-19-81

Test Title: Post-Thermal Aging Functional Test

Test Specimen No. 18

Visual Inspection - NO VISUAL DEFECTS

Insulation Resistance Tests at 500 VDC for 1 minute minimum
White to ground plane - $8 \times 10^{10}\,\Omega$ White to Black - $1.5 \times 10^{11}\,\Omega$
Black to ground plane - $9 \times 10^{10}\,\Omega$ White to Shield - $1.5 \times 10^{11}\,\Omega$
Shield to ground plane - $8 \times 10^{10}\,\Omega$ Black to Shield - $1.5 \times 10^{11}\,\Omega$

Dielectric Withstand Test, all conductors to ground plane, at 1000 VAC, 60 HZ, for 1 minute - 0.15 ma

Continuity Tests with ohm meter
White wire - 105 mΩ
Black wire - 104 mΩ
Shield - 98 mΩ

Specimen Failed: -
Specimen Passed: ✓
NCA Written: -

Tested By: Man Sung Lee Date: 5-21-81
Witness: - Date: -
Sheet No. 18 of 24
Approved: James Marcomet

DATA SHEET

WYLE LABORATORIES

Customer: Carolina Power & Light Co.
Specimen: In-Containment Cables
Part No.: Below
Spec.: WLTP 45307-1
Para.: 4.0
S/N: ---
GSI: ---
Amb. Temp.: ---
Photo: ---
Test Med.: ---
Specimen Temp.: Ambient
Job No.: 45307
Start Date: 5-19-81

Test Title: Post-Thermal Aging Functional Test

Test Specimen No. 19

Visual Inspection - NO VISUAL DEFECTS

Insulation Resistance Tests at 500 VDC for 1 minute minimum

White to ground plane - $1.5 \times 10^{11}\,\Omega$	White to Black - $4 \times 10^{11}\,\Omega$
Black to ground plane - $3 \times 10^{11}\,\Omega$	White to Shield - $2 \times 10^{11}\,\Omega$
Shield to ground plane - $2 \times 10^{11}\,\Omega$	Black to Shield - $3 \times 10^{11}\,\Omega$
Red to ground plane - $3 \times 10^{11}\,\Omega$	White to Red - $7 \times 10^{11}\,\Omega$
Green to ground plane - $2 \times 10^{11}\,\Omega$	White to Green - $1.5 \times 10^{11}\,\Omega$
Red to shield - $1 \times 10^{11}\,\Omega$	Red to Black - $5 \times 10^{11}\,\Omega$
Green to shield - $1.5 \times 10^{11}\,\Omega$	Black to Green - $5 \times 10^{11}\,\Omega$
Green to Red - $1.5 \times 10^{11}\,\Omega$	

Dielectric Withstand Test, all conductors to ground plane, at 1000 VAC, 60 HZ, for 1 minute - 0.15 ma

Continuity Tests with ohm meter

White wire - 107 mΩ	Red wire - 104 mΩ
Black wire - 104 mΩ	Green wire - 104 mΩ
Shield - 81 mΩ	

Specimen Failed: –
Specimen Passed: ✓
NOA Written: –

Tested By: Man Sung Lee Date: 5-21-81
Witness: – Date: –
Sheet No. 19 of 24
Approved: James Marconnet

DATA SHEET

Customer: Carolina Power & Light Co.
Specimen: In-Containment Cables
Part No.: Below
Spec.: WLTP 45307-1
Para.: 4.0
S/N: ---
GSI: ---

Amb. Temp.: ---
Photo: ---
Test Med.: ---
Specimen Temp.: Ambient

WYLE LABORATORIES
Job No.: 45307
Start Date: 5-19-81

Test Title: Post-Thermal Aging Functional Test

Test Specimen No. 20

Visual Inspection - NO VISUAL DEFECTS

Insulation Resistance Tests at 500 VDC for 1 minute minimum

White to ground plane - $1.2 \times 10^{11} \Omega$	White to Black - $1 \times 10^{11} \Omega$
Black to ground plane - $8 \times 10^{10} \Omega$	White to Shield - $1 \times 10^{11} \Omega$
Shield to ground plane - $8 \times 10^{10} \Omega$	Black to Shield - $1 \times 10^{11} \Omega$
Red to ground plane - $1 \times 10^{11} \Omega$	White to Red - $2 \times 10^{11} \Omega$
Green to ground plane - $1 \times 10^{11} \Omega$	White to Green - $5 \times 10^{11} \Omega$
Red to shield - $1 \times 10^{11} \Omega$	Red to Black - $2 \times 10^{11} \Omega$
Green to shield - $3 \times 10^{11} \Omega$	Black to Green - $8 \times 10^{11} \Omega$
Green to Red - $3 \times 10^{11} \Omega$	

Dielectric Withstand Test, all conductors to ground plane, at 1000 VAC, 60 HZ, for 1 minute - 0.17 ma

Continuity Tests with ohm meter

White wire - 107 mΩ	Red wire - 104 mΩ
Black wire - 104 mΩ	Green wire - 104 mΩ
Shield - 81 mΩ	

Specimen Failed: –
Specimen Passed: ✓
NOA Written: –

Tested By: Nam Sung Lee Date: 5-21-81
Witness: – Date: –
Sheet No. 20 of 24
Approved: James Marconnet

DATA SHEET

Customer Carolina Power & Light Co.
Specimen In-Containment Cables
Part No. Below
Spec. WLTP 45307-1
Para. 4.0
S/N ---
GSI ---
Amb. Temp. ---
Photo ---
Test Med. ---
Specimen Temp. Ambient

WYLE LABORATORIES
Job No. 45307
Start Date 5-19-81

Test Title Post-Thermal Aging Functional Test

Test Specimen No. 21

Visual Inspection - No VISUAL DEFECTS

Insulation Resistance Tests at 500 VDC for 1 minute minimum

White to ground plane - $3 \times 10^{11}\Omega$	White to Black - $9 \times 10^{10}\Omega$
Black to ground plane - $9 \times 10^{10}\Omega$	White to Shield - $8 \times 10^{10}\Omega$
Shield to ground plane - $1 \times 10^{11}\Omega$	Black to Shield - $5 \times 10^{10}\Omega$
Red to ground plane - $1 \times 10^{11}\Omega$	White to Red - $1.5 \times 10^{11}\Omega$
Green to ground plane - $6 \times 10^{10}\Omega$	White to Green - $1.5 \times 10^{11}\Omega$
Red to shield - $1 \times 10^{11}\Omega$	Red to Black - $1 \times 10^{11}\Omega$
Green to shield - $9 \times 10^{11}\Omega$	Black to Green - $7 \times 10^{11}\Omega$
Green to Red - $9 \times 10^{11}\Omega$	

Dielectric Withstand Test, all conductors to ground plane, at 1000 VAC, 60 HZ, for 1 minute - 0.16 ma

Continuity Tests with ohm meter

White wire - 107 mΩ	Red wire - 104 mΩ
Black wire - 104 mΩ	Green wire - 104 mΩ
Shield - 81 mΩ	

Specimen Failed —
Specimen Passed ✓
NOA Written —

Tested By Nam Sung Lee Date: 5-21-81
Witness — Date: —
Sheet No. 21 of 24
Approved James Marcomet

DATA SHEET

Customer: Carolina Power & Light Co.
Specimen: In-Containment Cables
Part No.: Below
Spec.: WLTP 45307-1
Para.: 4.0
S/N: ---
GSI: ---
Amb. Temp.: ---
Photo: ---
Test Med.: ---
Specimen Temp.: Ambient

WYLE LABORATORIES
Job No.: 45307
Start Date: 5-19-81

Test Title: Post - Thermal Aging Functional Test

Test Specimen No. 22

Visual Inspection - NO VISUAL DEFECT

Insulation Resistance Tests at 500 VDC for 1 minute minimum

White to ground plane - $5 \times 10^{11}\ \Omega$	White to Black - $1.5 \times 10^{12}\ \Omega$
Black to ground plane - $7 \times 10^{11}\ \Omega$	White to Shield - $3 \times 10^{12}\ \Omega$
Shield to ground plane - $1 \times 10^{11}\ \Omega$	Black to Shield - $3 \times 10^{12}\ \Omega$
Red to ground plane - $7 \times 10^{11}\ \Omega$	White to Red - $1.5 \times 10^{12}\ \Omega$
Green to ground plane - $7 \times 10^{11}\ \Omega$	White to Green - $1.5 \times 10^{12}\ \Omega$
Red to shield - $2 \times 10^{12}\ \Omega$	Red to Black - $1.2 \times 10^{12}\ \Omega$
Green to shield - $2 \times 10^{12}\ \Omega$	Black to Green - $1 \times 10^{12}\ \Omega$
Green to Red - $1.3 \times 10^{12}\ \Omega$	

Dielectric Withstand Test, all conductors to ground plane, at 1000 VAC, 60 HZ, for 1 minute - 0.16 ma

Continuity Tests with ohm meter

White wire - $106\ m\Omega$	Red wire - $104\ m\Omega$
Black wire - $104\ m\Omega$	Green wire - $104\ m\Omega$
Shield - $79\ m\Omega$	

Specimen Failed: –
Specimen Passed: ✓
NOA Written: –

Tested By: Nam Sung Lee Date: 5-21-81
Witness: – Date: –
Sheet No. 22 of 24
Approved: James Marconnet

DATA SHEET

Customer: Carolina Power & Light Co.
Specimen: In-Containment Cables
Part No.: Below
Spec.: WLTP 45307-1
Para.: 4.0
S/N: ---
GSI: ---

Amb. Temp.: ---
Photo: ---
Test Med.: ---
Specimen Temp.: Ambient

WYLE LABORATORIES
Job No.: 45307
Start Date: 5-20-81

Test Title: Post-Thermal Aging Functional Test

Test Specimen No. 23

Visual Inspection - NO VISUAL DEFECTS

Insulation Resistance Tests at 500 VDC for 1 minute minimum

White to ground plane - $7 \times 10^{11} \Omega$	White to Black - $2 \times 10^{12} \Omega$
Black to ground plane - $1 \times 10^{12} \Omega$	White to Shield - $3 \times 10^{12} \Omega$
Shield to ground plane - $4 \times 10^{11} \Omega$	Black to Shield - $4 \times 10^{12} \Omega$
Red to ground plane - $1.2 \times 10^{12} \Omega$	White to Red - $3 \times 10^{12} \Omega$
Green to ground plane - $1.5 \times 10^{12} \Omega$	White to Green - $3 \times 10^{12} \Omega$
Red to shield - $3 \times 10^{12} \Omega$	Red to Black - $2 \times 10^{12} \Omega$
Green to shield - $3 \times 10^{12} \Omega$	Black to Green - $3 \times 10^{12} \Omega$
Green to Red - $3 \times 10^{12} \Omega$	

Dielectric Withstand Test, all conductors to ground plane, at 1000 VAC, 60 HZ, for 1 minute - 0.16 ma

Continuity Tests with ohm meter

White wire - 107 mΩ	Red wire - 104 mΩ
Black wire - 104 mΩ	Green wire - 104 mΩ
Shield - 80 mΩ	

Specimen Failed: –
Specimen Passed: ✓
NOA Written: –

Tested By: Man Sung Lee Date: 5-21-81
Witness: – Date: –
Sheet No. 23 of 24
Approved: James Marconnet

DATA SHEET

Customer: Carolina Power & Light Co.
Specimen: In-Containment Cables
Part No.: Below
Spec.: WLTP 45307-1
Para.: 4.0
S/N: ---
GSI: ---

Amb. Temp.: ---
Photo: ---
Test Med.: ---
Specimen Temp.: Ambient

WYLE LABORATORIES
Job No.: 45307
Start Date: 5-20-81

Test Title: Post-Thermal Aging Functional Test

Test Specimen No. 24

Visual Inspection - NO VISUAL DEFECTS

Insulation Resistance Tests at 500 VDC for 1 minute minimum

White to ground plane - $8 \times 10^{11} \Omega$	White to Black - $3 \times 10^{12} \Omega$
Black to ground plane - $1 \times 10^{12} \Omega$	White to Shield - $5 \times 10^{12} \Omega$
Shield to ground plane - $2 \times 10^{11} \Omega$	Black to Shield - $7 \times 10^{12} \Omega$
Red to ground plane - $6 \times 10^{11} \Omega$	White to Red - $2 \times 10^{12} \Omega$
Green to ground plane - $1.5 \times 10^{12} \Omega$	White to Green - $2 \times 10^{12} \Omega$
Red to shield - $2 \times 10^{12} \Omega$	Red to Black - $3 \times 10^{12} \Omega$
Green to shield - $5 \times 10^{12} \Omega$	Black to Green - $3 \times 10^{12} \Omega$
Green to Red - $2 \times 10^{12} \Omega$	

Dielectric Withstand Test, all conductors to ground plane, at 1000 VAC, 60 HZ, for 1 minute - 0.16 ma

Continuity Tests with ohm meter

White wire - 107 mΩ	Red wire - 104 mΩ
Black wire - 104 mΩ	Green wire - 104 mΩ
Shield - 78 mΩ	

Specimen Failed: —
Specimen Passed: ✓
NCA Written: —

Tested By: Man Sung Lee Date: 5-21-81
Witness: — Date: —
Sheet No. 24 of 24
Approved: James Marcomet

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APPENDIX II

INSTRUMENTATION EQUIPMENT SHEET

INSTRUMENTATION EQUIPMENT SHEET

Date 5-18-81 Job No. 45307-01-6837 Test Area ELECTRONICS

Technician MAN SUNG LEE Customer CAROLINA POWER & LIGHT Type Test POST-THERMAL AGING FUNCTIONAL TEST

No.	Instrument	Manufacturer	Model No.	Serial No.	Wyle or Gov't No.	Range	Accuracy	Calibration On	Calibration Due
1	MEGOHMMETER	GENERAL RADIO	1864	3180	11898	0.5×10^6 – $20 \times 10^{13}\Omega$	mfg. spec.	12-5-80	6-5-81
2	AC HYPOT	ASSOCIATED RE.	4030	416	96776	0-4KV	± 3%	3-31-81	6-31-81
3	DIGITAL M.M.	KEITHLEY	164	-	11305	MULTI	mfg. spec.	4-17-81	10-17-81

Page No. V-30
Report No. 45307-1

REVIEWED BY QA
DATE 5/18/81
INITIALS ek

Instrument Test Engineer K Bushart

Checked & Received By James Marcomet

WH-1029

SECTION VI

LOSS OF COOLANT ACCIDENT (LOCA) QUALIFICATION

1.0 REQUIREMENTS

1.1 Test Specimen Mounting and Orientation

The cables and cable splice assemblies shall be placed on a Wyle-supplied steel cable tray and inserted into a Wyle LOCA chamber. The cables shall be located in such a manner as to ensure the cable splice assemblies are parallel to the floor of the cable tray. Penetrations shall be utilized along the LOCA chamber wall to allow for passage of the cables. All penetrations shall be potted with Scotchcast 9 epoxy.

1.2 Electrical Powering

Electrical powering of 48 VDC (± 10%) (this was changed from 480 VAC by Mr. Robert Schwager of CP&L) shall be provided to power the cables. This input voltage shall be wired in parallel to the cables. Each conductor shall be wired in series with the other conductor(s) in the individual cables. The current within an individual cable shall be limited 20 mA (± 10%) through the use of current-limiting resistors.

1.3 Electrical Monitoring

Twenty-five (25) electrical monitoring channels shall be recorded on a datalogger to monitor the electrical operation of the test items. These channels shall be utilized to monitor the input voltage (1 channel) and the current of each cable (24 channels).

1.4 Instrumentation

The chamber pressure shall be measured with a pressure transducer in combination with a pressure gauge. The temperature of the chamber shall be measured through the use of three (3) thermocouples connected in parallel located inside the LOCA chamber. The thermocouples shall be positioned in the chamber in such a way as to be within 2 inches of the test specimens. Paralleling means taking an average of three (3) thermocouples so that a single chamber temperature can be utilized for recording purposes.

Two (2) channels on the datalogger shall be used for recording chamber pressure and temperature. These readings shall be recorded at 30-minute intervals, except during the ramps, when the datalogger shall be operated at its peak rate. A pen chart recorder shall be used to continuously monitor chamber temperature.

1.0 REQUIREMENTS (Continued)

1.5 Chemical Spray

Chemical spray shall be initiated within 5 seconds into the second ramp and continue for the remainder of the test. The composition of the chemical spray shall be as follows:

- o Boric Acid (.28 molar)
- o Sodium Thiosulphate (.064 molar)
- o Sodium Hydroxide (as required to make a pH of 10.5 at 77°F)

The chemical spray shall be sprayed vertically downward at a rate of 0.15 (gal/min)/ft^2 of area of the test chamber projected onto a horizontal plane.

The chemical spray flow rate shall be recorded daily by measuring the differential pressure across the spray nozzle. The pH of the chemical spray shall be recorded prior to each ramp and on a daily basis therafter.

1.6 LOCA Profile

The cables and cable splice assemblies shall be subjected for a period of 30 days to the LOCA profile of Figure VI-1 on a best-effort basis.

1.7 Periodic Insulation Resistance Tests

An insulation resistance test between the conductors of each cable and ground (reference Paragraph 1.3.1 of Section I) shall be performed at each temperature peak and every week until termination of the LOCA test.

2.0 PROCEDURES

2.1 Test Specimen Mounting and Orientation

The wooden mandrels were removed from the steel cable tray and the cables were straightened out, leaving the cable splices in the approximate center of the cable tray. The cables and cable tray were moved as a unit into a 30-inch diameter by 10 feet long LOCA chamber. The cable tray was supported on blocks within the chamber to isolate it from the LOCA chamber floor. The cables were parallel to the floor of the cable tray. The ends of each cable were routed through the chamber end flange penetrations consist-

2.0 PROCEDURES (Continued)

2.1 Test Mounting and Orientation (Continued)

ing of piping that was filled with a two-part electrical insulating potting compound (Scotchcast No. 9) that provided a pressure seal. Since the cable tray was shorter than the LOCA chamber, the cables were supported on wooden blocks between the ends of the cable tray and the ends of the chamber. Reference Photograph VI-1 presented in Appendix III of this section.

2.2 Electrical Powering

Each conductor of each individual cable was wired in series with the other conductor(s) of that individual cable. A 0.5 amp fuse, a 1000 ohm potentiometer, a 680 ohm resistor, and a 1000 ohm precision resistor were wired in series with each cable splice assembly. The cables were connected in parallel to a 48 VDC power supply. The current in each cable was adjusted to 20 mA ($\pm$ 10%) by adjusting the appropriate potentiometer. The potentiometers were then locked for the duration of the test.

2.3 Electrical Monitoring

The 48 VDC input voltage was recorded as 24 VDC, using a pair of 5000 ohm precision resistors as a voltage divider. The 20 mA cable currents were recorded as 20 volts across the 1000 ohm precision resistor wired in series with each cable. A datalogger was used to record these 25 channels of data.

2.4 Instrumentation

The chamber pressure was indicated with a pressure gauge and recorded with a pressure transducer connected to the datalogger.

The temperature of the chamber was recorded with three (3) electrically paralleled thermocouples located within the LOCA chamber within 2 inches of the test specimens.

Photograph VI-1, presented in Appendix III of this section, shows the location of the thermocouples.

2.5 Chemical Spray

The chemical spray solution was prepared by mixing together the following:

- 50 gallons of tap water
- 7.6 pounds of 95% H_3BO_3
- 4.4 pounds of 95% $Na_2S_2O_3$
- NaOH as required for a pH of 10.5

2.0 PROCEDURES (Continued)

2.5 Chemical Spray (Continued)

The chemical spray was sprayed vertically downward at a rate of 0.15 (gal/min)/ft^2 of area of the test chamber projected onto a horizontal plane. Photograph VI-2 shows 2 of the 3 spray nozzles located along the top center of the LOCA chamber. The chemical spray flow rate was recorded daily by measuring the differential pressure across the spray nozzles. The pH of the chemical spray was adjusted to 10.5 prior to the first ramp. The pH was measured prior to each ramp and on a daily basis thereafter. The chemical spray solution was recirculated throughout the LOCA test.

2.6 LOCA Profile

The cables and cable splice assemblies were subjected for a period of 30 days to the LOCA profile of Figure VI-1 on a best-effort basis by injecting saturated steam and shop air into the LOCA chamber. Temperature reductions were at the chamber's thermal recovery rate.

2.7 Periodic Insulation Tests

The steel cable tray was grounded to the LOCA chamber. Insulation resistance tests were performed between the conductors (all conductors of a cable connected in series) of each cable and ground at 500 VDC for 1 minute minimum. These tests were performed at each temperature peak and every week until the termination of the LOCA test. An additional test was performed prior to the second temperature peak.

3.0 RESULTS

The test specimens, except Specimen Nos. 5 and 6, successfully met the requirements as specified in Paragraph 1.0 and as described in Paragraph 2.0 of this section.

Five (5) anomalies, consisting of two (2) test specimen anomalies and three (3) test equipment malfunctions, occurred during the performance of this test.

At the first temperature peak (286°F), insulation resistance measurements of the six (6) single-conductor cables were below the acceptance criteria of 1 megohm. Prior to the second temperature excursion, the insulation resistance measurements were repeated at room ambient temperature. During this test, it was discovered that the extension leads used with the six (6) single-conductor cables had a low insulation resistance. This invalidated the insulation resistance measure-

3.0 RESULTS (Continued)

ments performed on these six (6) cables at the first temperature peak. The insulation resistance measurements at room ambient temperature were all greater than 1 megohm. Reference Notice of Anomaly No. 1 presented in Appendix I of this section.

At the first temperature peak (286°F), the insulation resistance of Test Specimen No. 6 was 0.8 megohm. Prior to the second temperature excursion, the insulation resistance was greater than 1 megohm. Reference Notice of Anomaly No. 2 presented in Appendix I of this section.

At the second temperature peak (286°F), the insulation resistance of Test Specimen No. 5 was 0.76 megohm and that of Test Specimen No. 6 was 0.50 megohm. After the chamber temperature was reduced, the insulation resistance of these cables was greater than 1 megohm. Reference Notice of Anomaly No. 3 presented in Appendix I of this section.

A momentary power outage and later a malfunctioning redundant temperature controller caused the LOCA chamber temperature to fall below the required temperature for a total of 2 hours and 45 minutes during the 30-day test. The test was extended for 2 hours and 45 minutes. Reference Notices of Anomaly Nos. 4 and 5 presented in Appendix I of this section.

Figures VI-1 through VI-5, showing the required and actual LOCA test temperature/pressure/time profiles, are presented in Appendix II of this section.

Photographs VI-1 through VI-3 are presented in Appendix III of this section.

Data Sheets, showing the data recorded in this test sequence, are presented in Appendix IV of this section.

Equipment used in recording data is shown on the Instrumentation Equipment Sheets presented in Appendix V of this section.

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APPENDIX I

NOTICES OF ANOMALY

WYLE LABORATORIES (Eastern Operations)

NOTICE OF ANOMALY

DATE: 6/16/81

NOTICE NO: 1 P.O. NUMBER: HBR-01616 CONTRACT NO: N/A

CUSTOMER: Carolina Power and Light Co. WYLE JOB NO: 45307

NOTIFICATION MADE TO: Bob Schwager NOTIFICATION DATE: 6/16/81

NOTIFICATION MADE BY: James Marconnet VIA: Telephone

CATEGORY: ☐ SPECIMEN ☐ PROCEDURE ☒ TEST EQUIPMENT DATE OF ANOMALY: 6/15/81

PART NAME: In-Containment Cable Splice Assembly PART NO. N/A

TEST: Insulation Resistance Test during first LOCA peak I.D. NO. 7, 8, 9, 10, 11, 12

SPECIFICATION: Wyle Laboratories Qual. Plan 45307-1 PARA. NO. 3.4.1.4

REQUIREMENTS:

During the LOCA Test, an insulation resistance test between the conductor of each cable and ground, as described in Paragraph 3.1.2.2, shall be performed at each temperature peak and every week until termination.

(3.1.2.2) Measure insulation resistance between each conductor and ground (plane) at 500 VDC for 1 minute (minimum).

The insulation resistance shall not be less than 1 megohm.

DESCRIPTION OF ANOMALY:

An insulation resistance test was performed on each cable test specimen at the first LOCA temperature peak (286°F). The insulation resistance of test specimens No. 7 through 12 measured less than 0.5 megohm.

DISPOSITION · COMMENTS · RECOMMENDATIONS:

At the direction of the Customer, an insulation resistance test was performed on all 24 specimens at ambient temperature prior to the second temperature excursion. During these measurements, it was discovered that the extension leads used with test specimens 7 through 12 had a low insulation resistance which invalidated the insulation resistance measurements performed during the first temperature peak. After removing the extension leads, the insulation resistance measurements were all greater than 1 megohm. LOCA testing was continued.

VERIFICATION:

TEST WITNESS: —

REPRESENTING: —

QUALITY ASSURANCE: J Kramer

PROJECT ENGINEER: James Marconnet

PROJECT MANAGER: Bruce G Fowler

INTERDEPARTMENTAL COORDINATION: DS [illegible]

WYLE Form WH 1066, Rev. Jan, 81

WYLE LABORATORIES (Eastern Operations)

NOTICE OF ANOMALY

DATE: 6/17/81

NOTICE NO: 2 P.O. NUMBER: HBR-01616 CONTRACT NO: N/A

CUSTOMER: Carolina Power and Light Co. WYLE JOB NO: 45307

NOTIFICATION MADE TO: Bob Schwager NOTIFICATION DATE: 6/17/81

NOTIFICATION MADE BY: James Marconnet VIA: Telephone

CATEGORY: ☒ SPECIMEN ☐ PROCEDURE ☐ TEST EQUIPMENT DATE OF ANOMALY: 6/15/81

PART NAME: In-Containment Cable Splice Assembly PART NO. N/A

TEST: Insulation Resistance Test during first LOCA peak I.D. NO. 6

SPECIFICATION: Wyle Laboratories Qual. Plan 45307-1 PARA. NO. 3.4.1.4

REQUIREMENTS:

During the LOCA Test, an insulation resistance test between the conductor of each cable and ground, as described in Paragraph 3.1.2.2, shall be performed at each temperature peak and every week until termination.
(3.1.2.2) Measure insulation resistance between each conductor and ground (plane) at 500 VDC for 1 minute (minimum).
The insulation resistance shall not be less than 1 megohm.

DESCRIPTION OF ANOMALY:

An insulation resistance test was performed on each cable test specimen at the first LOCA temperature peak (286°F). The insulation resistance of test specimen No. 6 was 0.8 megohm.

DISPOSITION · COMMENTS · RECOMMENDATIONS:

At the direction of the Customer, an insulation resistance test was performed on all 24 specimens at ambient temperature prior to the second temperature excursion. The insulation resistance measurements were all greater than 1 megohm. LOCA testing was continued.

VERIFICATION:

TEST WITNESS: —

REPRESENTING: —

QUALITY ASSURANCE: JKramer

PROJECT ENGINEER: James Marconnet

PROJECT MANAGER: Bruce L Fowler

INTERDEPARTMENTAL COORDINATION: DS PEJ

WYLE Form WH 1066, Rev. Jan, 81

WYLE LABORATORIES (Eastern Operations)

NOTICE OF ANOMALY

DATE: 6/17/81

NOTICE NO: 3 P.O. NUMBER: HBR-01616 CONTRACT NO: N/A

CUSTOMER: Carolina Power and Light Co. WYLE JOB NO: 45307

NOTIFICATION MADE TO: Bob Schwager NOTIFICATION DATE: 6/17/81

NOTIFICATION MADE BY: James Marconnet VIA: Telephone

CATEGORY: ☒ SPECIMEN ☐ PROCEDURE ☐ TEST EQUIPMENT DATE OF ANOMALY: 6/16/81

PART NAME: In-Containment Cable Splice Assembly PART NO. N/A

TEST: Insulation Resistance Test during second LOCA peak I.D. NO. 5, 6

SPECIFICATION: Wyle Laboratories Qual. Plan 45307-1 PARA. NO. 3.4.1.4

REQUIREMENTS:

During the LOCA test, an insulation resistance test between the conductor of each cable and ground, as described in Paragraph 3.1.2.2, shall be performed at each temperature peak and every week until termination.
(3.1.2.2) Measure insulation resistance between each conductor and ground (plane) at 500 VDC for 1 minute (minimum).
The insulation resistance shall not be less than 1 megohm.

DESCRIPTION OF ANOMALY:

An insulation resistance test was performed on each cable test specimen at the second LOCA temperature peak (286°F). The insulation resistance of test specimen No. 5 was 0.76 megohm. The insulation resistance of test specimen No. 6 was 0.50 megohm.

DISPOSITION · COMMENTS · RECOMMENDATIONS:

At the direction of the Customer, LOCA testing was continued.

VERIFICATION:

TEST WITNESS: —

REPRESENTING: —

QUALITY ASSURANCE: J Kramer

PROJECT ENGINEER: James Marconnet

PROJECT MANAGER: Bruce F Fowler

INTERDEPARTMENTAL COORDINATION: DS LEJ

WYLE Form WH 1066, Rev. Jan, 81

WYLE LABORATORIES (Eastern Operations)

NOTICE OF ANOMALY

DATE: 7/14/81

NOTICE NO: 4 P.O. NUMBER: HBR-01616 CONTRACT NO: N/A

CUSTOMER: Carolina Power and Light Co. WYLE JOB NO: 45307

NOTIFICATION MADE TO: Bob Schwager NOTIFICATION DATE: 7/13/81

NOTIFICATION MADE BY: James Marconnet VIA: Telephone

CATEGORY: ☐ SPECIMEN ☐ PROCEDURE ☒ TEST EQUIPMENT DATE OF ANOMALY: 6/30/81

PART NAME: In-Containment Cable Splice Assembly PART NO. N/A

TEST: Accident (LOCA) I.D. NO. 1-24

SPECIFICATION: Wyle Laboratories Qual. Plan 45307-1 PARA. NO. 3.4.1

REQUIREMENTS:

The cables and cable splice assemblies shall be subjected for a period of 30 days to the LOCA profile of Figure 1 on a best-effort basis. From Figure 1, the temperature shall be 152°F from the second day to the 30th day of the LOCA test.

DESCRIPTION OF ANOMALY:

A momentary power outage caused the redundant temperature controller to shut off the steam supply to the environmental chamber. The chamber temperature went below the specification for 1 hour and 45 minutes. The minimum chamber temperature reached was 80°F.

DISPOSITION · COMMENTS · RECOMMENDATIONS:

At the direction of the customer, the LOCA test will be extended 1 hour and 45 minutes.

VERIFICATION:

TEST WITNESS: ______

REPRESENTING: ______

QUALITY ASSURANCE: J. Kramer

PROJECT ENGINEER: James Marconnet

PROJECT MANAGER: Herschel Jordan

INTERDEPARTMENTAL COORDINATION: KDS

WYLE Form WH 1066, Rev. Jan, 81

WYLE LABORATORIES (Eastern Operations)

NOTICE OF ANOMALY

DATE: 7/14/81

NOTICE NO: 5 P.O. NUMBER: HBR-01616 CONTRACT NO: N/A

CUSTOMER: Carolina Power and Light Co. WYLE JOB NO: 45307

NOTIFICATION MADE TO: Bob Schwager NOTIFICATION DATE: 7/13/81

NOTIFICATION MADE BY: James Marconnet VIA: Telephone

CATEGORY: ☐ SPECIMEN ☐ PROCEDURE ☒ TEST EQUIPMENT DATE OF ANOMALY: 7/10/81

PART NAME: In-Containment Cable Splice Assembly PART NO. N/A

TEST: Accident (LOCA) I.D. NO. 1-24

SPECIFICATION: Wyle Laboratories Qual. Plan 45307-1 PARA. NO. 3.4.1

REQUIREMENTS:

The cables and cable splice assemblies shall be subjected for a period of 30 days to the LOCA profile of Figure 1 on a best-effort basis. From Figure 1, the temperature shall be 152°F from the second day to the 30th day of the LOCA test.

DESCRIPTION OF ANOMALY:

The redundant temperature controller malfunctioned several times, shutting off the steam supply to the environmental chamber each time it malfunctioned. During the times the steam was shut off, the chamber temperature went below the specification for a total of one (1) hour. The minimum chamber temperature reached was 92°F.

DISPOSITION · COMMENTS · RECOMMENDATIONS:

The redundant temperature controller was replaced. At the direction of the customer, the LOCA test will be extended one (1) hour.

VERIFICATION:

TEST WITNESS: ______

REPRESENTING: ______

QUALITY ASSURANCE: J. Kramer

PROJECT ENGINEER: James Marconnet

PROJECT MANAGER: Herschel Jordan

INTERDEPARTMENTAL COORDINATION: BJ KDS

WYLE Form WH 1066, Rev. Jan, 81

APPENDIX II

FIGURES

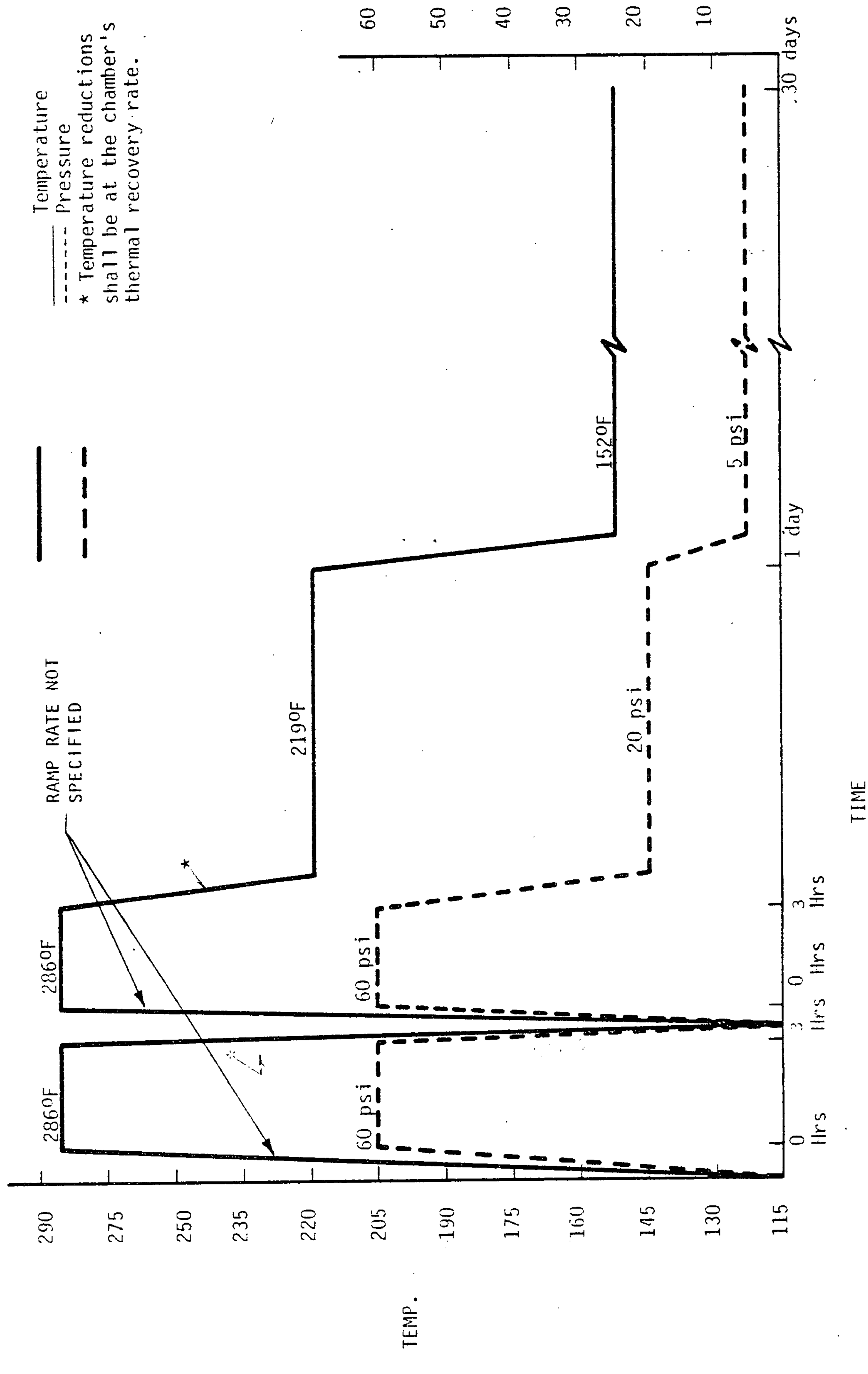


FIGURE VI-1
REQUIRED LOCA TEST PROFILE

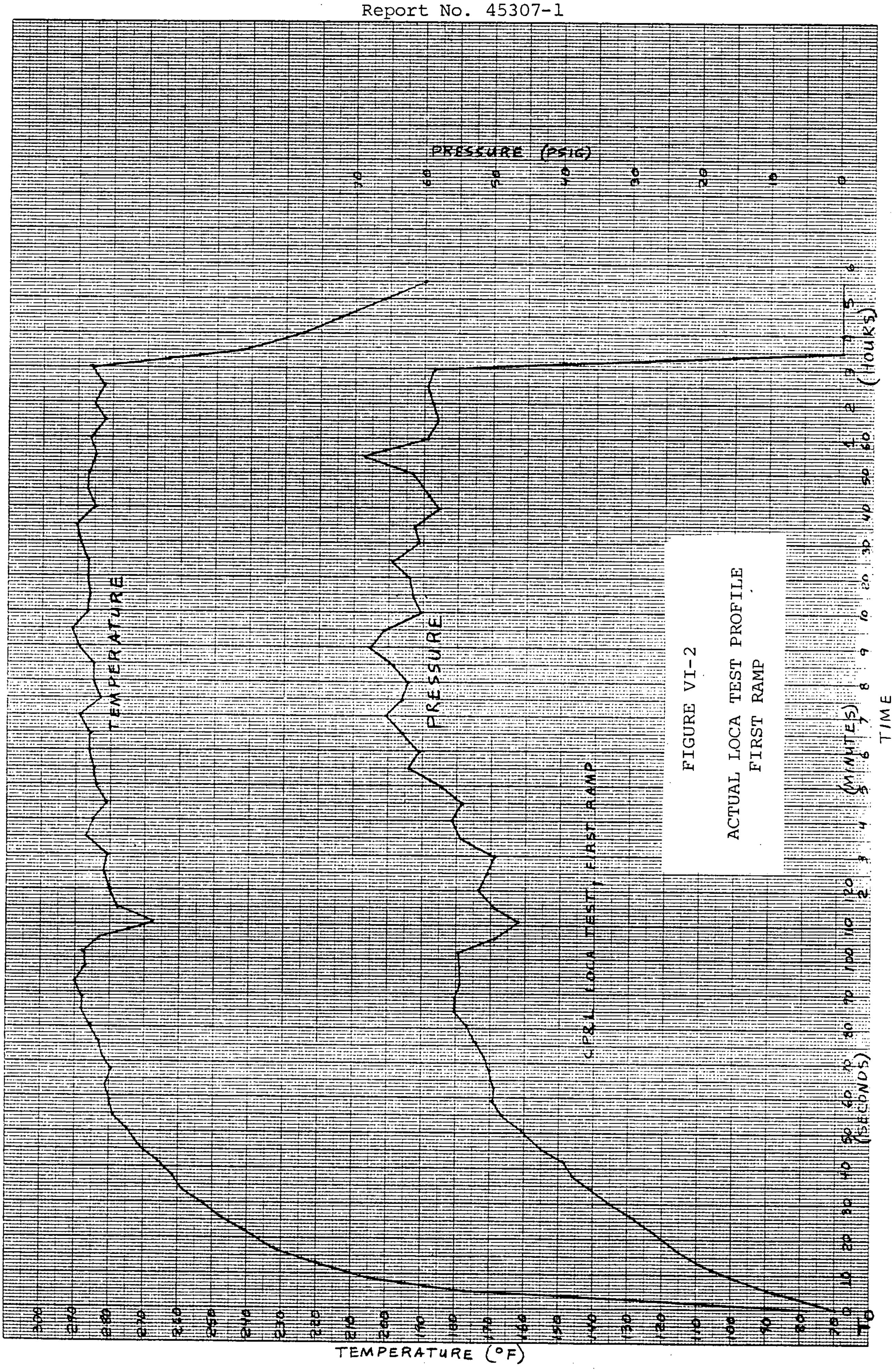


FIGURE VI-2

ACTUAL LOCA TEST PROFILE
FIRST RAMP

47 1513

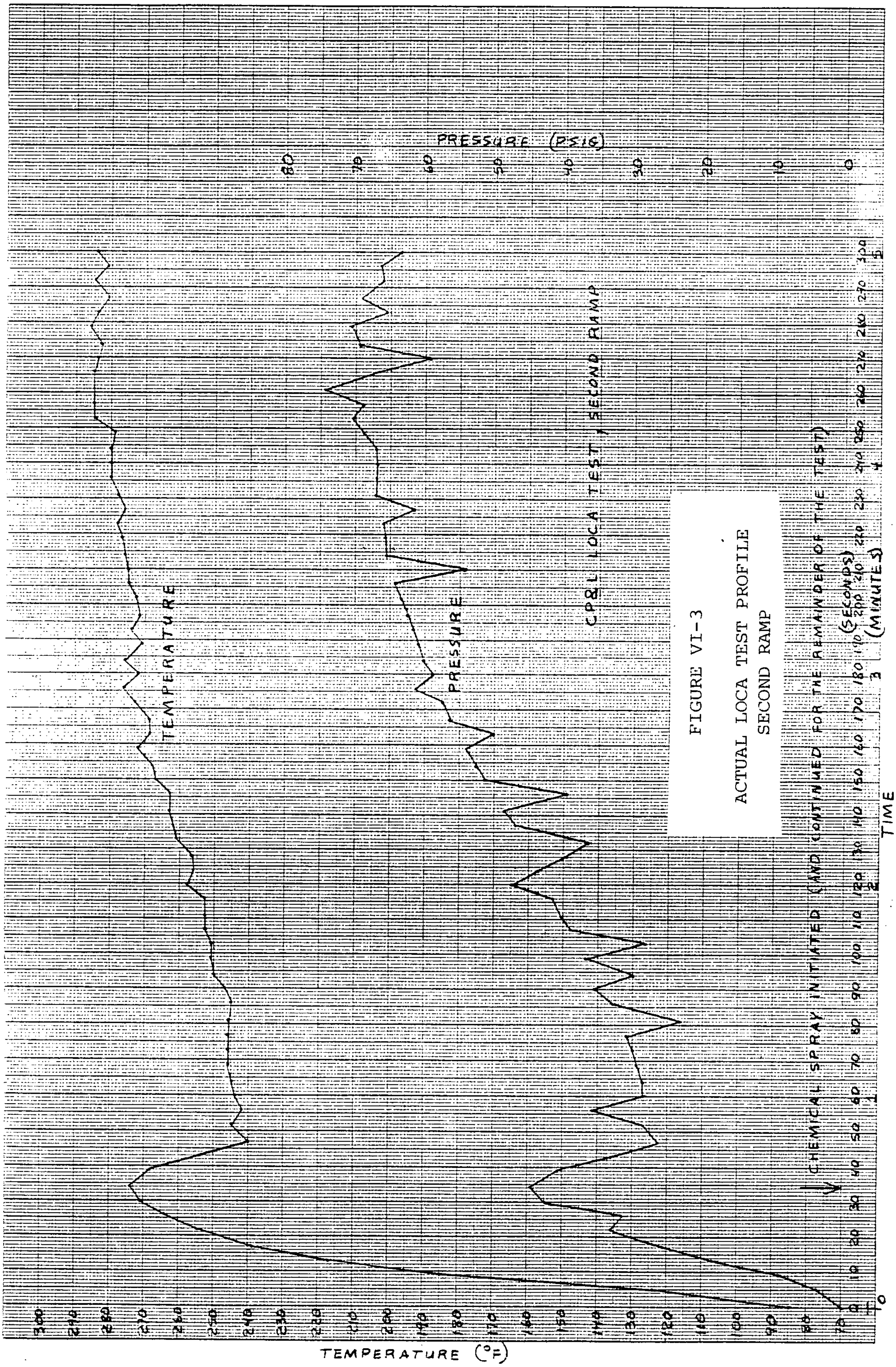


FIGURE VI-3
ACTUAL LOCA TEST PROFILE
SECOND RAMP

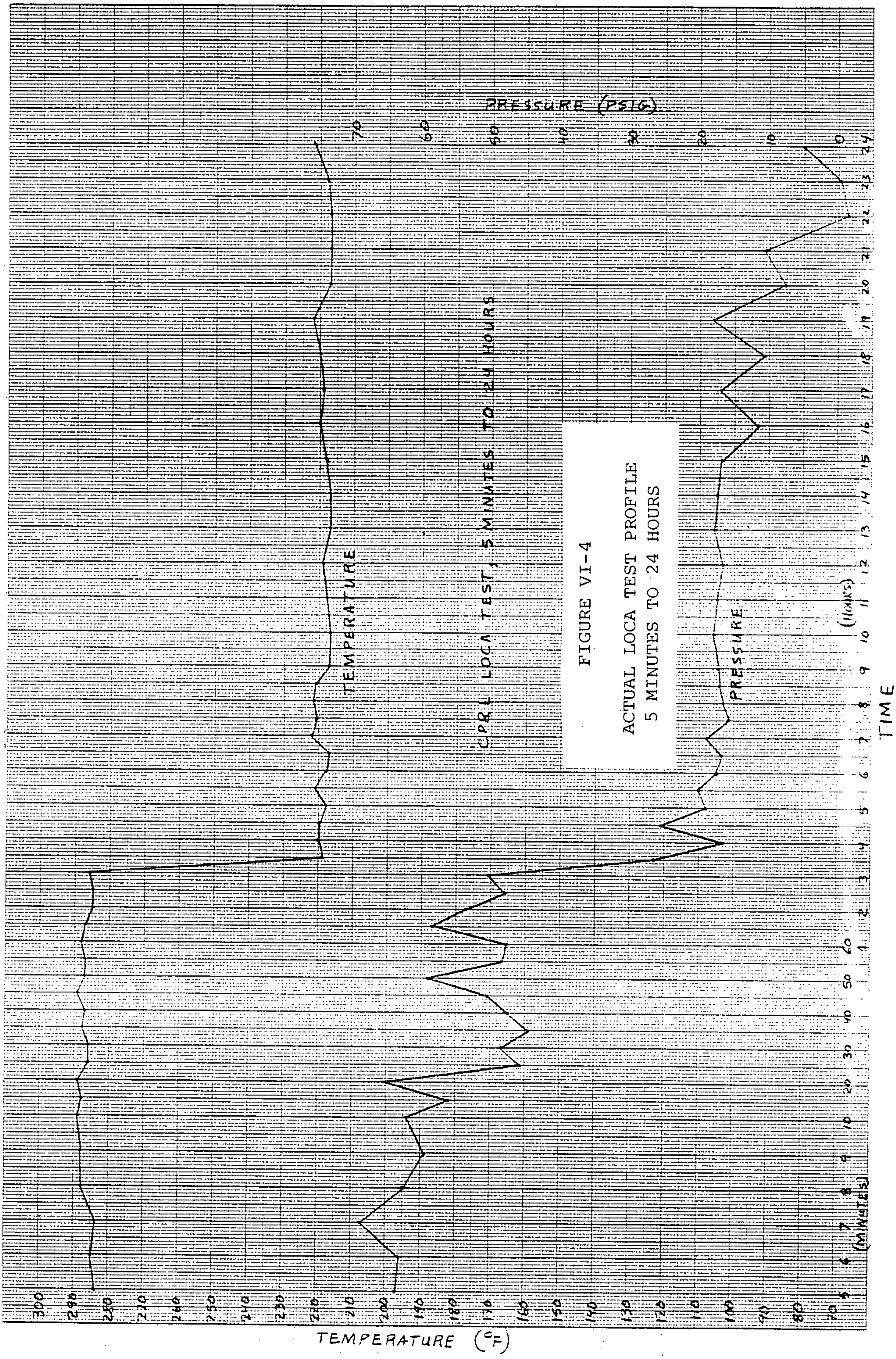


FIGURE VI-4

ACTUAL LOCA TEST PROFILE
5 MINUTES TO 24 HOURS

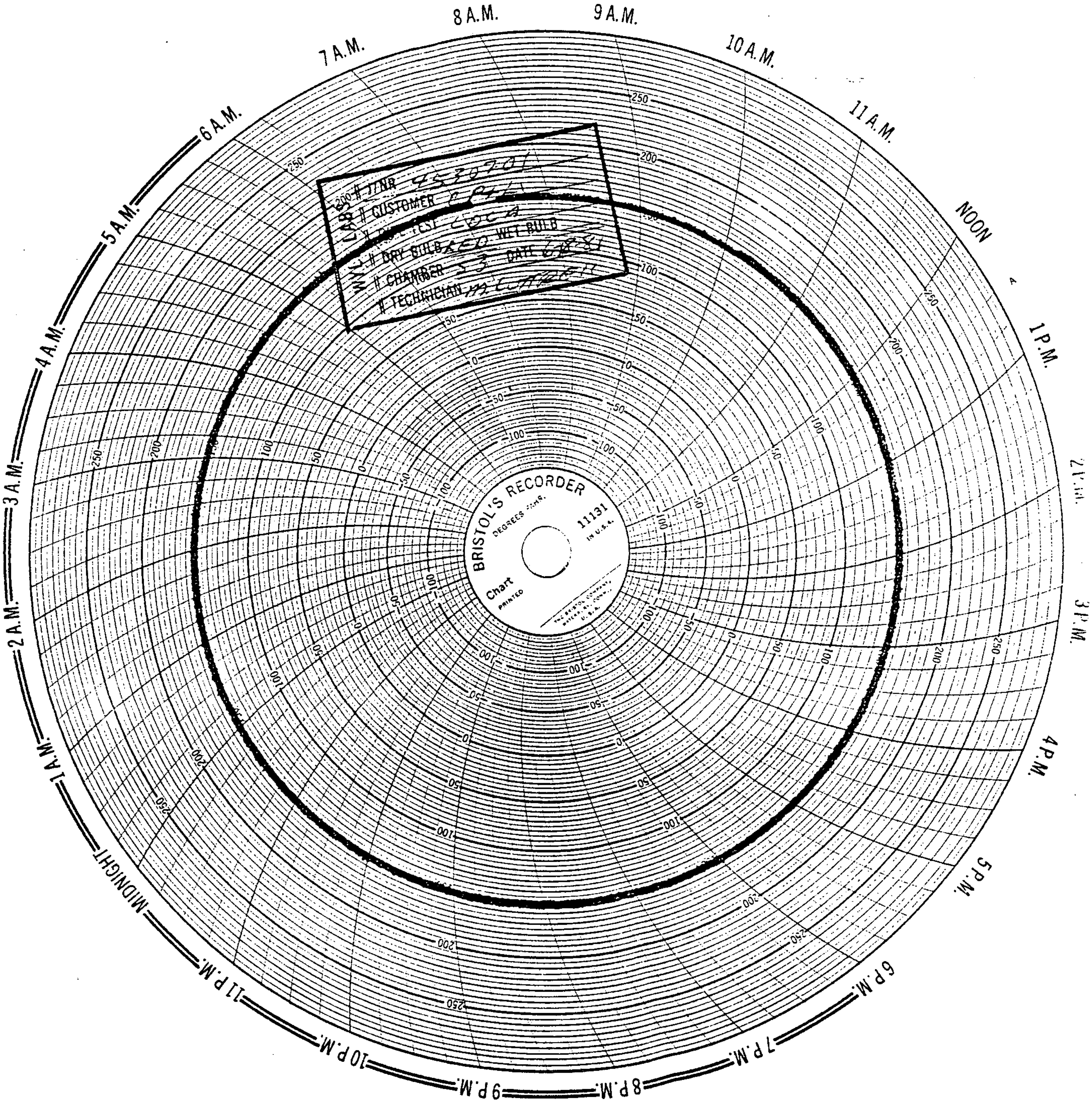
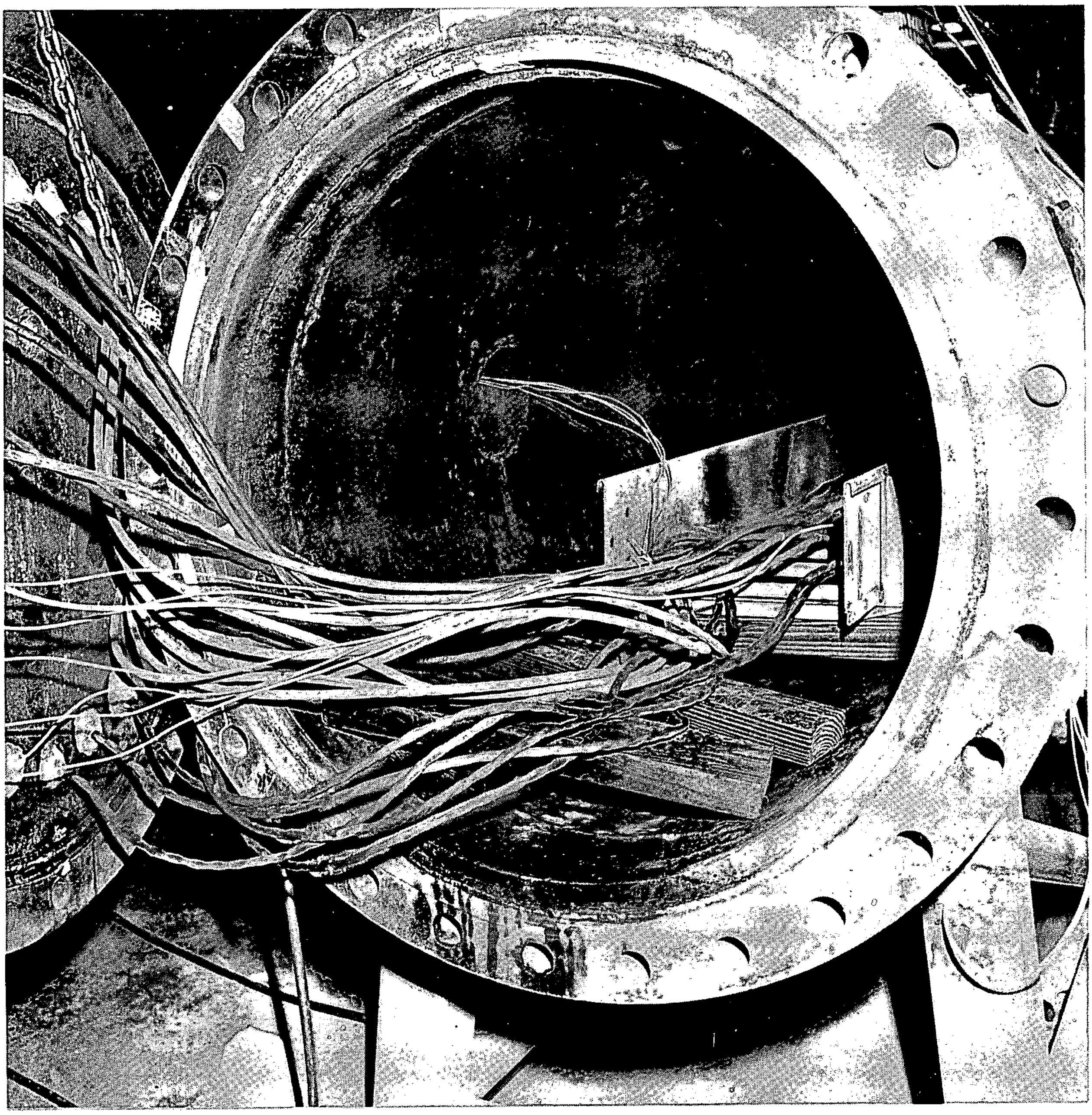


FIGURE VI-5

TYPICAL LOCA TEST TEMPERATURE CHART FROM DAY 2 TO DAY 30
(PRESSURE WAS 5 PSIG)

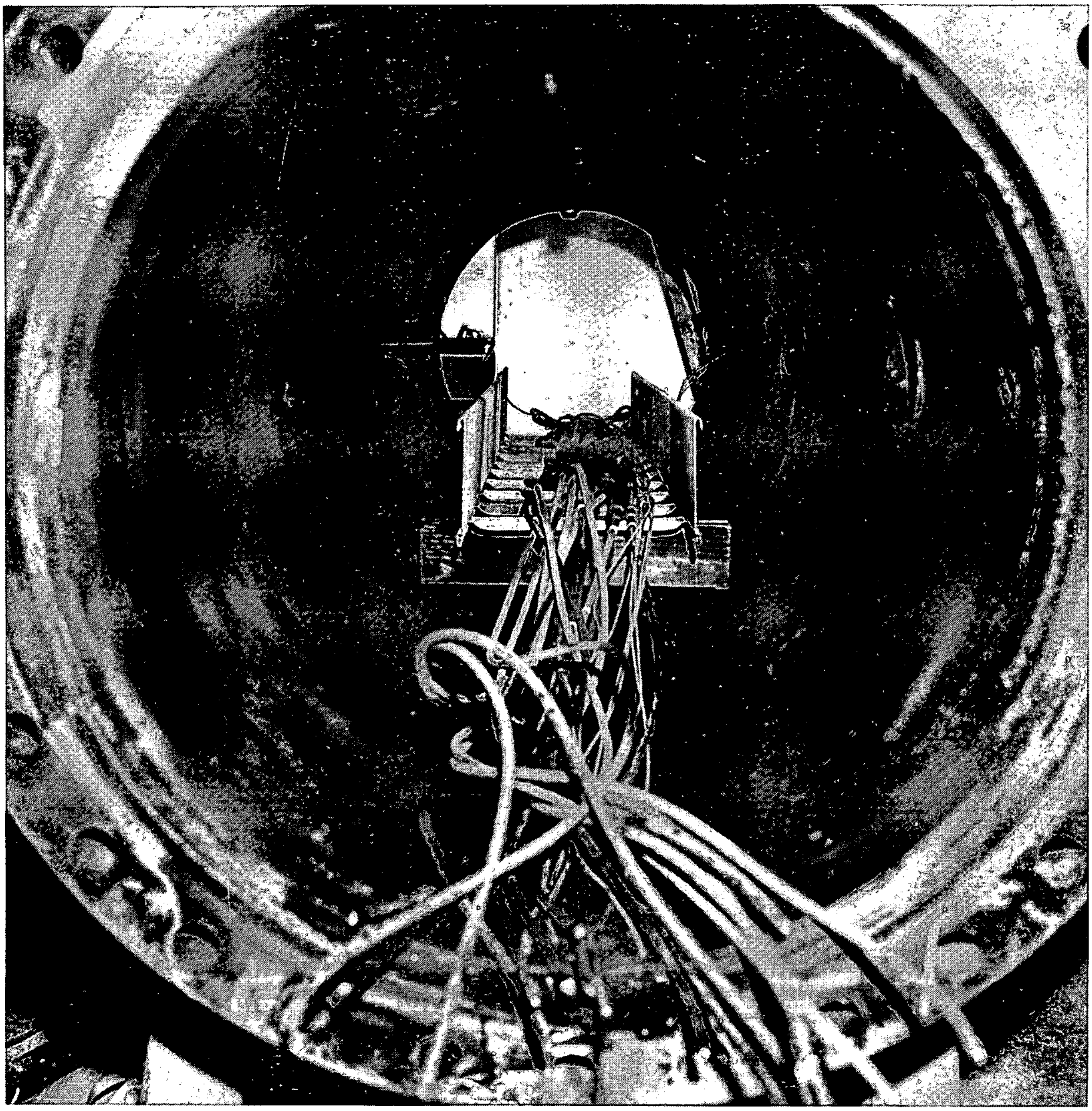
APPENDIX III

PHOTOGRAPHS



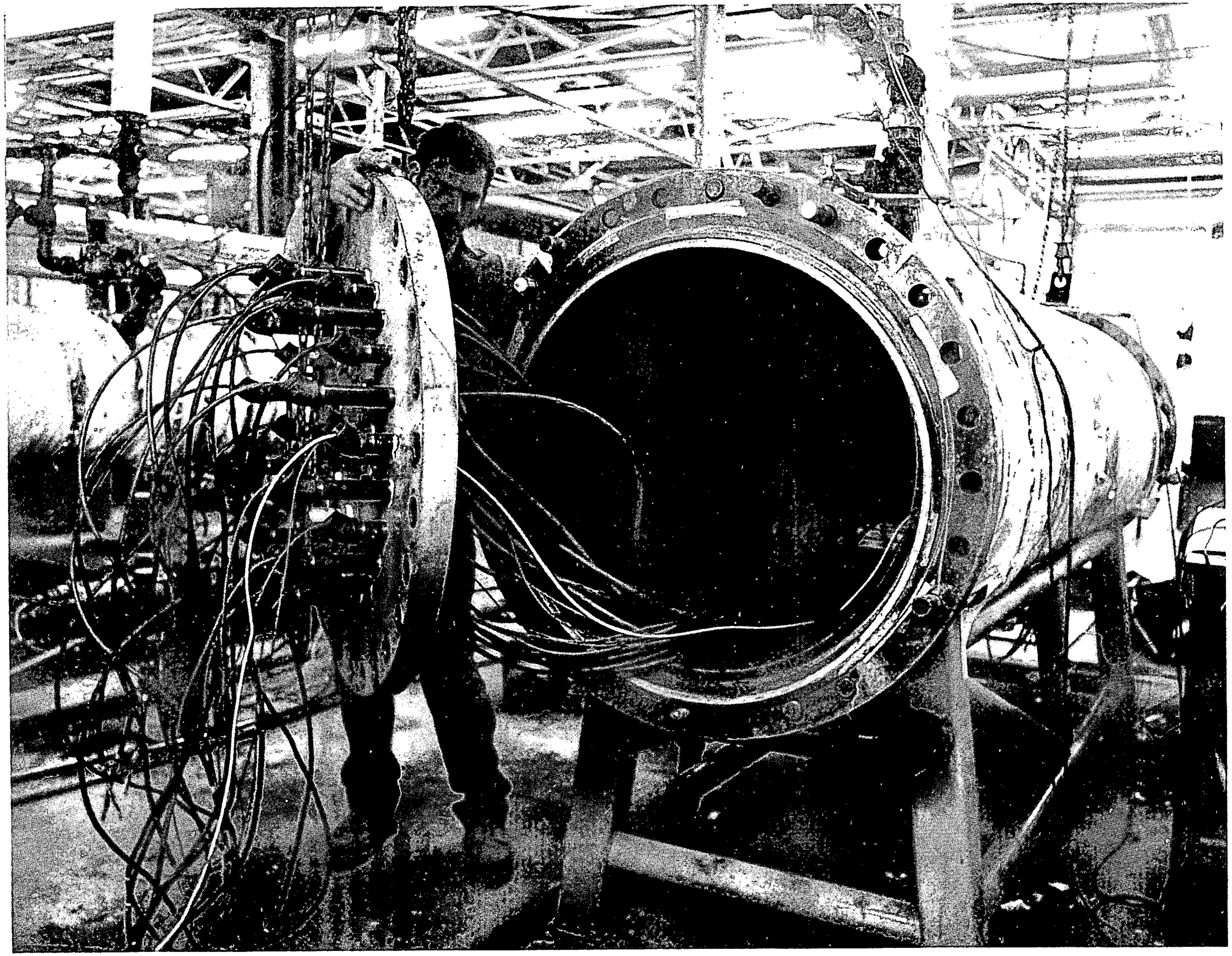
PHOTOGRAPH VI-1

TEST SPECIMEN CABLES AND CABLE TRAY IN LOCA CHAMBER
(VIEW 1) AFTER LOCA TEST



PHOTOGRAPH VI-2

TEST SPECIMEN CABLES AND CABLE TRAY IN LOCA CHAMBER
(VIEW 2) AFTER LOCA TEST



PHOTOGRAPH VI-3

TEST SPECIMEN CABLES DURING INSTALLATION IN LOCA CHAMBER

APPENDIX IV

DATA SHEETS

DATA SHEET

Customer Carolina Power & Light Co.
Specimen In-Containment Cables
Part No. Below
Spec. WLTP 45307-1
Para. 3.4.1.4
S/N ---
GSI ---

Amb. Temp. ---
Photo ---
Test Med. ---
Specimen Temp. 288°F

WYLE LABORATORIES
Job No. 45307
Start Date 6-15-81

Test Title INSULATION RESISTANCE - @ 288°F PLATEAU

INSULATION RESISTANCE TESTS AT 500 VDC FOR 1 MINUTE MINIMUM BETWEEN THE CABLE ~~CONDUCTORS AND THE CABLE TRAY (GROUND PLANE):~~

	TEST SPECIMEN	I.R.	TEST SPECIMEN	I.R.
	1	$.56 \times 10^1$ MEGOHMS	13	3.0×10^1 MEGOHMS
	2	2.25×10^0 MEGOHMS	14	3.5×10^1 MEGOHMS
	3	2.0×10^0 MEGOHMS	15	3.0×10^1 MEGOHMS
	4	$.90 \times 10^1$ MEGOHMS	16	4.0×10^1 MEGOHMS
	5	1.5×10^0 MEGOHMS	17	$.54 \times 10^2$ MEGOHMS
*	6	$.80 \times 10^0$ MEGOHMS	18	2.75×10^1 MEGOHMS
*	7	$< .5$ MEGOHMS	19	$.70 \times 10^2$ MEGOHMS
*	8	$< .5$ MEGOHMS	20	2.50×10^2 MEGOHMS
*	9	$< .5$ MEGOHMS	21	2.50×10^2 MEGOHMS
*	10	$< .5$ MEGOHMS	22	2.25×10^2 MEGOHMS
*	11	$< .5$ MEGOHMS	23	1.2×10^2 MEGOHMS
*	12	$< .5$ MEGOHMS	24	1.8×10^2 MEGOHMS

The conductors of each test specimen are connected in-series for electrical powering purposes.

Acceptance Criteria: The I.R. shall not be less than 1 megohm.

Specimen Failed —
Specimen Passed —
NOA Written * NOA No. 1, 2

Tested By DMHooper Date: 6-15-81
Witness — Date: —
Sheet No. 1 of 1
Approved James Marconnet

WH-614A

DATA SHEET

Customer: Carolina Power & Light Co.
Specimen: In-Containment Cables
Part No.: Below
Spec.: WLTP 45307-1
Para.: 3.4.1.4
S/N: ---
GSI: ---
Amb. Temp.: ---
Photo: ---
Test Med.: ---
Specimen Temp.: AMBIENT

WYLE LABORATORIES
Job No.: 45307
Start Date: 6-16-81

Test Title: INSULATION RESISTANCE - @ 88°F

INSULATION RESISTANCE TESTS AT 500 VDC FOR 1 MINUTE MINIMUM BETWEEN THE CABLE ~~CONDUCTORS AND THE CABLE TRAY (GROUND PLANE):~~

TEST SPECIMEN	I.R.	TEST SPECIMEN	I.R.
1	1.7×10^4 MEGOHMS	13	$.76 \times 10^5$ MEGOHMS
2	3.0×10^3 MEGOHMS	14	4.5×10^5 MEGOHMS
3	$.70 \times 10^4$ MEGOHMS	15	$.60 \times 10^5$ MEGOHMS
4	3.5×10^4 MEGOHMS	16	3.0×10^4 MEGOHMS
5	3.5×10^4 MEGOHMS	17	4.0×10^4 MEGOHMS
6	1.1×10^4 MEGOHMS	18	3.5×10^4 MEGOHMS
7	10×10^5 MEGOHMS	19	2.75×10^3 MEGOHMS
8	10×10^5 MEGOHMS	20	$.96 \times 10^4$ MEGOHMS
9	10×10^5 MEGOHMS	21	$.74 \times 10^4$ MEGOHMS
10	10×10^5 MEGOHMS	22	4.5×10^3 MEGOHMS
11	8.0×10^5 MEGOHMS	23	$.72 \times 10^4$ MEGOHMS
12	4.5×10^5 MEGOHMS	24	$.64 \times 10^4$ MEGOHMS

The conductors of each test specimen are connected in-series for electrical powering purposes.

Acceptance Criteria: The I.R. shall not be less than 1 megohm.

Specimen Failed: –
Specimen Passed: ✓
NOA Written: Ref. NOA No. 1, 2

Tested By: DM Hooper Date: 6-16-81
Witness: – Date: –
Sheet No. 1 of 1
Approved: James Marconnet

DATA SHEET

WYLE LABORATORIES

Customer Carolina Power & Light Co.
Specimen In-Containment Cables
Part No. Below
Spec. WLTP 45307-1
Para. 3.4.1.4
S/N ---
GSI ---

Amb. Temp. ---
Photo ---
Test Med. ---
Specimen Temp. 289°F

Job No. 45307
Start Date 6-16-81

Test Title INSULATION RESISTANCE - @ 289°F

INSULATION RESISTANCE TESTS AT 500 VDC FOR 1 MINUTE MINIMUM BETWEEN THE CABLE ~~CONDUCTORS AND THE CABLE TRAY (GROUND PLANE).~~

TEST SPECIMEN	I.R.	TEST SPECIMEN	I.R.
1	4.0×10^0 MEGOHMS	13	$.58 \times 10^2$ MEGOHMS
2	2.75×10^0 MEGOHMS	14	$.56 \times 10^2$ MEGOHMS
3	1.15×10^0 MEGOHMS	15	$.62 \times 10^2$ MEGOHMS
4	1.10×10^1 MEGOHMS	16	$.74 \times 10^2$ MEGOHMS
* 5	$.76 \times 10^0$ MEGOHMS	17	1.30×10^2 MEGOHMS
* 6	$.50 \times 10^0$ MEGOHMS	18	$.60 \times 10^2$ MEGOHMS
7	1.40×10^3 MEGOHMS	19	1.60×10^2 MEGOHMS
8	$.82 \times 10^3$ MEGOHMS	20	1.80×10^2 MEGOHMS
9	1.20×10^3 MEGOHMS	21	2.50×10^2 MEGOHMS
10	1.45×10^3 MEGOHMS	22	2.50×10^2 MEGOHMS
11	$.78 \times 10^3$ MEGOHMS	23	1.10×10^2 MEGOHMS
12	4.0×10^2 MEGOHMS	24	1.15×10^2 MEGOHMS

The conductors of each test specimen are connected in-series for electrical powering purposes.

Acceptance Criteria: The I.R. shall not be less than 1 megohm.

Specimen Failed –
Specimen Passed –
NOA Written * NOA No. 3

Tested By DMHooper Date: 6-16-81
Witness – Date: –
Sheet No. 1 of 1
Approved James Marcomet

WH-614A

DATA SHEET

Customer Carolina Power & Light Co.

Specimen In-Containment Cables

WYLE LABORATORIES

Part No. Below

Amb. Temp. ---

Job No. 45307

Spec. WLTP 45307-1

Photo ---

Para. 3.4.1.4

Test Med. ---

Start Date 6-17-81

S/N ---

Specimen Temp. 219°F

GSI ---

Test Title INSULATION RESISTANCE - @ 219° PLATEAU

INSULATION RESISTANCE TESTS AT 500 VDC FOR 1 MINUTE MINIMUM BETWEEN THE CABLE ~~CONDUCTORS AND THE CABLE TRAY (GROUND PLANE).~~

TEST SPECIMEN	I.R.	TEST SPECIMEN	I.R.
1	$.92 \times 10^2$ MEGOHMS	13	2.25×10^2 MEGOHMS
2	3.25×10^1 MEGOHMS	14	1.90×10^2 MEGOHMS
3	2.75×10^1 MEGOHMS	15	2.25×10^2 MEGOHMS
4	$.72 \times 10^2$ MEGOHMS	16	2.75×10^2 MEGOHMS
5	1.70×10^1 MEGOHMS	17	$.90 \times 10^3$ MEGOHMS
6	$.81 \times 10^1$ MEGOHMS	18	2.25×10^2 MEGOHMS
7	1.25×10^4 MEGOHMS	19	2.75×10^2 MEGOHMS
8	1.35×10^4 MEGOHMS	20	1.05×10^3 MEGOHMS
9	1.10×10^4 MEGOHMS	21	1.20×10^3 MEGOHMS
10	1.55×10^4 MEGOHMS	22	$.88 \times 10^3$ MEGOHMS
11	1.05×10^4 MEGOHMS	23	4.50×10^2 MEGOHMS
12	1.20×10^4 MEGOHMS	24	3.25×10^2 MEGOHMS

The conductors of each test specimen are connected in-series for electrical powering purposes.

Acceptance Criteria: The I.R. shall not be less than 1 megohm.

Specimen Failed —

Specimen Passed ✓

NOA Written —

Tested By DM Hooper Date: 6-17-81

Witness — Date: —

Sheet No. 1 of 1

Approved James Marconnet

WH-614A

DATA SHEET

WYLE LABORATORIES

Customer Carolina Power & Light Co.
Specimen In-Containment Cables
Part No. Below
Spec. WLTP 45307-1
Para. 3.4.1.4
S/N ---
GSI ---
Amb. Temp. ---
Photo ---
Test Med. ---
Specimen Temp. 152°F
Job No. 45307
Start Date 6-19-81

Test Title WEEKLY I.R-@500VDC-@152°F

INSULATION RESISTANCE TESTS AT 500 VDC FOR 1 MINUTE MINIMUM BETWEEN THE CABLE ~~CONDUCTORS AND THE CABLE TRAY (GROUND PLANE).~~

TEST SPECIMEN	I.R.	TEST SPECIMEN	I.R.
1	$.53 \times 10^4$ MEGOHMS	13	2.0×10^3 MEGOHMS
2	1.40×10^3 MEGOHMS	14	4.0×10^3 MEGOHMS
3	1.40×10^3 MEGOHMS	15	2.5×10^3 MEGOHMS
4	2.50×10^3 MEGOHMS	16	4.0×10^3 MEGOHMS
5	2.75×10^3 MEGOHMS	17	1.2×10^4 MEGOHMS
6	1.30×10^3 MEGOHMS	18	3.5×10^3 MEGOHMS
7	DMH 2.5×10^3 ~~2.0×10^3~~ MEGOHMS	19	4.25×10^3 MEGOHMS
8	5.0×10^5 MEGOHMS	20	1.05×10^4 MEGOHMS
9	2.25×10^5 MEGOHMS	21	$.88 \times 10^4$ MEGOHMS
10	3.5×10^5 MEGOHMS	22	1.10×10^4 MEGOHMS
11	3.0×10^5 MEGOHMS	23	$.86 \times 10^4$ MEGOHMS
12	2.0×10^5 MEGOHMS	24	2.75×10^3 MEGOHMS

The conductors of each test specimen are connected in-series for electrical powering purposes.

Acceptance Criteria: The I.R. shall not be less than 1 megohm.

Specimen Failed —
Specimen Passed ✓
NOA Written —

Tested By DMHooper Date: 6-19-81
Witness — Date: —
Sheet No. 1 of 1
Approved James Marconnet

WH-614A

DATA SHEET

WYLE LABORATORIES

Customer: Carolina Power & Light Co.
Specimen: In-Containment Cables
Part No.: Below
Spec.: WLTP 45307-1
Para.: 3.4.1.4
S/N: ---
GSI: ---
Amb. Temp.: ---
Photo: ---
Test Med.: ---
Specimen Temp.: 152°F
Job No.: 45307
Start Date: 6-25-81

Test Title: WEEKLY I.R. CHECK @ 500VDC -@152°F

INSULATION RESISTANCE TESTS AT 500 VDC FOR 1 MINUTE MINIMUM BETWEEN THE CABLE ~~CONDUCTORS AND THE CABLE TRAY (GROUND PLANE):~~

TEST SPECIMEN	I.R.	TEST SPECIMEN	I.R.
1	$.52 \times 10^4$ MEGOHMS	13	1.3×10^3 MEGOHMS
2	1.6×10^3 MEGOHMS	14	3.5×10^3 MEGOHMS
3	1.6×10^3 MEGOHMS	15	2.5×10^3 MEGOHMS
4	2.25×10^3 MEGOHMS	16	3.5×10^3 MEGOHMS
5	4.0×10^3 MEGOHMS	17	1.1×10^4 MEGOHMS
6	1.5×10^3 MEGOHMS	18	3.0×10^3 MEGOHMS
7	DMH 4.0×10^5 ~~3.5×10^3~~ MEGOHMS	19	3.0×10^3 MEGOHMS
8	8.0×10^5 MEGOHMS	20	$.92 \times 10^4$ MEGOHMS
9	4.0×10^5 MEGOHMS	21	$.76 \times 10^4$ MEGOHMS
10	4.0×10^5 MEGOHMS	22	$.85 \times 10^4$ MEGOHMS
11	3.5×10^5 MEGOHMS	23	$.74 \times 10^4$ MEGOHMS
12	4.5×10^5 MEGOHMS	24	2.25×10^2 MEGOHMS

The conductors of each test specimen are connected in-series for electrical powering purposes.

Acceptance Criteria: The I.R. shall not be less than 1 megohm.

Specimen Failed: —
Specimen Passed: ✓
NOA Written: —

Tested By: DM Hooper Date: 6-25-81
Witness: — Date: —
Sheet No. 1 of 1
Approved: James Marconnet

WH-614A

DATA SHEET

Customer Carolina Power & Light Co.

Specimen In-Containment Cables

Part No. Below

Spec. WLTP 45307-1

Para. 3.4.1.4

S/N ---

GSI ---

Amb. Temp. ---

Photo ---

Test Med. ---

Specimen Temp. 152 °F

WYLE LABORATORIES

Job No. 45307

Start Date 7-2-81

Test Title Weekly I. R. Check

INSULATION RESISTANCE TESTS AT 500 VDC FOR 1 MINUTE MINIMUM BETWEEN THE CABLE ~~CONDUCTORS AND THE CABLE TRAY (GROUND PLANE):~~

TEST SPECIMEN	I.R.	TEST SPECIMEN	I.R.
1	$6 \times 10^9 \Omega$	13	$1.1 \times 10^9 \Omega$
2	$1.8 \times 10^9 \Omega$	14	$4 \times 10^9 \Omega$
3	$2 \times 10^9 \Omega$	15	$2.4 \times 10^9 \Omega$
4	$3 \times 10^9 \Omega$	16	$3.5 \times 10^9 \Omega$
5	$5 \times 10^9 \Omega$	17	$1.2 \times 10^{10} \Omega$
6	$2 \times 10^9 \Omega$	18	$3 \times 10^9 \Omega$
7	$2 \times 10^{11} \Omega$	19	$1 \times 10^9 \Omega$
8	$2 \times 10^{11} \Omega$	20	$9 \times 10^9 \Omega$
9	$2 \times 10^{11} \Omega$	21	$7 \times 10^9 \Omega$
10	$3 \times 10^{11} \Omega$	22	$8 \times 10^9 \Omega$
11	$2 \times 10^{11} \Omega$	23	$7 \times 10^9 \Omega$
12	$2.4 \times 10^{11} \Omega$	24	$1 \times 10^7 \Omega$

The conductors of each test specimen are connected in-series for electrical powering purposes.

Acceptance Criteria: The I.R. shall not be less than 1 megohm.

Specimen Failed —

Specimen Passed ✓

NOA Written —

Tested By Nam Sung Lee Date: 7-2-81

Witness — Date: —

Sheet No. 1 of 1

Approved James Marconnet

WH-614A

DATA SHEET

Customer Carolina Power & Light Co.
Specimen In-Containment Cables
Part No. Below
Spec. WLTP 45307-1
Para. 3.4.1.4
S/N ---
GSI ---

Amb. Temp. ---
Photo ---
Test Med. ---
Specimen Temp.

WYLE LABORATORIES

Job No. 45307

Start Date 7-8-81

Test Title INSULATION RESISTANCE – Weekly check

INSULATION RESISTANCE TESTS AT 500 VDC FOR 1 MINUTE MINIMUM BETWEEN THE CABLE ~~CONDUCTORS AND THE CABLE TRAY (GROUND PLANE).~~

TEST SPECIMEN	I.R.	TEST SPECIMEN	I.R.
1	$3.5 \times 10^9 \Omega$	13	$0.7 \times 10^9 \Omega$
2	$1.4 \times 10^9 \Omega$	14	$2.4 \times 10^9 \Omega$
3	$1.4 \times 10^9 \Omega$	15	$1 \times 10^9 \Omega$
4	$1.7 \times 10^9 \Omega$	16	$2 \times 10^9 \Omega$
5	$3.5 \times 10^9 \Omega$	17	$9 \times 10^9 \Omega$
6	$1.2 \times 10^9 \Omega$	18	$1.8 \times 10^9 \Omega$
7	$1.1 \times 10^{11} \Omega$	19	$2 \times 10^8 \Omega$
8	$1.2 \times 10^{11} \Omega$	20	$8 \times 10^9 \Omega$
9	$1.4 \times 10^{11} \Omega$	21	$6 \times 10^9 \Omega$
10	$1.7 \times 10^{11} \Omega$	22	$6 \times 10^9 \Omega$
11	$1.4 \times 10^{11} \Omega$	23	$6 \times 10^9 \Omega$
12	$1.6 \times 10^{11} \Omega$	24	$4 \times 10^7 \Omega$

The conductors of each test specimen are connected in-series for electrical powering purposes.

Acceptance Criteria: The I.R. shall not be less than 1 megohm.

Specimen Failed –
Specimen Passed ✓
NOA Written –

Tested By NamSung Lee Date: 7-8-81
Witness – Date: –
Sheet No. 1 of 1
Approved James Marconnet

WH-614A

DATA SHEET

WYLE LABORATORIES

Customer Carolina Power & Light Co.
Specimen In-Containment Cables
Part No. Below
Spec. WLTP 45307-1
Para. 3.4.1.4
S/N ---
GSI ---

Amb. Temp. ---
Photo ---
Test Med. ---
Specimen Temp. 152°F

Job No. 45307
Start Date 7-15-81

Test Title Weekly I. R. Check

INSULATION RESISTANCE TESTS AT 500 VDC FOR 1 MINUTE MINIMUM BETWEEN THE CABLE ~~CONDUCTORS AND THE CABLE TRAY (GROUND PLANE).~~

TEST SPECIMEN	I.R.	TEST SPECIMEN	I.R.
1	$3.5 \times 10^9 \Omega$	13	$0.5 \times 10^9 \Omega$
2	$1.7 \times 10^9 \Omega$	14	$2.2 \times 10^9 \Omega$
3	$2 \times 10^9 \Omega$	15	$1.2 \times 10^9 \Omega$
4	$2.2 \times 10^9 \Omega$	16	$2.4 \times 10^9 \Omega$
5	$5 \times 10^9 \Omega$	17	$1.2 \times 10^{10} \Omega$
6	$2 \times 10^9 \Omega$	18	$1.5 \times 10^9 \Omega$
7	$8 \times 10^{10} \Omega$	19	$2 \times 10^8 \Omega$
8	$8 \times 10^{10} \Omega$	20	$7 \times 10^9 \Omega$
9	$1 \times 10^{11} \Omega$	21	$5 \times 10^9 \Omega$
10	$1.5 \times 10^{11} \Omega$	22	$7 \times 10^9 \Omega$
11	$1.5 \times 10^{11} \Omega$	23	$6 \times 10^9 \Omega$
12	$1.5 \times 10^{11} \Omega$	24	$2 \times 10^7 \Omega$

The conductors of each test specimen are connected in-series for electrical powering purposes.

Acceptance Criteria: The I.R. shall not be less than 1 megohm.

Specimen Failed —
Specimen Passed ✓
NOA Written —

Tested By ManSung Lee Date: 7-15-81
Witness — Date: —
Sheet No. 1 of 1
Approved James Marconnet

WH-614A

APPENDIX V

INSTRUMENTATION EQUIPMENT SHEETS

INSTRUMENTATION EQUIPMENT SHEET

Date 6-15-81 Job No. 45307-01-6843 Test Area Loca

Technician Dwight Sharp Customer CP&L Type Test Loca

No.	Instrument	Manufacturer	Model No.	Serial No.	Wyle or Gov't No.	Range	Accuracy	Calibration On	Calibration Due
1.	Recorder	Bristal	575FFT	183	95051	-200 to +300	± 2°F	6-8-81	9-8-81
2.	Redundant	R/I	61031A	N/A	11796	-125 to +375°F	+- 5%	4-15-81	10-15-81
3	Printer Omni 800	Texas Inst.	N/A	94217	11777	Multi	PM	1-9-81	1-9-82
4	Datalogger	Fluke	N/A	50014	96266	Multi	MFG	4-1-81	10-1-81
5	D.C. Power Supply	Electronic	N/A	4166	80244	0 to 35 VDC	MFG	3-17-81	9-17-81
6	Transducer	CEC	105-02T	1353A	3057	0 to 200 PSIA	±.25%	4-2-81	10-2-81
7.	Gauge	Robertshaw	0-160	31291	98670	0 to 160	+-1 PSI	6-10-81	9-10-81
8.	Gauge	Robertshaw	0-200	—	98648	0 to 200	MFG	6-1-81	9-1-81

REVIEWED BY QA
DATE 6/15/81
INITIALS JK

Page No. VI-34
Report No. 45307-1

Instrument Test Engineer B. Garrett Checked & Received By James Marcornet

WH-1029

INSTRUMENTATION EQUIPMENT SHEET

Page 1 of 1

Date 6-15-81 Job No. 45307-01 Test Area LOCA CHAMBER #53

Technician Hal Bice Customer CP&L Type Test LOCA

No.	Instrument	Manufacturer	Model No.	Serial No.	Wyle or Gov't No.	Range	Accuracy	Calibration On	Calibration Due
1	DATA LOGGER	FLUKE	2240A	—	96266	MULTI	± MFG SPEC	4-1-81	10-1-81
2	LINE PRINTER	TI	OMNI 800	—	11777	MULTI	± MFG SPEC	1-9-81	1-9-82
3	POWER SUPPLY	REGATRAN	TR036-0.5	—	80244	30VDC	± MFG SPEC	3-17-81	9-17-81
4	PRESSURE TRANSDUCER	CEC	171773-0105	1353A	305700	200 PSIA	± .25%	4-2-81	10-2-81
5	THERMOCOUPLES	MEDTHERM	TYPE K	—	—	-325°F 1800°F	MFG SPEC	6-15-81	PRIOR TO USE
6	THERMOCOUPLES	MEDTHERM	TYPE T	—	—	-450° 1800°F	MFG SPEC	6-15-81	PRIOR TO USE
7	DVM	DATA PRECISION	1450	—	11200	1000VDC	DC .03% AC .7%	5-14-81	11-14-81

REVIEWED BY QA
DATE 6/15/81
INITIALS [signature]

Instrument Test Engineer [signature] Checked & Received By James Marcomet

WH-1029

INSTRUMENTATION EQUIPMENT SHEET

Date 6-15-81 Job No. 45307-01 Test Area LOCA

Technician D.M. HOOPER Customer C.P.&L. Type Test INSULATION RESISTANCE @500VDC

No.	Instrument	Manufacturer	Model No.	Serial No.	Wyle or Gov't No.	Range	Accuracy	Calibration On	Calibration Due
1	POWER SUPPLY	KEPCO	SM100-2	C-25842	98058	0-160VDC	±.1% REG.	4-14-81	10-14-81
2	MEGOHMETER	GENERAL RADIO	1862C	2374	97892	MULTI	±3%	5-6-81	11-6-81

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Report No. 45307-1

Instrument Test Engineer K Burhart

Checked & Received By James Marconnet

WH-1029

INSTRUMENTATION EQUIPMENT SHEET

Date 7-2-81 Job No. 45307 Test Area LOCA

Technician MAN SUNG LEE Customer C.P.&L. Type Test INSULATION RESISTANCE @500VDC

No.	Instrument	Manufacturer	Model No.	Serial No.	Wyle or Gov't No.	Range	Accuracy	Calibration On	Calibration Due
1	MEGOHMMETER	GENERAL RADIO	1864	3180	11898	0.5M-∞	mfg. spec.	6-18-81	12-18-81

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Report No. 45307-1

Instrument Test Engineer DM Hooper

WYLE 293

Checked & Received By James Marcomet

SECTION VII

POST-LOCA FUNCTIONAL TESTS

1.0 REQUIREMENTS

Functional tests shall be performed as specified in Paragraph 1.3 of Section I.

2.0 PROCEDURES

The test specimens inside the LOCA chamber were subjected to the functional tests as specified in Paragraph 1.0 of this section.

3.0 RESULTS

The test specimens successfully met the requirements as specified in Paragraph 1.0 and as described in Paragraph 2.0 of this section.

One (1) procedural anomaly occurred during the performance of this test.

Notice of Anomaly No. 6 is presented in Appendix I of this section.

Data Sheets showing the data recorded in this test sequence are presented in Appendix II of this section.

Equipment used in recording data is shown on the Instrumentation Equipment Sheet presented in Appendix III of this section.

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APPENDIX I

NOTICE OF ANOMALY

WYLE LABORATORIES (Eastern Operations)

NOTICE OF ANOMALY

DATE: 7/20/81

NOTICE NO: 6 P.O. NUMBER: HBR-01616 CONTRACT NO: N/A

CUSTOMER: Carolina Power and Light Co. WYLE JOB NO: 45307

NOTIFICATION MADE TO: James Marconnet NOTIFICATION DATE: 7/17/81

NOTIFICATION MADE BY: Bob Schwager VIA: Telephone

CATEGORY: ☐ SPECIMEN ☒ PROCEDURE ☐ TEST EQUIPMENT DATE OF ANOMALY: 7/17/81

PART NAME: In-Containment Cable Splice Assembly PART NO. N/A

TEST: Functional Test and Post-Test Inspection I.D. NO. 1-24

SPECIFICATION: Wyle Laboratories Qual. Plan 45307-1 PARA. NO. 3.4

REQUIREMENTS:

N/A

DESCRIPTION OF ANOMALY:

The Post-Accident Functional Test and Post-Test Inspection paragraphs were inadvertently omitted from Qualification Plan 45307-1.

DISPOSITION · COMMENTS · RECOMMENDATIONS:

At the direction of the customer: The Baseline Functional Tests of Paragraph 3.1 shall be repeated after the Accident (LOCA) Test. Upon completion of the qualification program, the equipment shall be visually inspected. The equipment shall be disassembled to the extent necessary to perform the inspection. The condition of the equipment shall be recorded. These procedure changes shall be incorporated in Qualification Plan 45307-1. The revised Qualification Plan shall be included in the Qualification Test Report.

VERIFICATION:

TEST WITNESS: —

REPRESENTING: —

QUALITY ASSURANCE: N Kimbrell

PROJECT ENGINEER: James Marconnet

PROJECT MANAGER: Herschel D. Jordan

INTERDEPARTMENTAL COORDINATION: BJF KDS

WYLE Form WH 1066, Rev. Jan, 81

APPENDIX II

DATA SHEETS

DATA SHEET

WYLE LABORATORIES

Customer: Carolina Power & Light Co.
Specimen: In-Containment Cables
Part No.: Below
Spec.: WLTP 45307-1
Para.: 4.0
S/N: ---
GSI: ---
Amb. Temp.: ---
Photo: ---
Test Med.: ---
Specimen Temp.: Ambient
Job No.: 45307
Start Date: 7-17-81

Test Title: Post-LOCA Test Functional Test

Test Specimen No. 1

Visual Inspection - N/A

Insulation Resistance Tests at 500 VDC for 1 minute minimum

White to ground plane - $1 \times 10^{10}\,\Omega$ White to Black - $1 \times 10^{10}\,\Omega$
Black to ground plane - $1 \times 10^{10}\,\Omega$ White to Shield - $1.3 \times 10^{10}\,\Omega$
Shield to ground plane - $3 \times 10^{9}\,\Omega$ Black to Shield - $1.3 \times 10^{10}\,\Omega$

Dielectric Withstand Test, all conductors to ground plane, at 1000 VAC, 60 HZ, for 1 minute - 0.350 mA

Continuity Tests with ohm meter
White wire - $0.189\,\Omega$
Black wire - $0.122\,\Omega$
Shield - $0.156\,\Omega$

Specimen Failed: –
Specimen Passed: ✓
NOA Written: –

Tested By: Nam Sung Lee Date: 7-21-8
Witness: – Date: –
Sheet No. 1 of 24
Approved: James Marconnet

DATA SHEET

WYLE LABORATORIES

Customer: Carolina Power & Light Co.
Specimen: In-Containment Cables
Part No.: Below
Spec.: WLTP 45307-1
Para.: 4.0
S/N: ---
GSI: ---
Amb. Temp.: ---
Photo: ---
Test Med.: ---
Specimen Temp.: Ambient
Job No.: 45307
Start Date: 7-17-81

Test Title: Post-LOCA Test Functional Test

Test Specimen No. 2

Visual Inspection - N/A

Insulation Resistance Tests at 500 VDC for 1 minute minimum

White to ground plane - $2 \times 10^{10}\,\Omega$	White to Black - $3 \times 10^{10}\,\Omega$
Black to ground plane - $2 \times 10^{10}\,\Omega$	White to Shield - $3 \times 10^{10}\,\Omega$
Shield to ground plane - $7 \times 10^{8}\,\Omega$	Black to Shield - $3 \times 10^{10}\,\Omega$
Red to ground plane - $2 \times 10^{10}\,\Omega$	White to Red - $3.5 \times 10^{10}\,\Omega$
Green to ground plane - $2 \times 10^{10}\,\Omega$	White to Green - $4 \times 10^{10}\,\Omega$
Red to shield - $3 \times 10^{10}\,\Omega$	Red to Black - $4 \times 10^{10}\,\Omega$
Green to shield - $3 \times 10^{10}\,\Omega$	Black to Green - $4 \times 10^{10}\,\Omega$
Green to Red - $3 \times 10^{10}\,\Omega$	

Dielectric Withstand Test, all conductors to ground plane, at 1000VAC, 60HZ, for 1 minute - 0.63 mA

Continuity Tests with ohm meter

White wire - $0.108\,\Omega$	Red wire - $0.107\,\Omega$
Black wire - $0.105\,\Omega$	Green wire - $0.108\,\Omega$
Shield - $0.093\,\Omega$	

Specimen Failed: –
Specimen Passed: ✓
NOA Written: –

Tested By: ManSung Lee Date: 7-21-81
Witness: – Date: –
Sheet No. 2 of 24
Approved: James Marconnet

DATA SHEET

WYLE LABORATORIES

Customer: Carolina Power & Light Co.
Specimen: In-Containment Cables
Part No.: Below
Spec.: WLTP 45307-1
Para.: 4.0
S/N: ---
GSI: ---
Amb. Temp.: ---
Photo: ---
Test Med.: ---
Specimen Temp.: Ambient
Job No.: 45307
Start Date: 7-17-81

Test Title: Post- LOCA Test Functional Test

Test Specimen No. 3

Visual Inspection - N/A

Insulation Resistance Tests at 500 VDC for 1 minute minimum

White to ground plane - $4 \times 10^{9}\,\Omega$	White to Black - $1.5 \times 10^{10}\,\Omega$
Black to ground plane - $3 \times 10^{9}\,\Omega$	White to Shield - $1 \times 10^{10}\,\Omega$
Shield to ground plane - $4.5 \times 10^{8}\,\Omega$	Black to Shield - $1 \times 10^{10}\,\Omega$
Red to ground plane - $3 \times 10^{9}\,\Omega$	White to Red - $1.3 \times 10^{10}\,\Omega$
Green to ground plane - $6 \times 10^{9}\,\Omega$	White to Green - $1.2 \times 10^{10}\,\Omega$
Red to shield - $8 \times 10^{9}\,\Omega$	Red to Black - $2 \times 10^{10}\,\Omega$
Green to shield - $2 \times 10^{10}\,\Omega$	Black to Green - $1 \times 10^{10}\,\Omega$
Green to Red - $2 \times 10^{10}\,\Omega$	

Dielectric Withstand Test, all conductors to ground plane, at VAC, 60 HZ, for 1 minute - 0.65 mA

Continuity Tests with ohm meter

White wire - $0.309\,\Omega$	Red wire - $0.124\,\Omega$
Black wire - $0.323\,\Omega$	Green wire - $0.135\,\Omega$
Shield - $0.091\,\Omega$	

Specimen Failed: –
Specimen Passed: ✓
NOA Written: –

Tested By: Inan Sung Lee Date: 7-21-81
Witness: – Date: –
Sheet No. 3 of 24
Approved: James Marconnet

DATA SHEET

Customer Carolina Power & Light Co.
Specimen In-Containment Cables
Part No. Below
Spec. WLTP 45307-1
Para. 4.0
S/N ---
GSI ---

Amb. Temp. ---
Photo ---
Test Med. ---
Specimen Temp. Ambient

WYLE LABORATORIES
Job No. 45307
Start Date 7-17-81

Test Title Post-LOCA Test Functional Test

Test Specimen No. 4

Visual Inspection - N/A

Insulation Resistance Tests at 500 VDC for 1 minute minimum

White to ground plane - $1.2 \times 10^{10}\Omega$ White to Black - $1.5 \times 10^{10}\Omega$

Black to ground plane - $1 \times 10^{10}\Omega$ White to Shield - $1.7 \times 10^{10}\Omega$

Shield to ground plane - $1 \times 10^{9}\Omega$ Black to Shield - $1.5 \times 10^{10}\Omega$

Dielectric Withstand Test, all conductors to ground plane, at 1000 VAC, 60 HZ, for 1 minute - 0.350 mA

Continuity Tests with ohm meter

White wire - $0.109\ \Omega$

Black wire - $0.106\ \Omega$

Shield - $0.102\ \Omega$

Specimen Failed –
Specimen Passed ✓
NCA Written –

Tested By Nam Sung Lee Date: 7-21-81
Witness – Date: –
Sheet No. 4 of 24
Approved James Marconnet

DATA SHEET

Customer Carolina Power & Light Co.
Specimen In-Containment Cables
Part No. Below
Spec. WLTP 45307-1
Para. 4.0
S/N ---
GSI ---

Amb. Temp. ---
Photo ---
Test Med. ---
Specimen Temp. Ambient

WYLE LABORATORIES
Job No. 45307
Start Date 7-17-81

Test Title Post-LOCA Test Functional Test

Test Specimen No. 5

Visual Inspection - N/A

Insulation Resistance Tests at 500 VDC for 1 minute minimum

White to ground plane - $1.8 \times 10^{10} \Omega$ White to Black - $1.5 \times 10^{10} \Omega$
Black to ground plane - $2.6 \times 10^{10} \Omega$ White to Shield - $1.3 \times 10^{10} \Omega$
Shield to ground plane - $8 \times 10^{8} \Omega$ Black to Shield - $1.4 \times 10^{10} \Omega$

Dielectric Withstand Test, all conductors to ground plane, at 1000 VAC, 60 Hz, for 1 minute - 0.410 mA

Continuity Tests with ohm meter
White wire - 0.122Ω
Black wire - 0.112Ω
Shield - 0.108Ω

Specimen Failed —
Specimen Passed ✓
NCA Written —

Tested By NamSung Lee Date: 7-21-81
Witness — Date: —
Sheet No. 5 of 24
Approved James Marconnet

DATA SHEET

Customer Carolina Power & Light Co.
Specimen In-Containment Cables
Part No. Below
Spec. WLTP 45307-1
Para. 4.0
S/N ---
GSI ---

Amb. Temp. ---
Photo ---
Test Med. ---
Specimen Temp. Ambient

WYLE LABORATORIES
Job No. 45307
Start Date 7-17-81

Test Title Post-LOCA Test Functional Test

Test Specimen No. 6

Visual Inspection - N/A

Insulation Resistance Tests at 500 VDC for 1 minute minimum

White to ground plane - $1.5 \times 10^{10}\ \Omega$	White to Black - $7 \times 10^{9}\ \Omega$
Black to ground plane - $3 \times 10^{10}\ \Omega$	White to Shield - $8 \times 10^{9}\ \Omega$
Shield to ground plane - $5 \times 10^{8}\ \Omega$	Black to Shield - $1 \times 10^{10}\ \Omega$
Red to ground plane - $7 \times 10^{10}\ \Omega$	White to Red - $1 \times 10^{10}\ \Omega$
Green to ground plane - $5 \times 10^{9}\ \Omega$	White to Green - $1.2 \times 10^{10}\ \Omega$
Red to shield - $6 \times 10^{9}\ \Omega$	Red to Black - $1.5 \times 10^{10}\ \Omega$
Green to shield - $6 \times 10^{9}\ \Omega$	Black to Green - $1.2 \times 10^{10}\ \Omega$
Green to Red - $7 \times 10^{9}\ \Omega$	

Dielectric Withstand Test, all conductors to ground plane, at 1000 VAC, 60 HZ, for 1 minute - 0.72 mA

Continuity Tests with ohm meter

White wire - 0.111 Ω	Red wire - 0.130 Ω
Black wire - 0.107 Ω	Green wire - 0.107 Ω
Shield - 0.092 Ω	

Specimen Failed –
Specimen Passed ✓
NOA Written –

Tested By Man Sung Lee Date: 7-21-81
Witness – Date: –
Sheet No. 6 of 24
Approved James Marconnet

DATA SHEET

Customer: Carolina Power & Light Co.
Specimen: In-Containment Cables
Part No.: Below
Spec.: WLTP 45307-1
Para.: 4.0
S/N: ---
GSI: ---
Amb. Temp.: ---
Photo: ---
Test Med.: ---
Specimen Temp.: Ambient

WYLE LABORATORIES
Job No.: 45307
Start Date: 7-17-81

Test Title: Post-LOCA Test Functional Test

Test Specimen No. 7

Visual Inspection – N/A

Insulation Resistance Test at 500 VDC for 1 minute minimum, wire to ground plane – $1.5 \times 10^{10}\ \Omega$

Dielectric Withstand Test, conductor to ground plane, at 1000 VAC, 60 HZ, for 1 minute — 0.265 mA

Continuity Test with Ohm meter – 0.105 Ω

Specimen Failed: –
Specimen Passed: ✓
NCA Written: –

Tested By: Man Sung Lee Date: 7-21-81
Witness: – Date: –
Sheet No. 7 of 24
Approved: James Marconnet

DATA SHEET

WYLE LABORATORIES

Customer: Carolina Power & Light Co.
Specimen: In-Containment Cables
Part No.: Below
Spec.: WLTP 45307-1
Para.: 4.0
S/N: ---
GSI: ---

Amb. Temp.: ---
Photo: ---
Test Med.: ---
Specimen Temp.: Ambient

Job No.: 45307
Start Date: 7-17-81

Test Title: Post-LOCA Test Functional Test

Test Specimen No. 8

Visual Inspection - N/A

Insulation Resistance Test at 500 VDC for 1 minute minimum, wire to ground plane - $1.7 \times 10^{10}\ \Omega$

Dielectric Withstand Test, conductor to ground plane, at 1000 VAC, 60 Hz, for 1 minute — 0.255 mA

Continuity Test with Ohm meter - $0.109\ \Omega$

Specimen Failed: –
Specimen Passed: ✓
NOA Written: –

Tested By: Man Suns Lee Date: 7-21-81
Witness: – Date: –
Sheet No. 8 of 24
Approved: James Marconnet

DATA SHEET

Customer: Carolina Power & Light Co.
Specimen: In-Containment Cables
Part No.: Below
Spec.: WLTP 45307-1
Para.: 4.0
S/N: ---
GSI: ---

Amb. Temp.: ---
Photo: ---
Test Med.: ---
Specimen Temp.: Ambient

WYLE LABORATORIES
Job No.: 45307
Start Date: 7-17-81

Test Title: Post-LOCA Test Functional Test

Test Specimen No. 9

Visual Inspection – N/A

Insulation Resistance Test at 500 VDC for 1 minute minimum, wire to ground plane – $1.8 \times 10^{10}\ \Omega$

Dielectric Withstand Test, conductor to ground plane, at 1000 VAC, 60 HZ, for 1 minute — 0.265 mA

Continuity Test With Ohm meter – 0.105 Ω

Specimen Failed: –
Specimen Passed: ✓
NCA Written: –

Tested By: Man Sung Lee Date: 7-21-81
Witness: – Date: –
Sheet No. 9 of 24
Approved: James Marconnet

DATA SHEET

Customer: Carolina Power & Light Co.
Specimen: In-Containment Cables
Part No.: Below
Spec.: WLTP 45307-1
Para.: 4.0
S/N: ---
GSI: ---

Amb. Temp.: ---
Photo: ---
Test Med.: ---
Specimen Temp.: Ambient

WYLE LABORATORIES
Job No.: 45307
Start Date: 7-17-81

Test Title: Post-LOCA Test Functional Test

Test Specimen No. 10

Visual Inspection – N/A

Insulation Resistance Test at 500 VDC for 1 minute minimum, wire to ground plane – $2.4 \times 10^{10} \Omega$

Dielectric Withstand Test, conductor to ground plane, at 1000 VAC, 60 Hz, for 1 minute — 0.270 mA

Continuity Test with Ohm meter – 0.157 Ω

Specimen Failed: –
Specimen Passed: ✓
NCA Written: –

Tested By: Man Sung Lee Date: 7-21-81
Witness: – Date: –
Sheet No. 10 of 24
Approved: James Marconnet

DATA SHEET

Customer Carolina Power & Light Co.
Specimen In-Containment Cables

WYLE LABORATORIES

Part No. Below
Amb. Temp. ---
Job No. 45307
Spec. WLTP 45307-1
Photo ---
Para. 4.0
Test Med. ---
Start Date 7-17-81
S/N ---
Specimen Temp. Ambient
GSI ---

Test Title Post LOCA Test Functional Test

Test Specimen No. 11

Visual Inspection – N/A

Insulation Resistance Test at 500 VDC for 1 minute minimum, wire to ground plane – $2 \times 10^{10} \Omega$

Dielectric Withstand Test, conductor to ground plane, at 1000 VAC, 60 HZ, for 1 minute – 0.270 MA

Continuity Test with Ohm meter – 0.107 Ω

Specimen Failed –
Specimen Passed ✓
NOA Written –

Tested By Nam Sung Lee Date: 7-21-81
Witness – Date: –
Sheet No. 11 of 24
Approved James Marconnet

DATA SHEET

Customer: Carolina Power & Light Co.
Specimen: In-Containment Cables
Part No.: Below
Spec.: WLTP 45307-1
Para.: 4.0
S/N: ---
GSI: ---

Amb. Temp.: ---
Photo: ---
Test Med.: ---
Specimen Temp.: Ambient

WYLE LABORATORIES
Job No.: 45307
Start Date: 7-17-81

Test Title: Post-LOCA Test Functional Test

Test Specimen No. 12

Visual Inspection - N/A

Insulation Resistance Test at 500 VDC for 1 minute minimum, wire to ground plane - $4 \times 10^{10}\ \Omega$

Dielectric Withstand Test, conductor to ground plane, at 1000 VAC, 60 Hz, for 1 minute — 0.265 mA

Continuity Test with Ohm meter - 0.102 Ω

Specimen Failed: –
Specimen Passed: ✓
NOA Written: –

Tested By: Man Sung Lee Date: 7-21-81
Witness: – Date: –
Sheet No. 12 of 24
Approved: James Marconnet

DATA SHEET

Customer Carolina Power & Light Co.

Specimen In-Containment Cables

WYLE LABORATORIES

Part No. Below

Amb. Temp. ---

Job No. 45307

Spec. WLTP 45307-1

Photo ---

Para. 4.0

Test Med. ---

Start Date 7-17-81

S/N ---

Specimen Temp. Ambient

GSI ---

Test Title Post-LOCA Test Functional Test

Test Specimen No. 13

Visual Inspection - N/A

Insulation Resistance Tests at 500 VDC for 1 minute minimum

White to ground plane - $1.7 \times 10^{10}\,\Omega$ White to Black - $1.6 \times 10^{10}\,\Omega$

Black to ground plane - $2 \times 10^{10}\,\Omega$ White to Shield - $2 \times 10^{9}\,\Omega$

Shield to ground plane - $1.5 \times 10^{10}\,\Omega$ Black to Shield - $1.5 \times 10^{10}\,\Omega$

Dielectric Withstand Test, all conductors to ground plane, at 1000 VAC, 60 HZ, for 1 minute - 0.70 mA

Continuity Tests with ohm meter

White wire - 0.106 Ω

Black wire - 0.106 Ω

Shield - 0.105 Ω

Specimen Failed –

Specimen Passed ✓

NCA Written –

Tested By Ivan Susslee Date: 7-21-81

Witness – Date: –

Sheet No. 13 of 24

Approved James Marconnet

DATA SHEET

Customer: Carolina Power & Light Co.
Specimen: In-Containment Cables
Part No.: Below
Spec.: WLTP 45307-1
Para.: 4.0
S/N: ---
GSI: ---

Amb. Temp.: ---
Photo: ---
Test Med.: ---
Specimen Temp.: Ambient

WYLE LABORATORIES
Job No.: 45307
Start Date: 7-17-81

Test Title: Post-LOCA Test Functional Test

Test Specimen No. 14

Visual Inspection - N/A

Insulation Resistance Tests at 500 VDC for 1 minute minimum

White to ground plane - $2 \times 10^{10} \Omega$ White to Black - $2 \times 10^{10} \Omega$

Black to ground plane - $2 \times 10^{10} \Omega$ White to Shield - $2 \times 10^{10} \Omega$

Shield to ground plane - $1.5 \times 10^{10} \Omega$ Black to Shield - $2 \times 10^{10} \Omega$

Dielectric Withstand Test, all conductors to ground plane, at 1000 VAC, 60 HZ, for 1 minute - 0.70 mA

Continuity Tests with ohm meter

White wire - .107 Ω

Black wire - 0.105 Ω

Shield - 0.108 Ω

Specimen Failed: –
Specimen Passed: ✓
NOA Written: –

Tested By: Man Sung Lee Date: 7-21-81
Witness: – Date: –
Sheet No. 14 of 24
Approved: James Marconnet

DATA SHEET

WYLE LABORATORIES

Customer: Carolina Power & Light Co.
Specimen: In-Containment Cables
Part No.: Below
Spec.: WLTP 45307-1
Para.: 4.0
S/N: ---
GSI: ---
Amb. Temp.: ---
Photo: ---
Test Med.: ---
Specimen Temp.: Ambient
Job No.: 45307
Start Date: 7-17-81

Test Title: Post-LOCA Test Functional Test

Test Specimen No. 15

Visual Inspection - N/A

Insulation Resistance Tests at 500 VDC for 1 minute minimum

White to ground plane - $2 \times 10^{10}\ \Omega$ White to Black - $1.2 \times 10^{10}\ \Omega$

Black to ground plane - $5 \times 10^{10}\ \Omega$ White to Shield - $3 \times 10^{9}\ \Omega$

Shield to ground plane - $1.8 \times 10^{10}\ \Omega$ Black to Shield - $2 \times 10^{10}\ \Omega$

Dielectric Withstand Test, all conductors to ground plane, at 1000 VAC, 60 HZ, for 1 minute - 0.70 mA

Continuity Tests with ohm meter

White wire - $0.108\ \Omega$

Black wire - $0.106\ \Omega$

Shield - $0.105\ \Omega$

Specimen Failed: –
Specimen Passed: ✓
NCA Written: –

Tested By: Man Sun Lee Date: 7-21-81
Witness: – Date: –
Sheet No. 15 of 24
Approved: James Marconnet

DATA SHEET

Customer: Carolina Power & Light Co.
Specimen: In-Containment Cables
Part No.: Below
Spec.: WLTP 45307-1
Para.: 4.0
S/N: ---
GSI: ---
Amb. Temp.: ---
Photo: ---
Test Med.: ---
Specimen Temp.: Ambient

WYLE LABORATORIES
Job No.: 45307
Start Date: 7-17-81

Test Title: Post-LOCA Test Functional Test

Test Specimen No. 16

Visual Inspection - N/A

Insulation Resistance Tests at 500 VDC for 1 minute minimum

White to ground plane - $3 \times 10^{10} \Omega$ White to Black - $3.5 \times 10^{10} \Omega$

Black to ground plane - $3.5 \times 10^{10} \Omega$ White to Shield - $3.5 \times 10^{10} \Omega$

Shield to ground plane - $2.4 \times 10^{10} \Omega$ Black to Shield - $1 \times 10^{10} \Omega$

Dielectric Withstand Test, all conductors to ground plane, at 1000 VAC, 60 Hz, for 1 minute - 0.60 mA

Continuity Tests with ohm meter

White wire - 0.136 Ω

Black wire - 0.116 Ω

Shield - 0.112 Ω

Specimen Failed: -
Specimen Passed: ✓
NCA Written: -

Tested By: Man Sung Lee Date: 7-21-81
Witness: - Date: -
Sheet No. 16 of 24
Approved: James Marconnet

DATA SHEET

Customer Carolina Power & Light Co.
Specimen In-Containment Cables
Part No. Below
Spec. WLTP 45307-1
Para. 4.0
S/N ---
GSI ---

Amb. Temp. ---
Photo ---
Test Med. ---
Specimen Temp. Ambient

WYLE LABORATORIES
Job No. 45307
Start Date 7-17-81

Test Title Post-LOCA Test Functional Test

Test Specimen No. 17

Visual Inspection - N/A

Insulation Resistance Tests at 500 VDC for 1 minute minimum

White to ground plane - $4.5 \times 10^{10}\,\Omega$ White to Black - $5 \times 10^{10}\,\Omega$

Black to ground plane - $4 \times 10^{10}\,\Omega$ White to Shield - $4.5 \times 10^{10}\,\Omega$

Shield to ground plane - $2 \times 10^{10}\,\Omega$ Black to Shield - $4 \times 10^{10}\,\Omega$

Dielectric Withstand Test, all conductors to ground plane, at 1000 VAC, 60 Hz, for 1 minute - 0.70 mA

Continuity Tests with ohm meter

White wire - $0.119\,\Omega$

Black wire - $0.118\,\Omega$

Shield - $0.115\,\Omega$

Specimen Failed —
Specimen Passed ✓
NOA Written —

Tested By Man Sung Lee Date: 7-21-81
Witness — Date: —
Sheet No. 17 of 24
Approved James Marconnet

DATA SHEET

Customer Carolina Power & Light Co.
Specimen In-Containment Cables
Part No. Below
Spec. WLTP 45307-1
Para. 4.0
S/N ---
GSI ---

Amb. Temp. ---
Photo ---
Test Med. ---
Specimen Temp. Ambient

WYLE LABORATORIES
Job No. 45307
Start Date 7-17-81

Test Title Post-LOCA Test Functional Test

Test Specimen No. 18

Visual Inspection - N/A

Insulation Resistance Tests at 500 VDC for 1 minute minimum

White to ground plane - $4 \times 10^{10}\,\Omega$ White to Black - $4 \times 10^{10}\,\Omega$

Black to ground plane - $2.6 \times 10^{10}\,\Omega$ White to Shield - $3 \times 10^{10}\,\Omega$

Shield to ground plane - $2 \times 10^{10}\,\Omega$ Black to Shield - $8 \times 10^{9}\,\Omega$

Dielectric Withstand Test, all conductors to ground plane, at 1000 VAC, 60 HZ, for 1 minute - 0.55 mA

Continuity Tests with ohm meter

White wire - .115 Ω

Black wire - 0.114 Ω

Shield - 0.115 Ω

Specimen Failed —
Specimen Passed ✓
NCA Written —

Tested By Man Sung Lee Date: 7-21-81
Witness — Date: —
Sheet No. 18 of 24
Approved James Marcomet

DATA SHEET

Customer Carolina Power & Light Co.
Specimen In-Containment Cables

WYLE LABORATORIES

Part No.	Below	Amb. Temp.	---	Job No.	45307
Spec.	WLTP 45307-1	Photo	---		
Para.	4.0	Test Med.	---	Start Date	7-17-81
S/N	---	Specimen Temp.	Ambient		
GSI	---				

Test Title Post-LOCA Test Functional Test

Test Specimen No. 19

Visual Inspection - N/A

Insulation Resistance Tests at 500 VDC for 1 minute minimum

White to ground plane - $5 \times 10^{10}\,\Omega$	White to Black - $6 \times 10^{10}\,\Omega$
Black to ground plane - $8 \times 10^{10}\,\Omega$	White to Shield - $5 \times 10^{10}\,\Omega$
Shield to ground plane - $8 \times 10^{8}\,\Omega$	Black to Shield - $6 \times 10^{10}\,\Omega$
Red to ground plane - $2.4 \times 10^{10}\,\Omega$	White to Red - $5 \times 10^{10}\,\Omega$
Green to ground plane - $2.6 \times 10^{9}\,\Omega$	White to Green - $3 \times 10^{10}\,\Omega$
Red to shield - $7 \times 10^{9}\,\Omega$	Red to Black - $5 \times 10^{9}\,\Omega$
Green to shield - $5 \times 10^{8}\,\Omega$	Black to Green - $1 \times 10^{9}\,\Omega$
Green to Red - $1 \times 10^{9}\,\Omega$	

Dielectric Withstand Test, all conductors to ground plane, at 1000 VAC, 60 HZ, for 1 minute → 0.85 mA

Continuity Tests with ohm meter

White wire - $0.286\,\Omega$	Red wire - $0.250\,\Omega$
Black wire - $0.268\,\Omega$	Green wire - $0.245\,\Omega$
Shield - $0.241\,\Omega$	

Specimen Failed	–	Tested By	Man Sung Lee Date: 7-21-81
Specimen Passed	✓	Witness	– Date: –
NCA Written	–	Sheet No.	19 of 24
		Approved	James Marconnet

DATA SHEET

Customer: Carolina Power & Light Co.
Specimen: In-Containment Cables
Part No.: Below
Spec.: WLTP 45307-1
Para.: 4.0
S/N: ---
GSI: ---

Amb. Temp.: ---
Photo: ---
Test Med.: ---
Specimen Temp.: Ambient

WYLE LABORATORIES
Job No.: 45307
Start Date: 7-20-81

Test Title: Post-LOCA Test Functional Test

Test Specimen No. 20

Visual Inspection - N/A

Insulation Resistance Tests at 500 VDC for 1 minute minimum

White to ground plane - $5 \times 10^9 \Omega$	White to Black - $1 \times 10^{10} \Omega$
Black to ground plane - $5 \times 10^9 \Omega$	White to Shield - $1.1 \times 10^{10} \Omega$
Shield to ground plane - $3 \times 10^8 \Omega$	Black to Shield - $1.2 \times 10^{10} \Omega$
Red to ground plane - $4 \times 10^9 \Omega$	White to Red - $1.5 \times 10^{10} \Omega$
Green to ground plane - $5 \times 10^9 \Omega$	White to Green - $1.5 \times 10^{10} \Omega$
Red to shield - $5 \times 10^9 \Omega$	Red to Black - $1.5 \times 10^{10} \Omega$
Green to shield - $7 \times 10^9 \Omega$	Black to Green - $2 \times 10^{10} \Omega$
Green to Red - $8 \times 10^9 \Omega$	

Dielectric Withstand Test, all conductors to ground plane, at 1000VAC, 60HZ, for 1 minute - 2.1 mA

Continuity Tests with ohm meter

White wire - 0.244 Ω	Red wire - 0.214 Ω
Black wire - 0.310 Ω	Green wire - 0.199 Ω
Shield - 0.220 Ω	

Specimen Failed: –
Specimen Passed: ✓
NOA Written: –

Tested By: Man Sung Lee Date: 7-21-81
Witness: – Date: –
Sheet No. 20 of 24
Approved: James Marconnet

DATA SHEET

Customer Carolina Power & Light Co.
Specimen In-Containment Cables
Part No. Below
Spec. WLTP 45307-1
Para. 4.0
S/N ---
GSI ---
Amb. Temp. ---
Photo ---
Test Med. ---
Specimen Temp. Ambient

WYLE LABORATORIES
Job No. 45307
Start Date 7-20-81

Test Title Post-LOCA Test Functional Test

Test Specimen No. 21

Visual Inspection - N/A

Insulation Resistance Tests at 500 VDC for 1 minute minimum

White to ground plane - $2 \times 10^{10}\,\Omega$	White to Black - $3 \times 10^{10}\,\Omega$
Black to ground plane - $2 \times 10^{10}\,\Omega$	White to Shield - $3 \times 10^{10}\,\Omega$
Shield to ground plane - $3 \times 10^{8}\,\Omega$	Black to Shield - $3 \times 10^{10}\,\Omega$
Red to ground plane - $1.5 \times 10^{10}\,\Omega$	White to Red - $1.5 \times 10^{10}\,\Omega$
Green to ground plane - $2.4 \times 10^{10}\,\Omega$	White to Green - $2.4 \times 10^{10}\,\Omega$
Red to shield - $2 \times 10^{10}\,\Omega$	Red to Black - $1.7 \times 10^{10}\,\Omega$
Green to shield - $3 \times 10^{10}\,\Omega$	Black to Green - $3 \times 10^{10}\,\Omega$
Green to Red - $3 \times 10^{10}\,\Omega$	

Dielectric Withstand Test, all conductors to ground plane, at 1000 VAC, 60 HZ, for 1 minute → 1.9 mA

Continuity Tests with ohm meter

White wire - $0.179\,\Omega$	Red wire - $0.168\,\Omega$
Black wire - $0.171\,\Omega$	Green wire - $0.164\,\Omega$
Shield - $0.158\,\Omega$	

Specimen Failed —
Specimen Passed ✓
NOA Written —

Tested By Man Sung Lee Date: 7-21-81
Witness — Date: —
Sheet No. 21 of 24
Approved James Marconnet

DATA SHEET

Customer Carolina Power & Light Co.
Specimen In-Containment Cables
Part No. Below
Spec. WLTP 45307-1
Para. 4.0
S/N ---
GSI ---

Amb. Temp. ---
Photo ---
Test Med. ---
Specimen Temp. Ambient

WYLE LABORATORIES
Job No. 45307
Start Date 7-20-81

Test Title Post-LOCA Test Functional Test

Test Specimen No. 22

Visual Inspection – N/A

Insulation Resistance Tests at 500 VDC for 1 minute minimum

White to ground plane – $3.5 \times 10^{10}\,\Omega$	White to Black – $1.5 \times 10^{10}\,\Omega$
Black to ground plane – $4.5 \times 10^{10}\,\Omega$	White to Shield – $2.4 \times 10^{10}\,\Omega$
Shield to ground plane – $2.4 \times 10^{8}\,\Omega$	Black to Shield – $3 \times 10^{10}\,\Omega$
Red to ground plane – $3.5 \times 10^{10}\,\Omega$	White to Red – $3 \times 10^{10}\,\Omega$
Green to ground plane – $3 \times 10^{10}\,\Omega$	White to Green – $3.5 \times 10^{10}\,\Omega$
Red to shield – $3 \times 10^{10}\,\Omega$	Red to Black – $3 \times 10^{10}\,\Omega$
Green to shield – $3 \times 10^{10}\,\Omega$	Black to Green – $3 \times 10^{10}\,\Omega$
Green to Red – $3 \times 10^{10}\,\Omega$	

Dielectric Withstand Test, all conductors to ground plane, at 1000 VAC, 60 HZ, for 1 minute → 1.7 mA

Continuity Tests with ohm meter

White wire – $0.184\,\Omega$	Red wire – $0.169\,\Omega$
Black wire – $0.178\,\Omega$	Green wire – $0.166\,\Omega$
Shield – $0.152\,\Omega$	

Specimen Failed –
Specimen Passed ✓
NOA Written –

Tested By Man Sung Lee Date: 7-21-81
Witness – Date: –
Sheet No. 22 of 24
Approved James Marconnet

DATA SHEET

Customer Carolina Power & Light Co.
Specimen In-Containment Cables
Part No. Below
Spec. WLTP 45307-1
Para. 4.0
S/N ---
GSI ---

Amb. Temp. ---
Photo ---
Test Med. ---
Specimen Temp. Ambient

WYLE LABORATORIES
Job No. 45307
Start Date 7-20-81

Test Title Post-LOCA Test Functional Test

Test Specimen No. 23

Visual Inspection - N/A

Insulation Resistance Tests at 500 VDC for 1 minute minimum

White to ground plane - $2 \times 10^{10}\ \Omega$	White to Black - $1 \times 10^{10}\ \Omega$
Black to ground plane - $1.7 \times 10^{10}\ \Omega$	White to Shield - $1 \times 10^{10}\ \Omega$
Shield to ground plane - $3 \times 10^{\cancel{10}\ 8}\ \Omega$ m.Lee	Black to Shield - $1.2 \times 10^{10}\ \Omega$
Red to ground plane - $1.5 \times 10^{10}\ \Omega$	White to Red - $1 \times 10^{10}\ \Omega$
Green to ground plane - $1 \times 10^{10}\ \Omega$	White to Green - $1 \times 10^{10}\ \Omega$
Red to shield - $1.5 \times 10^{10}\ \Omega$	Red to Black - $1.2 \times 10^{10}\ \Omega$
Green to shield - $1 \times 10^{10}\ \Omega$	Black to Green - $3 \times 10^{10}\ \Omega$
Green to Red - $2 \times 10^{10}\ \Omega$	

Dielectric Withstand Test, all conductors to ground plane, at 1000 VAC, 60 HZ, for 1 minute - 1.7 mA

Continuity Tests with ohm meter

White wire - $0.170\ \Omega$	Red wire - $0.165\ \Omega$
Black wire - $0.168\ \Omega$	Green wire - $0.161\ \Omega$
Shield - $0.149\ \Omega$	

Specimen Failed –
Specimen Passed ✓
NOA Written –

Tested By Man Sung Lee Date: 7-21-81
Witness – Date: –
Sheet No. 23 of 24
Approved James Marconnet

DATA SHEET

Customer: Carolina Power & Light Co.
Specimen: In-Containment Cables
Part No.: Below
Spec.: WLTP 45307-1
Para.: 4.0
S/N: ---
GSI: ---

Amb. Temp.: ---
Photo: ---
Test Med.: ---
Specimen Temp.: Ambient

WYLE LABORATORIES
Job No.: 45307
Start Date: 7-20-81

Test Title: Post-LOCA Test Functional Test

Test Specimen No. 24

Visual Inspection - N/A

Insulation Resistance Tests at 500 VDC for 1 minute minimum

White to ground plane - $1 \times 10^{10}\ \Omega$	White to Black - $9 \times 10^{7}\ \Omega$
Black to ground plane - $8 \times 10^{9}\ \Omega$	White to Shield - $2 \times 10^{10}\ \Omega$
Shield to ground plane - $3 \times 10^{7}\ \Omega$	Black to Shield - $2 \times 10^{10}\ \Omega$
Red to ground plane - $4 \times 10^{8}\ \Omega$	White to Red - $2 \times 10^{8}\ \Omega$
Green to ground plane - $6 \times 10^{7}\ \Omega$	White to Green - $4 \times 10^{7}\ \Omega$
Red to shield - $3 \times 10^{8}\ \Omega$	Red to Black - $3 \times 10^{8}\ \Omega$
Green to shield - $3 \times 10^{7}\ \Omega$	Black to Green - $4 \times 10^{7}\ \Omega$
Green to Red - $3.5 \times 10^{7}\ \Omega$	

Dielectric Withstand Test, all conductors to ground plane, at 1000 VAC, 60 HZ, for 1 minute - 1.3 mA

Continuity Tests with ohm meter

White wire - $0.161\ \Omega$	Red wire - $0.153\ \Omega$
Black wire - $0.158\ \Omega$	Green wire - $0.152\ \Omega$
Shield - $0.140\ \Omega$	

Specimen Failed: —
Specimen Passed: ✓
NOA Written: —

Tested By: Inon Sung Lee Date: 7-21-81
Witness: — Date: —
Sheet No. 24 of 24
Approved: James Marconnet

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APPENDIX III

INSTRUMENTATION EQUIPMENT SHEET

INSTRUMENTATION EQUIPMENT SHEET

Page 1 of 1

Date 7-17-81 Job No. 45307 Test Area LOCA

Technician MAN SUNG LEE Customer CAROLINA POWER & LIGHT Type Test FUNCTIONAL - POST LOCA

No.	Instrument	Manufacturer	Model No.	Serial No.	Wyle or Gov't No.	Range	Accuracy	Calibration On	Calibration Due
1	MEGOHMMETER	GENERAL RADIO	1864	3180	11898	0.5M-∞	mfG.SPEC.	6-18-81	12-18-81
2	DIGITAL M.M.	KEITHLEY	164	N/A	11305	MULTI	mfG. SPEC.	4-17-81	10-17-81
3	AC HYPOT	ASSOCIATED RES.	4030	416	96776	1000VAC	mfG. SPEC.	7-2-81	10-2-81
4	DIGITAL M. M.	FLUKE	8012A	2096453	11703	MULTI	mfG.SPEC	4-24-81	7-24-81

Page No. VII-32
Report No. 45307-1

Instrument Test Engineer D M Hooper Checked & Received By James Marconnet

WH-1029

SECTION VIII

POST-TEST INSPECTION

1.0 REQUIREMENTS

Upon completion of the qualification program, the equipment shall be visually inspected. The equipment shall be disassembled to the extent necessary to perform the inspection. The condition of the equipment shall be recorded.

2.0 PROCEDURES

The cables were cut at the LOCA chamber penetrations, the test specimens and cable tray were removed from the LOCA chamber as a unit and a visual inspection was performed. No test specimen disassembly was performed at this time.

3.0 RESULTS

The visual inspection revealed a surface crack in the cable jacket of Test Specimen No. 1. This crack does not appear to extend completely through the cable jacket. Reference Notice of Anomaly No. 7 presented in Appendix I and Photograph VIII-1 presented in Appendix II of this section.

The test specimen cables and cable tray located underneath the chamber steam inlet were coated with rust deposits.

The PVC cables were noted to be more brittle than the other cables in this test program.

The PVC cables had deformed slightly and stuck to each other. When these cables were gently separated from each other, the previous points of contact were visible. The Raychem splicing sleeves all shrunk slightly longitudinally, leaving a small gap between the adhesive and the end of the sleeve.

Photographs of the test specimens are presented in Appendix II of this section.

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APPENDIX I

NOTICE OF ANOMALY

WYLE LABORATORIES (Eastern Operations)

NOTICE OF ANOMALY

DATE: 7-28-81

NOTICE NO: 7 P.O. NUMBER: HBR-01616 CONTRACT NO: N/A

CUSTOMER: Carolina Power and Light Co. WYLE JOB NO: 45307-01

NOTIFICATION MADE TO: Bob Schwager NOTIFICATION DATE: 7-28-81

NOTIFICATION MADE BY: James Marconnet VIA: Telephone

CATEGORY: ☒ SPECIMEN ☐ PROCEDURE ☐ TEST EQUIPMENT DATE OF ANOMALY: 7-27-81

PART NAME: In-Containment Cable Splice Assembly PART NO. N/A

TEST: Post-Test Inspection I.D. NO. 1

SPECIFICATION: WLQP 45307-1 PARA. NO. N/A

REQUIREMENTS:

Upon completion of the qualification program, the equipment shall be visually inspected. . . The condition of the equipment shall be recorded.

DESCRIPTION OF ANOMALY:

Test Specimen No. 1 has a surface crack in the cable jacket. The crack is approximately 5/8" long. It does not appear to extend completely through the cable jacket.

DISPOSITION · COMMENTS · RECOMMENDATIONS:

The Customer was notified of this anomaly.

VERIFICATION:

TEST WITNESS: —

REPRESENTING: —

QUALITY ASSURANCE: B. M. Hollingsworth

PROJECT ENGINEER: James Marconnet

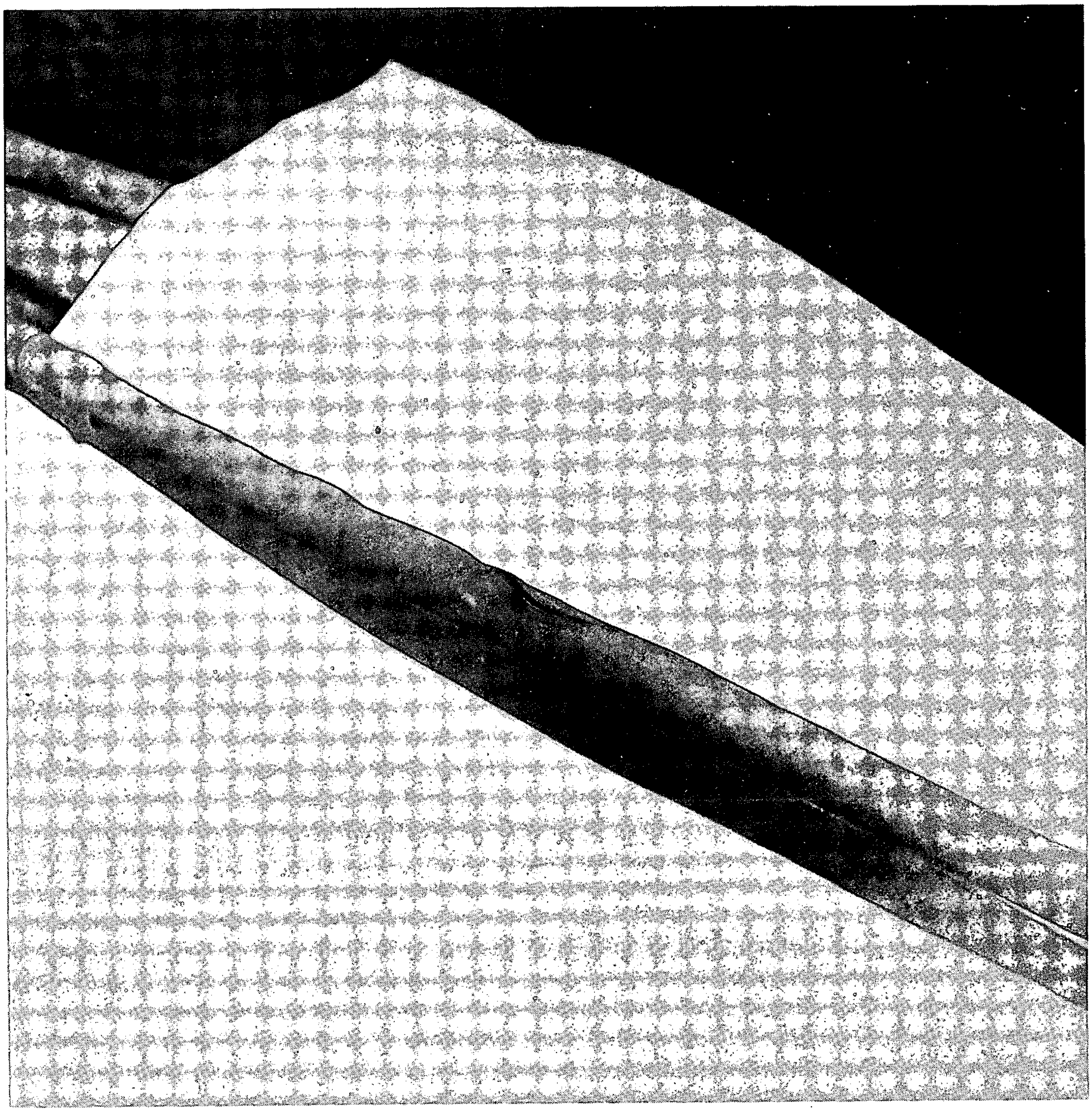
PROJECT MANAGER: Herschel Jordan

INTERDEPARTMENTAL COORDINATION: [illegible] DS [illegible]

WYLE Form WH 1066, Rev. Jan. 81

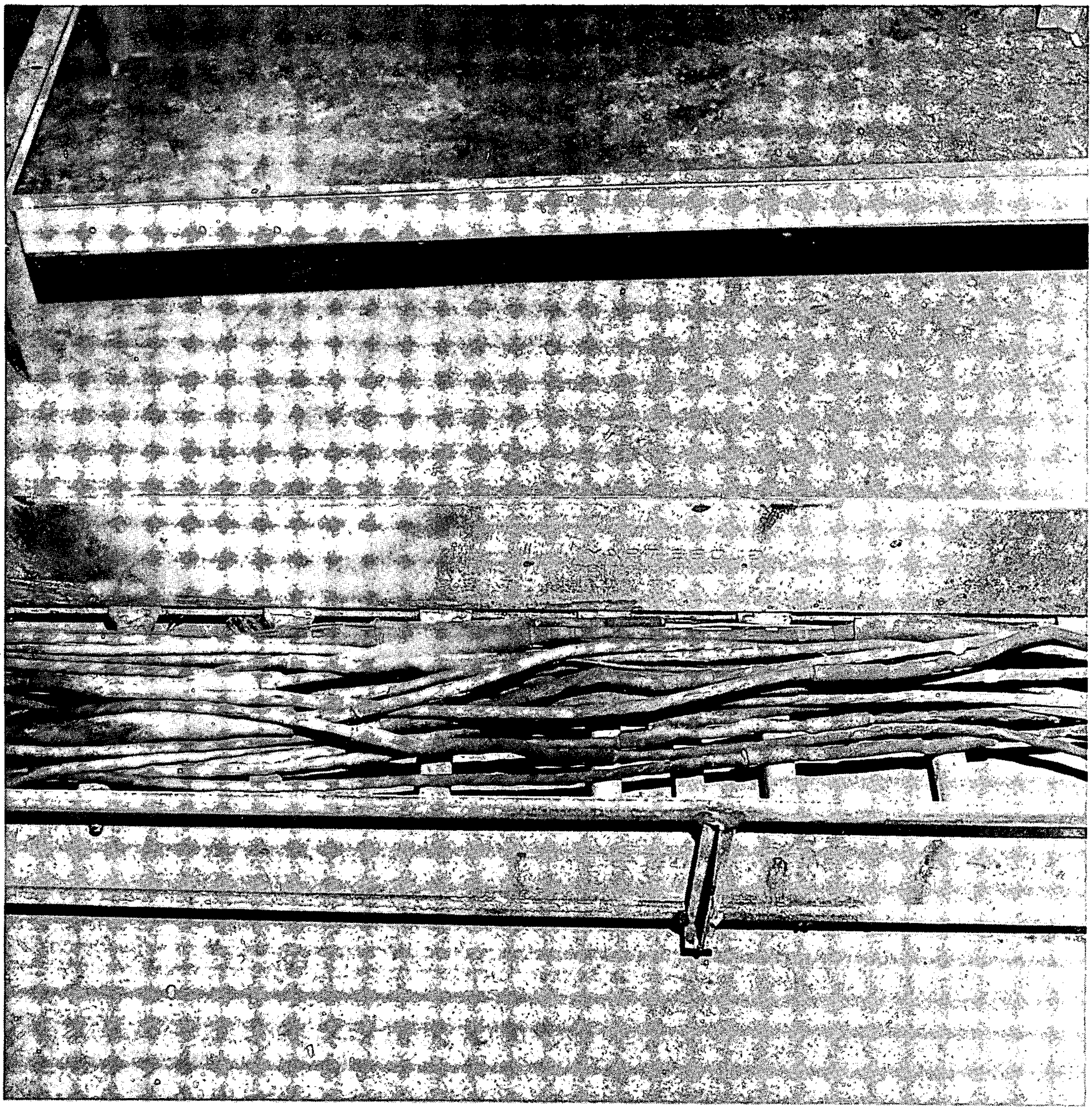
APPENDIX II

PHOTOGRAPHS



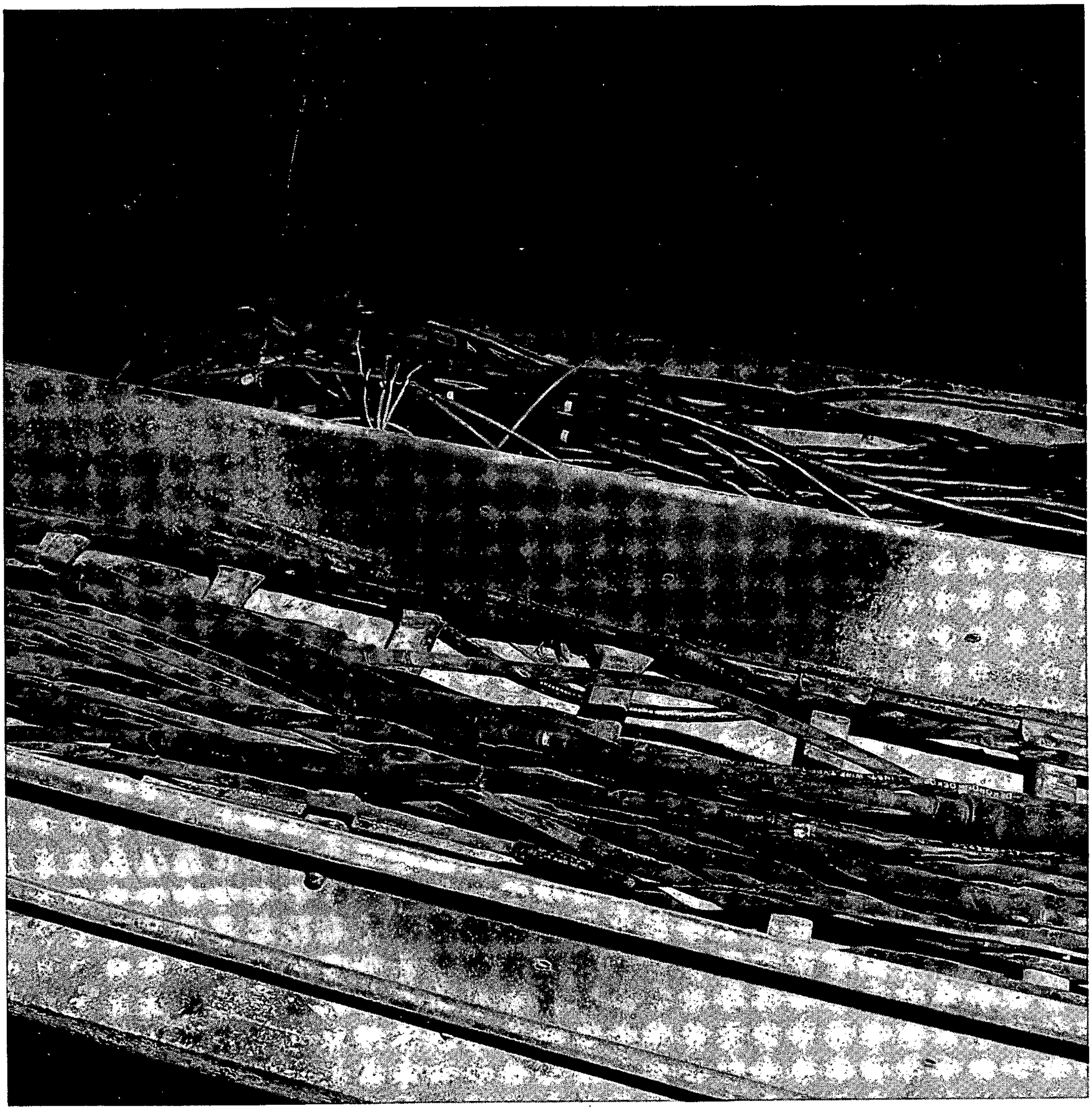
PHOTOGRAPH VIII-1

TEST SPECIMEN NO. 1
AFTER LOCA TEST



PHOTOGRAPH VIII-2

CABLE SPLICE ASSEMBLIES IN CABLE TRAY
AFTER LOCA TEST (VIEW 1)



PHOTOGRAPH VIII-3

CABLE SPLICE ASSEMBLIES IN CABLE TRAY
AFTER LOCA TEST (VIEW 2)

SECTION IX

MANDREL BEND TEST

1.0 REQUIREMENTS

1.1 Purpose

This test is to further demonstrate the operability of the cables and splice assemblies following a LOCA simulation.

1.2 Test Specimens

The test specimens shall be as follows:

- One (1) 4-conductor Wyle-supplied cable with the CP&L-approved splice
- One (1) 2-conductor PVC-insulated, PVC-jacketed cable with the Raychem-approved splice

1.3 Functional Test

The following functional tests shall be performed on the subject cables.

1) Coil the cables around a metal mandrel with a diameter of approximately 40 times the overall cable diameter.
2) Immerse the cable in tap water at room ambient temperature.
3) Measure the insulation resistance between each conductor and ground (plane) at 500 VDC for 1 minute (minimum).
4) Measure the dielectric strength between all conductors and ground at 1250 VDC, 60 Hz, single-phase, for 1 minute. Record the current.
5) Verify the continuity of each conductor, using an ohmmeter or equivalent.

1.4 Acceptance Criteria

The acceptance criteria for the instrumentation cables and cable splice assemblies are as follow:

1) The insulation resistance shall not be less than 1 megohm.

1.0 REQUIREMENTS (Continued)

1.4 Acceptance Criteria (Continued)

2) There shall be no breakdown or flashover during the dielectric withstand.

3) The cable must be continuous.

2.0 PROCEDURES

2.1 Test Specimens

The following test specimens were selected for the test.

- Test Specimen No. 1, 2-conductor, PVC cable with two (2) CP&L-approved cable splices, age 10 years.

- Test Specimen No. 23, 4-conductor, Continential Cable with one (1) Raychem-approved cable splice, equivalent age: greater than 40 years.

2.2 Functional Tests

The test specimens were subjected to the functional tests as described in Paragraph 1.3 of this section. A 15-inch diameter mandrel was used for these tests. Non-metallic cable straps were used to hold the test specimen on the mandrel.

Additional dielectric strength tests were later performed on Test Specimen 23.

3.0 RESULTS

The test specimens successfully met the requirements as specified in Paragraph 1.0 and as described in Paragraph 2.0 of this section, except for one (1) anomaly.

The leakage current during the first dielectric strength test of Test Specimen No. 23 exceeded the test equipment current limit. Additional dielectric strength tests were performed later without anomaly. Reference Notice of Anomaly No. 8 presented in Appendix I of this section.

Photographs of the test setup are presented in Appendix II of this secti

Data Sheets showing the data recorded in this test sequence are presente in Appendix III of this section.

Equipment used in recording data is shown on the Instrumentation Equipment Sheets presented in Appendix IV of this section.

APPENDIX I

NOTICE OF ANOMALY

WYLE LABORATORIES (Eastern Operations)

NOTICE OF ANOMALY

DATE: 10-15-81

NOTICE NO: 8 P.O. NUMBER: HBR-01616 CONTRACT NO: N/A

CUSTOMER: Carolina Power and Light Co. WYLE JOB NO: 45307-01

NOTIFICATION MADE TO: Bob Schwager NOTIFICATION DATE: 9-8-81

NOTIFICATION MADE BY: David Stinson VIA: Telephone

CATEGORY: ☒ SPECIMEN ☐ PROCEDURE ☐ TEST EQUIPMENT DATE OF ANOMALY: 9-4-81

PART NAME: In-Containment Cable Splice Assembly PART NO. N/A

TEST: Mandrel Bend I.D. NO. 23

SPECIFICATION: WLTP 45307-2 PARA. NO. 4.0

REQUIREMENTS:

Measure dielectric strength between all conductors and ground at 1250 VAC, 60 Hz, for one minute. Record the current.

DESCRIPTION OF ANOMALY:

The current was 5 milliamps at 825 volts. The specified voltage could not be reached because the test equipment current limit is 5 milliamps.

DISPOSITION · COMMENTS · RECOMMENDATIONS:

At the direction of the Customer, additional dielectric strength tests were performed on this test specimen on 10-2-81 before the cut-apart inspection was performed. There was no breakdown or flashover during these dielectric strength tests at 1250 VAC.

VERIFICATION:

TEST WITNESS: —

REPRESENTING: —

QUALITY ASSURANCE: B.N. Hollingsworth

PROJECT ENGINEER: James Marcomet

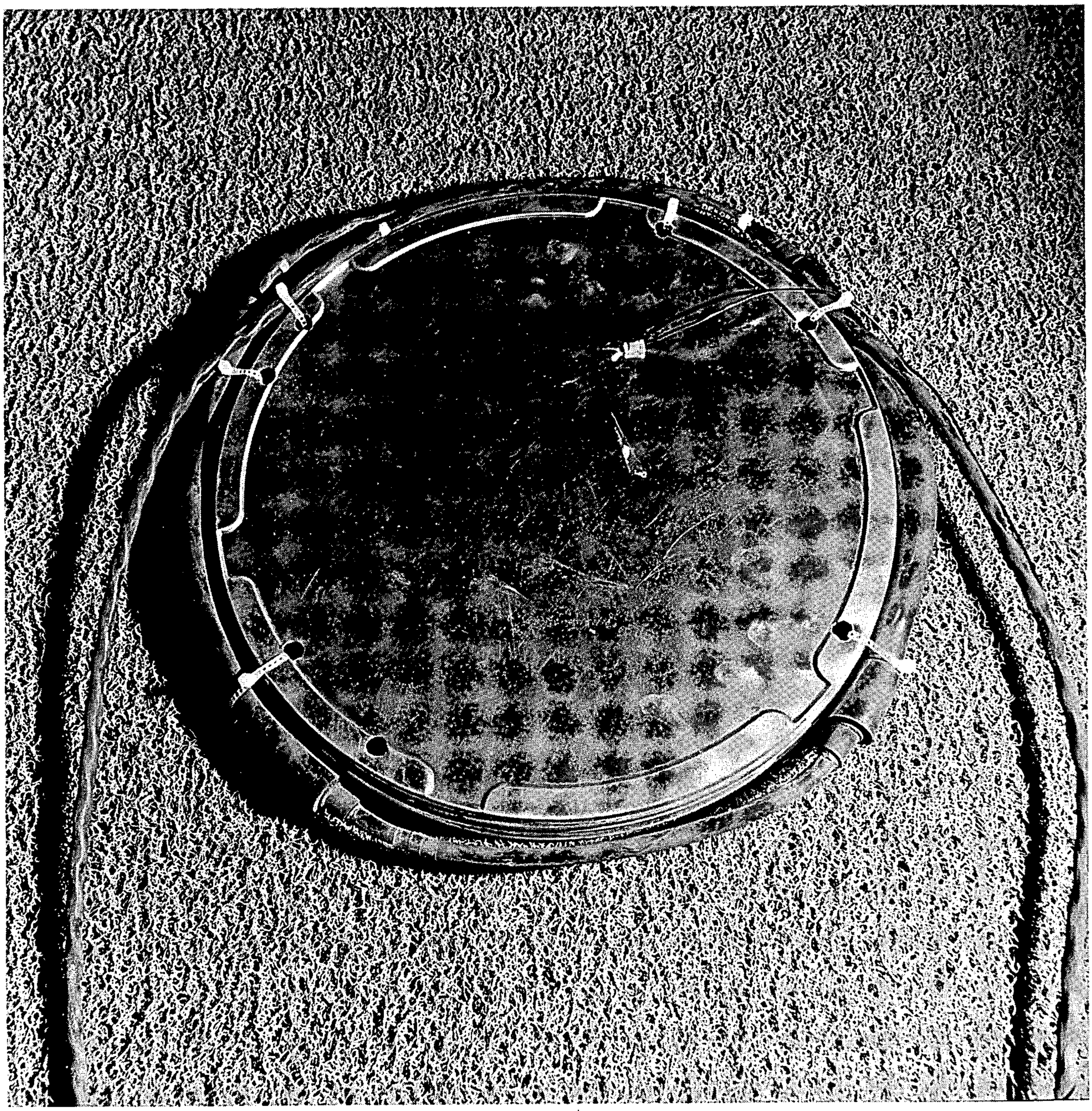
PROJECT MANAGER: Herschel Jordan

INTERDEPARTMENTAL COORDINATION: DS LB

WYLE Form WH 1066, Rev. Jan, 81

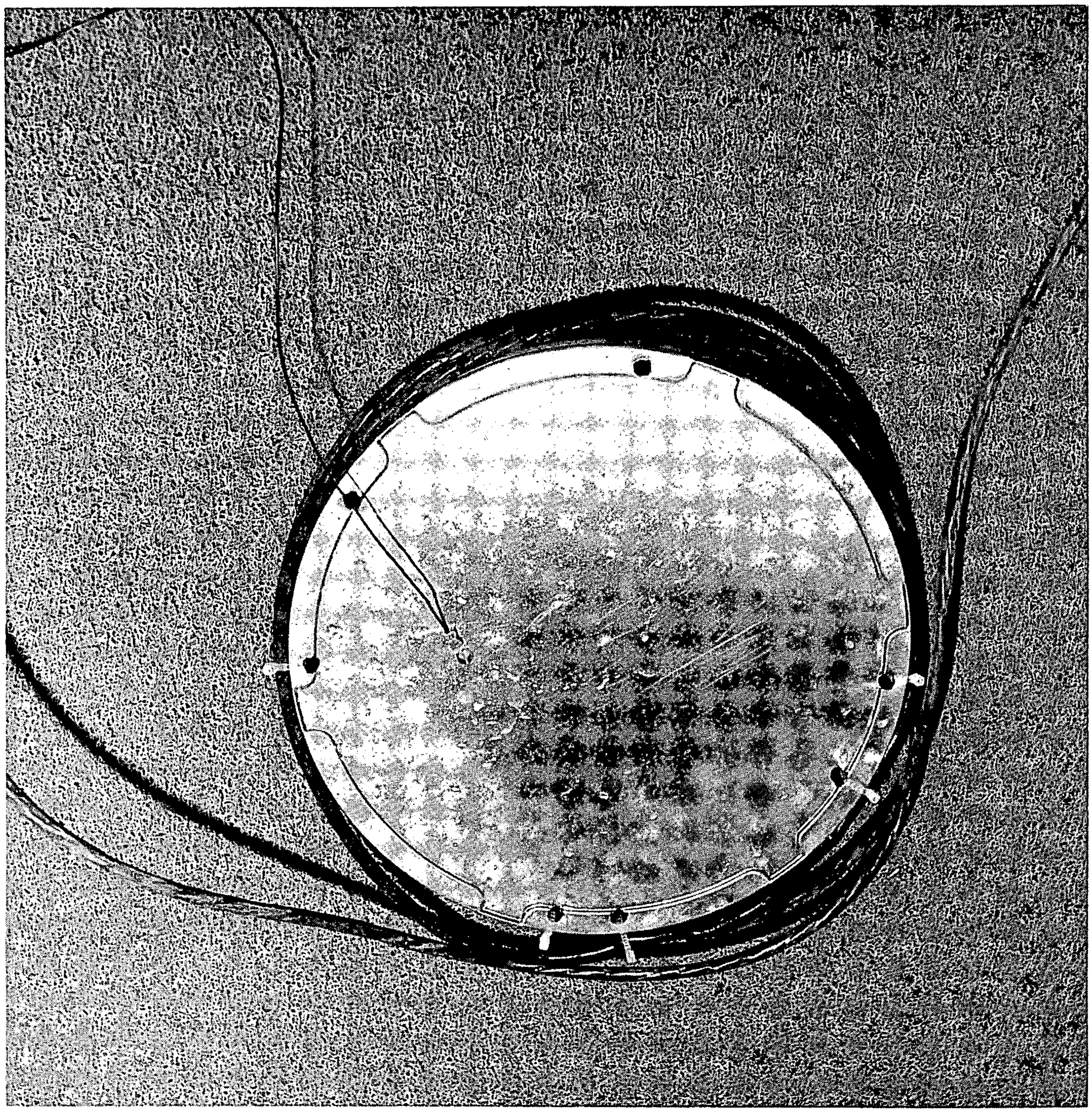
APPENDIX II

PHOTOGRAPHS



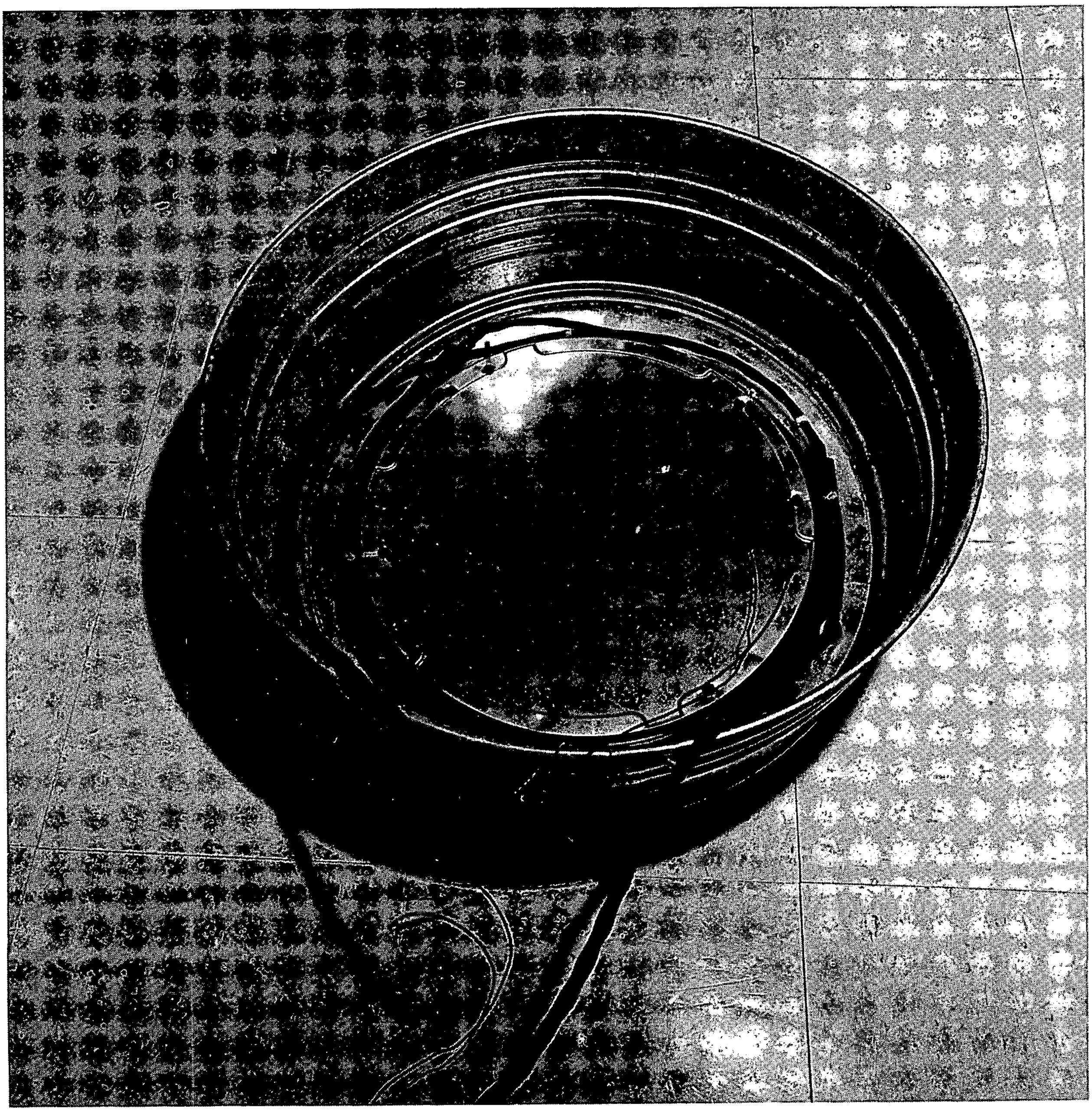
PHOTOGRAPH IX-1

TEST SPECIMEN NO. 1 MOUNTED ON MANDREL



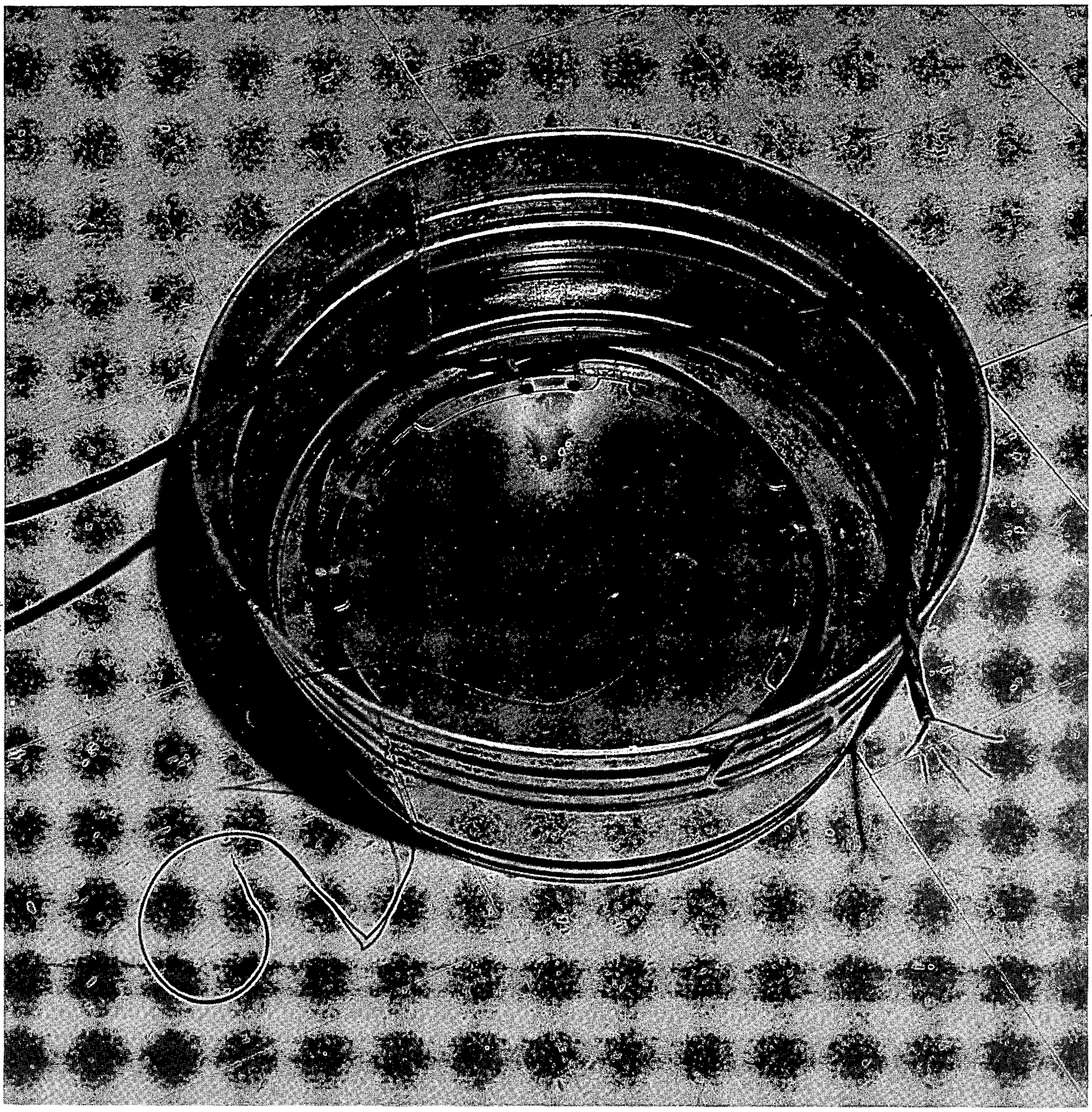
PHOTOGRAPH IX-2

TEST SPECIMEN NO. 1 MOUNTED ON MANDREL



PHOTOGRAPH IX-3

TEST SPECIMEN NO. 1 ON MANDREL
IMMERSED IN TAP WATER



PHOTOGRAPH IX-4

TEST SPECIMEN NO. 23 ON MANDREL
IMMERSED IN TAP WATER

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APPENDIX III

DATA SHEETS

DATA SHEET

Page No. IX-12
Report No. 45307-1

WYLE LABORATORIES

Customer CAROLINA POWER & LIGHT CO.
Specimen IN-CONTAINMENT CABLES
Part No. BELOW
Spec. WLTP 45307-2
Para. 4.0
S/N N/A
GSI NO

Amb. Temp. 74°F
Photo YES
Test Med. TAP WATER
Specimen Temp. AMBIENT

Job No. 45307
Start Date 9-4-81

Test Title MANDREL BEND TEST

TEST SPECIMEN NO. 1

COIL THE CABLE AROUND A 15 IN. DIA METAL MANDREL.
IMMERSE THE CABLE IN TAP WATER AT ROOM AMBIENT TEMPERATURE.
MEASURE INSULATION RESISTANCE BETWEEN EACH CONDUCTOR AND GROUND (PLANE) AT 500VDC FOR 1 MINUTE (MINIMUM).

WHITE TO GROUND PLANE - > 20×10^5 megohms
BLACK TO GROUND PLANE - 10×10^5 megohms
SHIELD TO GROUND PLANE - 1×10^5 megohms

MEASURE DIELECTRIC STRENGTH BETWEEN ALL CONDUCTORS AND GROUND AT 1,250VDC 60 HZ FOR 1 MINUTE - 0.6 mA

CONTINUITY TEST WITH OHMMETER
WHITE WIRE - 53.8 mΩ
BLACK WIRE - 56.8 mΩ
SHIELD - 49.3 mΩ

Specimen Failed —
Specimen Passed ✓
NOA Written —

Tested By Nam Sung Lee Date: 9-4-81
Witness — Date: —
Sheet No. 1 of 2
Approved James Marcornet

WH-614A

DATA SHEET

Page No. IX-13
Report No. 45307-1

WYLE LABORATORIES

Customer CAROLINA POWER & LIGHT CO.
Specimen IN-CONTAINMENT CABLES
Part No. BELOW
Spec. WLTP 45307-2
Para. 4.0
S/N N/A
GSI NO
Amb. Temp. 74°F
Photo YES
Test Med. TAP WATER
Specimen Temp. AMBIENT
Job No. 45307
Start Date 9-4-81

Test Title MANDREL BEND TEST

TEST SPECIMEN NO. 23
COIL THE CABLE AROUND A 15 IN. DIA METAL MANDREL.
IMMERSE THE CABLE IN TAP WATER AT ROOM AMBIENT TEMPERATURE.
MEASURE INSULATION RESISTANCE BETWEEN EACH CONDUCTOR AND
GROUND (PLANE) AT 500 VDC FOR 1 minute (MINIMUM)
WHITE TO GROUND PLANE – 10×10^5 megohms
BLACK TO GROUND PLANE – 10×10^5 megohms
SHIELD TO GROUND PLANE – 4×10^2 megohms
RED TO GROUND PLANE – 8×10^5 megohms
GREEN TO GROUND PLANE – 10×10^5 megohms
MEASURE DIELECTRIC STRENGTH BETWEEN ALL CONDUCTORS AND
GROUND AT 1,250 VDC 60HZ FOR 1 MINUTE – 5mA @ 825V
CONTINUITY TESTS WITH OHMMETER
WHITE WIRE – 59.6 mΩ
BLACK WIRE – 56.7 mΩ
SHIELD – 44.3 mΩ
RED WIRE – 57.0 mΩ
GREEN WIRE – 61.6 mΩ

Specimen Failed –
Specimen Passed –
NOA Written NOA No. 8

Tested By Man Sung Lee Date: 9-4-81
Witness – Date: –
Sheet No. 2 of 2
Approved James Marconnet

WH-614A

DATA SHEET

WYLE LABORATORIES

Customer CAROLINA POWER & LIGHT
Specimen IN-CONTAINMENT CABLES
Part No. BELOW
Spec. WLTP 45307-2
Para. 4.0
S/N N/A
GSI NO

Amb. Temp. 72°F
Photo NO
Test Med. TAP WATER
Specimen Temp. Amb.

Job No. 45307
Start Date 10-2-81

Test Title MANDREL BEND TEST

TEST SPECMEN NO. 23

DIELECTRIC STRENGTH AT 1250VAC 60HZ FOR 1MINUTE.

ALL WIRES TO GROUND - 4.6 mA

ALL WIRES BUT SHIELD TO SHIELD - 1.1 mA

SHIELD TO GROUND - 4.5 mA

ALL WIRES BUT SHIELD TO GROUND - 0.95 mA

DIELECTRIC STRENGTH AT 4000VAC FOR 1 MINUTE

ALL WIRES BUT SHIELD TO GROUND - 3.2 mA

Specimen Failed —
Specimen Passed ✓
NOA Written Ref: NOA No. 8

Tested By Nam Sung Lee Date: 10-2-81
Witness — Date: —
Sheet No. 1 of 1
Approved James Marconnet

WH-614A

APPENDIX IV

INSTRUMENTATION EQUIPMENT SHEETS

INSTRUMENTATION EQUIPMENT SHEET

Date 9-4-81 Job No. 45307-01-6287 Test Area ELECTRONICS

Technician MAN SUNG LEE Customer CAROLINA POWER & LIGHT Type Test MANDREL BEND TEST

No.	Instrument	Manufacturer	Model No.	Serial No.	Wyle or Gov't No.	Range	Accuracy	Calibration On	Calibration Due
1	MEGOHMMETER	GENERAL RADIO	1862-C	2374	97892	0.5M-∞	± 3%	5-6-81	11-6-81
2	AC HYPOT	ASSOCIATED RESEA.	4030	416	96776	1,250 VAC	mfg. spec.	7-2-81	10-2-81
3	THERMOMETER	FISHER	ASTM 63F	N/A	80241	18-88	± 1°F	6-23-81	6-23-82
4	DIGITAL M.M.	KEITHLEY	164	N/A	11305	MULTI	mfg. spec.	4-17-81	10-17-81

WYLE 295

WYLE 295

Instrument Test Engineer D M Hooper Checked & Received By James E. Marcomet

WH-1029

INSTRUMENTATION EQUIPMENT SHEET

Date 10-2-81 Job No. 45307-01-6281 Test Area ELECTRONICS

Technician MAN SUNG LEE Customer CAROLINA POWER & LIGHT Type Test MANDREL BEND TEST

No.	Instrument	Manufacturer	Model No.	Serial No.	Wyle or Gov't No.	Range	Accuracy	Calibration On	Calibration Due
1	AC HYPOT	ASSOCIATED RES.	4030	416	96776	0-4000V	mfg.	7-2-81	10-2-81

Instrument Test Engineer D M Hooper Checked & Received By James Marconnet

WH-1029

SECTION X

POST-TEST INSPECTION

1.0 REQUIREMENTS

Following completion of the functional tests, the test items shall be examined and color photographs taken. Additionally, an internal visual inspection shall be made of the CP&L and the Raychem-approved cable splice assembly. The Raychem material shall be dissected so that the insulated butt connector can be viewed. Color photographs shall be taken and the condition of all components documented.

2.0 PROCEDURES

The test specimens were inspected as specified in Paragraph 1.0 of this section.

3.0 RESULTS

The Raychem splice sleeving shrunk circumferentially and conformed to the cables, splices, and wires. Reference Photographs X-2, X-3, X-4, and X-9 of this section.

Raychem adhesive flowed into and conformed to the cable jackets, wire insulations, pre-insulated butt connectors, uninsulated butt connectors wire, and Raychem splice sleeving. Reference Photograph X-8, which shows the adhesive which flowed inside the pre-insulated butt splices. Reference also Photographs X-5 and X-10.

The field-bond of the Raychem adhesive was weaker than the factory bond of the adhesive to the inside of the splice sleeving. When the adhesive was peeled off the outside of the splice sleeving, the cable jackets, and the wire insulation, there were few instances of structural failure of the adhesive and no adhesion failures of the factory bond. Reference Photographs X-1, X-5, X-7, X-8, and X-10 of this section. Some of the factory-applied lettering on the outside of the Raychem splice sleeve was transferred to the adhesive. Reference Photograph X-5 of this section.

When the adhesive was peeled off the bare wires, the adhesive itself failed in places. Reference Photographs X-1 and X-6 of this section.

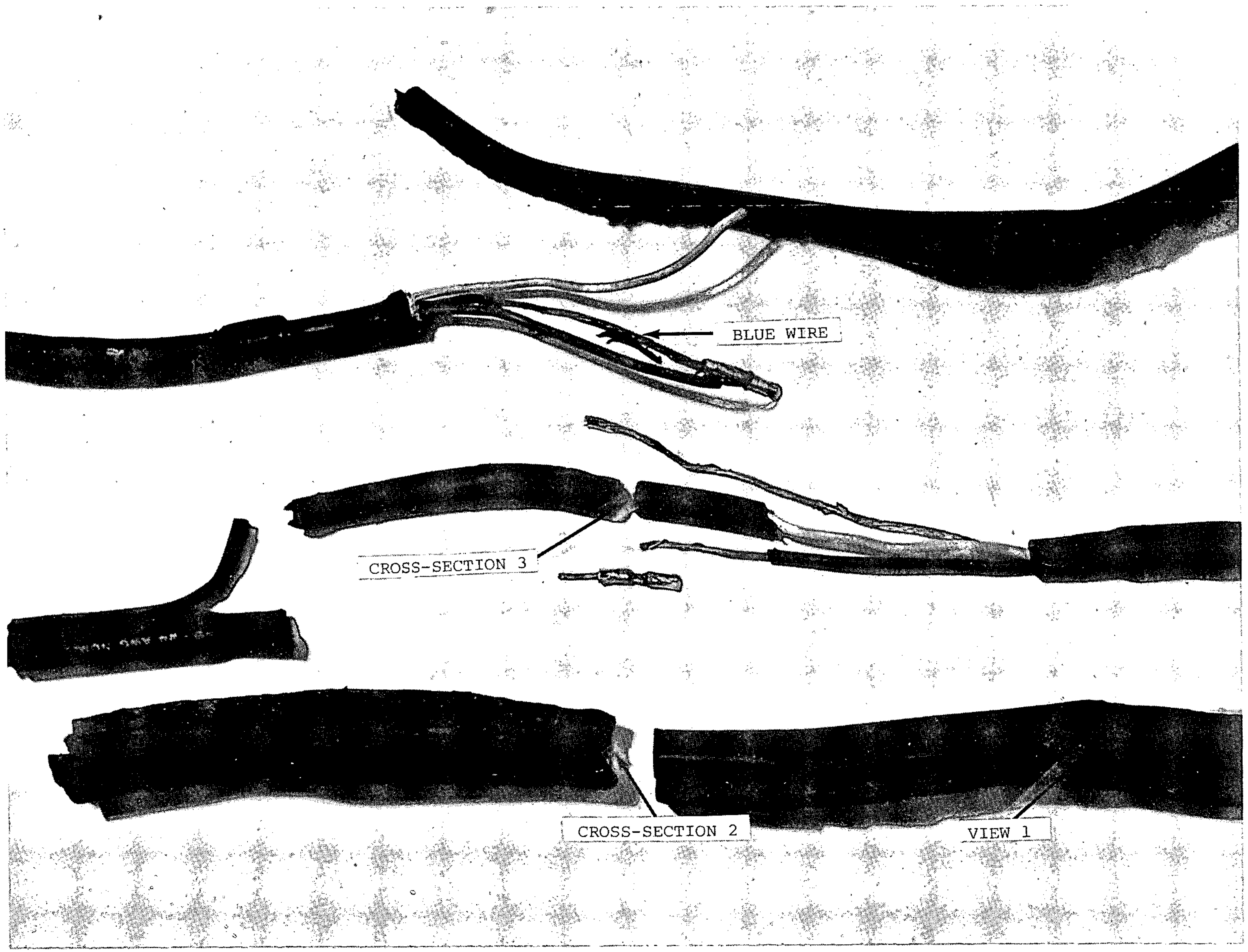
3.0 RESULTS (Continued)

One bare ground wire of Test Specimen No. 23 was bright blue from the crimp connector 2 inches along the wire. Reference Photograph X-6 of this section. No other unusual colors or discolorations were observed. No moisture nor indications of the presence of moisture were noted in the dissected cable splices.

Photographs of the dissected cable splices are presented in Appendix I of this section.

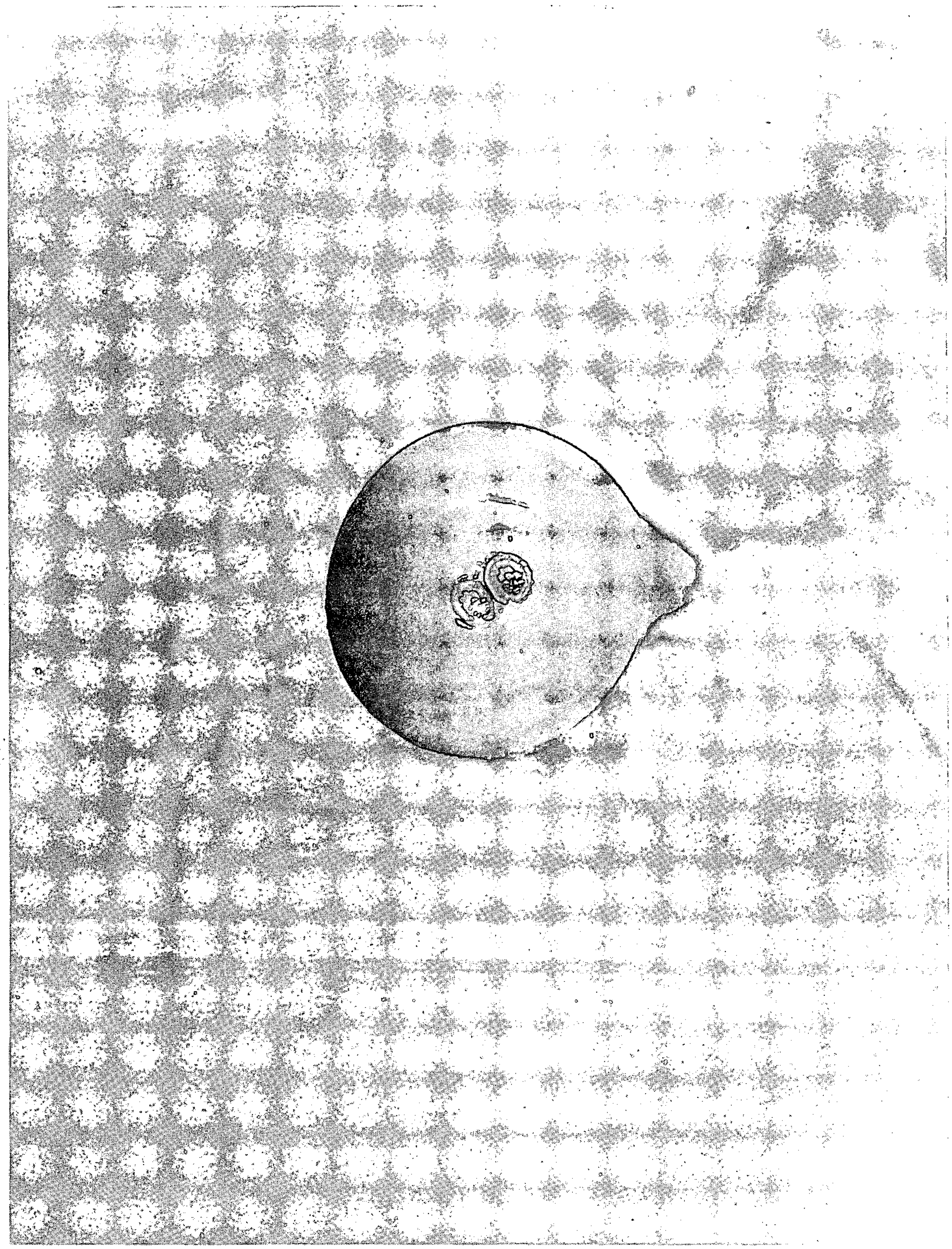
APPENDIX I

PHOTOGRAPHS



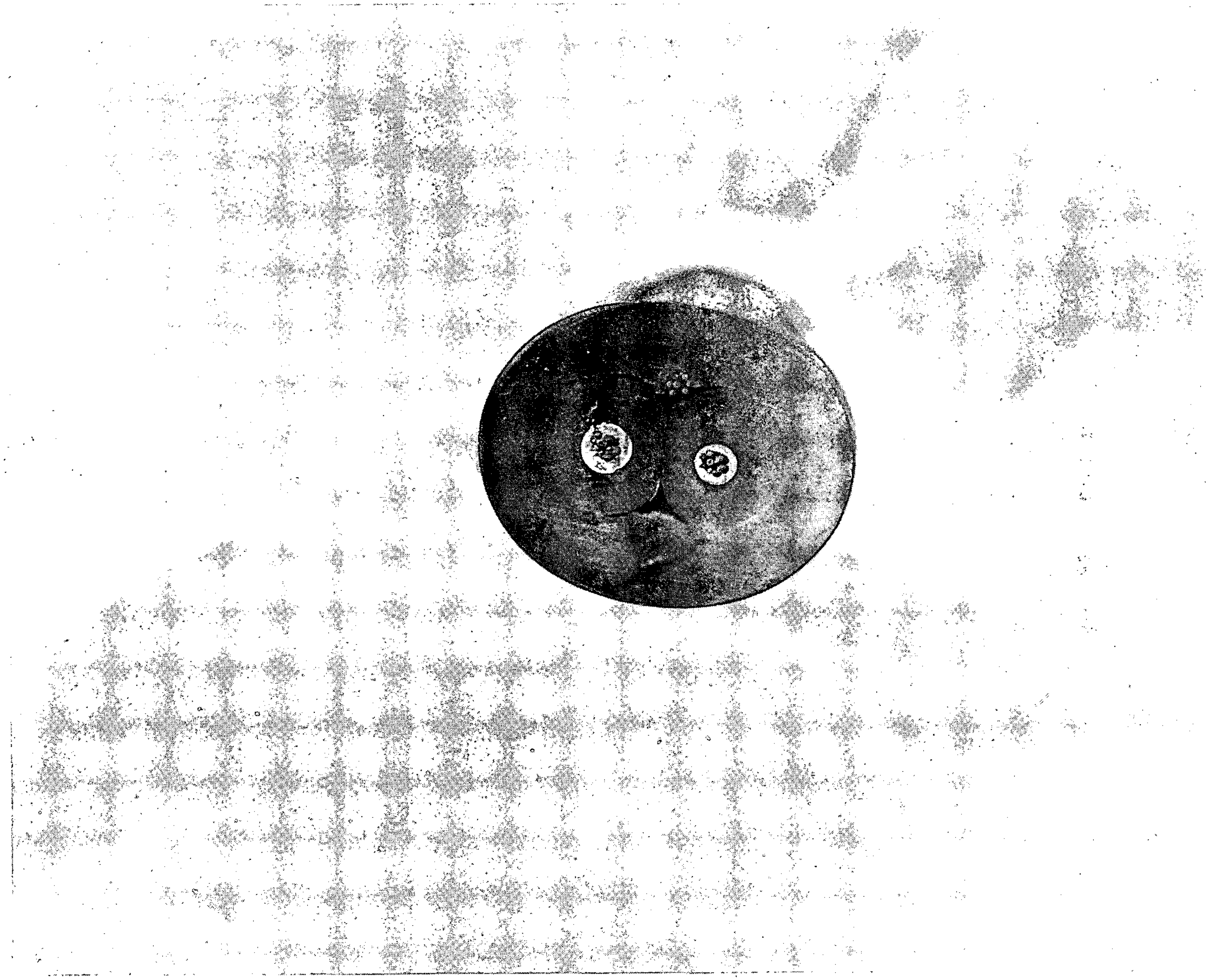
PHOTOGRAPH X-1

TEST SPECIMEN NO. 1
CABLE SPLICE AFTER DISSECTION



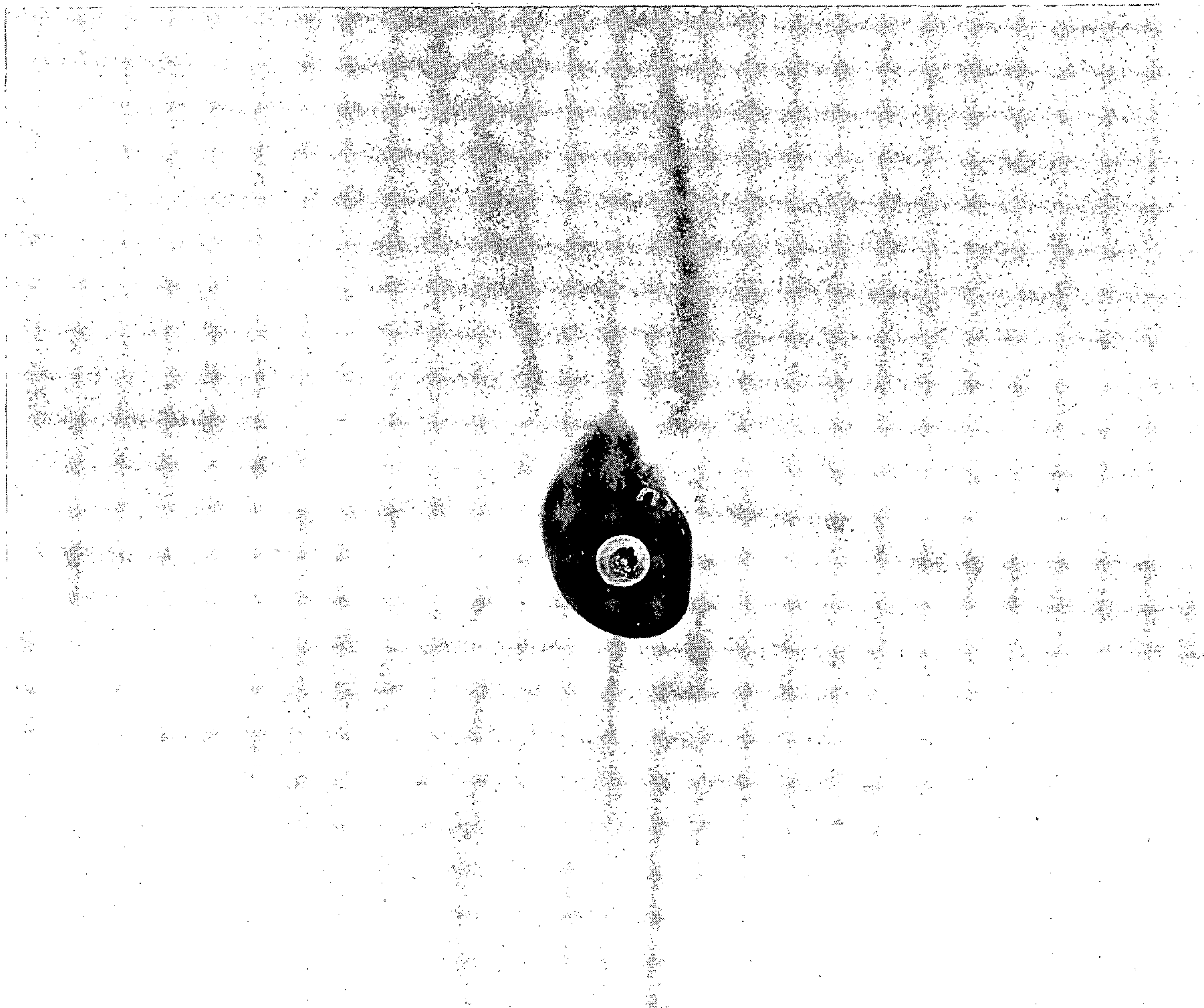
PHOTOGRAPH X-2

TEST SPECIMEN NO. 1
CROSS-SECTION 1



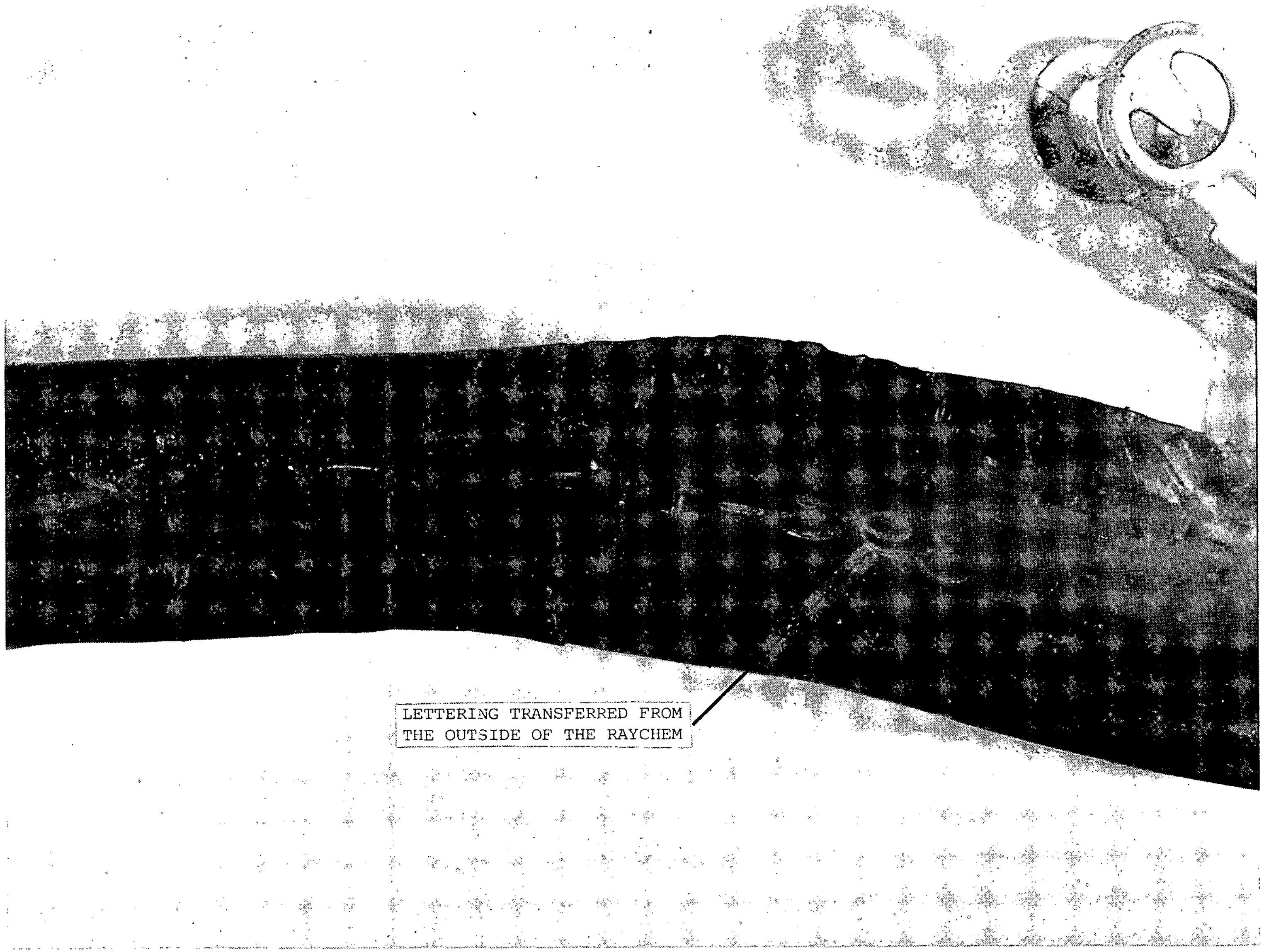
PHOTOGRAPH X-3

TEST SPECIMEN NO. 1
CROSS-SECTION 2



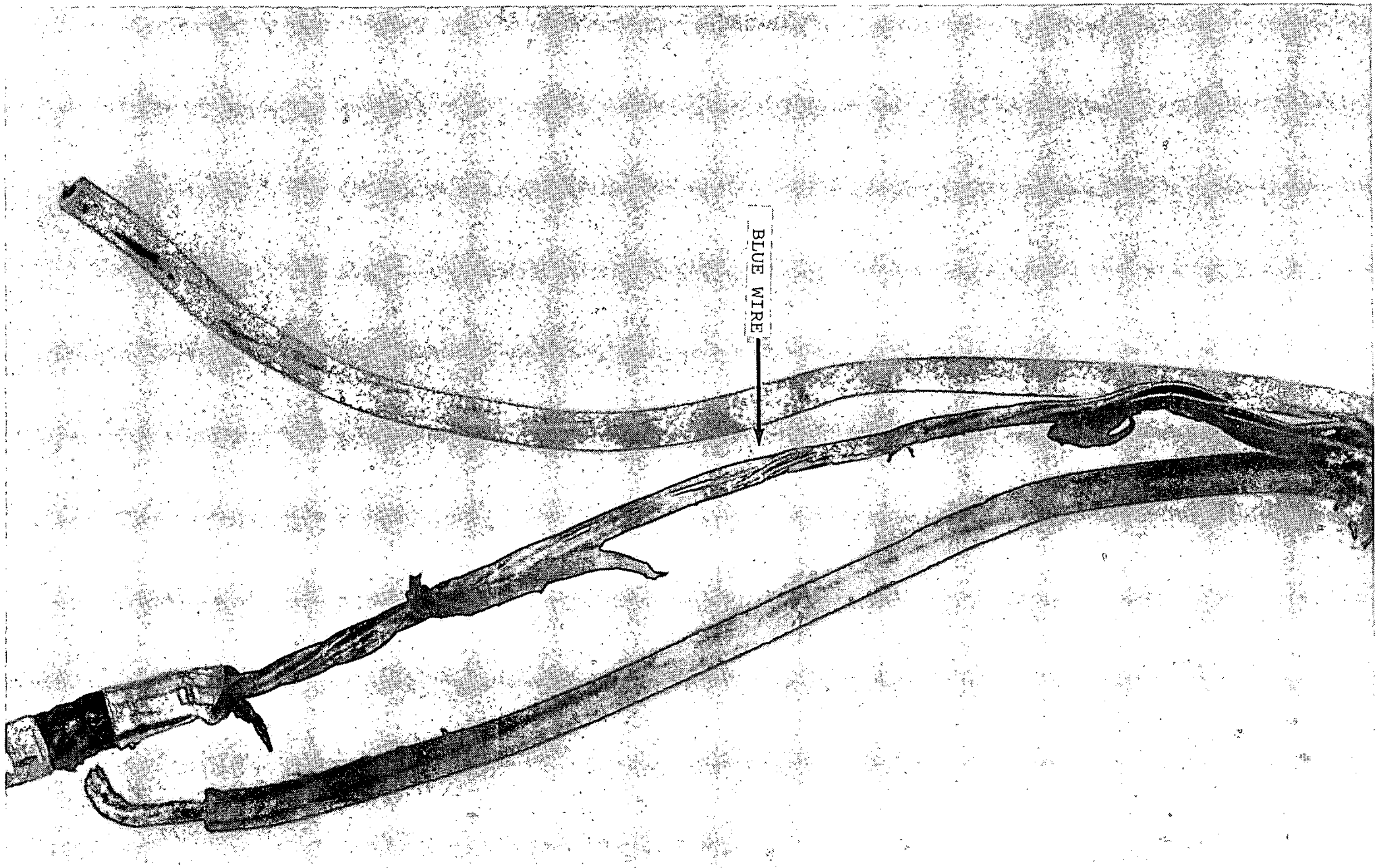
PHOTOGRAPH X-4

TEST SPECIMEN NO. 1
CROSS-SECTION 3



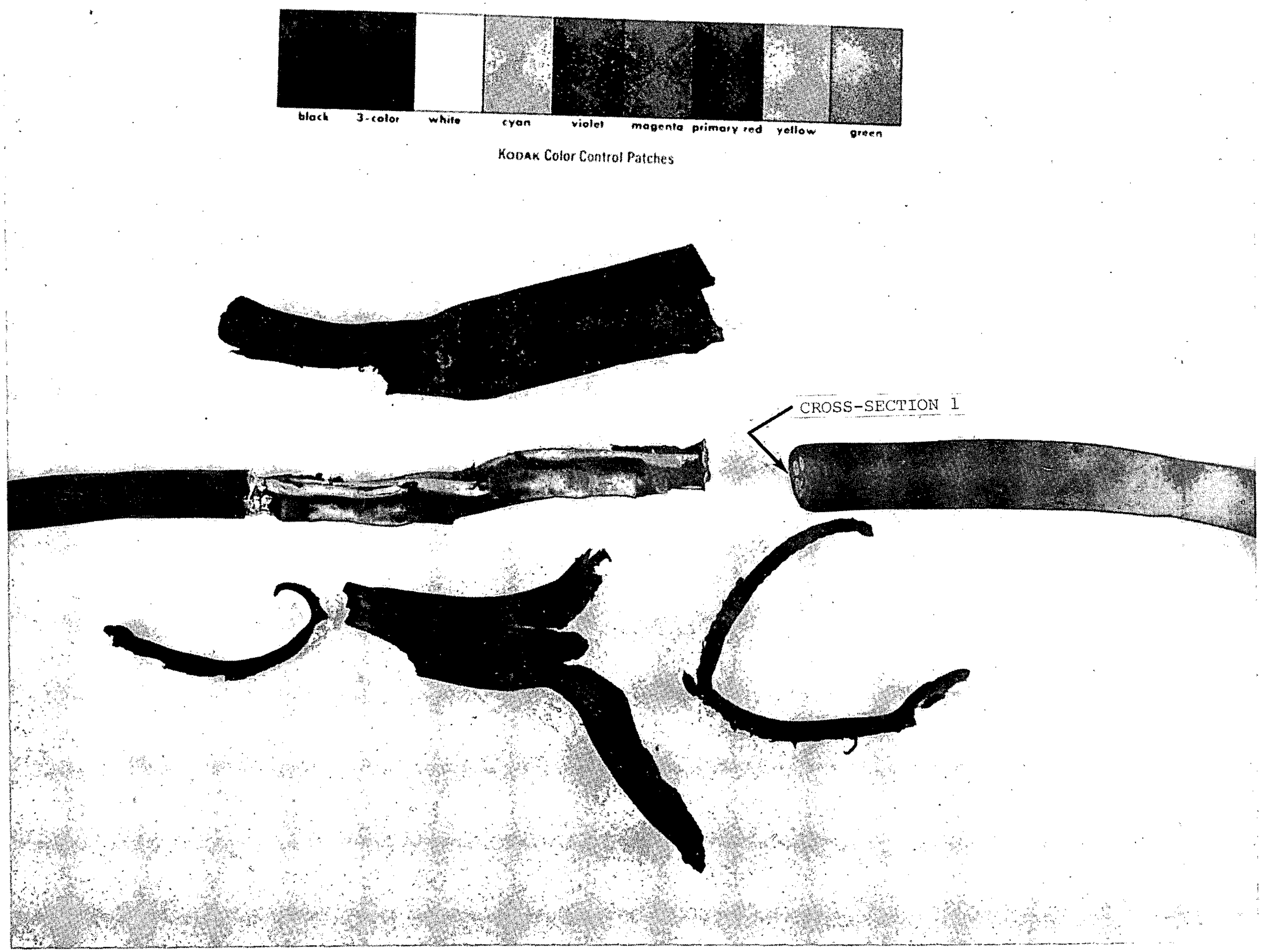
PHOTOGRAPH X-5

TEST SPECIMEN NO. 1
CLOSE-UP VIEW 1



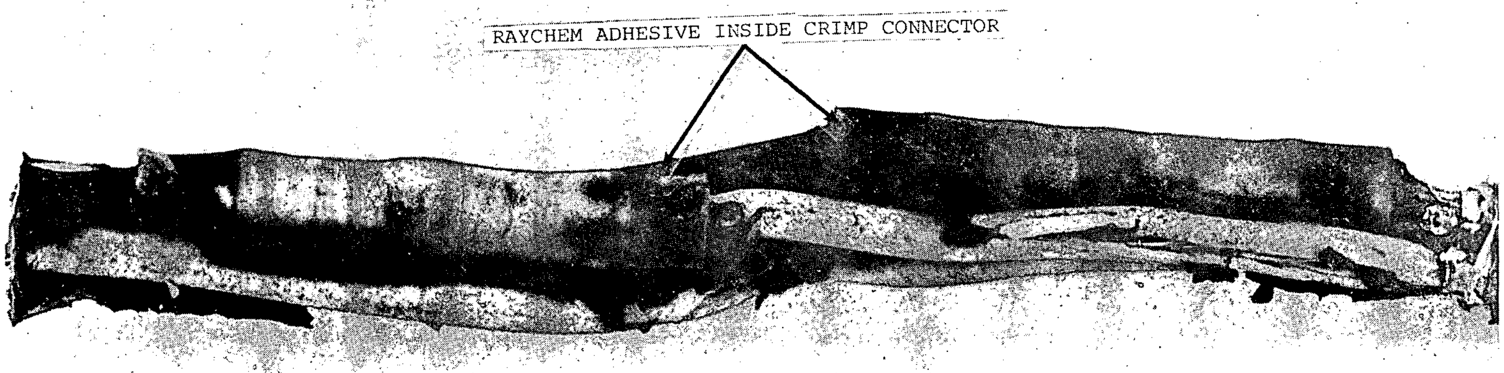
PHOTOGRAPH X-6

TEST SPECIMEN NO. 1
CLOSE-UP VIEW 2



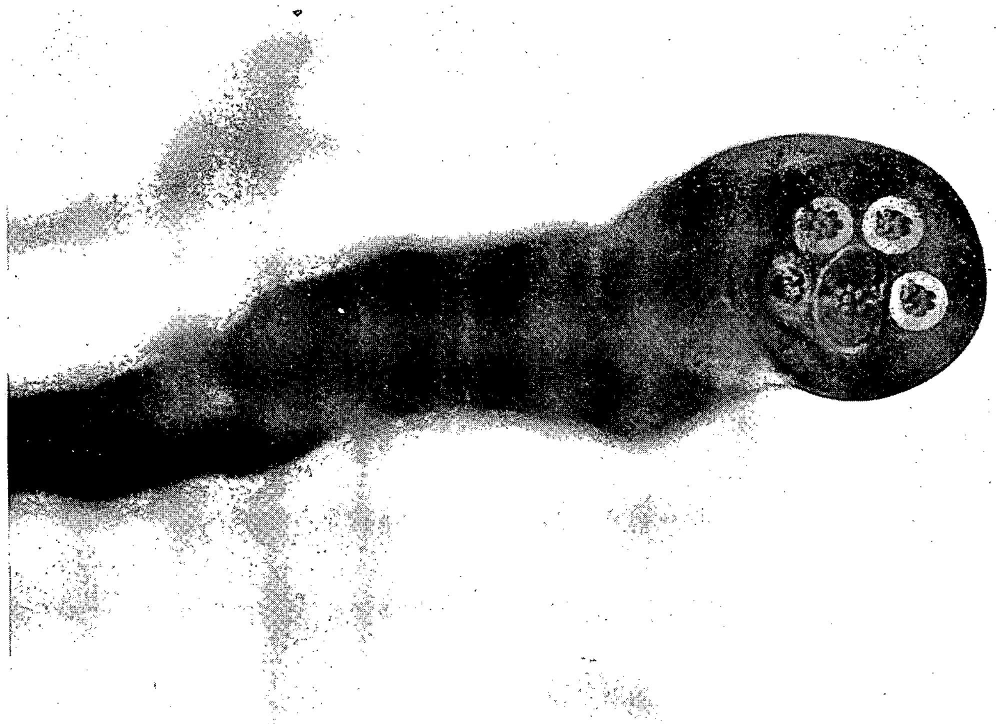
PHOTOGRAPH X-7

TEST SPECIMEN NO. 23
CABLE SPLICE AFTER DISSECTION



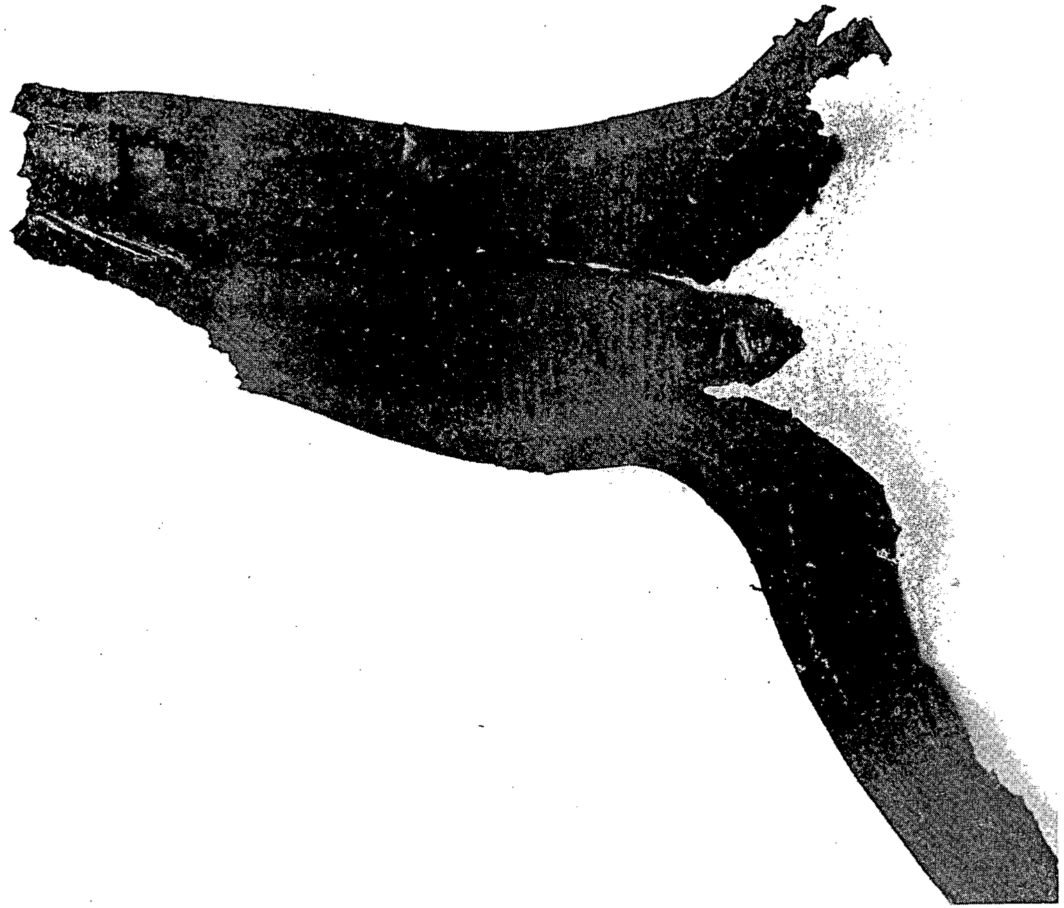
PHOTOGRAPH X-8

TEST SPECIMEN NO. 23
CLOSE-UP VIEW 1



PHOTOGRAPH X-9

TEST SPECIMEN NO. 23
CROSS-SECTION 1



PHOTOGRAPH X-10

TEST SPECIMEN NO. 23
CLOSE-UP VIEW 2

QUALIFICATION PLAN

WYLE LABORATORIES
SCIENTIFIC SERVICES AND SYSTEMS GROUP
P. O. BOX 1008 • HUNTSVILLE, ALABAMA 35807
TWX (810) 726-2225 • TELEPHONE (205) 837-4411

QUALIFICATION PLAN 45307-1

DATE: January 12,1981

FINAL QUALIFICATION PLAN
FOR
IN-CONTAINMENT CABLES
AND CABLE SPLICE ASSEMBLIES
FOR
CAROLINA POWER AND LIGHT COMPANY
RALEIGH, NORTH CAROLINA
FOR USE IN
H. B. ROBINSON NUCLEAR POWER GENERATING STATION

APPROVED BY: James F. H.
FOR: Qualification Plan Development

APPROVED BY: Bruce A. Fowler
FOR: Environmental Qualification

APPROVED BY:
FOR:

APPROVED BY PROJECT MANAGER: Robert A. Hall
Robert A. Hall

APPROVED BY QUALITY ENGINEER: Murvin J. Kimbrell
Murvin J. Kimbrell

PREPARED BY PROJECT ENGINEER: David Stinson
David Stinson

REVISIONS

FORM 1109-1 12-5-77

REV. NO.	DATE	PAGES AFFECTED	BY	APP'L.	DESCRIPTION OF CHANGES

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1.0 SCOPE

This document is prepared by Wyle Laboratories for Carolina Power and Light Company, hereinafter referred to as the customer, for equipment used in the H. B. Robinson Nuclear Power Generating Station.

1.1 Objectives

The purpose of this Qualification Plan is to present the approach, methods, philosophies, and procedures for qualifying in-containment cables and cable splice assemblies for use in Nuclear Power Generating Stations.

Nuclear environmental qualification of any safety-related device to meet the intent of IEEE 323-1974 is usually a three-step process, i.e., 1) radiation exposure; 2) aging; and 3) design basis event qualification (seismic, and for equipment inside containment, LOCA). The purpose of the first two steps is to put the sample equipment to be used for qualification into a condition that represents the worst state of deterioration that a plant operator will permit prior to taking corrective action, i.e., its end-of-qualified-life condition. The next step demonstrates that it still has adequate margin remaining to withstand the added environmental stresses of specified design basis events and still perform its safety-related functions.

It is incumbent on the equipment supplier to assure that the components and materials contained in the equipment actually placed into service are the same as those qualified.

The specific details of the qualification are defined herein.

1.2 Applicable Qualification Standards, Specifications, and Documents

- IEEE 323-1974, "IEEE Standard for Qualifying Class IE Equipment for Nuclear Power Generating Stations"

1.3 Test Item Description

Matrix Item No.	Description
1.0	2-Conductor, #16 AWG, Shielded Instrumentation Cable, approximately 30 inches long
	4-Conductor, #16 AWG, Shielded Instrumentation Cable, approximately 30 inches long
2.0	Cable Splice Assembly

The cables have been in service in the H. B. Robinson Nuclear Power Plant for 10 years.

1.0 SCOPE (CONTINUED)

1.3.1 Test Item Selection

Three (3) samples of each in-containment instrumentation cable, as identified in Paragraph 1.3, shall be utilized for the purposes of this Qualification Program. The intent is to use one (1) sample as a control, one (1) sample to demonstrate 20-year qualification, and one (1) sample to demonstrate a 40-year qualification. The purpose of the cable sample identified as a "control" is to determine the worst-case condition. The "control" cable shall be subjected to postulated radiation and design basis event conditions, but not to thermal aging. The "control" cable's performance throughout the Qualification Program shall then be analyzed against the cables which are subjected to accelerated aging to determine the effect of time in service, if any, on the cable's ability to perform its safety-related function.

Two (2) configurations of cable splice assemblies shall be utilized. A Raychem splicing procedure which has previously demonstrated an ability to perform its safety-related function under postulated accident conditions shall be utilized to configure one (1) cable splice assembly. A Carolina Power & Light-approved cable splice procedure shall be utilized to configure the second cable splice assembly. Since no known data is available which demonstrates the CP&L-approved cable splice assembly's capability to perform its safety-related function under the postulated accident conditions, it is necessary to introduce the Raychem-approved splice assembly to minimize the possibility of the CP&L-approved cable splice assembly jeopardizing the cable Qualification Program.

Utilizing the two (2) cable splice assemblies and the three (3) cable samples of each identified cable, the program design shall be based on the following table.

Equivalent Life of Cable	Configuration	
	A	B
10	2	4
20	4	2
40	2	4

where,

A = Raychem Splicing Procedure
B = CP&L Splicing Procedure
2 = 2-Conductor #16 AWG Shielded Instrumentation Cable
4 = 4-Conductor #16 AWG Shielded Instrumentation Cable

1.0 SCOPE (CONTINUED)

1.3.1 Test Item Selection (Continued)

Splices shall be applied to both ends of the test specimen. The splice shall join the customer-supplied cable (specimen) to the Wyle-supplied test cable. The Wyle-supplied test cable shall be previously qualified to IEEE 383 and certified as such by the supplier (reference following paragraph). Wyle test cables shall be long enough to penetrate the LOCA chamber (reference Paragraph 3.4).

The possible outcomes are:

1) All cables and splices pass.
2) Some or all cables with Raychem's splicing procedure pass.
3) Some or all cables with CP&L splicing procedure pass.
4) All cables fail, which also invalidates the cable splice qualification.

This program design does not, however, provide for the possibility of the instrumentation cables failing and jeopardizing the cable splice assembly qualification. To provide for this potential, additional cables shall be utilized to test the capability of the CP&L-approved cable splice assembly to perform its safety-related function. The cables shall have previously successfully completed a Qualification Program whose environmental parameters meet or exceed the CP&L profile. It is judged that certification to IEEE 383-1974 successfully fulfills this requirement. CP&L shall provide the 2-conductor cable and Wyle Laboratories shall provide the single-conductor and 4-conductor cable. Six (6) single-, 2-, and 4-conductor cables shall be utilized for the program. The radiation and thermal aging program shall not be influenced by the inclusion of these cables. A splice shall be used per cable. The cable shall be long enough to penetrate the LOCA chamber of Paragraph 3.4.

1.4 Qualification Sequence

Qualification shall be performed in the following sequence. It is considered that the radiation exposure and the aging effects on the equipment are cumulative and result in the same effects as simultaneous exposure experienced while operational in a nuclear power plant.

- Baseline Functional Test
- Radiation Exposure
- Functional Test
- Thermal Aging
- Functional Test
- Accident (LOCA) Qualification
- Functional Test
- Post-Test Inspection

2.0 QUALIFICATION REQUIREMENTS

2.1 Definition of Service Conditions

As directed by Carolina Power and Light, a 10% conservatism margin, as specified in Paragraph 6.3.1.5 of IEEE 323-1974, shall be added to the accident radiation dose.

2.1.1 Normal Conditions

The following normal service conditions are as specified by Carolina Power and Light:

- o Temperature: 115°F (average) (88°F to 120°F range)
- o Relative Humidity: 40%
- o Voltage: 480 VAC (± 10%)
- o Current: 20 mA (± 10%)
- o Radiation: 2.3×10^3 rads gamma, air equivalent dose, for a 40-year qualified life

2.1.2 Design Basis Event (DBE) Conditions

2.1.2.1 Accident (LOCA)

The accident time, temperature, and pressure parameters are as specified in Figure 1. The LOCA simulation shall be performed as specified in Paragraph 3.4.

- o Radiation: 1.4×10^7 rads gamma, total integrated dose

2.2 Safety-Related Functions

The safety classification of this equipment is Class IE. The subject equipment provides essential services in support of emergency reactor shutdown, containment isolation, reactor core cooling, and containment and reactor heat removal, or is otherwise essential in providing support to prevent significant release of radioactive material to the environment. The safety-related functions are described in the following paragraphs.

2.0 QUALIFICATION REQUIREMENTS (CONTINUED)

2.2.1 Description

The equipment performs the following functions: Transmits signals between Class IE equipment located in the containment building and the control room.

2.2.2 Acceptance Criteria

The acceptance criteria for the instrumentation cables and cable splice assemblies are as follows:

1) The insulation resistance shall not be less than 1 megohm.

2) There shall be no breakdown or flashover during the dielectric withstand.

3) The cable must be continuous.

3.0 QUALIFICATION PROGRAM

3.1 Baseline Functional Tests

3.1.1 Visual Inspection

A visual inspection of the equipment will be performed by Wyle Laboratories. This inspection will assure that the equipment has no obvious visible damage. Equipment identification will also be verified.

3.1.2 System Level Tests

The subject equipment shall be functionally tested on the system level. A system is defined as a cable and its associated cable splice assembly.

NOTE: Paragraph 3.1.2.1 is included to provide for the initial splicing of designated cables. After the Baseline Functional Tests, this paragraph is not applicable.

3.1.2.1 Cable Splicing Procedure

The CP&L-approved cable splice procedure is as follows:

1) Strip approximately 3 inches (this number may vary, depending on the number of conductors being spliced) of the cable jacket, shielding tape, fillers, and binder tape to expose the conductor(s) and associated insulation.

2) Cut the conductor(s) in such a manner as to stagger the spacing of the connectors.

3) Ensure the wire is in the AMP 53548-1 preinsulated butt splice fully.

4) Using the AMP crimping tool, crimp the splice. The tool will not reverse until a full crimp is completed.

5) Place Raychem shrink tubing over the cable. Ensure that enough tubing is used to allow for a minimum of a 3-inch overlap on the cable jacket.

6) Using a mini-torch for a heat source, cure the shrink tubing. The cure must be started from the center of the splice and worked out to one end. Return to the center of the splice and work out the other end. Using this method, no air pockets shall be trapped within the splice.

3.0 QUALIFICATION PROGRAM (CONTINUED)

3.1.2.1 Cable Splicing Procedure (Continued)

7) While curing the shrink tubing, work the torch around the splice for an even cure.

8) The red nuclear adhesive shall protrude from the end of the splice when the cure is complete.

The Raychem-approved cable splice procedure is as follows:

1) Strip approximately 3 inches (this number may vary, depending on the number of conductors being spliced) of the cable jacket, shielding tape, fillers, and binder tape to expose the conductor(s) and associated insulation.

2) Cut the conductor(s) in such a manner as to stagger the spacing of the connectors.

3) Using uninsulated butt connectors, crimp one end to the conductor.

4) Cut the Raychem shrink tubing so that the sleeve has a 2-inch (minimum) seal area at each end.

5) Abrade cable, if required, per cable manufacturer's or engineering information.

6) Mark an area on each end of the cable which defines the surface to be cleaned, using any type of tape or cable marker. These marks should extend 1/4" to 1/2" past the end of the sleeve when the tubing is centered on the splice.

7) Clean all surfaces thoroughly, using a good commercial cleaning solvent or 1.1.1 Trichloroethane.

8) Position the shrink tubing onto the cable and complete the crimping operation.

9) Center the shrink tubing, using the previously installed tape or other locating marks.

NOTE: If the cable construction is dual type (i.e., the outer layer is cross linked but the inner is not), then Step 10 is not applicable.

10) For noncross-linked or nonvulcanized insulating material, position a glass heat shield cloth over the exposed cable when shrinking.

3.0 QUALIFICATION PROGRAM (CONTINUED)

3.1.2.1 Cable Splicing Procedure (Continued)

11) Shrink the tubing by starting the shrinking action at the approximate center of the sleeve. Work the heat gun or torch from the center toward each end, using a waving action of the tool. Continue until the sleeve is smoothly shrunk onto the cable surface and a visible flow of adhesive is evident from each end of the sleeve.

12) Repeat Steps 3 through 11 for each conductor. When all conductors have been spliced, go to Step 12.

13) Repeat Steps 4 through 11 for the cable jacket. Raychem shrink tubing will now be shrunk over the spliced conductors and the cable jacket, as applicable, for an outer seal.

3.1.2.2 Functional Tests

The following functional tests shall be performed on the subject equipment:

1) Insulation Resistance

Measure insulation resistance between each conductor and ground (plane) at 500 VDC for 1 minute (minimum).

2) Dielectric Withstand

NOTE: Subsequent to the Baseline Functional Tests, all dielectric withstands shall be performed at 80% of the initial value.

Measure dielectric strength between all conductors and ground at 1,250 VAC, 60 Hz, single-phase, for 1 minute with tester set at 0.5 milliamperes.

3) Continuity

Verify the continuity of each conductor using a ohm meter or equivalent.

3.0 QUALIFICATION PROGRAM (CONTINUED)

3.2 Radiation

3.2.1 Radiation Exposure

Each component in the equipment has been reviewed in order to ascertain all materials. Evaluation has been made of the function of the component materials. This information has been compared to auditable data to determine the susceptibility of the material in its application to the radiation exposure level specified.

The radiation requirement for the cable and cable splice assembly is the accident and normal total integrated dose of 1.54×10^7 rads (a 10% conservatism margin has been included).

Table I defines the nonmetallic materials in the cable and cable splice assembly.

Radiation damage threshold levels for the polyvinyl chloride (PVC), Mylar, and Kynar are lower than the predicted radiation requirement of 1.54×10^7 rads. Because of the radiation damage threshold levels, a minimum radiation exposure of 1.54×10^7 rads gamma, air equivalent, using a Cobalt 60 source, is warranted to confirm the capability of the cable and cable splice assembly to perform their safety-related function. The radiation dose rate shall not exceed 1×10^6 rads per hour.

The cables shall be placed in a Wyle Laboratories-supplied steel cable tray 5 feet long, 6-1/2 inches deep, and 12 inches wide. The cables shall not be stacked or restrained to the cable tray except by gravity. Placement of the cables shall be such that the cable splice assemblies are parallel to the floor of the cable tray. Following irradiation, particular care must be taken to ensure the cables are transported in the same spatial orientation as they were irradiated.

3.2.2 Functional Test

The Baseline Functional Tests of Paragraph 3.1 shall be repeated.

3.0 QUALIFICATION PROGRAM (CONTINUED)

3.3 Aging

The desired qualified life of the subject equipment is 40 years. The desired qualified life for components is also 40 years. Where 40-year qualified life for components is not demonstrated during the test program, a shorter qualified life shall be established and the component assigned a maximum maintenace-replacement interval no greater than its qualified life.

Each component in the subject equipment has been reviewed for function and age-related failure mechanisms which could affect its function. A matrix, Table I, has been prepared which defines the components, manufacturer ratings, materials, service conditions, aging mechanisms, and qualified life. A literature search of Wyle's Aging Library has been utilized to obtain auditable aging data. This data has been used to exempt aging, as well as to define artificial aging procedures. When no applicable data existed, engineering judgment was utilized for the definition of artificial aging procedures. These are noted as assumptions. The aging mechanisms to be addressed for this equipment are time-temperature effects and humidity.

3.3.1 Time-Temperature Effects

The present state-of-the-art shall allow acceleration of the time-temperature aging effects artificially by increasing the temperature. Most components of the subject equipment contain metallic, as well as nonmetallic, materials. The deterioration due to these effects is judged to be insignificant for metallic materials. Therefore, the aging of these components shall be based on their nonmetallic materials.

For many nonmetallic materials, it is known that the degradation process can be defined by a single temperature-dependent reaction that follows the Arrhenius equation (References 1 and 2):

$$k = A \exp\left(-(E_a/k_B\,T)\right) \qquad (1)$$

where,

k = reaction rate
A = frequency factor
exp = exponent to base e
E_a = activation energy
k_B = Boltzmann's Constant
T = absolute temperature

3.0 QUALIFICATION PROGRAM (CONTINUED)

3.3.1 Time-Temperature Effects (Continued)

It is further noted that, for many reactions, the activation energy can be considered to be constant over the applicable temperature range. Equation (1) can be transformed into a form which yields an acceleration factor.

The acceleration factor is defined as t_2/t_1.

The equation is:

$$t_2/t_1 = \exp\left(-(Ea/k_B)(1/T_1 - 1/T_2)\right) \qquad (2)$$

where,

t_1 = accelerated aging time at temperature T_1
t_2 = normal service time at temperature T_2
exp = exponent to base e
Ea = activation energy (eV)
k_B = Boltzmann's Constant (8.617×10^{-5} eV/^{o}K)
T_1 = accelerated aging temperature (^{o}K)
T_2 = normal service temperature (^{o}K)

The transformation of the reaction rate form of the Arrhenius equation to an acceleration form is accomplished as follows:

Life is assumed to be inversely proportional to the chemical reaction rate (References 1 and 2). In terms of life, and after converting to Napierian base logarithms, Equation (1) becomes:

$$\ln(\text{life}) = (Ea/k_B)(1/T) + \text{Constant} \qquad (3)$$

Equation (3) has the algebraic form:

$$y = mx + b \qquad (4)$$

where,

y = ln (life)
x = 1/T
m = Ea/k_B, constant for single dominant reactions
b = constant

The constants, m and b, can be estimated by fitting the experimental data in the form of ln (life) versus 1/T ito the above simple linear relationship.

3.0 QUALIFICATION PROGRAM (CONTINUED)

3.3.1 Time-Temperature Effects (Continued)

The derivation of an acceleration factor is accomplished by taking the difference between any two points of the linear relationship.

Thus, if we substitute t for life into Equation (3), we obtain:

$$\ln t = (Ea/k_B)(1/T) + \text{Constant} \qquad (5)$$

For the set of points (t_1, T_1), Equation (5) becomes:

$$\ln t_1 = (Ea/k_B)(1/T_1) + \text{Constant} \qquad (6)$$

For the set of points (t_2, T_2), Equation (5) becomes:

$$\ln t_2 = (Ea/k_B)(1/T_2) + \text{Constant} \qquad (7)$$

Subtracting Equation (6) from Equation (7) yields:

$$\begin{aligned}\ln t_2 - \ln t_1 = {} & (Ea/k_B)(1/T_2) + \text{Constant} \\ & - (Ea/k_B)(1/T_1) - \text{Constant} \qquad (8)\end{aligned}$$

Simplifying and rearranging of Equation (8) yields:

$$\ln (t_2/t_1) = -(Ea/k_B)(1/T_1 - 1/T_2) \qquad (9)$$

Taking antilogarithms yields:

$$t_2/t_1 = \exp (-(Ea/k_B)(1/T_1 - 1/T_2)) \qquad (10)$$

Equation (10) is the same as Equation (2).

The acceleration factor (t_2/t_1) is the reciprocal of the time compression factor, (t_1/t_2). Taking the reciprocal of Equation (10) yields:

$$t_1/t_2 = \exp ((Ea/k_B)(1/T_1 - 1/T_2)) \qquad (11)$$

Solving Equation (11) for t_1 yields:

$$t_1 = t_2 \exp ((Ea/k_B)(1/T_1 - 1/T_2)) \qquad (12)$$

3.0 QUALIFICATION PROGRAM (CONTINUED)

3.3.1 Time-Temperature Effects (Continued)

Equation (12) can be used to derive the accelerated aging times for materials with known activation energies. In many cases, it is not practical to independently accelerate the time-temperature effects of each nonmetallic material. In this case, a determination is made as to which material has the lowest activation energy. The time-temperature effects are accelerated based upon the lowest activation energy for conservatism. This assures that the degradation of each age-sensitive material is accelerated to at least the equivalent degradation as that to be encountered during the qualified life.

The conservatism of basing accelerated aging on the lowest activation energy is demonstrated as follows:

The acceleration factor (t_2/t_1) of Equation (10) is greater than 1, for a constant activation energy, when the accelerated aging temperature T_1 is greater than the normal service temperature T_2.

With T_1 greater than T_2, the term ($1/T_1 - 1/T_2$) is negative. This negative multiplied by the negative in the exponent results in a positive exponent. A positive exponent, in turn, results in an acceleration factor greater than 1.

The acceleration factor versus (1/T) for various activation energies is plotted in Figure 2. Since the slope of each plot is proportional to the activation energy, per Equation (4), it is shown that a lower activation energy causes a lower slope. Thus, for a given accelerated aging temperature, different activation energies cause different acceleration factors, assuming that the normal service temperature is the same. This is demonstrated in the following example.

EXAMPLE: Assume that a system consists of four (4) materials which have activation energies of 0.4, 0.8, 1.0, and 2.0 eV. It is assumed that each material is normally at a service temperature of 30°C for a qualified life of 40 years. It is further assumed that accelerated thermal aging shall be performed at 50°C.

If the accelerated aging program is based upon the material with an activation energy of 1.0 eV, the following results:

The relationship for the curves of Figure 1 is generated from Equation (10) and is defined as:

$$t_2/t_1 = \exp\left(-(Ea/k_B)(1/T_1 - 1/T_2)\right) \qquad (13)$$

3.0 QUALIFICATION PROGRAM (CONTINUED)

3.3.1 Time-Temperature Effects (Continued)

Substituting Ea = 1.0 eV, T_1 = 323°K, T_2 = 303°K, into Equation (13) yields an acceleration factor of approximately:

$$t_2/t_1 = 11 \quad (14)$$

Thus, for a normal service time of 40 years (t_2 = 40), the accelerated aging time from Equation (14) is:

$$t_1 = 40/11 = 3.64 \text{ years} \quad (15)$$

Therefore, using the accelerated thermal aging program of 50°C for 3.64 years, the equivalent demonstrated normal service times at 30°C for the other materials with activation energies of 0.4, 0.8, and 2.0 eV can be calculated using Equation (13).

Thus, for Ea = 2.0 eV,

$$t_2 = 3.64 \exp\ (-(2.0/8.617^{-5})(1/323 - 1/303)) \quad (16)$$

$$t_2 - 418 \text{ years} \quad (17)$$

For Ea = 0.8 eV,

$$t_2 = 3.64 \exp\ (-(0.8/8.617 \times 10^{-5})(1/323 - 1/303)) \quad (18)$$

$$t_2 = 24.3 \text{ years} \quad (19)$$

For Ea = 0.4 eV,

$$t_2 = 3.64 \exp\ (-(0.4/8.617 \times 10^{-5})(1/323 - 1/303) \quad (20)$$

$$t_2 = 9.4 \text{ years} \quad (21)$$

Thus, it is seen that materials with activation energies less than 2.0, upon which the aging program was based, are underaged by the accelerated aging of 50°C for 3.64 years.

In order to assure the demonstration of a 40-year service time for all materials, the lowest activation energy should be chosen.

Basing the accelerated aging program on the lowest activation energy of 0.4 eV results in the following:

3.0 QUALIFICATION PROGRAM (CONTINUED)

3.3.1 Time-Temperature Effects (Continued)

Substituting Ea = 0.4 eV, T_1 = 323°K, T_2 = 303°K, into Equation (13) yields an acceleration factor of approximately

$$t_2/t_1 = 2.6 \quad (22)$$

Thus, the aging time is:

$$t_1 = 40/2.6 = 15.4 \text{ years} \quad (23)$$

Rechecking the other materials for adequate aging results in the following for an accelerated aging program of t_1 = 15.4 years, T_1 = 323°K, T_2 = 303°K.

For Ea = 0.8 eV,

$$t_2 = 103 \text{ years} \quad (24)$$

For Ea = 1.0 eV,

$$t_2 = 165 \text{ years} \quad (25)$$

For Ea = 2.0 eV,

$$t_2 = 1{,}768 \text{ years} \quad (26)$$

Thus, it has been demonstrated that basing an accelerated thermal aging program on the lowest activation energy, when the baseline temperatures are common, provides the conservatism desired.

END OF EXAMPLE

For components with time-temperature-related aging mechanisms, the aging was based upon available auditable aging data.

Where adequate information was available, a determination of age sensitivity was performed to determine the qualified life goal. Those items found to be age insensitive are noted in the column entitled "Aging Mechanisms, Time-Temperature Effects," Table I. A reference was made for the conclusion of age insensitivity. These references are to paragraphs in this document which justify the conclusion, reference documents, or other basis, such as metallic materials.

3.0 QUALIFICATION PROGRAM (CONTINUED)

3.3.1 Time-Temperature Effects (Continued)

For nonmetallic materials, a determination was made as to whether the material can be qualified for a 40-year life. This was done by using the worst-case normal service temperature for the baseline temperature. Raychem WCSF shrink tubing and Mylar insulation were found to have an expected life of greater than 1×10^4 years and 3.1×10^7 years, respectively, at the predicted baseline temperature and can be considered age insensitive.

The applicable Arrhenius equation was evaluated, using the baseline temperature, as demonstrated by the following example:

EXAMPLE: The Arrhenius equation, Equation (3), is repeated:

$$\ln(\text{life}) = (E_a/k_B)(1/T) + \text{Constant} \tag{27}$$

A substitution shall be made for the applicable slope and constant and the equation evaluated, e.g., for glass-filled nylon (Zytel 70G33L), for mechanical properties, the Arrhenius curve is:

$$\ln(\text{life}) = 9969.197026\,(1/T) - 14.71269763 \tag{28}$$

For an assumed baseline temperature of 37.8°C:

$$T = 37.8^{\circ}C + 273^{\circ}C = 310.8^{\circ}K \tag{29}$$

$$\ln(\text{life}) = 9969.197026\,(1/310.8) - 14.71269763 \tag{30}$$

$$\ln(\text{life}) = 17.26 \tag{31}$$

$$\text{life} = \text{greater than } 3{,}900 \text{ years} \tag{32}$$

It is concluded that this glass-filled nylon can be qualified for 40 years at a baseline temperature of 37.8°C. END OF EXAMPLE

The applicable Arrhenius equation refers to the equation which is most appropriate to the material application when more than one equation is known.

For components with time-temperature-related aging mechanisms, the aging was based upon available auditable aging data, as noted in Table I.

3.0 QUALIFICATION PROGRAM (CONTINUED)

3.3.1 Time-Temperature Effects (Continued)

The baseline operating temperature has been defined by Carolina Power and Light Company to be:

Temperature	Percentage of Qualified Life
120°F	84%
88°F	16%

It is assumed that any heat rise in the cable has been included in the operating temperatures.

3.3.2 Relative Humidity

Relative humidity is not considered to be an aging mechanism for the cables and cable splice assemblies. For insulating systems, its effect is usually not the primary failure mechanisms, as noted in Reference 3, with respect to motor insulations: "However, in most cases, moisture plays only a secondary role in the failure. It does not produce the damage in the insulation--the insulation wears away or cracks for other reasons. Moisture merely provides a direct electrical pathway between these matured devices and ground.

Therefore, the ability of the cables and cable splice assemblies to perform within their relative humidity environment shall be demonstrated during Functional Tests at room ambient and when the safety-related characteristics are tested during the design basis event.

3.3.3 Aging Summary

The PVC cables and cable splice assemblies which require accelerated aging to 40 years shall be thermally aged for 382 hours at 100°C with uncontrolled relative humidity.

The PVC cables and cable splice assemblies which require accelerated aging to 20 years shall be thermally aged for 128 hours at 100°C with uncontrolled relative humidity.

Because these cables have been in service at the H. B. Robinson Nuclear Power Plant for 10 years, the aging temperature and durations equate to the required life goal minus 10 years. For example, the cables and cable splice assemblies with a 40-year life goal are thermally aged for 382 hours at 100°C which equates to an equivalent 30-year life. When combined with the 10 years of natural aging, a 40-year equivalent life is reached for the PVC cables.

3.0 QUALIFICATION PROGRAM (CONTINUED)

3.3.3 Aging Summary (Continued)

The aging temperature was based on the manufacturer's lowest maximum temperature and engineering judgment. The aging duration was based on the aging temperature and the lowest activation energy. For the cables and cable splice assemblies, this was 1.29 eV, which was the activation energy for the polyolefin (Raychem WCSF shrink tubing). Polyolefin is not considered age sensitive at the predicted baseline temperatures and would not normally be utilized to base an aging program. This lower activation energy was used to account for any potential synergism between polyvinyl chloride and polyolefin.

3.3.3.1 Optional Aging Program

The cables and cable splice assemblies which were added to the Qualification Program to provide for potential qualification of the CP&L cable splice(s) in the event of failure of the PVC cable require less than 100 hours at 100°C to equate to a 30-year life at the specified baseline operating temperatures. To optimize the Qualification Program, it is recommended that these cables and cable splice assemblies be thermally aged for 382 hours at 100°C. By doing this, the cable splice assembly could be utilized at an operating baseline temperature of 152 °F for 84% of its qualified life and 88°F for 16% of its qualified life. This would be significant for other applications where the heat rise in the cable could cause the baseline temperature to exceed 120°F.

3.3.4 Functional Test

The Baseline Functional Tests of Paragraph 3.1 shall be repeated.

3.4 Design Basis Event

3.4.1 Accident (LOCA)

The cables and cable splice assemblies shall be subjected for a period of 30 days to the LOCA profile of Figure 1 on a best-effort basis. The chemical spray shall be initiated within 5 seconds into the second ramp and continue for the remainder of the test. The composition of the chemical spray is as follows:

- o Boric Acid (.28 molar)
- o Sodium Thiosulphate (.064 molar)
- o Sodium Hydroxide (as required to make a pH of 10.5 at 77°F)

The chemical spray shall be sprayed vertically downward at a rate of 0.15 (gal/min)/ft^2 of area of the test chamber projected onto a horizontal plane.

3.0 QUALIFICATION PROGRAM (CONTINUED)

3.4.1.1 Test Mounting and Orientation

The cables and cable splice assemblies shall be placed on a Wyle-supplied steel cable tray and inserted into a Wyle LOCA chamber. The cables shall be located in such a manner as to ensure the cable splice assemblies are parallel to the floor of the cable tray (refer also to Paragraph 1.3.1). Penetrations shall be utilized along the LOCA chamber wall to allow for passage of the cable. All penetrations shall be potted with Scotchcast 9 epoxy.

3.4.1.2 Instrumentation

The chamber pressure shall be measured with a pressure transducer in combination with a pressure gauge. The temperature of the chamber shall be measured through the use of three (3) thermocouples connected in parallel located inside each LOCA chamber. The thermocouples shall be positioned in the chamber in such a way as to be within 2 inches of the test specimen. Paralleling means taking an average of three (3) thermocouples so that a single chamber temperature can be utilized for recording purposes.

The flow rate of the chemical water shall be recorded daily by measuring the differential pressure across the spray nozzle. The pH of the chemical spray will be recorded prior to each ramp and on a daily basis thereafter. The chamber temperature and pressure shall be recorded on a datalogger at 30-minute intervals, except during ramps, when it shall be operated at its peak rate. The chamber temperature shall be continuously recorded, utilizing a pen chart recorder.

3.4.1.3 Electrical Powering

Electrical powering of 480 VAC (± 10%), 60 Hz shall be provided to power the cables. This input voltage shall be wired in parallel to the cables. Each conductor shall be wired in series with the other conductor(s) in the individual cables. The current within an individual cable shall be limited to 20 mA (± 10%) through the use of current-limiting resistors.

3.0 QUALIFICATION PROGRAM

3.4.1.4 Electrical Monitoring

Twenty-five (25) electrical monitoring channels shall be recorded on a datalogger to monitor the electrical operation of the test items. These channels shall be utilized to monitor the input voltage --480 VAC $\pm$ 10%, 60 Hz--(1 channel) and the current (20 mA $\pm$ 10%) of each cable (24 channels).

Two (2) channels on the datalogger shall be provided for recording chamber pressure and temperature. These readings shall be recorded at 30-minute intervals, except during the ramps, when the datalogger will be operated at its peak rate. A pen chart recorder shall be used to continuously monitor chamber temperature.

An insulation resistance test between the conductor of each cable and ground, as described in Paragraph 3.1.2.2, shall be performed at each temperature peak and every week until termination.

3.5 In-Process Inspection

The test items shall be examined for possible damage following all severe tests. All important test effects shall be logged.

Photographs shall be taken of any noticeable physical damage that may occur.

All instrumentation to be used in the performance of this test program shall be calibrated in accordance with Wyle Laboratories' Quality Assurance Policies and Procedures Manual, which conforms to the applicable portions of ANSI N-45.2, 10 CFR 50/Appendix B, and Military Specification MIL-C-45662A. Standards used in performing all calibrations are traceable to the National Bureau of Standards.

3.6 Report

Ten (10) copies of the test report shall be issued, describing the qualification requirements, procedures, and results. The report shall also include rationale and justification required for the qualification. The report shall be prepared in accordance with the requirements of IEEE 323-1974.

3.0 QUALIFICATION PROGRAM (CONTINUED)

3.7 References

1) IEEE 101-1972, "IEEE Guide for the Statistical Analysis of Thermal Life Test Data," Library Code 265-80

2) Handbook Of Engineering Fundamentals, Wiley, 1975, Library Code 247-80

3) Industrial Motor Users' Handbook of Insulation for Rewinds, L. J. Rejda and Kris Neville, Elsevier, 1977, Library Code 255-80

4) "Insulations and Jackets for Control and Power Cables in Thermal Reactor Nuclear Generating Stations," Robert B. Blodgett and Robert G. Fisher, May, 1969, Library Code 226-79

5) "Raychem Engineering Data on WCSF," Raychem Corporation Final Report No. F-C4033-3, Library Code 328-80

6) "Raychem Corporation WCSF Thermal Aging Data," EDR-2001, Library Code 360-80

7) International Journal of Polymeric Materials, Vol. 2, No. 1, October, 1971, p. 181, Library Code 042-78

8) "The Effect of Nuclear Radiation on Elastomeric and Plastic Materials," Battelle Radiation Effects Center, REIC Report No. 21, September 1, 1961, R. W. King, et. al., Library Code 286-80

9) General Electric Advertisement, January, 1978, Issue of Insulation Circuits, Library Code 031-78

10) "Thermal Degradation of Polymers at High Temperature," Samuel L. Madorsky and Sidney Straus, Journal of Research of the National Bureau of Standards, Library Code 134-78

11) "The Effects of Radiation on Electrical Insulating Materials," REIC Report No. 46, Library Code 299-80

MATERIALS	ACTIVATION ENERGY (eV)	APPLICATION	AGING MECHANISMS: TIME/ TEMPERATURE EFFECTS	AGING MECHANISMS: RADIATION DAMAGE THRESHOLD	AGING MECHANISMS: CYCLIC LIFE GOAL
ious, as described ow		Connection	X	X	N/A
yvinyl Chloride	1.39 (Ref 7)	Insulation	X	5 x 10^5 (Ref 4)	
ar	1.51 (Ref 9)	"	NAS (Para. 3.3.1)	4.4 x 10^6 (Ref 8)	
per		"	NAS (Metallic)		
ss		"	NAS (Inorganic)		
yvinyl Chloride	1.39 (Ref 7)	"	X	5 x 10^5 (Ref 4)	
per		Connection	NAS (Metallic)		
rious, as described low		"			
		"	X		
n-Plated Copper		Mechanical	NAS (Metallic)		
"		"	"		

o the aging mechanism.

TABLE I. AGING MATRIX (CONTINUED)

Item No.	ITEM AND MANUFACTURER	MANUFACTURER'S RATING ENVIRONMENTAL AND OPERATIONAL	MATERIALS	ACTIVATION ENERGY (eV)	APPLICATION	AGING MECHANISMS: TIME/ TEMPERATURE EFFECTS	AGING MECHANISMS: RADIATION DAMAGE THRESHOLD	AGING MECHANISMS: CYCLIC LIFE GOAL
2.1.3	Insulator		Kynar (Polyvinylidene Fluoride)	2.08 (Ref 10)	Insulation	X	1×10^7 (Ref 11)	
2.2	Shrink Tubing, Raychem WCSF	90° Cont.	Polyolefin	1.29 (Ref 6)	"	NAS (Para. 3.3.1)	Useful up to 2×10^8 (Ref 5)	

LEGEND: NAS = Not Age Sensitive; X = Material is sensitive to the aging mechanism.

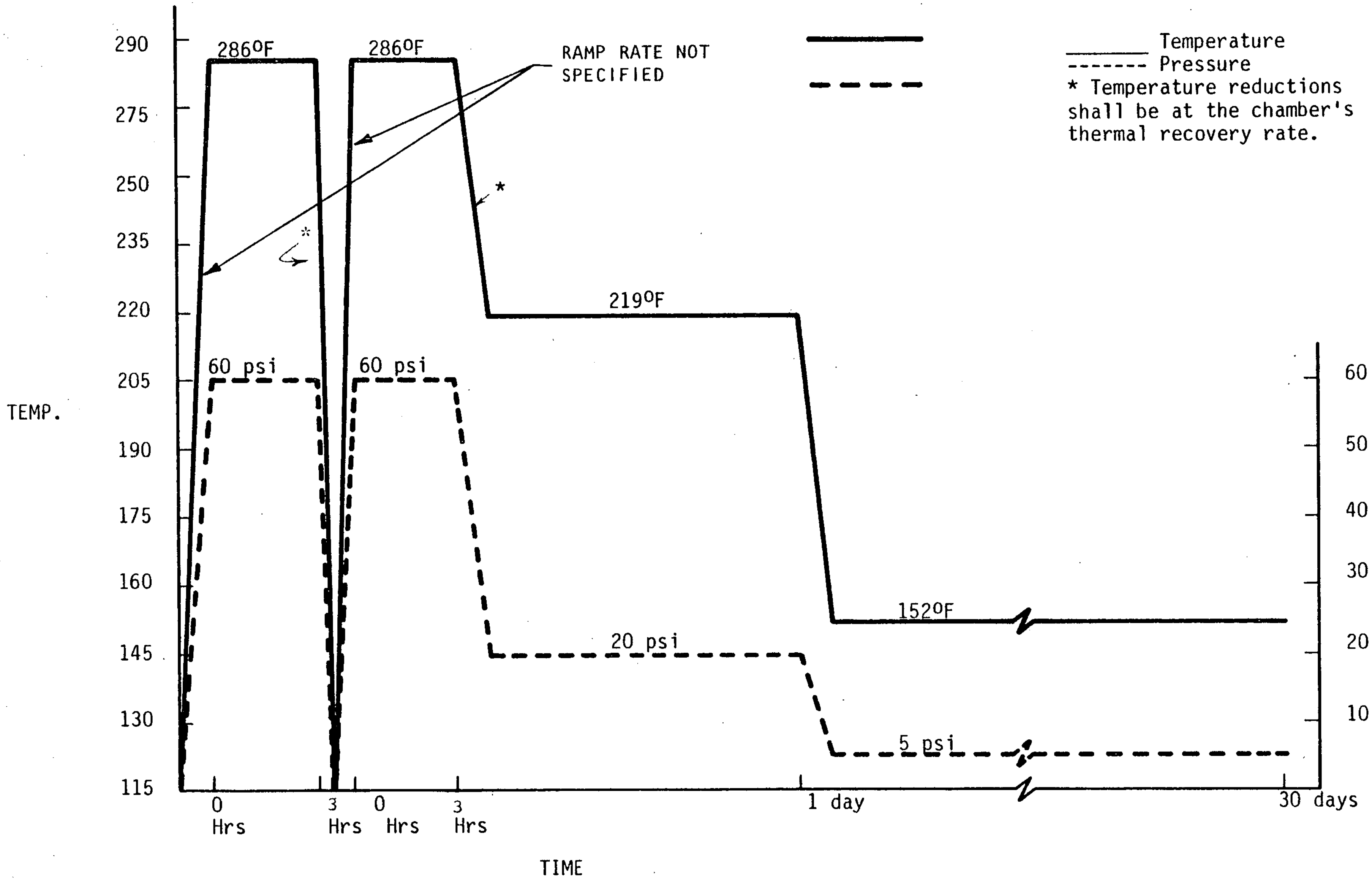

FIGURE 1. LOCA CURVE

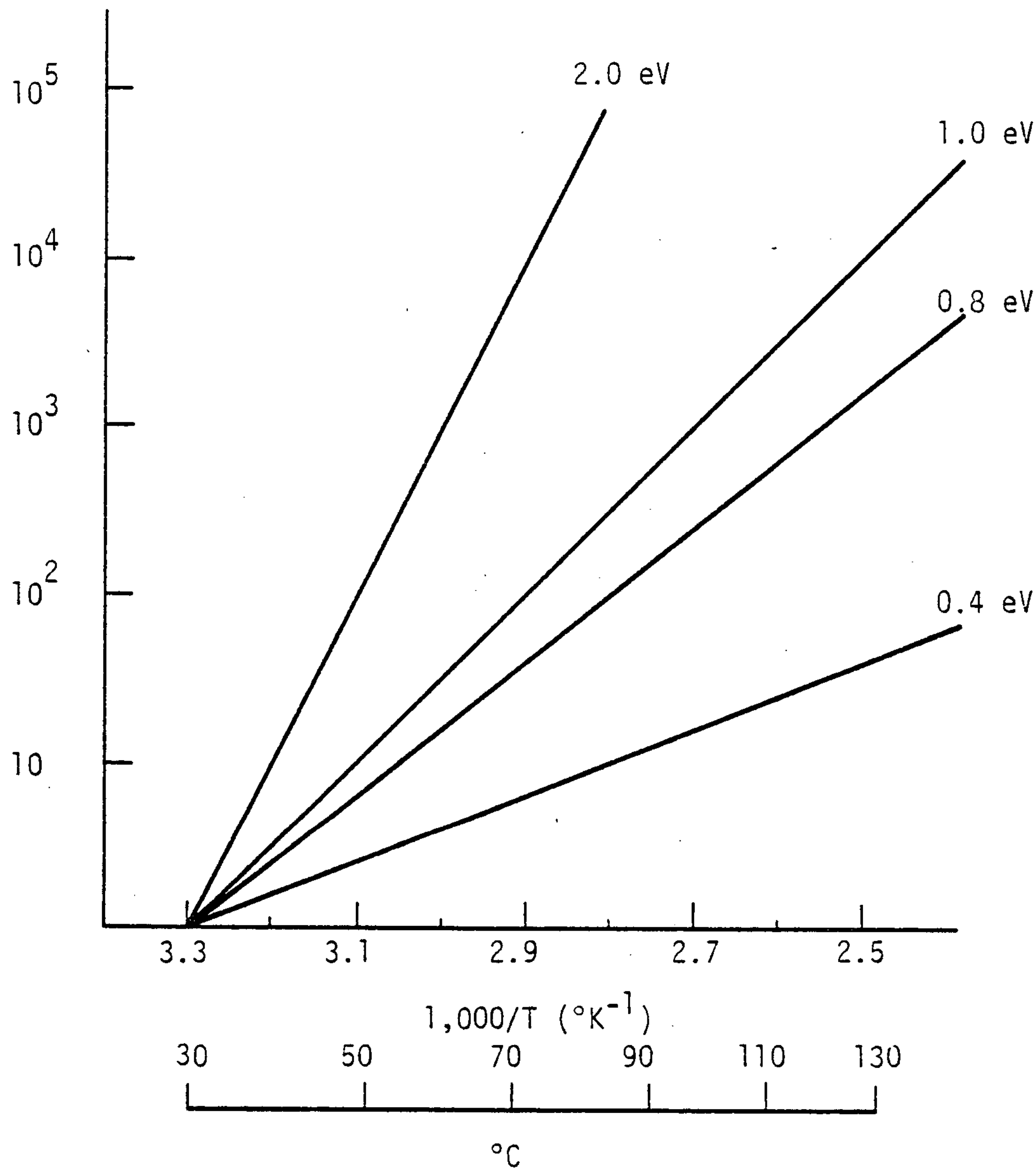

FIGURE 2. ACCELERATION FACTOR VERSUS (1/T) FOR ACTIVATION ENERGIES OF 0.4, 0.8, 1.0, and 2.0 eV

TEST PROCEDURE

WYLE LABORATORIES
SCIENTIFIC SERVICES AND SYSTEMS GROUP
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TEST PROCEDURE NO. 45307-1

DATE: September 8, 1980

RADIATION TEST PROCEDURE
FOR
INCONTAINMENT CABLES
FOR
CAROLINA POWER AND LIGHT

APPROVED BY: [signature]
FOR: Qualification Plan Development

APPROVED BY:
FOR:

APPROVED BY:
FOR:

APPROVED BY PROJECT MANAGER: Robert A. Hall
Robert A. Hall

APPROVED BY QUALITY ENGINEER: Marvin J. Kimbrell

PREPARED BY PROJECT ENGINEER: David Stinson
David Stinson

REVISIONS

FORM 1054-1 Rev. 4/74

REV. NO.	DATE	PAGES AFFECTED	BY	APP'L.	DESCRIPTION OF CHANGES

1.0 PURPOSE

The purpose of this procedure is to define the requirements and test procedure for Baseline Functional Tests, Radiation Functional Tests and the Sequence of Tests.

2.0 TEST ITEMS

2 - Conductor #16, shielded
4 - Conductor #16, shielded

3.0 TEST SEQUENCE

The tests to be performed per this procedure will be performed in the following sequence:

- o Baseline Functional Tests
- o Radiation Exposure
- o Functional Tests

4.0 Baseline Functional Tests

4.1 Pretest Visual Inspection

A visual inspection of the equipment will be performed upon arrival at Wyle Laboratories. This inspection will assure that the equipment is received with no obvious visible damage. Equipment identification will also be verified.

4.2 Insulation Resistance

Measure insulation resistance between each conductor and ground (plane) at 500 VDC for 1 minute minimum.

4.3 Dielectric Strength

Measure dielectric strength between all conductors and ground at 1,250 VAC, 60 Hz, single-phase for 1 minute with tester set at 0.5 milliamperes.

4.4 Continuity

Measure continuity of each conductor using an ohm meter or equivalent.

5.0 ACCEPTANCE CRITERIA

Acceptance criteria for the cable will be per the following paragraphs.

5.1 Insulation Resistance

1 megohm minimum at 500 VDC.

5.0 ACCEPTANCE CRITERIA (CONTINUED)

5.2 Dielectric Measurement

1,250 VAC, 60 Hz, single-phase, for 1 minute with tester set at 0.5 milliamperes. There should be no breakdown.

5.3 Continuity

Each cable must be continuous.

6.0 RADIATION

6.1 Radiation Exposure

Each component in the equipment has been reviewed in order to ascertain all materials. Evaluation has been made of the function of the component materials. This information has been compared to auditable data to determine the susceptibility of the material in its application to the radiation exposure level specified.

Radiation damage threshold levels for the non-metallic materials are: Polyvinyl Chloride: 2×10^7; Mylar: 1×10^6

Because of the threshold damage levels that are less than the radiation requirement of 1.54×10^7 rads gamma, defined by Carolina Power and Light, radiation exposure is warranted to confirm the capability of the cables to perform their safety-related function after radiation exposure.

6.2 Procedure for Radiation

The cables will be placed in a Wyle supplied cable tray and restrained to prevent excessive movement. The cable tray will then be placed in a "hot cell" and irradiated to the required dose of 1.54×10^7 rads gamma air equivalent radiation from a Cobalt 60 source. The dose rate is not to exceed 1×10^6 rads per hour.

7.0 FUNCTIONAL TEST

The Baseline Functional Tests of Paragraph 3.1, except the Pretest Visual Inspection of Paragraph 3.1.1, will be repeated.

TEST PROCEDURE

WYLE LABORATORIES
SCIENTIFIC SERVICES AND SYSTEMS GROUP
P. O. BOX 1008 • HUNTSVILLE, ALABAMA 35807
TWX (810) 726-2225 • TELEPHONE (205) 837-4411

TEST PROCEDURE NO. 45307-2

DATE: August 28, 1981

TEST PROCEDURE

FOR

CABLES AND CABLE SPLICE ASSEMBLIES

FOR

CAROLINA POWER AND LIGHT COMPANY

FOR USE IN

H. B. ROBINSON NUCLEAR POWER PLANT

APPROVED BY: James Marcomet
FOR: Environmental Qualification

APPROVED BY:
FOR:

APPROVED BY:
FOR:

APPROVED BY PROJECT MANAGER: J. F. Gleason
J. F. Gleason

APPROVED BY QUALITY ENGINEER: M. Kimbrell
M. F. Kimbrell

PREPARED BY PROJECT ENGINEER: David Stinson
K. D. Stinson

REVISIONS

FORM 1054-1 Rev. 4/74

REV. NO.	DATE	PAGES AFFECTED	BY	APP'L.	DESCRIPTION OF CHANGES

1.0 PURPOSE

The purpose of this Test Procedure is to further demonstrate the operability of the Cables and Cable Splice Assemblies following a post-LOCA simulation.

2.0 APPLICATION QUALIFICATION STANDARDS AND DOCUMENTS

- IEEE 383-1974, "IEEE Standard for Type Test of Class 1E Electrical Cables, Field Splices, and Connections for Nuclear Power Generating Stations"
- Wyle Laboratories Report No. 45307-1, "Final Qualification Plan for In-Containment Cables and Cable Splice Assemblies for Carolina Power and Light"

3.0 TEST SPECIMEN DESCRIPTION

The test specimens are as follow:

- One (1) 4-conductor Wyle-supplied cable with the CP&L approved splice
- One (1) 2-conductor PVC-insulated, PVC-jacketed cable with the Raychem approved splice

This program design allows for the cables aged to an equivalent 40-year life with both types of splice assemblies to be subjected to additional testing, if desired.

4.0 FUNCTIONAL TEST

The functional tests to be performed on the subject cables are as follow:

1) Coil the cables around a metal mandrel with a diameter of approximately 40 times the overall cable diameter.

2) Immerse the cable in tap water at room ambient temperature.

3) Measure insulation resistance between each conductor and ground (plane) at 500 VDC for 1 minute (minimum).

4) Measure dielectric strength between all conductors and ground at 1,250 VDC, 60 Hz, single-phase, for 1 minute. Record the current.

5) Verify the continuity of each conductor, using an ohmmeter or equivalent.

5.0 ACCEPTANCE CRITERIA

The acceptance criteria for the instrumentation cables and cable splice assemblies are as follow:

1) The insulation resistance shall not be less than 1 megohm.

2) There shall be no breakdown or flashover during the dielectric withstand.

3) The cable must be continuous.

6.0 POST-TEST INSPECTION

Following completion of the functional tests, the test items shall be examined and color photographs taken. Additionally, an internal visual inspection shall be made of the CP&L and the Raychem approved cable splice assembly. The Raychem material shall be dissected so that the insulated butt connector can be viewed. Color photographs shall be taken and the condition of all components documented.