

Facility: Browns Ferry Nuclear Plant Unit: 3

SYSTEM COMPONENT EVALUATION WORK SHEET (Rev 2)

Docket: 50-296

EEB-74-0001 Sheet No. Revision 0 Date 10-22-80

(3)

EQUIPMENT DESCRIPTION	ENVIRONMENT			DOCUMENTATION REF		QUALIFICATION METHOD	OUTSTANDING ITEMS	
EQUIPMENT DESCRIPTION	Parameter	Specifi- cation	Qualifi- cation	Specifi- cation	Qualifi- cation			
System: 74 Plant ID No. Attachment A	Operating Time	Attachment A	l Year	(1)	Attachment C.5	Engineering Analysis	None	
Component Cable - WBB 1/c, #12 AWG (PNJ) Manufacturer:Attachment B	Temperature (°F)	325	153	(4)	Attachments C.2 and C.3	Attachment C.4	None	
Model Number: N/A	Pressure (PSIA)	69.7	N/A	(4)	N/A	N/A	None	
Function: Control/Power	Relative Humidity (%)	100	100	(4)	IPCEA S-51-402 par 3.9, 3.7.3, 6.7	Standard Material Requirement	None	
Accuracy: Req'd: N/A Demon: N/A Category: Attachment A	Chemical Spray	N/A	N/A	(4)	N/A	N/A	None	
Service: Attachment A	Radiat'on (RAD)	6.5x10 <sup>7</sup> 8 4x10 <sup>9</sup> 8 Attach. C.1	4×10 <sup>7</sup>	(4)	NUREG-0588 Materials List	Generic Material Test	None	
Location: 0	Aging	N/A	10 years	(2)	Attachment C.3	Dper, Experience	None	
Flood Level Elev: 552' Above Flood Level: Yes≭ No	Submergence	N/A	N/A	(4)	N/A	. N/A	None	

Notes: (1) See Section 2.4 in 79-01B report.

(2) See Section 4.1.2 in 79-01B report.

(3) All notes and other information not on these sheets are on the attached appendix sheets.

(4) See Section 3.0 and/or Appendix B in 79-01B report.

Prepared by: Holmanouski Reviewed by: Afulanu Reviewed by

QA Acceptance:

System: 74			EEB -74-0001
Unit: 3	5		. Rev 0
Component: Cable, 1/C, #12 Mark: WBB	2 AWG PN		
Plant I. D. No. Room	Eunction/Service	Category	Operating Time
3ES1182-I 3ES3687-II 3ES3678-II	FCV-74-47 Control FCV-74-47 FCV-74-47	A	1 Year

# EEB -74-0001

Rev 0

- itin

### ATTACHMENT B

Mark WBB \*

ł.

4

14 an 14 an

The.

3

\* \*

Contract No.

Туре

67C3-91618 73C7-84528 72C7-75328-1 70C7-54179-1

11

PN PN PN PN

### Manufacturer

Brand-Rex Plastic Wire & Cable Corp Brand-Rex Brand-Rex

Sheet No: EEB- 74-0001

Revision: 0

### ATTACHMENT C

C.1 Integrated Dose - 10 years plus accident

#### Beta Dose

References:

- 1. W. W. Parkinson, O. Sisman, October 1970, The Use of Plastics and Elastomers in Nuclear Radiation.
- R. B. Blodgett, R. G. Fisher, June 1968, Insulations and Jackets for Control and Power Cables.
- M. Asaka, S. Yamamoto, 1973, Radiation Resistance of Plastic Insulating Materials for Cable.
- Anaconda-Continental Test Report No. 79117 dated April 1979.
- 5. Wyle Laboratory Test Report 43854-3.
- Franklin Institute Test Reports E-C4113 and FC-5120.
- 7. Rockbestos Company Test Report dated July 1977 amended 1979.

The TVA value of  $4 \times 10^9$  rads for the beta accident dose at the periphery of the containment is being reevaluated due to its high value. However, using this value and making reference to the 7901-B DOR guidelines section 4.2.1 and the depth dose penetration, which owing to the low penetrating power of beta particles gives a factor of 10 reduction for 40 mils of jacketing material, and a factor of 10 for an insulation thickness of 30 mils and which is conservative for TVA's 600-volt power and control cables and extremely conservative for TVA's triax and coax and signal cable due to their thickness and the presence of metallic shielding of metal trays, conduit, boxes, and flexible conduit, we arrive at a total effective dose of .8  $\times 10^7$  rads of beta.

Since the energy dissipation of gamma radiation occurs via ionizing processes, one can add the accident dose of  $4 \times 10^7$  rads of gamma directly. The accumulated integrated gamma 10-year dose (the time presently assigned to connectors and penetrations) amounts to 2.5 x 10<sup>7</sup> rads which added directly gives a total dose of 7.3 x 10<sup>7</sup> rads. In addition, since the containment is inerted in operation, the scission rate and deterioration of the insulation and jacketing materials through oxidation will be much less than for tests conducted in air.

Sheet No: EEB 74-00:01

Revision:

### ATTACHMENT C (Continued)

C.1 (Continued)

Since the above value of 7.3 x  $10^7$  is less than the values for which we have in-air test data for SROAJ types  $(1.2 \times 10^8)$  and for XLPE types  $(2 \times 10^8)$ , it is concluded that the beta dose in an accident will not disqualify the cables presently installed, and the cables will remain operable in the service environment.

C.2 IPCEA S-61-402 Paragraph 3.9 and Appendix D

C.3 TVA Engineering Report No. 1943

Cable types: PJ, PN, PNJ, PJJ, PSJ

Room: 0

This class of cables was purchased under TVA Standard Specification No. 25.013, based on IPCEA S-61-402 (NEMA WC5). These standards provide a product with an operating rating of 75° C continuous,  $95^{\circ}$  C ( $203^{\circ}$  F), 500-hour overload rating total in a normal lifetime. They are constructed of polyethylene insulation with Nylon and PVC jacketing.

The jacket material has a higher retention of strength at elevated temperature. The in-containment SLB temperature and duration exceeds the cable ratings and the insulation and jacket distortion temperatures.

However, the service which these cable have seen thus far has exposed them to a gamma radiation dose of 6.25 x 10° rads or more. This is sufficient to have cross-linked the polyethylene and PVC as well. Consequently, the insulation is now in fact a thermoset material and is capable of the same temperature that TVA's cross-linked polyethylene insulated cable has demonstrated and is capable of withstanding the LOCA/ SLB and the post-LOCA environment of 1 year. Thus, continued operation is justified.

TVA has prepared a LOCA/SLB, thermal aging, and radiation test procedure to be performed by Wyle Laboratories on samples of this cable to demonstrate the validity of this conclusion. Results of this testing program are expected to be available in April 1981.

C.4 Temperature Qualification Method

C.4.1 Standard material long-term overload temperature rating

C.4.2 Engineering analysis



SYSTEM COMPONENT EVALUATION WORK SHEET (Rev 2)

acility: Browns Ferry Nuclear Plant Init: 3

12

Date 10/22/80 iccket: 50-296 OUALIFICATION OUTSTANDING DOCUMENTATION REF ENVIRONMENT ITEMS METHOD EQUIPMENT DESCRIPTION Qualifi-Specifi-Specifi-Oualification cation cation Parameter cation None Engineering Attachment ystem: 74 1 Year Operating Attachment A Analysis C.4 'lant ID No. Attachment A Time (1)Cable WBB :omponent 1/c, #12AWG, (PNJ) Attachments None Temperature C.1 and C.2 Attachment C.3 'anufacturar: Attachment B 153 (4) 292 (°F) 81 Jul Pressure todel Number: N/A (PSIA) (4)N/A None 15.0 N/A N/A Standard unction: Control/Power LPCEA S-61-402 car 3.9. 3.7.3 Material Relative None Requirement 6.7 Humidity (%) (4)100 100 .ccuracy: Reg'd: N/A Demon: N/A Chemical Spray None N/A (4) ategory: Attachment A N/A N/A N/A NUREG-0588 Generic ervice: Attachment A Material Materials Radiation 3x107 None 4x107 (4) Test List (RAD) ocation: Room 2 Attachment C.2 Oper, Experience None (2) Aging N/A 20 years lood Level Elev: 552' N/A N/A bove Flood Level: Yes X Submergence N/A None N/A (4)No

(1) Sie Section 2.4 in 79-01B report. otas:

- (2) See Section 4.1.2 in 79-01B report.
- (3) All notes and other information not on these sheets are on the attached appendix sheets.
- (4) See Section 3.0 and/or Appendix B in 79-01B report.

(3)

Revision

Sheet No. EEB 74-0002

0

Prepared by: H.D. Romenouslifter Reviewed by: MBradley

QA Acceptance:

EEB 74-0002

Rev O

System: 74 Unit: 3

Component: Cable 1/c #12 Mark: WBB

Plant I. D. No. Room		Function/Service	Category	Operating Time
3R3264	2	MIS-74-137A PMP RM Humidity Cont	A	1 Year
3R3263 3R3256 3R3262	2 2 2	ME-74-137A MIS-74-137B TTS-74-136A A/C femp Control		

45

EEB 74-0002

Rev O

a inte

-

### ATTACHMENT B

Mark WBB

1.1

n di ka La <sup>n</sup> Ata

1

See.

Contrar No.

67C3-91618 73C7-84528 72C7-75328-1 70C7-54179-1 Type

PN

PN .

## Manufacturer

Brand-Rex Plastic Wire & Cable Corp Brand-Rex Brand-Rex

Sheet No.: <u>EEB-74-002</u> Revision: 0

### ATTACHMENT C

C.1 IPCEA S-61-402 Paragraph 3.9 and Appendix D

C.2 TVA Engineering Report No. 1943

Cable types: PJ, PN, PNJ, PJJ, PSJ

Rooms 1-18

This class of cables was purchased under TVA Standard Specification No. 25.013, based on IPCEA S-61-402 (NEMA WC5). These standards provide a product with an operating rating of 75° C continuous,  $95^{\circ}$  C (203° F), 500-hour overload rating total in a normal lifetime. They are constructed of polyethylene insulation with Nylon and FVC jacketing.

The jacket material has a higher retention of strength at elevated temperatures, as the material was subjected to air oven aging of 121°C ( $250^{\circ}$  F) for 7 days. Only compartments 1, 2, 3, 6, 9, 10, and 11 show HELB profiles which more than briefly surpass the softening temperature of the insulation. However, owing to the thermal time lags in the cable material and cable installation, the insulation nor even the jacket experience the temperature profile until some time has elapsed.

TVA has conducted tests (Chattanooga Central Laboratories Report No. 81L-81-6821 dated October 1980, of these cables under a temperature profile which envelopes all the HELB profiles. Following this exposure these samples sustained a dielectric test immersed in water of 660 volts ac for 6 minutes, 960 volts ac for 5 minutes, and 2200 volts for 5 minutes in succession.

It is therefore our engineering judgment that this test confirms the above and justifies interim operation until these types can be fully qualified by our Wyle Laboratory tests to be concluded next April or replaced at the next refueling outage.

C.3 Temperature Qualification Method

C.3.1 Standard material long-term overload temperature rating

C.3.2 Engineering Analysis

Prepared by:\_\_\_\_\_

Reviewed by:

QA Acceptance:

C.4 The post-HELB conditions are less than the normal cable rating and, in our judgment, the cables could operate satisfactorily for a post-accident of a year.



SYSTEM COMPONENT EVALUATION WORK SHEET (Rev 2)

'acility: Browns Ferry Nuclear Plant Init: 3 200

1.1

iys 11

:0!

'a:

10

้น

.C

Sheet No. EEB 74-0003 Revision O

(3)

cket: 50-296			•			Date 10/22/8	0	
	ENVIRONMENT			DOCUMEN	TATION REF	QUALIFICATION METHOD	OUTSTANDING ITEMS	
EQUIPMENT DESCRIPTION	Parameter	Specifi- cation	Qualifi- cation	Specifi- cation	Qualifi- cation	Hemos		
vstem: 74 lant ID No. Attachment A	Operating Time	Attachment A	l Year	(1)	Attachment C.4	Engineering Analysis	None	
omponent Cable WBB 1/c, #12AWG, (PNJ) anufacturer:Attachment B	Temperature	294	153	(4)	Attachments C.1 and C.2	Attachment C.3	None	
odel Number: N/A	Pressure (PSIA)	15.0	N/A	(4)	N/A	N/A	None	
unction: Control/Power	Relative Humidity (%)	100	100	(4)	IPCEA S-61-402 par 3.9, 3.7.3 6.7		None	
ccuracy: Req'd: N/A Demon: N/A ategory: Attachment A	Chemical Spray	N/A	N/A	(4)	N/A	N/A	None	
ervice: Attachment A	Radiation (RAD)	$3 \times 10^{7}$	4x10 <sup>7</sup>	(4)	NUREG-0588 Materials List	Generic Material Test	None	
ocation: Room 5	Aging	N/A	20 years	(2)	Attachment C.2	Oper, Experience	None	
lood Level Elev: 552' bove Flood Level: Yes X	Submergence	N/A	N/A	(4)	N/A .	N/A	None	

(1) See Section 2.4 in 79-018 report. otes:

- (2) See Section 4.1.2 in 79-01B report.
- (3) All notes and other information not on these sheets are on the attached appendix sheets.
- (4) See Section 3.0 and/or Appendix B in 79-01B report.

Prepared by: <u>H & Romenewski/AR</u> Reviewed by: <u>Albradley</u>

QA Acceptance:

System: 74 Unit: 3

Component: Cable 1/c #12 Mark: WBB

Plant I. D. No. Room 3R3254 5 Function/Service TTS-74-136B B/C TEMP CONTROL

ħ.

EEB-74-0003 Rev 0

Category Operating Time A 1 Year

# EEB \_ 74-0003

Rev O

18.0

. int

-

÷.

### ATTACHMENT B

Mark WBB

3

### Contract No.

73C7-84528 72C7-75328-1

7007-54179-1

67C3-91618

Туре

PN PN PN

PN

### Manufacturer

Brand-Rex Plastic Wire & Cable Corp Brand-Rex Brand-Rex

Sheet No.: \_\_\_\_\_\_\_ EZB- 74-003

Revision: 0

#### ATTACHMENT C

C.1 IPCEA S-61-402 Paragraph 3.9 and Appendix D

C.2 TVA Engineering Report No. 1943

Cable types: PJ, PN, PNJ, PJJ, PSJ

Rooms 1-18

This class of cables was purchased under TVA Standard Specification No. 25.013, based on IPCEA S-61-402 (NEMA WC5). These standards provide a product with an operating rating of 75° C continuous, 95° C (203° F), 500-hour overload rating total in a normal lifetime. They are constructed of polyethylene insulation with Nylon and PVC jacketing.

The jacket material has a higher retention of strength at elevated temperatures, as the material was subjected to air oven aging of  $121^{\circ}$  C ( $250^{\circ}$  F) for 7 days. Only compartments 1, 2, 3, 6, 9, 19, and 11 show HELB profiles which more than briefly surpass the softening temperature of the insulation. However, owing to the thermal time lags in the cable material and cable installation, the insulation nor even the jacket experience the temperature profile until some time has elapsed.

TVA has conducted tests (Chattanooga Central Laboratories Report No. 81L-81-6821 dated October 1980, of these cables under a temperature profile which envelopes all the HELB profiles. Following this exposure these samples sustained a dielectric test immersed in water of 660 volts ac for 6 minutes, 960 volts ac for 5 minutes, and 2200 volts for 5 minutes in succession.

It is therefore our engineering judgment that this test confirms the above and justifies interim operation until these types can be fully qualified by our Wyle Laboratory tests to be concluded next April or replaced at the next refueling outage.

C.3 Temperature Qualification Method

C.3.1 Standard material long-term overload temperature rating

C.3.2 Engineering Analysis

C.4 The post-HELB conditions are less than the normal cable rating and, in our judgment, the cables could operate satisfactorily for a post-accident of a year.

> Prepared by:\_\_\_\_\_ Reviewed by:\_\_\_\_\_ QA Acceptance:\_\_\_\_\_



(3) SYSTEM COMPONENT EVALUATION WORK SHEET (Rev 2) EEB 74-0004 Sheet No. acility: Browns Ferry Nuclear Plant Revision 0 Init: 3 locket: 50-296 Date 10/22/80 OUTSTANDING QUALIFICATION DOCUMENTATION REF **ENVIRONMENT** METHOD ITEMS EQUIPMENT DESCRIPTION Qualifi-Specifi-Qualifi-Specification cation cation Paraceter cation Engineering None vstem: 74 Attachment 1 Year Operating Attachment A Analysis C.4 lant IO No. Attachment A Time (1)component Cable WBB 1/c, #12AWG, (PNJ) Attachments None Temperature (°F) Attachment C.3 C.1 and C.2 lanufacturar: Attachment B 153 (4) 157 Pressure odel Number: N/A (PSIA) (4)None N/A 15.0 N/A N/A IPCEA S-61-402 Standard unction: Control/Power Material par 3.9, 3.7.3 Relative None Requirement 6.7 Humidity (%) (4)100 100 ccuracy: Reg'd: N/A Demon: N/A Chemical Spray None (4)N/A ategory: Attachment A N/A N/A N/A Generic NUREG-0588 ervice: Attachment A Material Materials Radiation None 4x107 (4) Test  $2.1 \times 10^{7}$ (RAD) List ecation: Room 8 Attachment C.2 Oper, Experience None N/A (2) Aging 20 years lood Level Elev: 552' N/A Submergence bove Flood Level: Yes X N/A N/A None N/A (4)No

(1) See Section 2.4 in 79-018 report. otes:

- (2) See Section 4.1.2 in 79-018 report.
- (3) All notes and other information not on these sheets are on the attached appendix sheets.
- (4) See Section 3.0 and/or Appendix B in 79-01B report.

Prepared by: <u>H.D. Romenowskiller</u> Reviewed by: <u>ABradlige</u>

QA Acceptance:

EEB-74-000 4 Rev 0

System: 74 Unit: 3

Component: Cable 1/c #12 Mark: WBB

Plant I. D. No.	Room	Function/Service	Category	Operating Time		
3ES3690-II	8	FCV-74-101FSV-23-56 SUPPLY	A	l Year		
3ES3687-II	8	FCV-74-47 Cont	A	1 Year		

1

1.

EEB \_74-0004

Rev O

die

- inte

÷.

1

1. 1

### ATTACHMENT B

Mark WBB

14

10

Contract No.

67C3-91618 73C7-84528 72C7-75328-1 7.0C7-54179-1 PN PN PN PN PN

### Manufacturer

Brand-Rex Plastic Wire & Cable Corp Brand-Rex Brand-Rex

Sheet No.: EEB-74-0004

Revision: 0

### ATTACHMENT C

C.1 IPCEA S-61-402 Paragraph 3.9 and Appendix D

C.2 TVA Engineering Report No. 1943

Cable types: PJ, PN, PNJ, PJJ, PSJ

Rooms 1-18

This class of cables was purchased under TVA Standard Specification No. 25.013, based on IPCEA S-61-402 (NEMA WC5). These standards provide a product with an operating rating of 75° C continuous, 95° C (203° F), 500-hour overload rating total in a normal lifetime. They are constructed of polyethylene insulation with Nylon and PVC jacketing.

The jacket material has a higher retention of strength at elevated temperatures, as the material was subjected to air oven aging of 121°C ( $250^{\circ}$  F) for 7 days. Only compartments 1, 2, 3, 6, 9, 10, and 11 show HELB profiles which more than briefly surpass the softening temperature of the insulation. However, owing to the thermal time lags in the cable material and cable installation, the insulation nor even the jacket experience the temperature profile until some time has elapsed.

TVA has conducted tests (Chattanooga Central Laboratories Report No. 81L-81-6821 dated October 1980, of these cables under a temperature profile which envelopes all the HELB profiles. Following this exposure these samples sustained a dielectric test immersed in water of 660 volts ac for 6 minutes, 960 volts ac for 5 minutes, and 2200 volts for 5 minutes in succession.

It is therefore our engineering judgment that this test confirms the above and justifies interim operation until these types can be fully qualified by our Wyle Laboratory tests to be concluded next April or replaced at the next refueling outage.

C.3 Temperature Qualification Method

C.3.1 Standard material long-term overload temperature rating

C.3.2 Engineering Analysis

C.4 The post-HELB conditions are less than the normal cable rating and, in our judgment, the cables could operate satisfactorily for a post-accident of a year.

Prepared by:

Reviewed by:

QA Acceptance:

SYSTEM COMPONENT EVALUATION WORK SHEET (Rev 2)

Facility: Browns Ferry Nuclear Plant Unit: 3

(3)EEB-74-0005 Sheet No. Revision 0 10-22-80 Date

Docket: 50-296

FOUTDHENT DESCOTOTION	ENVIRONMENT			DOCUMENTATION REF		QUALIFICATION METHOD	OUTSTANDING ITEMS	
EQUIPMENT DESCRIPTION	Parameter	Specifi- cation	Qualifi- cation	Specifi- Qualifi- cation cation				
System: 74 Plant ID No. Attachment A	Operating Time	Attachment A	1 Year	(1)	Attachment C.5	Engineering Analysis	None	
Component Cable - WCA 1/c, #14 AWG (PN) Manufacturer:Attachment B .	Temperature (°F)	325	153	(4)	Attachments C.2 and C.3	Attachment C.4	None	
Model Number: N/A	Pressure (PSIA)	69.7	N/A	(4)	N/A	N/A	None	
Function: Control/Power	Relative Humidity (%)	100	100	(4)	IPCEA S-61-402 par 3.9, 3.7.3, 6.7	Standard Material Requirement	None	
Accuracy: Req'd: N/A Demon: N/A Category: Attachment A	Chemical Spray	N/A	N/A	(4)	N/A	N/A	None	
Service: Attachment A	Radiation (RAD)	6.5x10 <sup>7</sup> 8 4x10 <sup>9</sup> Ø Attach. C.1	4×10 <sup>7</sup>	(4)	NUREG-0588 Materials List	Generic Material Test	None	
Location: 0	Aging	N/A	10 years	(2)	Attachment C.3	Oper. Experience	None	
Flood Level Elev: 552' Above Flood Level: Yes≭ No	Submergence	N/A	N/A	(4)	N/A	. N/A	None	

(1) See Section 2.4 in 79-01B report. Notes:

- (2) See Section 4.1.2 in 79-01B report.
- (3) All notes and other information not on these sheets are on the attached appendix sheets.

(4) See Section 3.0 and/or Appendix B in 79-01B report.

Prepared by: Demanauch Reviewed by: MBially

QA Acceptance:

System: 74 Unit: 3

Component: Cable 1/c #14 AWG Mark: WCA

Plant I. D. No. Room		Function/Service	Category	Operating Time	
3ES540-I	0	FCV-74-52 Cont	Ą	1 Year	
3ES541-I	0	FCV-74-52			
3ES547-1	0	FCV-74-52			
3ES3040-II	0	FCV-74-66			
3ES 3029-11	0	FCV-74-67			
3ES3028-II	0	FCV-74-67			
3ES3041-II	0	FCV-74-66			
3ES 3034-II	0	FCV-74-67			
3ES3041-II	0	FCV-74-66			
3ES528-1	0	FCV-74-53			
3ES529-II	õ	FCV-74-53			
3ES1182-I	0	FCV-74-47			
	0	FCV-74-47			
3ES3687-II 3ES3678-II	0	FCV-74-47	1		

2.1

EEB-,4-0005 Rev 0

# EEB -74-0005

Rev 0

## ATTACHMENT B

Mark WCA

Com	to war	-	*	- NJ	~	
Con	tra	ac	6	- 12	υ	
-		-		-	-	۴.

TR

Туре

### Manufacturer

72C7-75128	PN	Plastic Wire & Cable Corp
72X7-74885-1	PN	Brand-Rex Plastic Wire & Cable Corp
7307-84528 - 6703-91618	PN	Brand-Rex
72C7-75328-1	PN.	Brand-Rex Brand-Rex
70C7-54179-1	PN	
822378) Sequoyah 822639) 72C7-75228-1	PN	Plastic Wire & Cable Corp
822915) 7207-83874-1		Plastic Wire & Cable Corp

Sheet No: EEB-74-0005

1.1.471.01.5.1.1.1

Revision: 0

#### ATTACHMENT C

C.1 Integrated Dose - 10 years plus accident

#### Beta Dose

References:

- 1. W. W. Parkinson, O. Sisman, October 1970, The Use of Plastics and Elastomers in Nuclear Radiation.
- R. B. Blodgett, R. G. Fisher, June 1968, Insulations and Jackets for Control and Power Cables.
- M. Asaka, S. Yamamoto, 1973, Radiation Resistance of Plastic Insulating Materials for Cable.
- 4. Anaconda-Continental Test Report No. 79117 dated April 1979.
- 5. Wyle Laboratory Test Report 43854-3.
- 6. Franklin Institute Test Reports E-C4113 and FC-5120.
- 7. Rockbestos Company Test Report dated July 1977 amended 1979.

The TVA value of  $4 \times 10^9$  rads for the beta accident dose at the periphery of the containment is being reevaluated due to its high value. However, using this value and making reference to the 7901-B DOR guidelines section 4.2.1 and the depth dose penetration, which owing to the low penetrating power of beta particles gives a factor of 10 reduction for 40 mils of jacketing material, and a factor of 10 for an insulation thickness of 30 mils and which is conservative for TVA's 600-volt power and control cables and extremely conservative for TVA's triax and coax and signal cable due to their thickness and the presence of metallic shielding material, and assigning a factor of 5 for the installation shielding of metal trays, conduit, boxes, and flexible conduit, we arrive at a total effective dose of .8  $\times 10^7$  rads of beta.

Since the energy dissipation of gamma radiation occurs via ionizing processes, one can add the accident dose of  $4 \times 10^7$  rads of gamma directly. The accumulated integrated gamma 10-year dose (the time presently assigned to connectors and penetrations) amounts to 2.5 x 10' rads which added directly gives a total dose of 7.3 x 10<sup>7</sup> rads. In addition, since the containment is inerted in operation, the scission rate and deterioration of the insulation and jacketing materials through oxidation will be much less than for tests conducted in air.

Sheet No: EEB-74-0005

Revision: 0

#### ATTACHMENT C (Continued)

#### C.1 (Continued)

Since the above value of 7.3 x  $10^7$  is less than the values for which we have in-air test data for SROAJ types (1.2 x  $10^8$ ) and for XLPE types (2 x  $10^8$ ), it is concluded that the beta dose in an accident will not disqualify the cables presently installed, and the cables will remain operable in the service environment.

C.2 IPCEA S-61-402 Paragraph 3.9 and Appendix D

C.3 TVA Engineering Report No. 1943

Cable types: PJ, PN, PNJ, PJJ, PSJ

Room: 0

This class of cables was purchased under TVA Standard Specification No. 25.013, based on IPCEA S-61-402 (NEMA WC5). These standards provide a product with an operating rating of 75° C continuous, 95° C (203° F), 500-hour overload rating total in a normal life\*ime. They are constructed of polyethylene insulation with Nylon and PVC jacketing.

The jacket material has a higher retention of strength at elevated temperature. The in-containment SLB temperature and duration exceeds the cable ratings and the insulation and jacket distortion temperatures.

However, the service which these cable have seen thus far has exposed them to a gamma radiation dose of  $6.25 \times 10^6$  rads or more. This is sufficient to have cross-linked the polyethylene and PVC as well. Consequently, the insulation is now in fact a thermoset material and is capable of the same temperature that TVA's cross-linked polyethylene insulated cable has demonstrated and is capable of withstanding the LOCA/ SLB and the post-LOCA environment of 1 year. Thus, continued operation is justified.

TVA has prepared a LOCA/SLB, thermal aging, and radiation test procedure to be performed by Wyle Laboratories on samples of this cable to demonstrate the validity of this conclusion. Results of this testing program are expected to be available in April 1981.

C.4 Temperature Qualification Method

C.4.1 Standard material long-term overload temperature rating

C.4.2 Engineering analysis

Sheet No: EEB- 74-0005

Revision No: 0

# ATTACHMENT C (Continued)

C.5 Because of the conservatism of the tests for XLPE and for silicone insulation, including the severity of the mandrel bend and dielectric test in water after the combined LOCA/SLB profile, it is our engineering judgment that there is sufficient margin to give reasonable assurance of continued operability more than a year in the post-LOCA environment.

Prepared	by:	
Reviewed	by:	
QA Accep	tance:	

Facility: Browns Ferry Nuclear Plant . Unit: 3 SYSTEM COMPONENT EVALUATION WORK SHEET (Rev 2)

(3) Sheet No. <u>EEB-74-0006</u> Revision 0

Date 10/22/80

Cocket:50-296

1 8

	ENVIRONMENT			DOCUMENTATION REF		QUALIFICATION	OUTSTANDING	
EQUIPMENT DESCRIPTION	Parameter	Specifi- cation	Qualifi- cation	Specifi- cation	Qualifi- cation	METHOD	ITEMS	
System: 74 Plant ID No. Attachment A	Operating Time	Attachment A	1 Year	(1)	Attachment C.4	Engineering Analysis	None	
Component Cable - WCA 1/c, #14 AWG (PN) Manufacturer:Attachment B	Temperature (°F)	158	153	(4)	Attachments C.1 and C.2	Attachment C.3	None .	
Model Number: N/A	Pressure (PSIA)	15.0	N/A	(4)	N/A	N/A	None	
Function: Control/Power	Relative Humidity (%)	100	100	(4)	IPCEA S-61-402 par 3.9, 3.7.3 6.7		None	
Accuracy: Req'd: N/A Demon: N/A Category: Attachment A	Chemical Spray	N/A	N/A	(4)	N/A	N/A	None	
Service: Attachment A	Radiation (RAD)	3x10 <sup>7</sup>	4x10 <sup>7</sup>	(4)	NUREG-0588 Materials List	Generic Material Test	None	
Location: Room 2	Aging	N/A	20 years	(2)	Attachment C.2	Oper, Experience	None	
Flood Level Elev: 552' Above Flood Level: Yes × No	Submergence	N/A	N/A	(4)	N/A	. N/A	None	

Notes: (1) See Section 2.4 in 79-01B report.

- (2) See Section 4.1.2 in 79-01B report.
- (3) All notes and other information not on these sheets are on the attached appendix sheets.

(4) See Section 3.0 and/or Appendix B in 79-01B report.

Prepared by: H. D. Romenouslif

Reviewed by:

QA Acceptance:

System: 74 Unit: 3

Component: Cable 1/c #14 AWG Mark: WCA

Plant I. D. No.	Room	Function/Service	Category	Operating Time
3ES552-I	2	FCV-74-1 Cont	A	1 Year
3ES553-I	2	FCV-74-1	1	1
	2	FCV-74-1		
3ES554-1	2	FCV-74-12		
3ES565-I	2	FCV-74-12	1	
3ES566-I	2	FCV-74-12	1.	
3ES567-1	2		1.1	
3ES577-I	2	FCV-78-2		
3ES578-1	2	FCV-74-2		
3ES579-I	2	FCV-74-2	1	
3ES590-1	2	FCV-74-13		
3ES591-I	2	FCV-74-13		
3ES592-1	2	FCV-74-13		
3ES1155-I	2	FCV-74-7		
3ES1156-I	2	FCV-74-7	1	
3ES1152-I	2	FCV-74-7		
2ES3714	2	FCV-74-96	1	
2ES3715	2	FCV-74-96		
3ES 37 37	2	FCV-74-97	1	1
3ES3738		FCV-74-97		1
3R3264	2	MIS-74-137A PMP RM	A	1 Year
383204		HUMIDITY CONT	1	1
202262	2	ME-74-137A	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	
3R3263	2	MIS-74-137B		
3R3256	2	ME-74-1378		
3R3255	2			
3R3262	2	TTS-74-136A A/C TEMP CONTROL		

1 -

EEB-74-0006 Rev 0

EEB <u>74-0006</u> Rev <u>0</u>

e.

### ATTACHMENT B

Mark WCA

Manufacturer Type Contract No. Plastic Wire & Cable Corp PN 7207-75128 Brand-Rex PN 72X7-74885-1 Plastic Wire & Cable Corp PN 73C7-84528 Brand-Rex PN 67C3-91618 Brand-Rex PN. 72C7-75328-1 Brand-Rex PN 70C7-54179-1 TR 822378) Sequoyah Plastic Wire & Cable Corp PN 822639) 7207-75228-1 822915) Plastic Wire & Cable Corp 7207-83874-1

Sheet No.: <u>EEB-74-0006</u> Revision: 0

#### ATTACHMENT C

- C.1 IPCEA S-61-402 Paragraph 3.9 and Appendix D
- C.2 TVA Engineering Report No. 1943

Cable types: PJ, PN, PNJ, PJJ, PSJ

Rooms 1-18

This class of cables was purchased under TVA Standard Specification No. 25.013, based on IPCEA 5-61-402 (NEMA WC5). These standards provide a product with an operating rating of  $75^{\circ}$  C continuous,  $95^{\circ}$  C ( $203^{\circ}$  F), 500-hour overload rating total in a normal lifetime. They are constructed of polyethylene insulation with Nylon and PVC jacketing.

The jacket material has a higher retention of strength at elevated temperatures, as the material was subjected to air oven aging of 121°C (250°F) for 7 days. Only compartments 1, 2, 3, 6, 9, 10, and 11 show HELB profiles which more than briefly surpass the softening temperature of the insulation. However, owing to the thermal time lags in the cable material and cable installation, the insulation nor even the jacket experience the temperature profile until some time has elapsed.

TVA has conducted tests (Chattanooga Central Laboratories Report No. 81L-81-6821 dated October 1980, of these cables under a temperature profile which envelopes all the HELB profiles. Following this exposure these samples sustained a dielectric test immersed in water of 660 volts ac for 6 minutes, 960 volts ac for 5 minutes, and 2200 volts for 5 minutes in succession.

It is therefore our engineering judgment that this test confirms the above and justifies interim operation until these types can be fully qualified by our Wyle Laboratory tests to be concluded next April or replaced at the next refueling outage.

- C.3 Temperature Qualification Method
  - C.3.1 Standard material long-term overload temperature rating

C.3.2 Engineering Analysis

C.4 The post-HELB conditions are less than the normal cable rating and, in our judgment, the cables could operate satisfactorily for a post-accident of a year.

repared	by:	 	
Reviewed	by:	 	
DA Accept	tance.		

SYSTEM COMPONENT EVALUATION WORK SHEET (Rev 2)

'acility: Browns Ferry Nuclear Plant .
Init: 3
Incket: 50-296

(3) Sheet No. EEB 74-0007

12-10

0

Revision

Date

ocket: 50-296						Date 10/22/80	
	ENVIRONMENT			DOCUMENTATION REF		QUALIFICATION METHOD	OUTSTANDING ITEMS
EQUIPMENT DESCRIPTION -	Parameter	Specifi- cation	Qualifi- cation	Specifi- cation	Qualifi- cation		11LIIJ
ystem: 74 lant ID No. Attachment A	Operating Time	Attachment A	1 Year	(1)	Attachmen C.4	t Engineering Analysis	None
omponent Cable WCA 1/c, #14AWG, (PN) anufacturer:Attachment B	Temperature (°F)	294	153	(4)	Attachments C.1 and C.2	Attachment C.3	None
odel Number: N/A	Pressure (PSIA)	15.0	N/A	(4)	N/A	N/A	None
unction: Control/Power	Relative Humidity (%)	100	100	(4)	IPCEA S-61-402 par 3.9, 3.7.3 6.7		None
ccuracy: Req'd: N/A Demon: N/A ategory: Attachment A	Chemical Spray	N/A	N/A	(4)	N/A	N/A	None
ervics: Attachment A	Radiation (RAD)	$3 \times 10^{7}$	4×10 <sup>7</sup>	(4)	NUREG-0588 Materials List	Generic Material Test	None
ocation: Room 5	Aging	N/A	20 years	(2)	Attachment C.2	Oper, Experience	None
lood Level Elev: 552' bove Flood Level: Yes X No	Submergence	N/A	N/A	(4)	N/A	. N/A	None

stes: (1) See Section 2.4 in 79-01B report.

. 3'

- (2) See Section 4.1.2 in 79-01B report.
- (3) All notes and other information not on these sheets are on the attached appendix sheets.

(4) See Section 3.0 and/or Appendix B in 79-01B report.

Prepared by: H. D. Roma eveli

Reviewed by:

QA Acceptance:

EEB-74-0007 Rev 0

System: 74 Unit: 3

1/c #14 AWG

Component: Cable Mark: WCA

Plant I. D. No.	Room	Function/Service	Category	Operating Time
3ES 3052-II	5	FCV-74-24 Cont	A	l Year
3ES3053-II	5	FCV-74-24	1	1
3ES3054-II	5	FCV-74-24		
3ES 3065-II	5	FCV-74-35	1	
3ES3066-11	5	FCV-74-35		
3ES3067-II	5	FCV-74-35		
3ES3077-II	5	FCV-74-25		
3ES3078-II	5	FCV-74-25		
3ES3079	5	FCV-74-25		1
3ES 3090-II	5	FCV-74-36		
3ES 3091-II	5	FCV-74-36		1
3ES 3092-II	5	FCV-74-36		1
3ES 3637	5	FCV-74-30		
3ES3662-II	5	FCV-74-99		
3ES3663-II	5	FCV-74-99	1	

\*

# 

### ATTACHMENT B

Mark WCA

Contract No. 72C7-75128

72X7-74885-1

73C7-84528

67C3-91618

TR 822378)

822639)

822915)

7207-75328-1

70C7-54179-1

72C7-83874-1

Sequoyah

72C7-75228-1

TY	•	~

### Manufacturer

PNPlastic Wire & Cable CorpPNBrand-RexPNPlastic Wire & Cable CorpPNBrand-RexPNBrand-RexPNBrand-RexPNPlastic Wire & Cable Corp

Plastic Wire & Cable Corp

Sheet No.: <u>EEB- 74-0007</u> Revision: 0

#### ATTACHMENT C

C.1 IPCEA S-61-402 Paragraph 3.9 and Appendix D

C.2 TVA Engineering Report No. 1943

Cable types: PJ, PN, PNJ, PJJ, PSJ

Rooms 1-18

This class of cables was purchased under TVA Standard Specification No. 25.013, based on IPCEA S-61-402 (NEMA WC5). These standards provide a product with an operating rating of 75° C continuous, 95° C (203° F), 500-hour overload rating total in a normal lifetime. They are constructed of polyethylene insulation with Nylon and PVC jacketing.

The jacket material has a higher retention of strength at elevated temperatures, as the material was subjected to air oven aging of 121°C (250° F) for 7 days. Only compartments 1, 2, 3, 6, 9, 10, and 11 show HELB profiles which more than briefly surpass the softening temperature of the insulation. However, owing to the thermal time lags in the cable material and cable installation, the insulation nor even the jacket experience the temperature profile until some time has elapsed.

TVA has conducted tests (Chattanooga Central Laboratories Report No. 81L-81-6821 dated October 1980, of these cables under a temperature profile which envelopes all the HELB profiles. Following this exposure these samples sustained a dielectric test immersed in water of 660 volts ac for 6 minutes, 960 volts ac for 5 minutes, and 2200 volts for 5 minutes in succession.

It is therefore our engineering judgment that this test confirms the above and justifies interim operation until these types can be fully qualified by our Wyle Laboratory tests to be concluded next April or replaced at the next refueling outage.

- C.3 Temperature Qualification Method
  - C.3.1 Standard material long-term overload temperature rating

C.3.2 Engineering Analysis

C.4 The post-HELB conditions are less than the normal cable rating and, in our judgment, the cables could operate satisfactorily for a post-accident of a year.

Prepared by:\_\_\_\_\_

Reviewed by:

QA Acceptance:



<pre>'acility: Browns Ferry Nucl Init: 3 locket: 50-296</pre>	ear Plant .	SYSTEM COMPO	ONENT EVALUA	TION WORK SH	IEET (Rev 2)	(3) Sheet No. <u>EEB 7</u> Revision <u>o</u> Date <u>10/22/8</u>	
EQUIPMENT DESCRIPTION	ENVIRONMENT			DOCUMENTATION REF		QUALIFICATION METHOD	OUTSTANDING ITEMS
	Parameter	Specifi- cation	Qualifi- cation	Specifi- cation	Qualifi- cation	PETROD	
ystem: 74 'lant ID No. Attachment A	Operating Time	Attachment A	1 Year	(1)	Attachment C.4	Engineering Analysis	None
Component Cable WCA 1/c, #14AWG, (PN) Lanufacturer:Attachment B	Temperature (°F)	220	153	(4)	Attachments C.1 and C.2	Attachment C.3	None
lodel Number: N/A	Pressure (PSIA)	15.0	N/A	(4)	N/A	N/A	None
unction: Control/Power	Relative Humidity (%)	100	100	(4)	IPCEA S-61-402 par 3.9, 3.7.3 6.7		None
ccuracy: Req'd: N/A Demon: N/A ategory: Attachment A	Chemical Spray	N/A	N/A	(4)	N/A	N/A	None
ervice: Attachment A	Radiation (RAD)	$3.1 \times 10^{7}$	4x10 <sup>7</sup>	(4)	NUREG-0588 Materials List	Generic Material Test	None
ocation: Room 6	Aging	N/A	20 years	(2)	Attachment C.2	Oper, Experience	None
lood Level Elev: 552' bove Flood Level: Yes X	Submergence	N/A	N/A	(4)	N/A	. N/A	None

otes: (1) See Section 2.4 in 79-018 report.

Sec. Yes and

- (2) See Section 4.1.2 in 79-01B report.
- (3) All notes and other information not on these sheets are on the attached appendix sheets.
- (4) See Section 3.0 and/or Appendix B in 79-01B report.

Prepared by: H. D. Romanswell ofk

Reviewed by: Albradley

QA Acceptance:

System: 74 Unit: 3

Component: Cable 1/c #14 AWG Mark: WCA

Plant I. D. No.	Room	Function/Service	Category	Operating Time
3ES3682-II	6	FCV-74-46 Cont	A	1 year
3ES2979-11	6 .	FCV-7472		
3V2253	6	FSV-74-102 Supply	A	1 Hour
316633			В	l Year
3V2254	6	FCV-74-102 Cont	A	1 Year
3V2255	6	FCV-74-102	1.1	The strength of the
3V2264	6	FCV-74-103		and the second second
3V2265	6	FCV-74-103		
3V2256	6	FCV-74-119		
3V2257	6	FCV-74-119		
3V2258	6	FCV-74-119		
3V2267	6	FCV-74-103		
3V2268	6	FCV-74-120		
3V2269	6	FCV-74-120		
3ES3684-II	6	FCV-74-46		
3ES677-1	6	FCV-74-57		
7ES680-I	6	FCV-74-57		
3ES705-I	6	FCV-74-58		
3ES690-I	6	FCV-74-59		- 10 C 10 C
3ES693-I	6	FCV-74-59		
3ES3177-II	6	FCV-74-71		
3ES3180-II	6	FCV-74-71		
3ES3627-II	6	FCV-74-70		
3ES3630-II	6	FCV-74-20		
3ES3190-II	6	FCV-74-73		1.
3ES3193-II	6	FCV-74-73		
3ES702-1	6	FCV-74-58	1	
3V2266	6	FCV-74-103		

\* ; :

EEB-74-0008 Rev 0

## EEB \_\_\_\_\_\_\_

Rev O

### ATTACHMENT B

Mark WCA

Contract No.

72C7-75128

73C7-84528

67C3-91618

TR 822378)

822639)

822915)

72C7-75328-1

7007-54179-1

7207-83874-1

Sequoyah

72C7-75228-1

72X7-74885-1

Туре

PN

PN

PN

PN

PN.

PN

PN

### Manufacturer

Plastic Wire & Cable Corp Brand-Rex Plastic Wire & Cable Corp Brand-Rex Brand-Rex Brand-Rex

Plastic Wire & Cable Corp Plastic Wire & Cable Corp

Sheet No.: \_\_\_\_\_\_ EEB- 74-0008

Revision: 0

#### ATTACHMENT C

C.1 IPCEA S-61-402 Paragraph 3.9 and Appendix D

C.2 TVA Engineering Report No. 1943

Cable types: PJ, PN, PNJ, PJJ, PSJ

Rooms 1-18

This class of cables was purchased under TVA Standard Specification No. 25.013, based on IPCEA S-61-402 (NEMA WC5). These standards provide a product with an operating rating of 75° C continuous, 95° C (203° F), 500-hour over' ad rating total in a normal lifetime. They are constructed of polyethylene insulation with Nylon and PVC jacketing.

The jacket material has a higher retention of strength at elevated temperatures, as the material was subjected to air oven aging of 121°C ( $250^{\circ}$  F) for 7 days. Only compartments 1, 2, 3, 6, 9, 10, and 11 show HELB profiles which more than briefly surpass the soft ning temperature of the insulation. However, owing to the thermal time lags in the cable material and cable installation, the insulation nor even the jacket experience the temperature profile until some time has elapsed.

TVA has conducted tests (Chattanooga Central Laboratories Report No. 81L-81-68'l dated October 1980, of these cables under a temperature profile which envelopes all the HELB profiles. Following this exposure these samples sustained a dielectric test immersed in water of 660 volts ac for 6 minutes, 960 volts ac for 5 minutes, and 2200 volts for 5 minutes in succession.

It is therefore our engineering judgment that this test confirms the above and justifies interim operation until these types can be fully qualified by our Wyle Laboratory tests to be concluded next April or replaced at the next refueling ortage.

C.3 Temperature Qualification Method

C.3.1 Standard material long-term overload temperature rating

C.3.2 Engineering Analysis

C.4 The post-HELB conditions are less than the normal cable rating and, in our judgment, the cables could operate satisfactorily for a post-accident of a year.

Prepared by:

Reviewed by:

QA Acceptance:\_\_\_\_\_



(3)SYSTEM COMPONENT EVALUATION WORK SHEET (Rev 2) Sheet No. EEB 74-0009 acility: Browns Ferry Nuclear Plant Revision 0 Init: 3 locket: 50-296 Date 10/22/80 **OUALIFICATION** OUTSTANDING DOCUMENTATION REF ENVIRONMENT ITEMS METHOD EQUIPMENT DESCRIPTION Qualifi-Specifi-Specifi-Qualification cation cation Parameter cation jystem: 74 Engineering None Operating Attachment A Attachment 1 Year Analysis 'lant ID No. Attachment A C.4 Time (1)Cable WCA :omponent 1/c. #14AWG, (PN) Attachments Temperature lanufacturer: Attachment B Attachment C.3 None C.1 and C.2 153 (4) (°F) 308 \* \* Pressure lodel Number: N/A 21.5 (PSIA) (4)N/A None N/A N/A LPCEA 5-61-402 Se ..... Standard unction: Control/Power par 3.9, 3.7.3 Material Relative None 6.7 Requirement Humidity (%) (4) 100 100 .ccuracy: Reg'd: N/A Demon: N/A Chemical Spray (4) None ategory: Attachment A N/A ' N/A N/A N/A NUREG-0588 Generic ervice: Attachment A Material Materials Radiation  $2 \times 10^{6}$ 4×107 (4) None .est (RAD) List ocation: Room 7 Attachment C.2 Oper, Experience None (2) Aging N/A 20 years lood Level Elev: 552' bove Flood Level: Yes x Submergence N/A N/A N/A None N/A (4) No .

otes: (1) See Section 2.4 in 79-01B report.

F . 8 . 1 . 1

3

- (2) See Section 4.1.2 in 79-01B report.
- (3) All notes and other information not on these sheets are on the attached appendix sheets.
- (4) See Section 3.0 and/or Appendix B in 79-01B report.

Prepared by: <u>A & Romenewskips</u> Reviewed by: <u>Albradley</u>

QA Acceptance:

System: 74 Unit: 3

Component: Cable 1/c #14 AWG Mark: WCA

.

Plant I. D. No.	Room	Function/Service	Category	Operating Time
3ES528-I 3ES529-II 3ES534-I	7 7 7	FCV-74-53 Cont FCV-74-53 FCV-74-53	Î	l Year

EEB-74-0009 Rev 0

3

\* 5

## EEB \_ 74-0009

Rev 0

#### ATTACHMENT B

Mark WCA

Contract No. Туре Manufacturer 72C7-75128 PN Plastic Wire & Cable Corp 72X7-74885-1 PN Brand-Rex 73C7-84528 Plastic Wire & Cable Corp PN 67C3-91618 PN Brand-Rex 7207-75328-1 PN. Brand-Rex 70C7-54179-1 PN Brand-Rex TR 822378) Sequoyah 822639) PN Plastic Wire & Cable Corp 72C7-75228-1 822915) 72C7-83874-1 Plastic Wire & Cable Corp

Sheet No.: EEB-74-0009

Revision: 0

Prepared by:\_\_\_\_\_

Reviewed by:\_\_\_\_\_

QA Acceptance:

#### ATTACHMENT C

C.1 IPCEA S-61-402 Paragraph 3.9 and Appendix D

C.2 TVA Engineering Report No. 1943

Cable types: PJ, PN, PNJ, PJJ, PSJ

Rooms 1-18

This class of cables was purchased under TVA Standard Specification No. 25.013, based on IPCEA S-61-402 (NEMA WC5). These standards provide a product with an operating rating of  $75^{\circ}$  C continuous,  $95^{\circ}$  C (203° F), 500-hour overload rating total in a normal lifetime. They are constructed of polyethylene insulation with Nylon and PVC jacketing.

The jacket material has a higher retention of strength at elevated temperatures, as the material was subjected to air oven aging of 121°C (250°F) for 7 days. Only compartments 1, 2, 3, 6, 9, 10, and 11 show HELB profiles which more than briefly surpass the softening temperature of the insulation. However, owing to the thermal time lags in the cable material and cable installation, the insulation nor even the jacket experience the temperature profile until some time has elapsed.

TVA has conducted tests (Chattanooga Central Laboratories Report No. 81L-81-6821 dated October 1980, of these cables under a temperature profile which envelopes all the HELB profiles. Following this exposure these samples sustained a dielectric test immersed in water of 660 volts ac for 6 minutes, 960 volts ac for 5 minutes, and 2200 volts for 5 minutes in succession.

It is therefore our engineering judgment that this test confirms the above and justifies interim operation until these types can be fully qualified by our Wyle Laboratory tests to be concluded next April or replaced at the next refueling outage.

C.3 Temperature Qualification Method

C.3.1 Standard material long-term overload temperature rating

C.3.2 Engineering Analysis

C.4 The post-HELB conditions are less than the normal cable rating and, in our judgment, the cables could operate satisfactorily for a post-accident of a year.



SYSTEM COMPONENT EVALUATION WORK SHEET (Rev 2)

Facility: Browns Ferry Nuclear Plant init: 3 Cocket: 50-296

EQUIPMENT DESCRIPTION

Plant ID No. Attachment A

(3) Sheet No. EEB 74-0010 Revision 0

Date 10/22/80 QUALIFICATION OUTSTANDING DOCUMENTATION REF ENVIRONMENT ITEN'S METHOD Specifi-Specifi-Qualifi-Qualification cation cation Parameter cation Engineering None Attachment T Year Analysis C.4 Operating Attachment A

Tane to no. Accounter a	1 1105			(1)			
<pre>:omponent Cable WCA     1/c, #14AWG, (PN) 'anufacturer:Attachment B</pre>	Temperature (°F)	157	153	(4)	Attachments C.1 and C.2	Attachment C.3	None
iodel Number: N/A	Pressure (PSIA)	15.0	Ń/A	(4)	N/A	N/A	None
unction: Control/Power	Relative Humidity (%)	100	100	(4)	IPCEA S-61-402 par 3.9, 3.7.3 6.7		None
ategory: Attachment A	Chemical Spray	N/A	N/A	(4)	N/A	N/A	None
ervice: Attachment A	Radiation (RAD)	$2.1 \times 10^{7}$	4x10 <sup>7</sup>	(4)	NUREG-0588 Materials List	Generic Material Test	None
ocation: Room 8	Aging	N/A	20 years	(2)	Attachment C.2	Oper, Experience	None
lood Level Elev: 552' bove flood Level: Yes X	Submergence	N/A	N/A	(4)	N/A	N/A	None

(1) See Section 2.4 in 79-01B report. otes:

- (2) See Section 4.1.2 in 79-01B report.
- (3) All notes and other information not on these sheets are on the attached appendix sheets.

Time

(4) See Section 3.0 and/or Appendix B in 79-01B report.

Prepared by: A. D. Romanauski / JAK Reviewed by: MBredley

QA Acceptance:

25

iystem: 74

AL RUMAR AL CONTRACTOR AND A REAL AND THE REAL AND THE

.

System: 74 Unit: 3

Component: Cable 1/c #14 AWG Mark: WCA

Plant I. D. No.	Room	Function/Service	Category	Operating Time
3ES3165-II	8	FCV-74-75 Cont	Ą	1 Year
3ES3692-11	8	FCV-24-101	1.	
3ES3675-II	8	FCV-74-101		
3E33073-11	0	FCV-23-57		
3ES3654-II	8	FCV-74-101		
3ES3727	8	ECV-74-100		
3ES3728	8	FCV-74-100		
3ES540-I	8	FCV-74-52		
3ES541-I	8	FCV-74-52		
3ES528-I	8	FCV-74-58		
3ES529-II	8	FCV-74-53		
3ES547-1	8	FCV-74-52		
3ES534-1	8	FCV-74-53		
3ES2979-11	8	FCV-74-72		
3ES652-I	8	FCV-74-60		
3ES665-I	8	FCV-74-61		
3ES3040-II	8	FCV-74-66		
3ES3029-II	8	FCV-74-67		
3ES3028-II	8	FCV-74-67		
3ES3041-11	8	FCV-74-66		
3ES655-I	8	FCV-74-61		
	8	FCV-74-61	1	
3ES668-1	8	FCV-74-67		
3ES 3034-11		FCV-74-66	ł	
3ES3047-II 3ES3091-II	8	FCV-74-30		

\*' ;;

EEB-74-0010 Rev 0

EEP <u>74-0010</u> Rev <u>0</u>

## ATTACHMENT B

# Mark WCA

Contract No.	Type	Manufacturer	
7207-75128	PN PN	Plastic Wire & Cable Co Brand-Rex	orp
72X7-74885-1 73C7-84528 67C3-91618	PN	Plastic Wire & Cable Co Brand-Rex	oro
72C7-75328-1 70C7-54179-1	PN. PN	Brand-Rex Brand-Rex	
\$ 822378) Sequoyah 822639) 72C7-75228-1 822915)	PN	Plastic Wire & Cable C	orp
7207-83874-1		Plastic Wire & Cable C	orp

2

TR

. . . . .

Sheet No.: <u>EEB-74-0010</u> Revision: 0

#### ATTACHMENT C

C.1 IPCEA S-61-402 Paragraph 3.9 and Appendix D

C.2 IVA Engineering Report No. 1943

Cable types: PJ, PN, PNJ, PJJ, PSJ

Rooms 1-18

This class of cables was purchased under TVA Standard Specification No. 25.013, based on IPCEA S-61-402 (NEMA WC5). These standards provide a product with an operating rating of 75° C continuous, 95° C (203° F), 500-hour overload rating total in a normal lifetime. They are constructed of polyc hylene insulation with Nylon and PVC jacketing.

The jacket material has a higher retention of strength at elevated temperatures, as the material was subjected to air oven aging of 121°C (256°F) for 7 days. Only compartments 1, 2, 3, 6, 9, 10, and 11 show HELB profiles which more than briefly surpass the softening temperature of the insulation. However, owing to the thermal time lags in the cable material and cable installation, the insulation nor even the jacket experience the temperature profile until some time has elapsed.

TVA has conducted tests (Chattanooga Central Laboratories Report No. 81L-81-6821 dated October 1980, of these cables under a temperature profile which envelopes all the HELB profiles. Following this exposure these samples sustained a dielectric test immersed in water of 660 volts ac for 6 minutes, 960 volts ac for 5 minutes, and 2200 volts for 5 minutes in succession.

It is therefore our engineering judgment that this test confirms the above and justifies interim operation until these types can be fully qualified by our Wyle Laboratory tests to be concluded next April or replaced at the next refueling outage.

C.3 Temperature Qualification Method

C.3.1 Standard material long-term overload temperature rating

C.3.2 Engineering Analysis

C.4	The post-HELB	conditions	are less	than the	normal	cable	rating	and,
	in our judgme	nt, the cab	les could	operate	satisfac	ctorily	for a	
	post-accident	of a year.						

Prepared by:\_\_\_\_\_

Reviewed by:

QA Acceptance:\_\_\_\_\_



acility: Browns Ferry Nucl Init: 3 ocket: 50-296	lear Plant	SYSTEM COMPO	ONENT EVALUA	TION WORK SH	IEET (Rev 2)	(3) Sheet No. <u>EEB</u> Revision <u>O</u> Date <u>10/22/80</u>	
		ENVIRONMENT	- 1	DOCUMEN	ITATION REF	QUALIFICATION METHOD	OUTSTANDING ITEMS
EQUIPMENT DESCRIPTION	Parameter	Specifi- cation	Qualifi- cation	Specifi- cation	Qualifi- cation	HETHOD	11010
ystem: 74 lant ID No. Attachment A	Operating Time	Attachment A	1 Year	(1)	Attachmen C.4	Engineering Analysis	None .
<pre>`omponent Cable WCA</pre>	Temperature (°F)	211	153	(4)	Attachments C.1 and C.2	Attachment C.3	None
odel Number: N/A	Pressure (PSIA)	15.0	N/A	(4)	N/A	N/A	None
unction: Control/Power	Relative Humidity (%)		100	(4)	IPCEA S-61-402 par 3.9, 3.7.3 6.7		None
ccuracy: Req'd: N/A Demon: N/A ategory: Attachment A	Chemical Spray	N/A	N/A	(4)	N/A	N/A	None
ervice: Attachment A	Radiation (RAD)	2.1 × 107	i 4x10 <sup>7</sup>	(4)	NUREG-0588 Materials List	Generic Material Test	None
ocation: Room 9	Aging	N/A	20 years	(2)	Attachment C.2	Oper, Experience	None
lood Level Elev: 552' bove Flood Level: Yes X	Submergence	N/A	N/A	(4)	N/A	. N/A	None

otes: (1) See Section 2.4 in 79-01B report.

- (2) See Section 4.1.2 in 79-01B report.
- (3) All notes and other information not on these sheets are on the attached appendix sheets.
- (4) See Section 3.0 and/or Appendix B in 79-01B report.

Prepared by: <u>H. D. Romanowskip</u> Reviewed by: <u>M. Bradley</u>

QA Acceptance: \_\_\_\_

r.

EEB-74-0011 System: 74 Rev O Unit: 3 1/c #14 AWG Component: Cable WCA Mark: Operating Time Function/Service Category Plant I. D. No. Room 1 Year FCV-74-74 Cont 9. A 3ES3152-II FCV-74-60 9 . 3ES652-I FCV-74-61 9 3ES665-1 FCV-74-61 3ES655-I 9 FCV-74-61 9 3ES668-I

# EEB \_74-001

Rev O

# ATTACHMENT B

Mark WCA

Contract No.	Туре	-	Manufacturer
7207-75128	PN PN		Plastic Wire & Cable Corp Brand-Rex
72X7-74885-1 73C7-84528 67C3-91618 72C7-75328-1 70C7-54179-1	PN PN PN PN		Plastic Wire & Cable Corp Brand-Rex Brand-Rex Brand-Rex
822378) 822639) Sequoyah 822915) 72C7-75228-1	PN		Plastic Wire & Cable Corp
7207-83874-1			Plastic Wire & Cable Corp

TR

Sheet No.: EEB- 74-0011

Revision: 0

#### ATTACHMENT C

C.1 IPCEA S-61-402 Paragraph 3.9 and Appendix D

C.2 TVA Engineering Report No. 1943

Cable types: PJ, PN, PNJ, PJJ, PSJ

Rooms 1-18

This class of cables was purchased under TVA Standard Specification No. 25.013, based on IPCEA S-61-402 (NEMA WC5). These standards provide a product with an operating rating of 75° C continuous, 95° C (203° F), 500-hour overload rating total in a normal lifetime. They are constructed of polyethylene insulation with Nylon and PVC jacketing.

The jacket material has a higher retention of strength at elevated temperatures, as the material was subjected to air oven aging of  $121^{\circ}$  C ( $250^{\circ}$  F) for 7 days. Only compartments 1, 2, 3, 6, 9, 10, and 11 show HELB profiles which more than briefly surpass the softening temperature of the insulation. However, owing to the thermal time lags in the cable material and cable installation, the insulation nor even the jacket experience the temperature profile until some time has elapsed.

TVA has conducted tests (Chattanooga Central Laboratories Report No. 81L-81-6821 dated October 1980, of these cables under a temperature profile which envelopes all the HELB profiles. Following this exposure these samples sustained a dielectric test immersed in water of 660 volts ac for 6 minutes, 960 volts ac for 5 minutes, and 2200 volts for 5 minutes in succession.

It is therefore our engineering judgment that this test confirms the above and justifies interim operation until these types can be fully qualified by our Wyle Laboratory tests to be concluded next April or replaced at the next refueling outage.

C.3 Temperature Qualification Method

C.3.1 Standard material long-term overload temperature rating

C.3.2 Engineering Analysis

C.4 The post-HELB conditions are less than the normal cable rating and, in our judgment, the cables could operate satisfactorily for a post-accident of a year.

Prepared by:

Reviewed by:

QA Acceptance:



'acility: Browns Ferry Nucl Init: 3 Nocket: 50-296	ear Plant	SYSTEM COMPO	ONENT EVALUA	TION WORK SH	EET (Rev 2)	(3) Sheet No. <u>EEB 7</u> Revision <u>O</u> Date <u>10/22/80</u>	
		ENVIRONMENT		DOCUMEN	TATION REF	QUALIFICATION METHOD	OUTSTANDING ITEMS
EQUIPMENT DESCRIPTION	Parameter	Specifi- cation	Qualifi- cation	Specifi- cation	Qualifi- cation	HE MOD	
System: 74 'lant ID No. Attachment A	Operating Time	Attachment A	1 Year	(1)	Attachment C.4	Engineering Analysis	None
Component Cable WCA 1/c, #14AWG, (PN) Nanufacturer:Attachment B	Temperature (°F)	199	153	(4)	Attachments C.1 and C.2	Attachment C.3	None
odel Number: N/A	Pressure (PSIA)	15.0	N/A	(4)	N/A	N/A	None
ccuracy: Reg'd: N/A	Relative Humidity (%)	100	100	(4)	IPCEA S-61-402 par 3.9, 3.7.3 6.7		None
ategory: Attachment A	Chemical Spray	N/A	N/A	(4)	N/A	N/A	None
ervice: Attachment A	Radiation (RAD)	3.1 × 10 <sup>4</sup>	4×10 <sup>7</sup>	(4)	NUREG-0588 Materials List	Generic Material - Test	None
ocation: Room 12	Aging	N/ .	20 years	(2)	Attachment C.2	Oper, Experience	None
lood Level Elev: 552' bove Flood Level: Yes X	Submergence	N/A	N/A	14	N/A	. N/A	None

otes: (1) See Section 2.4 in 79-01B report.

13

(2) See Section 4.1.2 in 79-01B report.

×.,

- (3) All notes and other information not on these sheets are on the attached appendix sheets.
- (4) See Section 3.0 and/or Appendix B in 79-01B report.

Prepared by: H. & Romanowski /

Reviewed by: MBradlay

QA Acceptance: \_\_\_\_

System: 74 Unit: 3				EEB-74-0012 Rev 0
Component: Cable Mark: WCA	1/c #1	4 AWG		
<u>Piant I. D. No.</u> 3ES1169-1 3ES1170-1	Room 12 12	Function/Service FCV-74-77 Cont FCV-74-77 1	Category A I	Operating Time 1 Year

### EEB \_74-0012

Rev \_\_\_\_\_

## ATTACHMENT B

1

Mark WCA

Contract No.	Туре	Manufacturer
72C7-75128 72X7-74885-1 73C7-84528 67C3-91618 72C7-75328-1 70C7-54179-1	PN PN PN PN PN. PN	Plastic Wire & Cable Corp Brand-Rex Plastic Wire & Cable Corp Brand-Rex Brand-Rex Brand-Rex
R 822378) Sequoyah 822639) 7207-75228-1 822915) 7207-75228-1 7207-83874-1	PN	Plastic Wire & Cable Corp Plastic Wire & Cable Corp

\*

TR

Sheet No.: \_ EEB- 74-0012

Revision: 0

#### ATTACHMENT C

C.1 IPCEA S-61-402 Paragraph 3.9 and Appendix D

C.2 TVA Engineering Report No. 1943

Cable types: PJ, PN, PNJ, PJJ, PSJ

Rooms 1-18

This class of cables was purchased under TVA Standard Specification No. 25.013, based on IPCEA S-61-402 (NEMA WC5). These standards provide a product with an operating rating of 75° C continuous, 95° C (203° F), 500-hour overload rating total in a normal lifetime. They are constructed of polyethylene insulation with Nylon and PVC jacketing.

The jacket material has a higher retention of strength at elevated temperatures, as the material was subjected to air oven aging of  $121^{\circ}$  C ( $250^{\circ}$  F) for 7 days. Only compartments 1, 2, 3, 6, 9, 10, and 11 show HELB profiles which more than briefly surpass the softening temperature of the insulation. However, owing to the thermal time lags in the cable material and cable installation, the insulation nor even the jacket experience the temperature profile until some time has elapsed.

TVA has conducted tests (Chattanooga Central Laboratories Report No. 81L-81-6821 dated October 1980, of these cables under a temperature profile which envelopes all the HELB profiles. Following this exposure these samples sustained a dielectric test immersed in water of 660 volts ac for 6 minutes, 960 volts ac for 5 minutes, and 2200 volts for 5 minutes in succession.

It is therefore our engineering judgment that this test confirms the above and justifies interim operation until these types can be fully qualified by our Wyle Laboratory tests to be concluded next April or replaced at the next refueling outage.

- (.3 Temperature Qualification Method
  - C.3.1 Standard material long-term overload temperature rating

C.3.2 Engineering Analysis

C.4 The post-HELB conditions are less than the normal cable rating and, in our judgment, the cables could operate satisfactorily for a post-accident of a year.

> Prepared by:\_\_\_\_\_ Reviewed by:\_\_\_\_\_ QA Acceptance:\_\_\_\_\_

Facility: Browns Ferry Nuclear Plant Unit: 3 Docket: 50-206

SYSTEM COMPONENT EVALUATION WORK SHEET (Rev 2)

(3) Sheet No. EEB 74-0013 Revision 0 Date

10/22/80

3

EQUIPMENT DESCRIPTION		ENVIRONMENT		DOCUMEN	NTATION REF	QUALIFICATION METHOD	OUTSTANDING ITEMS
	Parameter	Specifi- Qualifi- cation cation		Specifi- cation	Qualifi- cation	AL HOU	
System: 74 Flanc ID No. Attachment A	Operating Time	Attachment A	l year	(1)	Attachment C.3	Engineering Analysis and Test	None
Component Cable WDD 1/c, #18AWG, (CPJ) Manufacturer: Attachment B	Temperature (°F)	157	325	(4)	Attachment C.1	Generic Simultaneous Test	None
Model Number: N/A	Pressure (PSIA)	15.0	N/A	(4)	N/A	N/Á	None
Function Control/Power	Relative Humidity (%)	100	100	(4)	Attachment C.1	Generic Simultaneous Test	None
Accuracy: Req'd: N/A Demon: N/A Category: Attachment A	Chemical Spray	N/A	N/A	(4)	N/A	N/A	None
Service: Attachment A	Radiation (RAD)	2.1 × 10 <sup>7</sup>	6.9×10 <sup>7</sup>	(4)	Attachment C.1	Generic Sequential Test	None
Location: Room 8	Aging	N/A	40 years	(2)	Attachment C.2	Generic Mat'l Test	None
Flood Level Elev: 552' Above Flood Level: Yes X No	Submergence	N/A	N/A	(4)	N/A	N/A	None

Notes: (1) See Section 2.4 in 79-01B report.

(2) See Section 4.1.2 in 79-01B report.

(3) All notes and other information not on these sheets are on the attached appendix sheets.

(4) See Section 3.0 and/or Appendix B in 79-01B report.

Prepared by: <u>A. D. Brandlif</u>sax Reviewed by: <u>Albradla</u>

QA Acceptance:

System: 74 Unit: 3 EEB-74-0013 Rev 0

Component: Cable 1/c #8 AWG Mark: WDD

Plant I. D. No.	Room	Function/Service	Category	Operating Time
3ES3163-II	8	FCV-74-75 Supply	A	1 Year
3ES3150-II	8	FCV-74-74		

 $\mathbb{Z}_{1}^{\prime}$ 

# EEB . 74-0013

Rev O

# ATTACHMENT B

Mark WDD

1k822936BerletonteCPJPhelps Dodge71C7-54180CPJTriangle Conduit & Cabl75C7-85744CPJGE Cable Corp67C7-91619CPJGE Cable Corp72C7-75328-3CPJRome		Contract No.	Туре	Manufacturer	
71C7-54180         CPJ         Phelps Dodge           75C7-85744         CPJ         Triangle Conduit & Cabl           67C7-91619         CPJ         GE Cable Corp           72C7-75328-3         CPJ         Rome	TR		CPJ	Plastic Wire & Cable Corp	
72C7-75533-1 CP3 L33EA		71C7-54180 75C7-85744 67C7-91619	CPJ CPJ	Triangle Conduit & Cable GE Cable Corp	

ŝ

Facility: Browns Ferry Nucl Unit: 3 Docket: 50-296	ear Plant	SYSTEM COM	ONENT EVALUA	TION WORK SH	HEET (Rev 2)	(3) Sheet No. EEB 7 Revision O Date 10/22/80	4-0014
		ENVIRONMENT		DOCUMEN	NTATION REF	QUALIFICATION	OUTSTANDING ITEMS
EQUIPMENT DESCRIPTION	Parameter	Specifi- cation	Qualifi- cation	Specifi- cation	Qualifi- cation	METHOD	TIERS
System: 74 Plant ID No. Attachment A	Operating Time	Attachment A	l year .	(1)	Attachment C.3	Engineering Analysis and Test	None
Component Cable WDD 1/c, #18AWG, (CPJ) Manufacturer: Attachment B	Temperature (°F)	211	325	(4)	Attachment C.1	Generic Simultaneous Test	None ·
Model Number: N/A	Pressure (PSIA)	15.0	N/A	(4)	N/A	N/Á	None
Function: Control/Power	Relative Humidity (%)	100	100	(4)	Attachment C.1	Generic Simultaneous Test	None
Accuracy: Req'd:N/A Demon:N/A Category: Attachment A	Chemical Spray	N/A	N/A	(4)	N/A	N/A	None
Service: Attachment A	Radiation (RAD)	$2.1 \times 10^{7}$	6.9x10 <sup>7</sup>	(4)	Attachment C.1	Generic Sequential Test	None
Location: Room 9	Aging	N/A	40 years	(2)	Attachment C.2	Generic Mat'l Test	None
Flood Level Elev: 552' Above Flood Level: Yes X No	Submergence	N/A	N/A	(4)	N/A	N/A	, None

Notes: (1) See Section 2.4 in 79-01B report.

A. 1993 S. 1994

- (2) See Section 4.1.2 in 79-01B report.
- (3) All notes and other information not on these sheets are on the attached appendix sheets.

(4) See Section 3.0 and/or Appendix B in 79-01B report.

Prepared by: <u>A. B. Romanuski</u> Reviewed by: <u>ABradles</u> QA Acceptance: \_\_\_\_\_

EEB-74-0014

Rev O

System: 74 Unit: 3

Component: Cable 1/c #8 AWG Mark: WDD

Plant I. D. No.	Room	Function/Service	Category	Operating Time
3ES3150-II 3ES3163-II	9	FCV-74-74 Supply FCV-74-75	А	l Year

2

7° ; .

# EEB \_74-0014\_

Rev O

#### ATTACHMENT B

Mark WDD

Туре

CPJ

CPJ CPJ CPJ CPJ

CPJ

TR	Contrac	t No.
TR	822936	Bellefonte 86150
	71C7-54 75C7-85 67C7-91 72C7-75 72C7-75	744 619 5328-3

## Manufacturer

Plastic Wire & Cable Corp

Phelps Dodge Triangle Conduit & Cable GE Cable Corp Rome Essex

Sheet No.: EEB- 74-0014

Revision: 0

#### ATTACHMENT C

.

- C.1 Wyle Laboratory Report No. 43854-3.
- C.2 NUREG-0588 Material List.
- C.3 Because of the conservatism of the tests for XLPE and for silicone insulation, including the severity of the mandrel bend and dielectric test in water after the combined LOCA/SLB profile, it is our engineering judgment that there is sufficient margin to give reasonable assurance of continued operability more than a year in the post-LOCA environment.

Prepared	pà.	
Reviewed	by:	
QA Accept	ance:	



SYSTEM COMPONENT EVALUATION WORK SHEET (Rev 2) EEB 74-0015 Sheet No. acility: Browns Ferry Nuclear Plant Revision 0 Init: Date 10/22/80 locket: 50-296 **OUALIFICATION** DOCUMENTATION REF ENVIRONMENT METHOD EQUIPMENT DESCRIPTION Qualifi-Specifi-Qualifi-Specification cation cation cation Parameter iystem: 74 Engineering Attachment C.4 Attachment A 1 year Operating Analysis and 'lant ID No. Attachment A Time Tests (1)component Cable WDG Generic 1/c, #2AWG, (CPJ) Simultaneous Temperature (°F) Attachment C.2 Test lanufacturer:Attachment B (4) 325 325 Pressure N/A lodel Number: N/A N/A (4)(PSIA) N/A 69.7 Generic unction: Simultaneous Relative ontrol/Power Attachment C.2 Test 100 (4) Humidity (%) 100 iccuracy: Req'd: N/A **Chemical** Demon: N/A Spray N/A (4) N/A N/A N/A Attachment A ategory: 6.5x10'8 4x10 8 Generic ervice: Attachment A Sequential Radiation

Attach. C.1

N/A

N/A

6.9x107

10 years

N/A

(4)

(2)

111

(1) See Section 2.4 in 79-01B report. lotes:

No

(2) See Section 4.1.2 in 79-01B report.

(3) All notes and other information not on these sheets are on the attached appendix sheets.

Submergence

(RAD)

Aging

(4) See Section 3.0 and/or Appendix B in 79-018 report.

None

None

None

OUTSTANDING

ITEMS

None

None

None

None

None

× ...

N/A

Generic Mat'l Test

Test

Attachment C.2

Attachment C.3

N/A

(3)

Prepared by: <u>A. 19. Romonouskilon</u> Reviewed by: <u>Albradlay</u>

ocation:

0

bove Flood Level: Yes X

lood Level Elev: 552'

QA Acceptance:

System: 74 Unit: 3

EEB-74-0015 Rev 0

Component: Cable WDG Mark:

1/c #2 AWG

Plant I. D. No. 3ES3685-11 3ES3906-11 Room 0. 0 Function/Service FCV-74-47 Supply FCV-74-67

Operating Time Category 1 year +

A +

# EEB <u>14-0015</u> REV 0

# ATTACHMENT B

Mark WDG

Contract No.	Type	Manufacturer
67C7-91619	CPJ	General Cable Corp
71C7-54180-1	CPJ	Phelps Dodge
86150 XFR Bellefonte	CPJ	Plastic Wire & Cable Corp
72C7-75328-3	CPJ	Rome
78K5-824443-2	PXJ	GE
72C7-75533-1	PXJ	Essex

14 . 14

Sheet No: EEB 74-0015

Revision: 0

#### ATTACHMENT C

C.1 Integrated dose - 10 years plus accident

Beta Dose

References:

- 1. W. W. Parkinson, O. Sisman, October 1970, The Use of Plastics and Elastomers in Nuclear Radiation.
- R. B. Blodgett, R. G. Fisher, June 1968, Insulations and Jackets for Control and Power Cables.
- M. Asaka, S. Yamamoto, 1973, Radiation Resistance of Plastic Insulating Materials for Cable.
- Anaconda-Continental Test Report No. 7911; 'ated April 1979.
- 5. Wyle Laboratory Test Report 43854-3.
- 6. Franklin Institute Test Reports E-C4113 and FC-5120.
- 7. Rockbestos Company Test Report dated July 1977 amended 1979.

The TVA value of  $4 \times 10^9$  rads for the beta accident dose at the periphery of the containment is being reevaluated due to its high value. However, using this value and making reference to the 7901-3 DOR guidelines section 4.2.1 and the depth dose penetration, which owing to the low penetrating power of beta particles gives a factor of 10 reduction for 40 mils of jacketing material, and a factor of 10 for an insulation thickness of 30 mils and which is conservative for TVA's 600-volt power and control cables and extremely conservative for TVA's triax and coax and signal cable due to their thickness and the presence of metallic shielding material, and assigning a factor of 5 for the installation shielding of metal trays, conduit, boxes, and flexible conduit, we arrive at a total effective dose of .8  $\times$  10<sup>7</sup> rads of beta.

Since the energy dissipation of gamma radiation occurs via ionizing processes, one can add the accident dose of  $4 \times 10^7$  rads of gamma directly. The accumulated integrated gamma 10-year dose (the time presently assigned to connectors and penetrations) amounts to 72.5 x 107 rads which added directly gives a total dose of 7.3 x 107 rads. In addition, since the containment is instead in operation, the scission rate and deterioration of the insulation and jacketing materials through oxidation will be much less than for tests conducted in air.

Since the above value of 7.3 x  $10^7$  is less than the values for which we have in-air test data for SROAJ types (1.2 x  $10^8$ ) and for XLPE types (2 x  $10^8$ ), it is concluded that the beta dose in an accident will not disqualify the cables presently installed, and the cables will remain operable in the service environment.

Sheet No: EEB 74-0015

Revision: 0

#### ATTACHMENT C (con'd)

- C.2 Wyle Laboratory Report No. 43854-3
- C.3 NUREG-0588 Material List
- C.4 Because of the conservatism of the tests for XLPE and for silicone insulation, including the severity of the mandrel bend and dielectric test in water after the combined LOCA/SLB profile, it is our engineering judgment that there is sufficient margin to give reasonable assurance of continued operability more than a year in the post-LOCA environment.

Reviewed	by:	 in
Prepared	by:	
QA Accep	tance:	 

Facility: Browns Ferry Nucl Unit: 3 Docket: 50-296	ear Plant	SYSTEM COMP	ONENT EVALUA	TION WORK SH	HEET (R.v 2)	(3) Sheet No. EEB Revision 0 Date 10/22/8	74-0016
		ENVIRONMENT		DOCUMENTATION REF		QUALIFICATION METHOD	OUTSTANDING ITEMS
EQUIPMENT DESCRIPTION	Parameter	Specifi- cation	Qualifi- cation	Specifi- cation	Qualifi- cation	METHOD	
System: 74 Plant ID No. Attachment A Component Cable WDG 1/c, #2AWG, (CPJ) Manufacturer: Attachment B	Operating Time	Attachment A	l year	(1)	Attachment C.3	Engineering Analysis and Test	None
	Temperature (°F)	157	325	(4)	Attachment C.1	Generic Simultaneous Test	None
Model Number: N/A	Pressure (PSIA)	15.0	N/A	(4)	N/A	N/A	None
Function: Control/Power	Relative Humidity (%)	100	100	(4)	Attachment C.1	Generic Simultaneous Test	None
Accuracy: Req'd: N/A Demon: N/A Category: Attachment A	Chemical Spray	N/A	N/A	(4)	N/A	N/A	None
Service: Attachment A	Radiation (RAD)	$2.1 \times 10^{7}$	6.9x10 <sup>7</sup>	(4)	Attachment C.	Generic Sequential Test	None
.ocation: Room 8	Aging	N/A	4C years	(2)	Attachment C.	Generic Mat'l Test	None
Nove Flood Level: Yes X	Submergence	N/A	N/A	(4)	N/A	N/A	None

POOR ORIGINA

lotes: (1) See Section 2.4 in 79-01B report.

- (2) See Section 4.1.2 in 79-01B report.
- (3) All notes and other information not on these sheets are on the attached appendix sheets.
- (4) See Section 3.0 and/or Appendix B in 79-01B report.

Prepared by: <u>A.B. Rongauskiljank</u> Reviewed by: <u>ABralley</u>

QA Acceptance:

System: 74 Unit: 3

(

EEB-74-0016 Rev 0

Component: Cable 1/c #2 AWG Mark: WDG

Plant I. D. No.	Room	Function/Service	Category	Operating Time
3ES 3685-II	8	FCV-74-47 SUPPLY	A	l Y_ar

# EEB \_ 74-0016

REV 0

# ATTACHMENT B

Mark WDG

Contract No.	Туре	Manufacturer		
67C7-91619	CPJ	General Cable Corp		
71C7-54180-1	CPJ	Phelps Dodge		
86150 XFR Bellefonte	CPJ	Plastic Wire & Cable Corp		
72C7-75328-3	CPJ	Rome		
78K5-824443-2	PXJ	GE		
72C7-75533-1	PXJ	Essex		

ł

. . . 1

. 8

ž

Sheet No.: EEB- 74-0016

1 . . . 1

Ravision: 0

#### ATTACHMENT C

. .

- C.1 Wyle Laboratory Report No. 43854-3.
- C.2 NUREG-0588 Material List.
- C.3 Because of the conservatism of the tests for XLPE and for silicone insulation, including the severity of the mandrel bend and dielectric test in water after the combined LOCA/SLB profile, it is our engineering judgment that there is sufficient margin to give reasonable assurance of continued operability more than a year in the post-LOCA environment.

Prepared	by:		 -
Reviewed	by:		
QA Accept	tanc	e:	

SYSTEM COMPONENT EVALUATION WORK SHEET (Rev 2)

Facility: Browns Ferry Nuclear Plant Unit: 3 Docket: 50-296

5

Sheet No. EEB 74-0017 Revision 0 Date 10/22/80

(3)

DUCACE. SO LSS						INTERION	
FOUTONENT DESCOTOTION	ENVIRONMENT		DOCUMENTATION REF		QUALIFICATION METHOD	OUTSTANDING ITEMS	
EQUIPMENT DESCRIPTICN	Parameter	Specifi- Qualifi- cation cation		Specifi- cation	Qualifi- cation		
System: 74 Piant ID No. Attachment A	Operating Time	Attachment A	l year	(1)	Attachment C.4	Engineering Analysis and Test	None .
Component Cable WDG-1 1/c, #2AWG, (PXJ) Manufacturer:Attachm 3	Temperature (°F)	325	385	(4)	AttachmentC.2	Generic Simultaneous Test	None
Model Number: N/A	Pressure (PSIA)	69.7	N/A	(4)	N/A	N/A	None
Function: Control/Power	Relative Humidity (%)	100	100	(4)	AttachmentC.2	Generic Simultaneous Test	None
Accuracy: Req'd: N/A Demon: N/A Category: Attachment A	Chemical Spray	N/A	N/A	(4)	N/A	N/A	None
Service: Attachment A	Radiation (RAD)	6.5x10'X 4x10 B Attach. C.1	2x10 <sup>8</sup>	(4)	AttachmentC.2	Generic Sequential Test	None
Location: 0	Aging	N/A	10 years	(2)	Attachmentc.3	Generic Mat'l Test	None
Flood Level Elev: 552' Above Flood Level: Yes X No	Submergence	N/A	N/A	(4)	N/A	N/A	None

Notes: (1) See Section 2.4 in 79-018 report.

- (2) See Section 4.1.2 in 79-01B report.
- (3) All notes and other information not on these sheets are on the attached appendix sheets.

(4) See Section 3.0 and/or Appendix B in "9-01B report.

Prepared by: A DRomawskif

QA Acceptance:

System: 74 Unit: 3

Component: Cable 1/c #2 AWG Mark: WDG-1 Rev O

EEB-74-0017

Plant I. D. No.	Room	Function/Service	Category	Operating Time
3ES526-1	0	FCV-74-47 Supply	А	l Year

 $\mathbb{T}_{i}$ 

\*

# EEB <u>74-0017</u> REV <u>0</u>

\*

#### ATTACHMENT B

Mark WDG-1

#### Contract No.

Туре

Manufacturer

TR 823368 From WBNP 821609-3 PXJ

Cyprus Wire & Cable

Sheet No: EEB 74-0017

Revision: 0

#### ATTACHMENT C

C.1 Integrated dose - 10 years plus accident

Beta Dose

References:

- 1. W. W. Parkinson, O. Sisman, October 1970, The Use of Plastics and Elastomers in Nuclear Padiation.
- R. B. Blodgett, R. G. Fisher, June 1968, Insulations and Jackets for Control and Power Cables.
- 3. M. Asaka, S. Yamamoto, 1973, Radiation Resistance of Plastic Insulating Materials for Cable.
- 4. Anaconda-Continental Test Report No. 79117 dated April 1979.
- 5. Wyle Laboratory Test Report 43854-3.
- 6. Franklin Institute Test Reports E-C4113 and FC-5120.
- 7. Rockbestos Company Test Report dated July 1977 amended 1979.

The TVA value of  $4 \times 10^9$  rads for the beta accident dose at the periphery of the containment is being reevaluated due to its high value. However, using this value and making reference to the 7901-B DOR guidelines section 4.2.1 and the depth dose penetration, which owing to the low penetrating power of beta particles gives a factor of 10 reduction for 40 mils of jacketing material, and a factor of 10 for an insulation thickness of 30 mils and which is conservative for TVA's 600-volt power and control cables and extremely conservative for TVA's triax and coax and signal cable due to their thickness and the presence of metallic shielding material, and a assigning a factor of 5 for the installation shielding of metal trays, conduit, boxes, and flexible conduit, we arrive at a total effective dose of .8  $\times$  10 rads of beta.

Since the energy dissipation of gamma radiation occurs via ionizing processes, one can add the accident dose of 4 x 10 rads of gamma directly. The accumulated integrated gamma 10-year dose (the time presently assigned to connectors and penetrations) amounts to  $72.5 \times 10^{\circ}$  rads which added directly gives a total dose of 7.3 x 10 rads. In addition, since the containment is  $10^{\circ}$  rted in operation, the scission rate and deterioration of the insul tion and jacketing materials through oxidation will be much less than for tests conducted in air.

Sheet No: EEB 74-0017

Revision: 0

#### ATTACHMENT C (con'd)

Since the above value of 7.3 x  $10^7$  is less than the values for which we have in-air test data for SROAJ types (1.2 x  $10^9$ ) and for XLPE types (2 x  $10^9$ ), it is concluded that the beta dose in an accident will not disqualify the cables presently installed, and the cables will remain operable in the service environment.

C.2 TVA Engineering Report No. 1946

Cable types: CP, CPJ, CPJJ, PXJ

Rooms: 0-18

The CP family of cables consists of cross-linked polyethylene insulation and polyvinyl chloride jacketing, and the PX family of cables consists of cross-linked polyethylene or ethylene propylene rubber, and the jacket is chlorosulfonated polyethylene or chloronated polyethylene. The following LOCA/SLB test apply:

- CP types Wyle Laboratory Test Report 43854-3 dated April 26, 1978,LOCA and SLB Qualification Test of Cables and Cable Splices.
- PX types Franklin Institute Test Report F-C4113 dated May 1975.
  - Rockbestos Company Test Report dated July 1977, amended 1979.
  - Franklin Institute Test Report F-C5120 dated May 1980.

These cable are qualified by the above for all HELB areas and the LOCA/SLB of the containment. Because of the conservatism of these tests including the severity of the mandrel bend and dielectric test in water after the combined LOCA/SLB profile, it is our engineering judgment that there is sufficient margin to give reasonable assurance of continued operability more than a year in the post-LOCA environment.

#### C.3 NUREG-0588 Material List

C.4 Because of the conservatism of the tests for XLPE and for silicone insulation, including the severity of the mandrel bend and dielectric test in water after the combined LOCA/SLB profile, it is our engineering judgment that there is sufficient margin to give reasonable assurance of continued operability more than a year in the post-LOCA environment.

Reviewed by:

Prepared by:

QA Acceptance:

5C

Facility: Browns Ferry Nucl Unit: 3 Docket: 50-296	ear Plant .	SYSTEM COMPO	DNENT EVALUA	TION WORK SH	EET (Rev 2)	(3) Sheet No. <u>FFR 74-</u> Revision <u>O</u> Date <u>10/22/80</u>	
EQUIDMENT DESCRIPTION		ENVIRONMENT		DOCUMEN	TATION REF	QUALIFICATION METHOD	OUTSTANDING ITEMS
EQUIPMENT DESCRIPTION	Parameter	Specifi- cation	Qualifi- cation	Specifi- cation	Qualifi- cation	inc mos	
System: 74 Plant ID No.Attachment A	Operating Time	Attachment A	1 Year	(1)	Attachment C.3	Engineering Analysis and Test	None
Component Cable WDG-1 1/c, #2AWG, (PXJ) Manufacturer:Attachment B	Temperature (°F)	308	385	(4)	Attachment C.1	Generic Simultaneous Test	None
Model Number: N/A	Pressure (PSIA)	21.5	N/A	(4)	N/A	N/A	None
Function: Control/Power	Relative Humidity (%)	100	100	(4)	Attachment C.1	Generic Simultaneous Test	None
Accuracy: Raq'd: N/A Demon: N/A Category: Attachment A	Chemical Spray	N/A	N/A	(4)	N/A	N/A	-None
Service: Attachment A	Radiation (RAD)	2 x 10 <sup>6</sup>	2x10 <sup>8</sup>	(4)	Attachment C.	and the second data was a second of the second data was a second data was a second data was a second data was a	None
Location: Room 7	Aging	N/A	40 years	(2)	Attachment C.	Generic Mat'l Test	None
Flood Level Elev: 552' Above Flood Level: Yes X No	Submergence	N/A	N/A	(4)	N/A	N/A	None

in in

0

Votes: (1) See Section 2.4 in 79-01B report.

- (2) See Section 4.1.2 in 79-01B report.
- (3) All notes and other information not on these sheets are on the attached appendix sheets.
- (4) See Section 3.0 and/or Appendix B in 79-01B report.

Prepared by: <u>A. A. Romonowski</u> Reviewed by: <u>Albrally</u> QA Acceptance:

QA Acceptance:

17

System: 74 Unit: 3 EEB-74-0018 Rev 0

Component: Cable 1/c #2 AWG Mark: WDG-1

Plant I. D. No.	Room	Function/Service	Category	Operating Time
3ES526-1 7		FCV-74-47 Supply	А	1 Year

3

\*

# EEB \_ 74-0018

REV 0

## ATTACHMENT B

Mark WDG-1

## Contract No.

Туре

## Manufacturer

TR 823368 From WBNP 821609-3

.(

PXJ

Cyprus Wire & Cable

Sheet No: EEB 74-0018

Revision: 0

#### ATTACHMENT C

C.1 TVA Engineering Report No. 1946

Cable types: CP, CPJ, CPJJ, PXJ

Rooms: 0-18

The CP family of cables consists of cross-linked polyethylene insulation and polyvinyl chloride jacketing, and the PX family of cables consists of cross-linked polyethylene or ethylene propylene rubber, and the jacket is chlorosulfonated polyethylene or chloronated polyethylene. The following LOCA/SLB test apply:

- CP types Wyle Laboratory Test Report 43854-3 dated April 26, 1978, LOCA and SLB Qualification Test of Cables and Cable Splices.
- PX types Franklin Institute Test Report F-C4113 dated May 1975.
  - Rockbestos Company Test Report dated July 1977, amended 1979.
  - Franklin Institute Test Report F-C5120 dated May 1980.

These cable are qualified by the above for all HELB areas and the LOCA/SLB of the containment. Because of the conservatism of these tests including the severity of the mandrel bend and dielectric test in water after the combined LOCA/SLB profile, it is our engineering judgment that there is sufficient margin to give reasonable assurance of continued operability more than a year in the post-LOCA environment.

- C.2 NUREG-0588 Material List
- C.3 Because of the conservatism of the tests for XLPE and for silicone insulation, including the severity of the mandrel bend and dielectric test in water after the combined LOCA/SLB profile, it is our engineering judgment that there is sufficient margin to give reasonable assurance of continued operability more than a year in the post-LOCA environment.

Reviewed	by:	 	
Prepared	by:	 	
QA Accep	tance:	 	

12C

Facility: Browns Ferry Nuclear Plant Unit: 3 Cocket: 50-296

SYSTEM COMPONENT EVALUATION WORK SHEET (Rev 2)

(3) EEB 74-0019 Sheet No. Revision 0

10/22/80

Date

						10/0-/00	
EQUIPMENT DESCRIPTION	ENVIRONMENT		DOCUMENTATION REF		QUALIFICATION METHOD	OUTSTANDING ITEMS	
	Parameter	Specifi- cation	Qualifi- cation	Specifi- cation	Qualifi- cation		110100
System: 74 Plant ID No.Attachment A	Operating Time	Attachment A	1 Year	(1)	Attachment C.3	Engineering Analysis and Test	None
Component Cable WDG-1 1/c, #2 AWG PXJ	Temperature					Generic Simultaneous	Nana
Manufacturer: Attachment B	Temperature (°F)	157	385	(4)	Attachment C.1	Test	None
Model Number: N/A	Pressure (PSIA)	15.0	N/A	(4)	N/A	N/A	None
Function: Control/Power	Relative Humidity (%)	100	100	(4)	Attachment C.1	Generic Simultaneous Test	None
Accuracy: Req'd: N/A Demon: N/A Category: Attachment A	Chemical Spray	N/A	N/A	(4)	N/A	N/A	None
Service: Attachment A	Radiation (RAD)	$2.1 \times 10^{7}$	2×10 <sup>8</sup>	(4)	Attachment C.1	Generic Sequential Test	None
Location: Room 8	Aging	N/A	40 years	(2)	Attachment C.2	Generic Mat'l Test	None
Flood Level Elev: 552' Above Flood Level: Yes X	Submergence	N/A	N/A	(4)	N/A	N/A	None

Votes: (1) See Section 2.4 in 79-01B report.

- (2) See Section 4.1.2 in 79-01B report.
- (3) All notes and other information not on these sheets are on the attached appendix sheets.
- (4) See Section 3.0 and/or Appendix B in 79-01B report.

QA Acceptance:

Prepared by: <u>H. A. Romennuski</u>sson Reviewed by: <u>Alballey</u>

1.1

## EEB 74-0019

REV\_0

## ATTACHMENT B

-44

Mark WDG-1

Contract No.

Туре

Manufacturer

TR 823368 From WBNP 821609-3

10

PXJ

Cyprus Wire & Cable

Sheat No: EEB 74-0019

Revision: 0

#### ATTACHMENT C

C.1 TVA Engineering Report No. 1946

Cable types: CP, CPJ, CPJJ, PXJ

Rooms: 0-18

The CP family of cables consists of cross-linked polyethylene insulation and polyvinyl chlorid jacketing, and the PX family of cables consists of cross-linked polyethylene or ethylene propylene rubber, and the jacket is chlorosulfonated polyethylene or chloronated polyethylene. The following LOCA/SLB test apply:

- CP types Wyle Laboratory Test Report 43854-3 dated April 26, 1978, LOCA and SLB Qualification Test of Cables and Cable Splices.
- PX types Franklin Institute Test Report F-C4113 dated May 1975.
  - Rockbestos Company Test Report dated July 1977, amended 1979.
  - Franklin Institute Test Report F-C5120 dated May

These cable are qualified by the above for all HELB areas and the LOCA/SLB of the containment. Because of the conservatism of these tests including the severity of the mandrel bend and dielectric test in water after the combined LOCA/SLB profile, it is our engineering judgment that there is sufficient margin to give reasonable assurance of continued operability more than a year in the post-LOCA environment.

- C.2 NUREG-0588 Material List
- C.3 Because of the conservatism of the tests for XLPE and for silicone insulation, including the severity of the mandrel bend and dielectric test in water after the combined LOCA/SLB profile, it is our engineering judgment that there is sufficient margin to give reasonable assurance of continued operability more than a year in the post-LOCA environment.

Reviewed by: \_\_\_\_\_

QA Acceptance:

12C

System: 74 Unit: <b>3</b>				EEB-74-0019 Rev 0
Component: Cable Mark: WDG-1		1/c #2 AWG		
Plant I. D. No.	Room	Function/Service	Category	Operating Time
3ES526-I	8	FCV-74-47 Supply	A	l Year

Facility: Browns Ferry Nuclear Plant Unit: 3 Docket: 50-296

SYSTEM COMPONENT EVALUATION WORK SHEET (Rev 2)

(3) Sheet No. EEB 74-0020 Revision 0

10/22/80

Date

EQUIDMENT DESCONDITION	ENVIRONMENT		DOCUMENTATION REF		QUALIFICATION METHOD	OUTSTANDING ITEMS		
EQUIPMENT DESCRIPTION	Parameter	Specifi- cation	Qualifi- cation	Specifi- cation	Qualifi- cation	NE MOD		
System: 74 Plant ID No.Attachment A	Operating Time	Attachment A	1 Year	(1)	Attachment C.3	Engineering Analysis and Test	None	
Component Cable WDG-1 1/c, #2AWG, (PXJ) Manufacturer: Attachment B	Temperature (°F)	211	385	(4)	Attachment C.1	Generic Simultaneous Test	None	
Model Number: N/A	Pressure (PSIA)	15.0	N/A	(4)	N/A	N/A	None	
Function: Control/Power	Relative Humidity (%)	100	100	(4)	Attachment C.1	Generic Simultaneous Test	None	
Accuracy: Req'd: N/A Demon: N/A Category: Attachment A	Chemical Spray	N/A	N/A	(4)	N/A	N/A	None	
Service: Attachment A	Radiation (RAD)	2.1 × 10 <sup>7</sup>	2x10 <sup>8</sup>	(4)	Attachment C.1	Generic Sequential Test	None	
Location: Room 9	Aging	N/A	40 years	(2)	Attachment C.2	Generic Mat'l Test	None	
Flood Level Elev: 552' Above Flood Level: Yes X No	Submergence	N/A	N/A	(4)	N/A	N/A	, None	

Votes: (1) See Section 2.4 in 79-01B report.

- (2) See Section 4.1.2 in 79-018 report.
- (3) All notes and other information not on these sheets are on the attached appendix sheets.
- (4) See Section 3.0 and/or Appendix B in 79-01B report.

Prepared by: H. A.Romanowskill

Reviewed by:

QA Acceptance:

11

System: 74<br/>Unit: 3EEB-74-0020<br/>Rev 0Component: Cable<br/>Mark: WDG-11/c #2 AWGPlant I. D. No.<br/>3ES526-1Room<br/>9Function/Service<br/>FCV-47-74 SupplyCategory<br/>AOperating Time<br/>1 Year

3

1.0

1

# EEB \_ 74-0020

REV 0

## ATTACHMENT B

Mark WDG-1

# Contract No.

Туре

Manufacturer

TR 823368 From WBNP 821609-3

1

PXJ

Cyprus Wire & Cable

Sheet No: EEB 74-0020

Revision: 0

#### ATTACHMENT C

C.1 TVA Engineering Report No. 1946

Cable types: CP, CPJ, CPJJ, PXJ

Rooms: 0-18

The CP family of cables consists of cross-linked polyethylene insulation and polyvinyl chloride jacketing, and the PX family of cables consists of cross-linked polyethylene or ethylene propylene rubber, and the jacket is chlorosulfonated polyethylene or thloronated polyethylene. The following LOCA/SLB test apply:

- CP types Wyle Jaboratory Test Report 43854-3 dated April 26, 1978, LOCA and SLB Qualification Test of Cables and Cable Splices.
- PX types Franklin Institute Test Report F-C4113 dated May 1975.
  - Rockbestos Company Test Report dated July 1977, amended 1979.
  - Franklin Institute Test Report F-C5120 dated May 1980.

These cable are qualified by the above for all HELB areas and the LOCA/SLB of the containment. Because of the conservatism of these tests including the severity of the mandrel bend and dielectric test in water after the combined LOCA/SLB profile, it is our engineering judgment that there is sufficient margin to give reasonable assurance of continued operability more than a year in the post-LOCA environment.

- C.2 NUREG-0588 Material List
- C.3 Because of the conservatism of the tests for XLPE and for silicone insulation, including the severity of the mandrel bend and dielectric test in water after the combined LOCA/SLB profile, it is our engineering judgment that there is sufficient margin to give reasonable assurance of continued operability more than a year in the post-LOCA environment.

Reviewed by: \_\_\_\_\_

QA Acceptance: \_\_\_\_\_

12C

UATION WORK SHEET (Rev 2)

DOCUMENTATION RE

Facility: Browns Ferry Nuclear Pla nit: 3 Socket: 50-296	ant . SYSTEM COMPONENT EVALU
EQUIPMENT DESCRIPTION	ENVIRONMENT
EQUIPMENT DESCRIPTION	Specifi- Qualifi-

CONTRACTOR DESCRIPTION			a film and the second second			METHOD	ITEMS
EQUIPMENT DESCRIPTION	Parameter	Specifi- cation	Qualifi- cation	Specifi- cation	Qualifi- cation		
System: 74 Mant ID No. Attachment A	Operating Time	Attachment A	l year	(1)	Attachment C.4	Engineering Analysis and Tests	None
Component Cable WDH 1/c, #1/0, (CPJ) CanufacturerAttachment B	Temperature (°F)	325	325	(4)	Attachment C.2	Generic Simultaneous Test	None
Number: N/A	Pressure (PSIA)	69.7	N/A	(4)	N/A	N/A	None
function: Control/Power	Relative Humidity (%)	100	100	(4)	Attachment C.2	Generic Simultaneous Test	None
<pre>lccuracy: Req'd: N/A Demon: N/A lategory: Attachment A</pre>	Chemical Spray	N/A	N/A	(4)	N/A	N/A	None
Service: Attachment A	Radiation (RAD)	6.5x10'8 4x10 \$ Attach. C.1	6.9x10 <sup>7</sup>	(4)	Attachment C.2	Generic Sequential Test	None
.ocation: 0	Aging	N/A	10 years	(2)	Attachment C.3	Generic Mat'l Test	the same survey of the same of the same set of the same
Tood Level Elev: 552' bove Flood Level: Yes X No	Submergence	N/A	N/A	(4)	N/A	N/A	None

lotes: (1) See Section 2.4 in 79-01B report.

- (2) See Section 4.1.2 in 79-01B report.
- (3) All notes and other information not on these sheets are on the attached appendix sheets.
- (4) See Section 3.0 and/or Appendix B in 79-01B report.

(3)

Sheet No. Revision 0 Date 10/22/80

OUALIFICATION

EEB 74-0021

OUTSTANDING

Prepared by: # A Roman wake - 59K Reviewed by: Albally

QA Acceptance:

System: 74 Unit: 3

Ę

EEB-74-0021 Rev 0

Component: CAble 1/c #10 AWG Mark: WDH

Plant I. D. No.	Room	Function/Service	Category	Operating Time
3ES538-I	0	FCV-74-52 Supply	А	1 year

2

\* :

EEB \_74-0021

Rev \_ O

# ATTACHMENT B

Mark WDH

Contract No.

Туре

٠.

Manufacturer

70C7-92430 71C7-54180-2 67C7-91619 CPJ CPJ CPJ Essex International Simplex General Cable

Sheet No: EEB 74-0021

Revision: 0

#### ATTACHMENT C

C.1 Integrated dose - 10 years plus accident

#### Beta Dose

References:

- 1. W. W. Parkinson, O. Sisman, October 1970, The Use of Plastics and Elastomers in Nuclear Radiation.
- R. B. Blodgett, R. G. Fisher, June 1968, Insulations and Jackets for Control and Power Cables.
- M. Asaka, S. Yamamoto, 1973, Radiation Resistance of Plastic Insulating Materials for Cable.
- 4. Anaconda-Continental Test Report No. 79117 dated April 1979.
- 5. Wyle Laboratory Test Report 43854-3.
- 6. Franklin Institute Test Reports E-C4113 and FC-5120.
- 7. Rockbestos Company Test Report dated July 1977 amended 1979.

The TVA value of  $4 \times 10^9$  rads for the beta accident dose at the periphery of the containment is being reevaluated due to its high value. However, using this value and making reference to the 7901-B DOR guidelines section 4.2.1 and the depth dose penetration, which owing to the low penetrating power of beta particles gives a factor of 10 reduction for 40 mils of jacketing material, and a factor of 10 for an insulation thickness of 30 mils and which is conservative for TVA's 600-volt power and control cables and extremely conservative for TVA's triax and coax and signal cable due to their thickness and the presence of metallic shielding material, and assigning a factor of 5 for the installation shielding of metal trays, conduit, boxes, and flexible conduit, we arrive at a total effective dose of .8 x  $10^7$  rads of beta.

Since the energy dissipation of gamma radiation occurs via ionizing processes, one can add the accident dose of  $4 \times 10^7$  rads of gamma directly. The accumulated integrated gamma 10-year dose (the time presently assigned to connectors and penetrations) amounts to 72.5 x 10<sup>7</sup> rads which added directly gives a total dose of 7.3 x 10<sup>7</sup> rads. In addition, since the containment is inerted in operation, the scission rate and deterioration of the insulation and jacketing materials through oxidation will be much less than for tests conducted in air.

Since the above value of 7.3 x  $10^7$  is less than the values for which we have in-air test data for SROAJ types (1.2 x  $10^8$ ) and for XLPE types (2 x  $10^8$ ), it is concluded that the beta dose in an accident will not disqualify the cables presently installed, and the cables will remain operable in the service environment.

Sheet No: EEB 74-0021

Revision: 0

#### ATTACHMENT C (con'd)

C.2 Wyle Laboratory Report No. 43854-3

- C.3 NUREG-0588 Material List
- C.4 Because of the conservatism of the tests for XLPE and for silicone insulation, including the severity of the mandrel bend and dielectric test in water after the combined LOCA/SLB profile, it is our engineering judgment that there is sufficient margin to give reasonable assurance of continued operability more than a year in the post-LOCA environment.

Reviewed	by:	 	
Prepared	by:		
QA Accep	tancet		
du vereh	Cass-CC .	 	

SYSTEM COMPONENT EVALUATION WORK SHEET (Rev 2)

Facility: Browns Ferry Nuclear Plant . Unit: 3 Docket: 50-296 (3) Sheet No. EEB 74-0022 Revision O Date 10/22/80

JULNEL. JULIU						Dale 10/22/80	2
EQUIPMENT DESCRIPTION	ENVIRONMENT			DOCUMENTATION REF		QUALIFICATION METHOD	OUTSTANDING ITEMS
EQUIPMENT DESCRIPTION	Parameter	Specifi- cation	Qualifi- cation	Specifi- cation	Qualifi- cation		
System: 74 Plant ID No. Attachment A	Operating Time	Attachment A	l year .	(1)	Attachment C.3	Engineering Analysis and Test	None
Component Cable WDH 1/c, #1/0, (CPJ) Manufacturer: Attachment B	Temperature (°F)	157	325	(4)	Attachment C.1	Generic Simultaneous Test	None ·
todel Number: N/A	Pressure (PSIA)	15.0	N/A	(4)	N/A	N/A	None
Function: Control/Power	Relative Humidity (%)	100	100	(4)	Attachment C.1	Generic Simultaneous Test	None
Accuracy: Req'd: N/A Demon: N/A Category: Attachment A	Chemical Spray	N/A	N/A	(4)	N/A	N/A	None
Service: Attachment A	Radiation (RAD)	$2.1 \times 10^7$	6.9x10 <sup>7</sup>	(4)	Attachment C.1	Generic Sequential Test	None
.ocation: Room 8	Aging	N/A	40 years	(2)	Attachment C.2	Generic Mat'l Test	None
Flood Level Elev: 552' Above Flood Level: Yes X	Submergence	N/A	N/A	(4)	N/A	N/A	None

Notes: (1) See Section 2.4 in 79-01B report.

- (2) See Section 4.1.2 in 79-01B report.
- (3) All notes and other information not on these sheets are on the attached appendix sheets.
- (4) See Section 3.0 and/or Appendix B in 79-01B report.

Prepared by: H. D. Romanous

QA Acceptance:

Reviewed by

9

System: 74 Unit: 3	철학 것 같은 것을 것		EEB-74-0022 Rev 0
Component: Cable Mark: WDH	1/c #10 AWG	-	
Plant I. D. No. Roor	n Function/Service	Category	Operating Time
3ES538-I 8	FCV-74-52	A	1 Year
			,

4

\* 32

# EEB \_74-0022

Rev 0

# ATTACHMENT B

## Mark WDH

Contract No.

## Туре

Manufacturer

70C7-92430 71C7-54180-2 67C7-91619 CPJ CPJ CPJ

14

Essex International Simplex General Cable

Sheet No.: EEB- 74-0022

1.84

Revision: 0

#### ATTACHMENT C

.

- C.1 Wyle Laboratory Report No. 43854-3.
- C.2 NUREG-0588 Material List.
- C.3 Because of the conservatism of the tests for XLPE and for silicone insulation, including the severity of the mandrel bend and dielectric test in water after the combined LOCA/SLB profile, it is our engineering judgment that there is sufficient margin to give reasonable assurance of continued operability more than a year in the post-LOCA environment.

Prepared	by:		 	-
Reviewed	by:			
QA Accept	tance	2:		



ENVIRONMENT

SYSTEM COMPONENT EVALUATION WORK SHEET (Rev 2)

Facility: Browns Ferry Nuclear Plant Unit: 3 Docket: 50-296 (3) Sheet No. <u>EEB 74-0023</u> Revision

DOCUMENTATION REF QUALIFICATION OUTSTANDING Cifi- Qualifi- METHOD ITEMS

EQUIPMENT DESCRIPTION					METHOD	ITEMS	
	Parameter	Specifi- cation	Qualifi- cation	Specifi- cation	Qualifi- cation	METHOD	
System: 74 Plant ID No. Attachment A	Operating Time	Attachment A	l year .	(1)	Attachment C.3	Engineering Analysis and Test	None
Component Cable WDH 1/c, #1/0, (CPJ) Manufacturer: Attachment B	Temperature (°F)	211	325	(4)	Attachment C.1	Generic Simultaneous Test	None
Model Number: N/A	Pressure (PSIA)	15.0	N/A	(4)	N/A	N/A	None
<pre>-unction: Control/Power Accuracy: Reg'd: N/A</pre>	Relative Humidity (%)	100	100	(4)	Attachment C.1	Generic Simultaneous Test	None
Demon: N/A Category: Attachment A	Chemical Spray	N/A	N/A	(4)	N/A	N/A	None
Service: Attachment A	Radiation (RAD)	2.1 × 10 <sup>7</sup>	6.9x10 <sup>7</sup>	(4)	Attachment C.1	Generic Sequential Test	None
.ocation: Room 9	Aging	N/A	40 years	(2)	Attachment C.2	Generic Mat'l Test	None
Flood Level Elev: 552' Nove Flood Level: Yes X	Submergence	N/A	N/A	(4)	N/A	N/A	, None

lotes: (1) See Section 2.4 in 79-01B report.

- (2) See Section 4.1.2 in 79-01B report.
- (3) All notes and other information not on these sheets are on the attached appendix sheets.
- (4) See Section 3.0 and/or Appendix B in 79-01B report.

Prepared by: H.D. Romonouskil

Reviewed by:

TOAK



QA Acceptance:

9

EEB \_74-0023

Rev O

System: 74 Unit: 3

Component: Cable 1/c #10 AWG Mark: WDH

Plant I. D. No.	Room	Function/Service	Category	Operating Time
3ES538-1	9	FCV-74-52	А	l Year

2

\*. N.

# EEB \_ 74-0023

Rev 0

# ATTACHMENT B

Mark WDH

Contract No.

Type

Manufacturer

2

70C7-92430 71C7-54180-2 67C7-91619 CPJ CPJ CPJ

١,

Essex I.ternational Simplex General Cable

Sheet No.: EEB- 74- 9023

Revision: 0

#### ATTACHMENT C

. .

- C.1 Wyle Laboratory Report No. 43854-3.
- C.2 NUREG-0588 Material List.
- C.3 Because of the conservatism of the tests for XLPE and for silicone insulation, including the severity of the mandrel bend and dielectric test in water after the combined LOCA/SLB profile, it is our engineering judgment that there is sufficient margin to give reasonable assurance of continued operability more than a year in the post-LOCA environment.

Prepared	by: -	 	
eviewed	by:	 1	
QA Accept	tance		_

1

SYSTEM COMPONENT EVALUATION WORK SHEET (Rev 2)

Facility: Browns Ferry Nuclear Plant E0 200

Jocket: 50-290						Date 10/2-/	80
FOULDMENT DESCOLUTION	ENVIRONMENT			DOCUMEN	NTATION REF	QUAL IFICATION METHOD	OUTSTANDING ITEMS
EQUIPMENT DESCRIPTION	Parameter	Specifi- cation	Qualifi- cation	Specifi- cition	Qualif1- cation	nemou	11LIN
System: 74 Plant ID No. Attachment A	Operating Time	Attachment A	l year	(1)	Attachment C.4	Engineering Analysis and Tests	None .
Component Cabie WDI 1/c, #2/0, (CPJ) ManufacturerAttachment B	Temperature (°F)	325	325	. (4)	Attachment C.2	Generic Simultaneous Test	None
1odel Number: N/A	Pressure (PSIA)	69.7	N/A	(4)	N/A	N/A	None
Sunction: Control/Power	Relative Humidity (%)	100	100	(4)	Attachment C.2	Generic Simultaneous Test	None
Accuracy: Req'd: N/A Demon: N/A Category: Attachment A	Chemical Spray	N/A	N/A	(4)	N/A	N/A	None .
ervice: Attachment A	Radiation (RAD)	6.5x10 ¥ 4x10 \$ Attach. C.1	6.9x10 <sup>7</sup>	(4)	Attachment C.2	Generic Sequential Test	None
.ocation: 0	Aging	N/A	10 years	(2)	Attachment C.3	Generic Mat'l Test	and the second sec
Tood Level Elev: 552' bove Flood Level: Yes X	Submergence	N/A	N/A	(4)	N/A	N/A	None

lotes: (1) See Section 2.4 in 79-01B report.

- (2) See Section 4.1.2 in 79-01B report.
- (3) All notes and other information not on these sheets are on the attached appendix sheets.
- (4) See Section 3.0 and/or Appendix B in 79-01B report.

Prepared by: H. D. Romanaux

ABralley Reviewed by:

QA Acceptance:

(3)

EEB 74-0024

0

Sheet No.

Revision

System: 74 Unit: 3

3ES3038-11

EEB-74-0024 Rev O

Component: Cable 1/c #2/0 Mark: WDI

Plant I. D. No. Room

0

Function/Service

FCV-74-66 Supply

\* 12

Category Operating Time A 1 year

1

# EEB <u>74-0024</u> REV <u>0</u>

# ATTACHMENT B

MarkWDI

Contra	ct No.	Туре	Manufacturer
820032	XFR from WBNP 74C7-85069 WBNP WDJ	CPJ	Triangle Conduit & Cable
75C7-8 73C7-8 71C7-5 67C7-9 72C7-7 69C7-6	4528 4180 1619 5533-1	CPJ CPJ CPJ CPJ CPJ CPJ CPJ	Triangle Conduit & Cable Plastic Wire & Cable Corp Simplex General Cable Corp Essex Rockbestos

ł

Sheet No: EEB 74-0024

Revision: 0

## ATTACHMENT C

C.1 Integrated dose - 10 years plus accident

#### Beta Dose

#### References:

- 1. W. W. Parkinson, O. Sisman, October 1970, The Use of Plastics and Elastomers in Nuclear Radiation.
- R. B. Blodgett, R. G. Fisher, June 1968, Insulations and Jackets for Control and Power Cables.
- M. Asaka, S. Yamamoto, 1973, Radiation Resistance of Plastic Insulating Materials for Cable.
- 4. Anaconda-Continental Test Report No. 79117 dated April 1979.

5. Wyle Laboratory Test Report 43854-3.

- 6. Franklin Institute Test Reports E-C4113 and FC-5120.
- 7. Rockbestos Company Test Report dated July 1977 amended 1979.

The TVA value of  $4 \times 10^9$  rads for the beta accident dose at the periphery of the containment is being reevaluated due to its high value. However, using this value and making reference to the 7901-B DOR guidelines section 4.2.1 and the depth dose penetration, which owing to the low penetrating power of beta particles gives a factor of 10 reduction for 40 mils of jacketing material, and a factor of 10 for an insulation thickness of 30 mils and which is conservative for TVA's 600-volt power and control cables and extremely conservative for TVA's triax and coax and signal cable due to their thickness and the presence of metallic shielding material, and assigning a factor of 5 for the installation shielding of metal trays, conduit, boxes, and flexible conduit, we arrive at a total effective dose of .8 x 107 rads of beta.

Since the energy dissipation of gamma radiation occurs via ionizing processes, one can add the accident dose of  $4 \times 10^7$  rads of gamma directly. The accumulated integrated gamma 10-year dose (the time presently assigned to connectors and penetrations) amounts to 7 rads which added directly gives a total dose of  $7.3 \times 10^7$  rads. In addition, since the containment is inerted in operation, the scission rate and deterioration of the insulation and jacketing materials through oxidation will be much less than for tests conducted in air.

Since the above value of 7.3 x  $10^7$  is less than the values for which we have in-air test data for SROAJ types (1.2 x  $10^8$ ) and for XLPE types (2 x  $10^8$ ), it is concluded that the beta dose in an accident will not disqualify the cables presently installed, and the cables will remain operable in the service environment.

Sheet No: EEB 74-0024

Revision: 0

#### ATTACHMENT C (con'd)

- C.2 Wyle Laboratory Report No. 43854-3
- C.3 NUREG-0588 Material List
- C.4 Because of the conservatism of the tests for XLPE and for silicone insulation, including the severity of the mandrel bend and dielectric test in water after the combined LOCA/SLB profile, it is our engineering judgment that there is sufficien. margin to give reasonable assurance of continued operability more than a year in the post-LOCA environment.

Reviewed	by:	
Prepared	by:	
OA Accep	ance:	

SYSTEM COMPONENT EVALUATION WORK SHEET (Rev 2)

Facility: Browns Ferry Nuclear Plant Jn 200

nît: 3 ocket: 50-296						Revision O Date 10/22/8	0
EQUIPMENT DESCRIPTION		ENVIRONMENT		DOCUMEN	TATION REF	QUALIFICATION METHOD	OUTSTANDING ITEMS
EQUIPMENT DESCRIPTION	Parameter	Specifi- cation	Qualifi- cation	Specifi- cation	Qualifi- cation	ne moo	
ystem: 74 lant ID No. Attachment A	Operating Time	Attachment A	l year .	(1)	Attachment C.3	Engineering Analysis and Test	None
omponent Cable WDI 1/c, #2/0, (CPJ) anufacturer: Attachment B	Temperature (°F)	157	325	(4)	Attachment C.1	Generic Simultaneous Test	None
odel Number: N/A unction: Control/Power	Pressure (PSIA)	15.0	N/A	(4)	N/A	N/A	None
	Relative Humidity (%)	100	100	(4)	Attachment C.1	Generic Simultaneous Test	None
ategory: Attachment A	Chemical Spray	N/A	N/A	(4)	N/A	N/A	None
ervice: Attachment A	Radiation (RAD)	$2.1 \times 10^{7}$	6.9×10 <sup>7</sup>	(4)	Attachment C.1	Generic Sequential Test	None
ocation: Room 8	Aging	N/A	40 years	(2)	Attachment C.2	Generic Mat'l Test	None
lood Level Elev: 552' bove Flood Level: Yes x No	Submergence	N/A	N/A	(4)	N/A	N/A	None

'otes: (1) See Section 2.4 in 79-01B report.

- (2) See Section 4.1.2 in 79-018 report.
- (3) All notes and other information not on these sheets are on the attached appendix sheets.
- (4) See Section 3.0 and/or Appendix B in 79-01B report.

Prepared by: H.D. Pomonowskif

Reviewed by:

Albralley

QA Acceptance:

(3)

Sheet No.

EEB 74-0025

9

5y 21

20

10

÷u

10

;a 18

EEB 74-0025

Rev O

System: 74 Unit: 3

Component: Cable 1/c #2/0 Mark: WDI

to any i

Plant I. D. No.	Room	Function/Service	Category	Operating Time
3553038-II	8	FCV-74-66 Supply	А	1 Year

\*....

1

# EE8 74-0025 REV 0

# ATTACHMENT B

# Mark WDI

Contract	No.	Туре	Manufacturer
820032	XFR from WBNP 74C7-85069 WBNP WDJ	СРЈ	Triangle Conduit & Cable
75C7-857 73C7-845 71C7-54 67C7-910 72C7-75 69C7-64	528 180 519 533-1	CPJ CPJ CPJ CPJ CPJ CPJ CPJ	Triangle Conduit & Cable Plastic Wire & Cable Corp Simplex General Cable Corp Essex Rockbestos

820032		7-85069	
75C7-85 73C7-84			
71C7-54 67C7-91	180		
7207-75			
69C7-64	924		

Sheet No.: EEB- 74-0025

Revision: 0

### ATTACHMENT C

.

- C.1 Wyle Laboratory Report No. 43854-3.
- C.2 NUREG-0588 Material List.
- C.3 Because of the conservatism of the tests for XLPE and for silicone insulation, including the severity of the mandrel bend and dielectric test in water after the combined LOCA/SLB profile, it is our engineering judgment that there is sufficient margin to give reasonable assurance of continued operability more than a year in the post-LOCA environment.

Prepared	by:	 
Reviewed	by:	
QA Accept	tance:	



(3)SYSTEM COMPONENT EVALUATION WORK SHEET (Rev 2) Sheet No. EEB 74-0026 acility: Browns Ferry Nuclear Plant Revision Init: 3 0 locket: 50-296 Date 10/22/80 OUTSTANDING QUALIFICATION DOCUMENTATION REF ENVIRONMENT METHOD ITEMS EQUIPMENT DESCRIPTION Specifi-Qualifi-Specifi-Qualification cation Parameter cation cation ystem: 74 Engineering None Attachment Operating Attachment A 1 Year Analysis C.4 Time lant ID No. Attachment A (1)component Cable WEENJ) Attachments Temperature (°F) None lanufacturer: Artachment B C.1 and C.2 Attachment C.3 153 (4) 211 Pressure lodel Number: N/A 15.0 (PSIA) (4)81.1.8 N/A None N/A unction: Control/Power LPCEA S-61-402 Standard par 3.9, 3.7.3 Material Relative 6.7 Requirement None Humidity (%) (4)100 100 ccuracy: Reg'd: N/A Demon: N/A Chemical Spray 'None ategory: Attachment A (4)N/A N/A N/A N/A ervice: Attachment A NUREG-0588 Generic Radiation Materials Material 2.1 × 107 4x107 (4) Test None (RAD) List Room 9 ocation: Attachment C.2 Oper, Experience (2) None Aging N/A 20 years lood Level Elev: 552' bove Flood Level: Yes x Submergence N/A N/A N/A None N/A (4)No

otes: (1) See Section 2.4 in 79-018 report.

- (2) See Section 4.1.2 in 79-01B report.
- (3) All notes and other information not on these sheets are on the attached appendix sheets.

See Section 3.0 and/or Appendix B in 79-01B report. (4)

Prepared by: H. D. Romonowiski/SAK Reviewed by: Albrahley

QA Acceptance:

18

Attachment A

EEB 14-0026

Rev O

System: 74 Unit: 3

Component: Cable Mark: WFE

5/c #10 AWG

Plant I. D. No.	Room	Function/Service	Category	Operating Time
3ES1167-I	9	FCV-74-77 Supply	A	l Year

\*...

### EEB \_74-0026

Rev O

### ATTACHMENT B

## Mark WFE

ż

1

Contract No.

Type

PNJ

PJJ

PNJ

### Manufacturer

the sta

1.74

67C3-91618 73C7-84528 70C7-54179-2

11

Plastic Wire & Cable Corp Rome Cable Plastic Wire & Cable Corp

Sheet No.: \_\_\_\_\_EEB-74-0026

Revision: 0

#### ATTACHMENT C

C.1 IPCEA S-61-402 Paragraph 3.9 and Appendix D

C.2 TVA Engineering Report No. 1943

Cable types: PJ, PN, PNJ, PJJ, PSJ

Rooms 1-18

This class of cables was purchased under TVA Standard Specification No. 25.013, based on IPCEA S-61-402 (NEMA WC5). These standards provide a product with an operating rating of 75° C continuous, 95° C (203° F), 500-nour overload rating total in a normal lifetime. They are constructed of polyethylene insulation with Nylon and PVC jacketing.

The jacket material has a higher retention of strength at elevated temperatures, as the material was subjected to air oven aging of 121°C ( $250^{\circ}$  F) for 7 days. Only compartments 1, 2, 3, 6, 9, 10, and 11 show HELB profiles which more than briefly surpass the softening temperature of the insulation. However, owing to the thermal time lags in the cable material and cable installation, the insulation nor even the jacket experience the temperature profile until some time has elapsed.

TVA has conducted tests (Chattanooga Central Laboratories Report No. 81L-81-6821 dated October 1980, of these cables under a temperature profile which envelopes all the HELB profiles. Following this exposure these samples sustained a dielectric test immersed in water of 660 volts ac for 6 minutes, 960 volts ac for 5 minutes, and 2200 volts for 5 minutes in succession.

It is therefore our engineering judgment that this test confirms the above and justifies interim operation until these types can be fully qualified by our Wyle Laboratory tests to be concluded next April or replaced at the next refueling outage.

- C.3 Temperature Qualification Method
  - C.3.1 Standard material long-term overload temperature rating

C.3.2 Engineering Analysis

C.4 The post-HELB conditions are less than the normal cable rating and, in our judgment, the cables could operate satisfactorily for a post-accident of a year.

Prepared by:

Reviewed by:

QA Acceptance:

SYSTEM COMPONENT EVALUATION WORK SHEET (Rev 2)

Facility: Browns Ferry Nuclear Plant 3

EEB-74-0028 Sheet No. Revision 0 Date 10/22/80

(3)

Docket: 50-296

Unit:

FOUTDHENT DECONDETON	ENVIRONMENT		DOCUMENTATION REF		QUALIFICATION METHOD	OUTSTANDING ITEMS		
EQUIPMENT DESCRIPTION	Parameter	Specifi- cation	Qualifi- cation	Specifi- cation	Qualifi- cation	nemos		
System: 74 Plant ID No. Attachment A	Operating Time	Attachment A	1 Year	(1)	Attachment C.5	Engineering Analysis	None	
Component Cable - WGB 2/c, #12 AWG (PNJ)(PJJ) Manufacturer:Attachment B	Temperature (°F)	325	153	(4)	Attachments C.2 and C.3	Attachment C.4	None	
Model Number: N/A	Pressure (PSIA)	69.7	N/A	(4)	N/A	N/A	None	
Function: Control/Power	Relative Humidity (%)	100	100	(4)	IPCEA S-61-402 par 3.9, 3.7.3, 6.7	Standard Material Requirement	None	
Accuracy: Req'd: N/A Demon: N/A Category: Attachment A	Chemical Spray	N/A	N/A	(4)	N/A	N/A	None.	
Service: Attachment A	Radiation (RAD)	6.5x10 8 4x10 8 Attach. C.1	4×10 <sup>7</sup>	(4)	NUREG-0588 Materials List	Generic Material Test	None	
Location: 0	Aging	N/A	10 years	(2)	Attachment C.3	Oper. Experience		
Flood Level Elev: 552' Above Flood Level: Yes X No	Submergence	N/A	N/A	(4)	N/A	. N/A	None	

Notes: (1) See Section 2.4 in 79-01B report.

- (2) See Section 4.1.2 in 79-01B report.
- (3) All notes and other information not on these sheets are on the attached appendix sheets.

(4) See Section 3.0 and/or Appendix B in 79-01B report.

Prepared by: H. D. Romonowe

alley Reviewed by:

QA Acceptance:

Attachment A

EEB-74-0028 System: 74 Rev O 3 Unit: 2/c #12 AWG Component: Cable WGB Mark: Category Operating Time Function/Service Room Plant I. D. No. FCV-74-47 Relay Logic A 1 Year 0 3ES1054-I Circuit A Cont FCV-74-47 0 3ES1083-I FCV-74-47 Relay Logic 3ES3554-II 0 Circuit B Cont FCV-74-47 0 3ES3583-II

1

.

2

1.14

### EEB \_\_\_\_\_\_\_

Rev O

#### ATTACHMENT B

Mark WGB

Contract No. 67C3-91618 73C7-84528 75K7-86150-1 75K5-86506-1 74C7-85069-1 70C7-54179-2 71X7-54761-1 72C7-54872 70C7-54179-1

1. 1

Type

PNJ

PJJ

PJJ

PJJ

PJJ

PNJ

PNJ

PNJ

PNJ

#### Manufacturer.

Brand-Rex Rome Cable Cyprus American Insulated Wire Rome Plastic Wire & Cable Corp General Cable Plastic Wire & Cable Corp Brand-Rex

Sheet No: EEB- 74 -0028

Revision: 0

#### ATTACHMENT C

C.1 Integrated Dose - 10 years plus accident

#### Beta Dose

References:

- 1. W. W. Parkinson, O. Sisman, October 1970, The Use of Plastics and Elastomers in Nuclear Radiation.
- R. B. Blodgett, R. G. Fisher, June 1968, Insulations and Jackets for Control and Power Cables.
- M. Asaka, S. Yamamoto, 1973, Radiation Resistance of Plastic Insulating Materials for Cable.
- 4. Anaconda-Continental Test Report No. 79117 dated April 1979.
- 5. Wyle Laboratory Test Report 43854-3.
- 6. Franklin Institute Test Reports E-C4113 and FC-5120.
- 7. Rockbestos Company Test Report dated July 1977 amended 1979.

The TVA value of  $4 \times 10^9$  rads for the beta accident dose at the periphery of the containment is being reevaluated due to its high value. However, using this value and making reference to the 7901-B DOR guidelines section 4.2.1 and the depth dose penetration, which owing to the low penetrating power of beta particles gives a factor of 10 reduction for 40 mils of jacketing material, and a factor of 10 for an insulation thickness of 30 mils and which is conservative for TVA's 600-volt power and control cables and extremely conservative for TVA's triax and coax and signal cable due to their thickness and the presence of metallic shielding material, and assigning a factor of 5 for the installation shielding of metal trays, conduit, boxes, and flexible conduit, we arrive at a total effective dose of .8 x  $10^7$  rads of beta.

Since the energy dissipation of gamma radiation occurs via ionizing processes, one can add the accident dose of  $4 \times 10^7$  rads of gamma directly. The accumulated integrated gamma 10-year dose (the time presently assigned to connectors and penetrations) amounts to 2.5 x 10<sup>7</sup> rads which added directly gives a total dose of 7.3 x 10<sup>7</sup> rads. In addition, since the containment is inerted in operation, the scission rate and deterioration of the insulation and jacketing materials through oxidation will be much less than for tests conducted in air.

Sheet No: EER 74-0028

Revision: O

### A TACHMENT C (Continued)

#### C.1 (Continued)

Since the above value of 7.3  $\times 10^7$  is less than the values for which we have in-air test data for SROAJ types (1.2  $\times 10^8$ ) and for XLPE types (2  $\times 10^8$ ), it is concluded that the beta dose in an accident will not disqualify the cables presently installed, and the cables will remain operable in the service environment.

C.2 IPCEA S-61-402 Paragraph 3.9 and Appendix D

C.3 TVA Engineering Report No. 1943

Cable types: PJ, PN, PNJ, PJJ, PSJ

Room: 0

This class of cables was purchased under TVA Standard Specification No. 25.013, based on IPCEA S-61-402 (NEMA WC5). These standards provide a product with an operating rating of 75° C continuous,  $95^{\circ}$  C ( $203^{\circ}$  F), 500-hour overload rating total in a normal lifetime. They are constructed of polyethylene insulation with Nylon and PVC jacketing.

The jacket material has a higher retention of strength at elevated temperature. The in-containment SLB temperature and duration exceeds the cable ratings and the insulation and jacket distortion temperatures.

However, the service which these cable have seen thus far has exposed them to a gamma radiation dose of  $6.25 \times 10^6$  rads or more. This is sufficient to have cross-linked the polyethylene and PVC as well. Consequently, the insulation is now in fact a thermoset material and is capable of the same temperature that TVA's cross-linked polyethylene insulated cable has demonstrated and is capable of withstanding the LOCA/ SLB and the post-LOCA environment of 1 year. Thus, continued operation is justified.

TVA has prepared a LOCA/SLB, thermal aging, and radiation test procedure to be performed by Wyle Laboratories on samples of this cable to demonstrate the validity of this conclusion. Results of this testing program are expected to be available in April 1981.

C.4. Temperature Qualification Method

C.4.1 Standard material long-term overload temperature rating

C.4.2 Engineering analysis

Sheet No: EEB- 74-0028

Revision No: 0

ATTACHMENT C (Continued)

C.5 Because of the conservatism of the tests for XLPE and for silicone insulation, including the severity of the mandrel bend and dielectric test in water after the combined LOCA/SLB profile, it is our engineering judgment that there is sufficient margin to give reasonable assurance of continued operability more than a year in the post-LOCA environment.

Prepared	by:
Reviewed	by:
QA Accept	tance:

POOR ORIGINAL

Facility: Browns Ferry Nucl Init: 3 Jocket: 50-296	ear Plant .	SYSTEM COMPONENT EVALUATION WORK SHEET (Rev 2)			(3) Sheet No. EEB 74-0029 Revision 0 Date 10/22/80		
		ENVIRONMENT		DOCUMEN	TATION REF	QUALIFICATION METHOD	OUTSTANDING ITEMS
EQUIPMENT DESCRIPTION	Parameter	Specifi- cation	Qualifi- cation	Specifi- cation	Qual fi- cation	n L mov	
System: 74 Plant ID No. Attachment A	Operating Time	Attachment A	1 Year	(1)	Attachment C.4	Engineering Analysis	None
Component Cable WGB 2/c, #12AWG, (PNJ)(PJJ) anufacturer:Attachment B	Temperature	158	153	(4)	Attachments C.1 and C.2	Attachment C.3	None ·
odel Number: N/A	Pressure (PSIA)	15.0	N/A	(4)	N/A	N/A	None
unction: Control/Power	Relative Humidity (%)	100	100	(4)	IPCEA S-61-402 par 3.9, 3.7.3 6.7		None
Ccuracy: Req'd: N/A Demon: N/A Sategory: Attachment A	Chemical Spray	N/A	N/A	(4)	N/A	N/A	None
Fervice: Attachment A	Radiation (RAD)	3 x 10 <sup>7</sup>	4x10 <sup>7</sup>	(4)	NUREG-0588 Materials List	Generic Material Test	None
.cation: Room 2	Aging	N/A	20 years	(2)	Attachment C.2	Oper, Experience	None
lood Level Elev: 552' Dove Flood Level: Yes X	Submergence	N/A	N/A	(4)	N/A	. N/A	None

'stes: (1) See Section 2.4 in 79-01B report.

e wednesde at here is dough at

- (2) See Section 4.1.2 in 79-01B report.
- (3) All notes and other information not on these sheets are on the attached appendix sheets.
- (4) See Section 3.0 and/or Appendix B in 79-01B report.

Prepared by: 4 D. Romonowieki/ SAK Reviewed by: ABradley

QA Acceptance:

Attachment A

System: 74 Unit: 3

EEB-74-0029 Rev O

Component: Cable 2/c #12 AWG Mark: WGB

Plant I. D. No.	Room	Function/Service	Category	Operating Time
3ES1115-I	2	PT-74-51 Relay Logic Circuit A Control	A 	1 Year
3ES1116-I	2	PT-74-51		
3ES1117-I	2	PT-74-51	1.000	
3ES1118-I	2	PT-74-51		
3R3265	2	ME-74-137A Pump A Seal Leakage Hi		24 Test
3R3266	2	ME-74-137A PMP C Seal Leakage Hi Control		
3R3257	2	MIS-74-137B PMP B Leakage Hi Control		
3R3258	2	MIS-74-137B PUMP D		12 . S
3ES1575-I	2	RHR PMP 3C HTR Cont		Strain and the start of the
3ES1565-1	2	RHR PMP 3A HTR Cont		
3ES1085-1	2	FIS-74-50 RHR SYS FLOW	*	v

9° 1

### EEB \_74-0029\_

Rev O

### ATTACHMENT B

Mark WGB

Contract No.

67C3-91618 7307-84523 75K7-86150-1 75K5-86506-1 74C7-85069-1 70C7-54179-2 71x7-54761-1 72C7-54872 70C7-54179-1

2

Type

PNJ PJJ PJJ PJJ PJJ PNJ PNJ PNJ PNJ Brand-Rex Rome Cable Cyprus American Insulated Wire Rome Plastic Wire & Cable Corp General Cable Plastic Wire & Cable Corp Brand-Rex

Manufacturer

Sheet No.: EEB-74-0029

Revision: 0

#### ATTACHMENT C

C.1 IPCEA S-61-402 Paragraph 3.9 and Appendix D

C.2 TVA Engineering Report No. 1943

Cable types: PJ, PN, PNJ, PJJ, 2SJ

Rooms 1-18

This class of cables was purchased under TVA Standard Specification No. 25.013, based on IPCEA S-61-402 (NEMA WC5). These standards provide a product with an operating rating of 75° C continuous, 95° C (203° F), 500-hour overload rating total in a normal lifetime. They are constructed of polyethylene insulation with Nylon and PVC jacketing.

The jacket material has a higher retention of strength at elevated temperatures, as the material was subjected to air oven aging of 121°C ( $250^{\circ}$  F) for 7 days. Only compartments 1, 2, 3, 6, 9, 10, and 11 show HELB profiles which more than briefly surpass the softening temperature of the insulation. However, owing to the thermal time lags in the cable material and cable installation, the insulation nor even the jacket experience the temperature profile until some time has elapsed.

TVA has conducted tests (Chattanooga Central Laboratories Report No. 81L-81-6821 dated October 1980, of these cables under a temperature profile which envelopes all the HELB profiles. Following this exposure these samples sustained a dielectric test immersed in water of 660 volts ac for 6 minutes, 960 volts ac for 5 minutes, and 2200 volts for 5 minutes in succession.

It is therefore our engineering judgment that this test confirms the above and justifies interim operation until these types can be fully qualified by our Wyle Laboratory tests to be concluded next April or replaced at the next refueling outage.

- C.3 Temperature Qualification Method
  - C.3.1 Standard material long-term overload temperature rating

C.3.2 Engineering Analysis

C.1 The post-HELB conditions are less than the normal cable rating and, in our judgment, the cables could operate satisfactorily for a post-accident of a year.

Prepared by:

Reviewed by:

QA Acceptance:



'acility: Browns Ferry Nuclear Plant .
Init: 3
locket: 50-296

12

SYSTEM COMPONENT EVALUATION WORK SHEET (Rev 2)

(3) Sheet No. <u>EEB 74-0030</u> Revision <u>O</u> Date <u>10/22/80</u>

	EMVIRONMENT		DOCUMENTATION REF		QUALIFICATION METHOD	OUTSTANDING ITEMS	
EQUIPMENT DESCRIPTION -	Parameter	Specifi- cation	Qualifi- cation	Specifi- cation	Qualifi- cation	ne moo	
ystem: 74 Tant ID No. Attachment A	Operating Time	Attachment A	1 Year	(1)	Attachment C.4	Engineering Analysis	None
Component Cable WGB 2/c, #12AWG, (PNJ)(PJJ) Lanufacturer:Attachment B	Temperature (°F)	294	153	(4)	Attachments C.1 and C.2	Attachment C.3	None
odel Number: N/A	Pressure (PSIA)	. 15.0	N/A	(4)	N/A	N/A	None
unction: Control/Power	Relative Humidity (%)	100	100	(4)	IPCEA S-61-402 par 3.9, 3.7.3 6.7		None
ccuracy: Req'd: N/A Demon: N/A ategory: Attachment A	Chemical Spray	N/A	N/A	(4)	N/A	N/A	None
ervice: Attachment A	Radiation (RAD)	3 x 10 <sup>7</sup>	4x107	(4)	NUREG-0588 Materials List	Generic Material Test	None
ocation: Room 5	Aging	N/A	20 years	(2)	Attachment C.2	Oper, Experience	None
lood Level Elev: 552' bove Flood Level: Yes ×	Submergence	N/A	N/A	(4)	N/A	N/A	None

otes: (1) See Section 2.4 in 79-01B report.

(2) See Section 4.1.2 in 79-018 report.

(3) All notes and other information not on these sheets are on the attached appendix sheets.

(4) See Section 3.0 and/or Appendix B in 79-01B report.

Prepared by: H.D. Romonouskil

Reviewed by:

QA Acceptance:

### Attachment A

System: 74 Unit: 3				EEB-74-0030 Rev 0
Component: Cable Mark: WGB		2/c #12 AWG		
Plant I. D. No.	Room	Function/Service	Category	Operating Time
3ES3586-II	5	PT-74-65 RHR Relay Logic	A	1 Year
3ES3615-II	5	PT-74-65 RHR Relay Logic B		
3ES3616-II	5	PT-74-65		
3ES3617-II	5	PT-74-65		
3ES3618-II	5	PT-74-65 ¥		
3ES4065-I	5	RHR Pmp 3B Htr Cont		
3ES4075-I	5	RHR Pmp 3D Htr Cont	۷.	T

ž.

\* 5

### EEB 74-0030

Rev \_\_\_\_\_O

ź

#### ATTACHMENT B

Mark WGB

Contract No. 67C3-91618 73C7-84528 75K7-86150-1 75K5-86506-1 74C7-85069-1 70C7-54179-2 71X7-54761-1 72C7-54872 70C7-54179-1 Туре

PNJ

PJJ

PJJ

PJJ

PJJ

PNJ

PNJ

PNJ

PNJ

Manufacturer

Brand-Rex Rome Cable Cyprus American Insulated Wire Rome Plastic Wire & Cable Corp General Cable Plastic Wire & Cable Corp Brand-Rex



'acility: Browns Ferry Nuclear Plant init: 3 ocket: 50-296

4.4

SYSTEM COMPONENT EVALUATION WORK SHEET (Rev 2)

Sheet No. EEB 74-0031 Revision 0 Date 10/22/80

(3)

		ENVIRONMENT		DOCUMEN	ITATION REF	QUALIFICATION METHOD	OUTSTANDING ITEMS
EQUIPMENT DESCRIPTION	Parameter	Specifi- cation	Qualifi- cation	Specifi- cation	Qualifi- cation	METHOD	TILIN .
ystem: 74 'lant ID No. Attachment A	Operating Time	Attachment A	1 Year	(1)	Attachment C.4	Engineering Analysis	None
Component Cable WGB 2/c, #12AWG, (PNJ)(PJJ) Manufacturer:Attachment B	Temperature (°F)	157	153	(4)	Attachments C.1 and C.2	Attachment C.3	None -
odel Number: N/A	Pressure (PSIA)	15.0	N/A	(4)	N/A	N/A	None
unction: Control/Power	Relative Humidity (%)	100	100	(4)	IPCEA S-61-402 par 3.9, 3.7.3 6.7		None
ccuracy: Req'd: N/A Demon: N/A ategory: Attachment A	Chemical Spray	N/A	N/A	(4)	N/A	N/A	None
ervice: Attachment A	Radiation (RAD)	2.1 × 10 <sup>7</sup>	4×10 <sup>7</sup>	(4)	NUREG-0588 Materials List	Generic Material Test	None
ocation: Room 8	Aging	N/A	20 years	(2)	Attachment C.2	Oper, Experience	None
lood Level Elev: 552' bove Flood Level: Yes X No	Submergence	N/A	N/A	(4)	N/A	. N/A	None

(1) See Section 2.4 in 79-01B report. otes:

The serve stations a

(2) See Section 4.1.2 in 79-018 report.

(3) All notes and other information not on these sheets are on the attached appendix sheets.

(4) See Section 3.0 and/or Appendix B in 79-01B report.

Prepared by: H.D. Remonauskil SAK Reviewed by: MBrakley

QA Acceptance:

Attachment A

EEB 74-0031

Rev Q

System: 74 Unit: 3

Component: Cable 2/c #12 AWG Mark: WGB

Plant I. D. No.	Room	Function/Service	Category	Operating Time
3ES1115-I	8	PT-74-51 Relay Logic	A	1 Year
		Circuit A Cont	1.00	
3ES1116-I	8	PT-74-51		
3ES1117-I	8	PT-74-51		
3ES1118-I	8	PT-74-51		
3ES1054-I	8	FCV-74-47 Relay Logic		
-P01034 *		Circuit A Cont		
3ES1083-I	8	FCV-74-47		
3ES3554-II	8	FCV-74-47 Relay Logic		State States
3633334-11		Circuit B Cont		
3ES3583-II	8	FCV-74-47		1. T. B. S. L. L. S. M. M. S.
3ES3586-II	8	T-74-65 RHR Relay Log	ic	
3623300-11	Ŭ.	Logic		
3ES3615-II	8	PT-74-65 RHR Relay	S. 1. C. P. H	
3653013-11	· ·	Logic B		
3003636 77	8	PT-74-65		
3ES3616-II	8	PT-74-65		
3ES3617-II		PT-74-65		
3ES3618-II	8	RHR PMP 3B HTR		and the second second
3ES4065-I	0	Control		
and a second second second	0	RHR PMP 3C HTR		
3ES1575-I	8	Cont		
		RHR PMP 3A HTR Cont		
3ES1565-I	8			
3ES4075-II	8	RHR PMP 3D HTR Cont		
3ES1085-1	8	F1S-74-50 RHR SYS Flow		

۰. . .

### EEB \_74-0031\_

Rev \_\_\_\_\_

### ATTACHMENT B

Mark WGB

Contract No.

Туре

Manufacturer

67C3-91618	
7307-84528	
75K7-86150-1	
75K5-86506-1	
7407-85069-1	
70C7-54179-2	
71 x7-54761-1	
72C7-54872	
70C7-54179-1	

PN PJJ PJJ PJJ PNJ PNJ PNJ PNJ

Brand-Rex Rome Cable Cyprus Anterican Insulated Wire Rome Plastic Wire & Cable Corp General Cable Plastic Wire & Cable Corp Brand-Rex

Sheet No.: <u>EEB-74-003</u> Revision: <u>0</u>

#### ATTACHMENT C

C.1 IPCEA S-61-402 Paragraph 3.9 and Appendix D

C.2 TVA Engineering Report No. 1943

Cable types: PJ, PN, PNJ, PJJ, PSJ

Rooms 1-18

This class of cables was purchased under TVA Standard Specification No. 25.013, based on IPCEA S-61-402 (NEMA WC5). These standards provide a product with an operating rating of 75° C continuous, 95° C (203° F), 500-hour overload rating total in a normal lifetime. They are constructed of polyethylene insulation with Nylon and PVC jacketing.

The jacket material has a higher retention of strength at elevated temperatures, as the material was subjected to air oven aging of 121°C ( $250^{\circ}$  F) for 7 days. Only compartments 1, 2, 3, 6, 9, 10, and 11 show HELB profiles which more than briefly surpass the softening temperature of the insulation. However, owing to the thermal time lags in the cable material and cable installation, the insulation nor even the jacket experience the temperature profile until some time has elapsed.

TVA has conducted tests (Chattanooga Central Laboratories Report No. 81L-81-6821 dated October 1980, of these cables under a temperature profile which envelopes all the HELB profiles. Following this exposure these samples sustained a dielectric test immersed in water of 660 volts ac for 6 minutes, 960 volts ac for 5 minutes, and 2200 volts for 5 minutes in succession.

It is therefore our engineering judgment that this test confirms the above and justifies interim operation until these types can be fully qualified by our Wyle Laboratory tests to be concluded next April or replaced at the next refueling outage.

C.3 Temperature Qualification Method

C.3.1 Standard material long-term overload temperature rating

C.3.2 Engineering Analysis

C.4 The post-HELB conditions are less than the normal cable rating and, in our judgment, the cables could operate satisfactorily for a post-accident of a year.

Prepared by:

Reviewed by:

QA Acceptance:\_\_\_\_\_

SYSTEM COMPONENT EVALUATION WORK SHEET (Rev 2)

Facility: Browns Ferry Nuclear Plant Unit: 3 Docket: 50-296

18

(3) Sheet No. EEB 74-0032 Revision O Date 10/22/80

DOCKET: 50-296						Date 10/20/80	
	ENVIRONMENT		DOCUMENTATION REF		QUALIFICATION METHOD	OUTSTANDING ITEMS	
EQUIPMENT DESCRIPTION	Parameter	Specifi- cation	Qualifi- cation	Specifi- cation	Qualifi- cation	inc moo	
System: 74 Plant ID No. Attachment A	Operating Time	Attachment A	l Year	(1)	Attachment C.4	Engineering Analysis	None
Component Cable WGB 2/c, #12AWG, (PNJ)(PJJ) Manufacturer:Attachment B	Temperature (°F)	211	153	(4)	Attachments C.1 and C.2	Attachment C.3	None .
Model Number: N/A	Pressure (PSIA)	15.0	·N/A	(4)	N/A	N/A	None
Function: Control/Power	Relative Humidity (%)	100	100	(4)	IPCEA S-61-402 par 3.9, 3.7.3 6.7		None
Accuracy: Req'd: N/A Demon: N/A Category: Attachment A	Chemical Spray	N/A	N/A	(4)	N/A	N/A	None
Service: Attachment A	Radiation (RAD)	2.1 x 10 <sup>7</sup>	4×10 <sup>7</sup>	(4)	NUREG-0588 Materials List	Generic Material Test	None
Location: Room 9	Aging	N/A	20 years	(2)	Attachment C.2	Oper, Experience	None
Flood Level Elev: 552' Above Flood Level: Yes X No	Submergence	N/A	N/A	(4)	N/A	. N/A	None

Notes: (1) See Section 2.4 in 79-01B report.

the state and the same that it

- (2) See Section 4.1.2 in 79-01B report.
- (3) All notes and other information not on these sheets are on the attached appendix sheets.
- (4) See Section 3.0 and/or Appendix B in 79-01B report.

Prepared by: H.D. Romonowaki / 59

Reviewed by

QA Acceptance:

Attachmert A

EEB 14-0032

Rev O

System: 74 Unit: 3

2/c #12 AWG

Component: Cable Mark: WGB

Plant I. D. No.	Room	Function/Service	Category	Operating Time
		PT-74-51 Relay Logic	A	1 Year
3ES1115-I	9	Circuit A Cont /	1	
3ES1116-I	9	PT-74-51		
3ES1117-I	9	PT-74-51		and the second second
3ES1118-I	9	PT-74-51		
3ES1054-I	9	FCV-74-47 Relay Logic	a second	
20202024-2		Circuit A Cont		
3ES1083-I	9	FCV-74-47		
3ES3554-II	9	FCV-74-47 Relay Logic		
		Circuit B Cont		
3ES3583-II	9	FCV-74-47		
3ES3586-II	9	PT-74-65 RHR Relay LC	ogic	
		Logic	1.1	
3ES3615-II	9	PT-74-65 RHR Rel y		
		Logic B		
3ES3616-II	9	PT-74-65		
3ES3617-II	9	PT-74-65		
3ES3618-II	9	PT-74-65		
3ES1085-1	9	FIS-74-50 RHR SYS FLO	w 4	4

\*\*\*<sub>1211</sub> :

### EEB \_74-0032

Rev O

### ATTACHMENT B

Mark WGB

Type

PNJ

PJJ

PJJ

PJJ

PJJ

PNJ

PNJ

PNJ

PNJ

Contract No. 67C3-91618 73C7-84528 75K7-86150-1 75K5-86506-1 74C7-85069-1 70C7-54179-2 71X7-54761-1 72C7-54872 70C7-54179-1 Manufacturer.

Brand-Rex Rome Cable Cyprus American Insulated Wire Rome Plastic Wire & Cable Corp General Cable Plastic Wire & Cable Corp Brand-Rex

Sheet No.: EEB- 74-0032 Revision: 0

#### ATTACHMENT C

C.1 IPCEA S-61-402 Paragraph 3.9 and Appendix D

C.2 TVA Engineering Report No. 1943

Cable types: PJ, PN, PNJ, PJJ, PSJ

Rooms 1-18

This class of cables was purchased under TVA Standard Specification No. 25.013, based on IPCEA S-61-402 (NEMA WC5). These standards provide a product with an operating rating of  $75^{\circ}$  C continuous, 95° C (203° F), 500-hour overload rating total in a normal lifetime. They are constructed of polyethylene insulation with Nylon and PVC jacketing.

The jacket material has a higher retention of strength at elevated temperatures, as the material was subjected to air oven aging of 121°C (250°F) for 7 days. Only compartments 1, 2, 3, 6, 9, 10, and 11 show HELB profiles which more than briefly surpass the softening temperature of the insulation. However, owing to the thermal time lags in the cable material and cable installation, the insulation nor even the jacket experience the temperature profile until some time has elapsed.

TVA has conducted tests (Chattanooga Central Laboratories Report No. 81L-81-6821 dated October 1980, of these cables under a temperature profile which envelopes all the HELB profiles. Following this exposure these samples sustained a dielectric test immersed in water of 660 volts ac for 6 minutes, 960 volts ac for 5 minutes, and 2200 volts for 5 minutes in succession.

It is therefore our engineering judgment that this test confirms the above and justifies interim operation until these types can be fully qualified by our Wyle Laboratory tests to be concluded next April or replaced at the next refueling outage.

C.3 Temperature Qualification Method

C.3.1 Standard material long-term overload temperature rating

C.3.2 Engineering Analysis

C.4 The post-HELB conditions are less than the normal cable rating and, in our judgment, the cables could operate satisfactorily for a post-accident of a year.

Prepared by:\_\_\_\_\_ Reviewed by:\_\_\_\_\_ QA Acceptance:\_\_\_\_\_

Facility: Browns Ferry Nucl Unit: 3 Docket: 50-296	ear Plant .	SYSTEM COMPO	DNENT EVALUA	TION WORK SH	EET (Rev 2)	(3) Sheet to. EEB Revision O Date 10/22/80	
EQUIPMENT DESCRIPTION	ENVIRONMENT			DOCUMENTATION REF		QUALIFICATION METHOD	OUTSTANDING ITEMS
	Parameter	Specifi- cation	Qualifi- cation	Specifi- cation	Qualifi- cation	HEINOD	
System: 74 Plant ID No. Attachment A	Operating Time	Attachment A	1 Year	(1)	Attachment C.4	Engineering Analysis	None
Component Cable WGD 4/c, #12AWG, (PNJ) Manufacturer:Attachment B	Temperature (°F)	158	153	(4)	Attachments C.1 and C.2	Attachment C.3	None
Model Number: N/A	Pressure (PSIA)	. 15.0	N/A	(4)	N/A	N/A	None
Function: Control/Power	Relative Humidity (%)	100	100	(4)	IPCEA S-61-402 par 3.9, 3.7.3 6.7		None
Accuracy: Req'd: N/A Demon: N/A Category: Attachment A	Chemical Spray	N/A	N/A	(4)	N/A	N/A	None
Service: Attachment A	Radiation (RAD)	3 × 10 <sup>7</sup>	4x10 <sup>7</sup>	(4)	NUREG-0588 Materials List	Generic Material Test	None
Location Room 2	Aging	N/A	20 years	(2)	Attachment C.2	Oper. Experience	None
Flood Level Elev: 552' Above Flood Level: Yes X	Submergence	N/A	N/A	(4)	N/A	N/A	None

(1) See Section 2.4 in 79-01B report. Notes:

- (2) See Section 4.1.2 in 79-018 report.
- (3) All notes and other information not on these sheets are on the attached appendix sheets.

(4) See Section 3.0 and/or Appendix B in 79-01B report.

Prepared by: <u>A D. Romanowski</u>/ Reviewed by: <u>Albrabley</u> QA Acceptance: \_\_\_\_\_

Actachment A

EEB-74-0033 System: 74 Unit: 3 Rev O Component: Cable 4/c #12 AWG WGD Mark: Category Operating Time Function/Service Room Plant I. D. No. 1 year 2 RHR PMP 3A Cont A 3ES1562-I 2 RHR PMT 3C 3ES1572-I 3ES1154-I FCV-74-7 2 ¥ ¥. ¥

2

\* 1

### EEB \_74-0033 \_\_

Rev O

### ATTACHMENT B

Mark WGD

<u>Contract No</u>. 73C7-84528 67C3-91618 72C7-75220-1 72C7-54762-2

7407-85069

70C7-54179-1

Type PJJ PNJ PJJ PJJ PJJ PJJ PNJ Manufacturer

Rome Cable Plastic Wire & Cable Corp Plastic Wire & Cable Corp Plastic Wire & Cabel Corp Rome Brand-Rex

Sheet No.: EEB- 74-0033

Revision: 0

#### ATTACHMENT C

- C.1 IPCEA S-61-402 Paragraph 3.9 and Appendix D
- C.2 TVA Engineering Report No. 1943

Cable types: PJ, PN, PNJ, PJJ, PSJ

Rooms 1-18

This class of cables was purchased under TVA Standard Specification No. 25.013, based on IPCEA S-61-402 (NEMA WC5). These standards provide a product with an operating rating of 75° C continuous, 95° C (203° F), 500-hour overload rating total in a normal lifetime. They are constructed of polyethylene insulation with Nylon and PVC jacketing.

The jacket material has a higher retention of strength at elevated temperatures, as the material was subjected to air oven aging of 121°C (250°F) for 7 days. Only compartments 1, 2, 3, 6, 9, 10, and 11 show HELB profiles which more than briefly surpass the softening temperature of the insulation. However, owing to the thermal time lags in the cable material and cable installation, the insulation nor even the jacket experience the temperature profile until some time has elapsed.

TVA has conducted tests (Chattanooga Central Laboratories Report No. 81L-81-6821 dated October 1980, of these cables under a temperature profile which envelopes all the HELB profiles. Following this exposure these samples sustained a dielectric test immersed in water of 660 volts ac for 6 minutes, 960 volts ac for 5 minutes, and 2200 volts for 5 minutes in succession.

It is therefore our engineering judgment that this test confirms the above and justifies interim operation until these types can be fully qualified by our Wyle Laboratory tests to be concluded next April or replaced at the next refueling outage.

- C.3 Temperature Qualification Method
  - C.3.1 Standard material long-term overload temperature rating

C.3.2 Engineering Analysis

C.4 The post-HELB conditions are less than the normal cable rating and, in our judgment, the cables could operate satisfactorily for a post-accident of a year.

Prepared by:\_\_\_\_\_

Reviewed by:

QA Acceptance:

Facility: Browns Ferry Nuclear Plant Unit: 3

SYSTEM COMPONENT EVALUATION WORK SHEET (Rev 2)

(3) Sheet No. EEB 74-0034

0

10/22/80

Revision

Date

Cocket: 50-296

11

QUALIFICATION OUTSTANDING ENVIRONMENT DOCUMENTATION REF METHOD ITEMS EQUIPMENT DESCRIPTION Qualifi-Specifi-Specifi-Qualification cation Parameter cation cation None Engineering System: 74 Attachment Operating Attachment A 1 Year Analysis C.4 Time Plant ID No. Attachment A (1)Cable 'WGD Component 4/c. #12AWG, (PNJ) Attachments None Temperature Manufacturer: Attachment B Attachment C.3 C.1 and C.2 153 (4)294 (°F) 6. . . Pressure Model Number: N/A (PSIA) (4)15.0 N/A None N/A N/A IPCEA 5-61-402 Function: Control/Power Standard par 3.9, 3.7.3 Material Relative Requirement None 6.7 Humidity (%) (4)100 100 Accuracy: Reg'd: N/A Demon: N/A Chemical. Spray Category: Attachment A (4)N/A None N/A N/A CA. Service: Attachment A NUREG-0588 Generic Materia] Radiation Materials 4×107 3 x 107 None (RAD) (4) list Test Location: Room 5 N/A (2) Attachment C.2 Oper, Experience None Aging 20 years Flood Level Elev: 552' Above Flood Level: Yes X N/A Submergence N/A N/A N/A None (4)No

Notes: See Section 2.4 in 79-018 report. (1)

· · · · ·

- See Section 4.1.2 in 79-018 report. (2)
- (3) All notes and other information not on these sheets are on the attached appendix sheets.
- (4) See Section 3.0 and/or Appendix B in 79-01B report.

Prepared by: <u>H.O. Romonouiski</u> Reviewed by: <u>MBradley</u> QA Acceptance.

Attachment A

EEB-74-0034 System: 74 Rev O Unit: 3 4/c #12 AWG Component: Cable WGD Mark: Operating Time Function/Service Category Plant I. D. No. Room RHR Pump 3B Cont RHR Pump 3D Cont FCV-74-30 1 year A 5 3ES4062-II 5 . 3ES4072-II ÷ ¥ 5 3ES3639-II

2

.

## 

Rev 0

### ATTACHMENT B

### Mark WGD

Contract No.	Туре	Manufacturer
73C7-84528	PJJ	Rome Cable
67C3-91618	PNJ	Plastic Wire & Cable Corp
72C7-75228-1	PJJ	Plastic Wire & Cable Corp
72C7-54762-2	PNJ	Plastic Wire & Cabel Corp
74C7-85069	PJJ	Rome
70C7-54179-1	PNJ	Brand-Rex

Sheet No.: <u>EEB- 74 -0034</u> Revision: <u>0</u>

### ATTACHMENT C

- C.1 IPCEA S-61-402 Paragraph 3.9 and Appendix D
- C.2 TVA Engineering Report No. 1943

Cable types: PJ, PN, PNJ, PJJ, PSJ

Rooms 1-18

This class of cables was purchased under TVA Standard Specification No. 25.013, based on IPCEA S-61-402 (NEMA WC5). These standards provide a product with an operating rating of 75° C continuous, 95° C (203° F), 500-hour overload rating total in a normal lifetime. They are constructed of polyethylene insulation with Nylon and PVC jacketing.

The jacket material has a higher retention of strength at elevated temperatures, as the material was subjected to air oven aging of 121°C ( $250^{\circ}$  F) for 7 days. Only compartments 1, 2, 3, 6, 9, 10, and 11 show HELB profiles which more than briefly surpass the softening temperature of the insulation. However, owing to the thermal time lags in the cable material and cable installation, the insulation nor even the jacket experience the temperature profile until some time has elapsed.

TVA has conducted tests (Chatt> ga Central Laboratories Report No. 81L-81-6821 dated October 1980, of these cables under a temperature profile which envelopes all the HELB profiles. Following this exposure these samples sustained a dielectric test immersed in water of 660 volts ac for 6 minutes, 960 volts ac for 5 minutes, and 2200 volts for 5 minutes in succession.

It is therefore our engineering judgment that this test confirms the above and justifies interim operation until these types can be fully qualified by our Wyle Laboratory tests to be concluded next April or replaced at the next refueling outage.

- C.3 Temperature Qualification Method
  - C.3.1 Standard material long-term overload temperature rating

C.3.2 Engineering Analysis

C.4 The post-HELB conditions are less than the normal cable rating and, in our judgment, the cables could operate satisfactorily for a post-accident of a year.

Prepared by:\_\_\_\_\_

Reviewed by:

QA Acceptance:\_\_\_\_\_

SYSTEM COMPONENT EVALUATION WORK SHEET (Rev 2)

Facility: Browns Ferry Nuclear Plant . Unit. 3 Cocket: 50-296 (3) Sheet No. <u>EEB 74-0035</u> Revision <u>O</u> Date 10/22/80

EQUIPMENT DESCRIPTION	ENVIRONMENT			DOCUMENTATION REF		QUALIFICATION METHOD	OUTSTANDING ITEMS
	Parameter	Specifi- cation	Qualifi- cation	Specifi- cation	Qualifi- cation	nemou	11203
System: 74 Plant ID No. Attachment A	Operating Time	Attachment A	1 Year	(1)	Attachment C.4	Engineering Analysis	None
Component Cable WGD 4/c, #12 AWG, PNJ Manufacturer:Attachment B	Temperature (°F)	157	153	(4)	Attachments C.1 and C.2	Attachment C.3	None
Model Number: N/A Function: Control/Power	Pressure (PSIA)	15.0	N/A	(4)	N/A	N/A	None
	Relative Humidity (%)	100	100	(4)	IPCEA S-61-402 par 3.9, 3.7.3 6.7		None
Accuracy: Req'd: N/A Demon: N/A Category: Attachment A	Chemical Spray	N/A	N/A	(4)	N/A	N/A	None
Service: Attachment A	Radiation (RAD)	$2.1 \times 10^{7}$	4x10 <sup>7</sup>	(4)	NUREG-0588 Materials List	Generic Material Test	None
Lecation: Room 8	Aging	N/A	20 years	(2)	Attachment C.2	Oper, Experience	None
Flood Level Elev: 552' Above Flood Level: Yes X	Submergence	N/A	N/A	(4)	N/A	. N/A	None

Notes: (1) See Section 2.4 in 79-01B report.

- (2) See Section 4.1.2 in 79-01B report.
- (3) All notes and other information not on these sheets are on the attached appendix sheets.

(4) See Section 3.0 and/or Appendix B in 79-01B report.

Prepared by: H. B. Romanowskill

Reviewed by:

adley

QA Acceptance:

Attachment A

1

EEB \_74-0035

Rev O

System: 74 Unit: 3				RevO
Component: Cabl Mark: WGD	e 4/c #1	2 AWG		
Plant I. D. No.	Room	Function/Service	Category	Operating Time
3ES1562-I 3ES1572-I 3ES4062-II 3ES4072-II 3ES1154-I 3ES3639-II	8 8 8 8 8	RHR PMP 3A Cont RHR PMP 3C Cont RHR PMP 3B Cont RHR PMP 3D Cont FCV-74-7 Cont FCV-74-30	A	1 Year

(\* <sub>111)</sub>

# EEB \_74-0035

Rev O

### ATTACHMENT B

Mark WGD

Contract No. 73C7-84528 67C3-91618 72C7-75228-1 72C7-54762-2 74C7-85069 70C7-54179-1 Туре

PJJ

PNJ

PJJ PNJ PJJ PNJ

### Manufacturer

Rome Cable Plastic Wire Plastic Wire Plastic Wire Rome	&	Cable	Corp
Brand-Rex			

Sheet No.: <u>EEB-74-0035</u> Revision: <u>0</u>

#### ATTACHMENT C

C.1 IPCEA S-61-402 Paragraph 3.9 and Appendix D

C.2 TVA Engineering Report No. 1943

Cable types: PJ, PN, PNJ, PJJ, PSJ

Rooms 1-18

This class of cables was purchased under TVA Standard Specification No. 25.013, based on IPCEA S-61-402 (NEMA WC5). These standards provide a product with an operating rating of 75° C continuous, 95° C (203° F), 500-hour overload rating total in a normal lifetime. They are constructed of polyethylene insulation with Nylon and PVC jacketing.

The jacket material has a higher retention of strength at elevated temperatures, as the material was subjected to air oven aging of  $121^{\circ}$  C ( $250^{\circ}$  F) for 7 days. Only compartments 1, 2, 3, 6, 9, 10, and 11 show HELB profiles which more than briefly surpass the softening temperature of the insulation. However, owing to the thermal time lags in the cable material and cable installation, the insulation non-oven the jacket experience the temperature profile until some time has elapsed.

TVA has conducted tests (Chattanooga Central Laboratories Report No. 81L-81-682" dated October 1980, of these cables under a temperature profile which envelopes all the HELB profiles. Following this exposure these samples sustained a dielectric test immersed in water of 550 volts ac for 6 minutes, 960 volts ac for 5 minutes, and 2200 volts for 5 minutes in succession.

It is therefore our engineering judgment that this test confirms the above and lustifies interim operation until these types can be fully qualified by our Wyle Laboratory tests to be concluded next April or replaced at the next refueling outage.

C.3 Temperature Qualification Method

C.3.1 Standard material long-term overload temperature rating

C.3.2 Engineering Analysis

C.4 The post-HELB conditions are less than the normal cable rating and, in our judgment, the cables could operate satisfactorily for a post-accident of a year.

Prepared by:

Reviewed by:

QA Acceptance:

SYSTEM COMPONENT EVALUATION WORK SHEET (Rev 2)

Facility: Browns Ferry Nuclear Plant . Unit: 3 Docket: 50-296

· B

Date 10/22/80 OUTSTANDING OUALIFICATION DOCUMENTATION REF ENVIRONMENT ITEMS METHOD EQUIPMENT DESCRIPTION Specifi-Qualifi-Qualifi-Specification cation cation Parameter cation None System: 74 Engineering Attachment Operating Attachment A 1 Year Analysis C.4 Time Plant ID No. Attachment A (1)Cable WGD Component 4/c, #12 AWG, PNJ Attachments Temperature None Attachment C.3 Manufacturer: Attachment B C.1 and C.2 211 153 (4) $(^{\circ}F)$ Pressure Model Number: N/A (PSIA) 15.0 (4)None N/A N/A N/A LPCEA 5-61-402 Standard Function: Control/Power par 3.9, 3.7.3 Material Relative None Requirement 6.7 Humidity (%) (4)100 100 Accuracy: Reg'd: N/A Demon: N/A Chemical Spray (4) None N/A Category: Attachment A N/A N/A N/A NUREG-0588 Generic Service: Attachment A Materials Material Radiation 2.1 x 107 4×107 None Test (4)(RAD) List Location: Room 9 Attachment C.2 Oper, Experience None (2) N/A Aging 20 years Flood Level Elev: 552' N/A Above Flood Level: Yes x Submergence N/A N/A N/A None (4)No

Notes: (1) See Section 2.4 in 79-01B report.

S Yre

- (2) See Section 4.1.2 in 79-01B report.
- (3) All notes and other information not on these sheets are on the attached appendix sheets.
- (4) See Section 3.0 and/or Appendix B in 79-01B report.

Prepared by: d. D. Romanowskif

(3)

Revision

Sheet No. EEB 74-0036

0

Minadley

QA Acceptance:

Reviewed by:

EEB 74-0036

Rev O

System: 74 Unit: 3				Rev O
Component: Cabl Mark: WGD	e 4/	/c #12 AWG		
Plant I. D. No.	Room	Function/Service	Category	Operating Time
3ES1154-I 3ES3639-II	9 9	FCV-74-7 Cont FCV-74-30 ¥	A ↓	l Year

1 . . . .

10.00

## 

Rev O

## ATTACHMENT B

Mark WGD

Contract No.

73C7-84528 67C3-91618 72C7-75228-1 72C7-54762-2 74C7-85069 70C7-54179-1 Type PJJ PNJ PJJ PJJ PJJ PNJ

Manufacturer

Rome Cable Plastic Wire & Cable Corp Plastic Wire & Cable Corp Plastic Wire & Cabel Corp Rome Brand-Rex

Sheet No.: \_\_\_\_\_ EEB- 74-0036 Revision: \_\_\_\_\_ 0

#### ATTACHMENT C

C.1 IPCEA S-61-402 Paragraph 3.9 and Appendix D

C.2 TVA Engineering Report No. 1943.

Cable types: PJ, PN, PNJ, PJJ, PSJ

Rooms 1-18

This class of cables was purchased under TVA Standard Specification No. 25.013, based on IPCEA S-61-402 (NEMA WC5). These standards provide a product with an operating rating of 75° C continuous,  $95^{\circ}$  C (203° F), 500-hour overload rating total in a normal lifetime. They are constructed of polyethylene insulation with Nylon and PVC jacketing.

The jacket material has a higher retention of strength at elevated temperatures, as the material was subjucted to air oven aging of 121°C (250°F) for 7 days. Only compartments 1, 2, 3, 6, 9, 10, and 11 show HELB profiles which more than briefly surpass the softening temperature of the insulation. However, owing to the thermal time legs in the cable material and cable installation, the insulation may even the jacket experience the temperature profile until some time has elapsed.

TVA has conducted tests (Chattanooga Central Laboratories Report No. 81L-81-622) dated October 1980, of these cables under a temperature profile whice invelopes all the HELB profiles. Following this exposure these samples sustained a dielectric test immersed in water of 660 whits ac for 6 minutes, 960 volts ac for 5 minutes, and 2200 volts for 5 minutes in succession.

It is therefore our engineering judgment that this test confirms the above and distifies interim operation until these types can be fully qualified by our Wyle Laboratory tests to be concluded next April or replaced at the next refueling outage.

- C.3 Temperature Qualification Method
  - C.3.1 Standard material long-term overload temperature rating

.3.2 Engineering Analysis

C.4 The post-HELB conditions are less than the normal cable rating and, in our judgment, the cables could operate satisfactorily for a post-accident of a year.

Prepared by:

Reviewed by:

QA Acceptance:

SYSTEM COMPONENT EVALUATION WORK SHEET (Rev 2)

Facility: Browns Ferry Nuclear Plant Unit: 3 Docket: 50-296

. 11

(3) Sheet No. EEB 74-0037 Revision 0

OUTSTANDING

ITEMS

None

None

None

None

None

None

None

None

. .

÷ .....

Date 10/22/80

OUALIFICATION

METHOD

Engineering

Analysis

Qualifi-

Attachment

cation

Materials

N/A

List

(4)

(2)

(4)

C.4

DOCUMENTATION REF ENVIRONMENT EQUIPMENT DESCRIPTION Specifi-Qualifi-Specification cation cation Parameter System: 74 Attachment A Operating 1 Year Time Plant ID No. Attachment A (1)Cable 'WGG Component

7/c, #12AWG, (PNJ) Attachments Temperature Attachment C.3 Manufacturer: Attachment B C.1 and C.2 153 (4) $(^{\circ}F)$ 158 Pressure Model Number: N/A 15.0 (PSIA) (4)N/A N/A . N/A IPCEA S-61-402 Standard Function: Control/Power Material par 3.9, 3.7.3 Relative Requirement 6.7 Humidity (%) (4)100 100 Accuracy: Reg'd: N/A Chemical. Demon: N/A Spray N/A Category: Attachment A N/A (4) N/A N/A Generic NUREG-0588 Service: Attachment A Material

4×107

N/A

20 years

 $3 \times 10^{7}$ 

N/A

N/A

Location: Room 2

Flood Level Elev: 552' Above Flood Level: Yes X

See Section 2.4 in 79-01B report. Notes: (1)

No

1 . 1 . . . .

- See Section 4.1.2 in 79-01B report. (2)
- (3) All notes and other information not on these sheets are on the attached appendix sheets.

Submergence

Radiation

(RAD)

Aging

(4) See Section 3.0 and/or Appendix B in 79-01B report.

Prepared by: H. D. Romonomiaking

N/A

Test

Attachment C.2 Oper, Experience

Reviewed by: Monally

QA Acceptance:

System: 74 Unit: 3				EEB-74-0037 Rev 0
Component: Cable Mark: WGG		7/c #12 AWG		
Plant I. D. No.	Room	Function/Service	Category	Operating Time
3R3259	2	MIS-74-137A RHR Temp & Moist Control	A	l Year
3R3251	2	MIS-74-137B	*	•

λ.

Ľ

## EEB \_\_\_\_\_\_\_\_\_\_\_

Rev \_\_\_\_\_

## ATTACHMENT B

## Mark WGG

Contract No.

Туре

Manufacturer

67C3-91618 71X7-54761-1 70C7-54179-1 72C7-75328-2 69C7-64923 PNJ PNJ PNJ PNJ PNJ

Plastic Wire & Cable Corp General Cable Brand-Rex Tamaqua Rockbestos

Sheet No.: <u>EEB-74-003</u>7 Revision: <u>0</u>

#### ATTACHMENT C

C.1 IPCEA S-61-402 Paragraph 3.9 and Appendix D

C.2 TVA Engineering Report No. 1943.

Cable types: PJ, PN, PNJ, PJJ, PSJ

Rooms 1-18

This class of cables was purchased under TVA Standard Specification No. 25.013, based on IPCEA S-61-402 (NEMA WC5). These standards provide a product with an operating rating of 75° C continuous, 95° C (203° F), 500-hour overload rating total in a normal lifetime. They are constructed of polyethylene insulation with Nylon and PVC jacketing.

The jacket material has a higher retention of strength at elevated temperatures, as the material was subjected to air oven aging of 121° C (250° F) for 7 days. Only compartments 1, 2, 3, 6, 9, 10, and 11 show HELB profiles which more than briefly surpass the softening temperature of the insulation. However, owing to the thermal time lags in the cable material and cable installation, the insulation not oven the jacket experience the temperature profile until some time has elapsed.

TVA has conducted tests (Chattanooga Central Laboratories Report No. 81L-81-652) dated October 1980, of these cables under a temperature profile which invalopes all the HELB profiles. Foilowing this exposure these comples sustained a dielectric test immersed in water of 660 zeros ac for 6 minutes, 960 volts ac for 5 minutes, and 2200 volts for 5 minutes in succession.

It is therefore our engineering judgment that this test confirms the above and costifies interim operation until these types can be fully qualified by our Wyle Laboratory tests to be concluded next April or replaced at the next refueling outage.

- C.3 Temperature Qualification Method
  - C.3.1 Standard material long-term overload temperature rating

C.3.2 Engineering Analysis

C.4 The post-HELB conditions are less than the normal cable rating and, in our judgment, the cables could operate satisfactorily for a post-accident of a year.

Prepared by:\_\_\_\_\_

Reviewed by:\_\_\_\_\_

QA Acceptance:

28

SYSTEM COMPONENT EVALUATION WORK SHEET (Rev 2)

Facility: Browns Ferry Nuclear Plant . Unit: 3 Docket: 50-296

	ENVIRONMENT		DOCUMENTATION REF		QUALIFICATION METHOD	OUTSTANDING ITEMS	
EQUIPMENT DESCRIPTION	Parameter	Specifi- cation	Qualifi- cation	Specifi- cation	Qualifi- cation	HETHOD	
System: 74 Plant ID No. Attachment A	Operating Time	Attachment A	1 Year	(1)	Attachment C.4	Engineering Analysis	None
Component Cable WGG 7/c, #12AWG, (PNJ) Manufacturer:Attachment B	Temperature (°F)	220	153	(4)	Attachments C.1 and C.2	Attachment C.3	None ·
Model Number: N/A	Pressure (PSIA)	15.0	-N/A	(4)	N/A	N/A	None
Function: Control/Power	Relative Humidity (%)	100	100	(4)	IPCEA S-61-402 par 3.9, 3.7.3 6.7		None
Accuracy: Req'd: N/A Demon: N/A Category: Attachment A	Chemical Spray	R/A	N/A	(4)	N/A	N/A	None
Service: Attachment A	Radiation (RAD)	$3.1 \times 10^{7}$	4x10 <sup>7</sup>	(4)	NUREG-0588 Materials List	Generic Material Test	None
Location: Room 6	Aging	N/A	20 years	(2)	Attachment C.2	Oper, Experience	None
Flood Level Elev: 552' Above Flood Level: Yes X No	Submergence	R/A	N/A	(4)	N/A	. N/A	None

Notes: (1) See Section 2.4 in 79-01B report.

- (2) See Section 4.1.2 in 79-01B report.
- (3) All notes and other information not on these sheets are on the attached appendix sheets.

(4) See Section 3.0 and/or Appendix B in 79-01B report.

Prepared by: H. D. Romonouski /

Reviewed by:

(3)

Date 10/22/80

Revision

Sheet No. EEB 74-0038

0

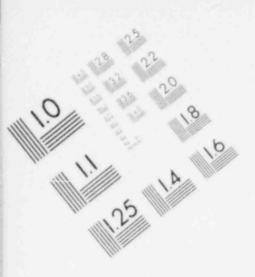
Brally

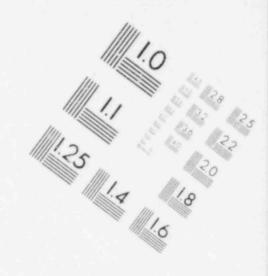
QA Acceptance:

System: 74 Unit: 3				EEB-74 - 0038 Rev 0
Component: Cable Mark: WGG		7/c #12 AWG	~	
Plant I. D. No.	Room	Function/Service	Category	Uperating Time
3V2252 3V2263	6 6	FCV-74-102 & 119 Cont FCV-74-103 & 112 4	A ↓	l Year

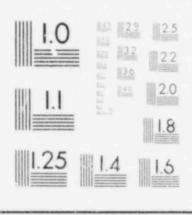
 $\tilde{I}_{j}$  :

\*

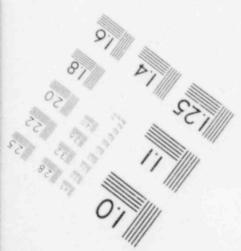




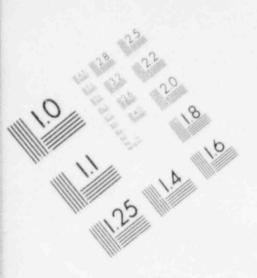
# IMAGE EVALUATION TEST TARGET (MT-3)

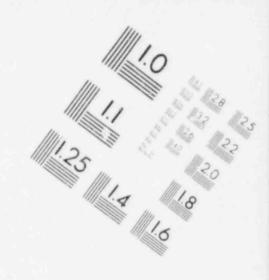


6"



-





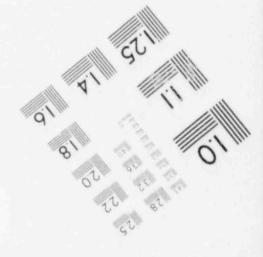
# IMAGE EVALUATION TEST TARGET (MT-3)



6"

OI DI SEI

-



## EEB \_74-0038

Rev O

## ATTACHMENT B

## Mark WGG

Contract No. 67C3-91618 71X7-54761-1 70C7-54179-1

70C7-54179-1 72C7-75328-2 69C7-64923 Type

PNJ

PNJ

PNJ

PNJ

PNJ

Manufacturer

Plastic Wire & Cable Corp General Cable Brand-Rex Tamaqua Rockbestos

1.

Sheet No.: \_ EEB- 74-00.38

Revision: 0

#### ATTACHMENT C

- C.1 IPCEA S-61-402 Paragraph 3.9 and Appendix D
- C.2 TVA Engineering Report No. 1943.
- . Cable types: PJ, PN, PNJ, PJJ, PSJ

Rooms 1-18

This class of cables was purchased under TVA Standard Specification No. 25.013, based on IPCEA S-61-402 (NEMA WC5). These standards provide a product with an operating rating of 75° C continuous, 95° C (203° F), 500-hour overload rating total in a normal lifetime. They are constructed of polyethylene insulation with Nylon and PVC jacketing.

The jacket material has a higher retention of strength at elevated temperatures, as the material was subjected to air oven aging of 121°C (250°F) for 7 days. Only compartments 1, 2, 3, 6, 9, 10, and 11 show HELB profiles which more than briefly surpass the softening temperature of the insulation. However, owing to the thermal time lags in the cable material and cable installation, the insulation nor even the jacket experience the temperature profile until some time has elapsed.

TVA has conducted tests (Chattanooga Central Laboratories Report No. 81L-81-6021 dated October 1980, of these cables under a temperature profile which envelopes all the MELB profiles. Following this exposure these samples sustained a dielectric test immersed in water of 660 dates for 6 minutes, 960 volts ac for 5 minutes, and 2200 volts for 5 minutes in succession.

It is therefore our engineering judgment that this test confirms the above and justifies interim operation until these types can be fully qualified by our Wyle Laboratory tests to be concluded next April or replaced at the next refueling outage.

- C.3 Temperature Qualification Method
  - C.3.1 Standard material long-term overload temperature rating

C.3.2 Engineering Analysis

C.4 The post-HELB conditions are less than the normal cable rating and, in our judgment, the cables could operate satisfactorily for a post-accident of a year.

Prepared by:\_\_\_\_\_

Reviewed by:

QA Acceptance:

SYSTEM COMPONENT EVALUATION WORK SHELT (Rev 2)

Facility: Browns Ferry Nuclear Plant Unit: 50-296 Docket:

Date 10/22/80 OUTSTANDING QUALIFICATION DOCUMENTATION REF ENVIRONMENT ITEMS METHOD EQUIPMENT DESCRIPTION Specifi-Qualifi-Qualifi-Speci14cation cation cation cation Parameter Attachment C.5 Engineering System: 74 1 Year Attachment A Operating Analysis None Plant ID No. Attachment A Time (1)Cable - WGI Component 16/c, #12 AWG (PNJ)(PJJ) Attachments Temperature (°F) Manufacturer:Attachment B None C.2 and C.3 Attachment C.4 (4)153 325 . Pressure Model Number: N/A (4) N/A N/A None (PSIA) 69.7 N/A Function: IPCEA S-61-402 Standard Control/Power Relative Material par 3.9. Humidity (%) (4) 3.7.3, 6.7 Requirement None 100 100 Accuracy: Reg'd: N/A Chemical Demon: N/A Spray None (4)N/A Attachment A N/A Category: N/A N/A 6.5x10 8 NUREG-0588 Service: Attachment A Generic Material None 4x109 B Materials Radiation Test 4x10/ List (4)(RAD) Attach, C.1 None Location: 0 Attachment C. 3bper, Experience 10 years (2) Aging N/A Flood Level Elev: 552' N/A Above Flood Level: Yes X Submargence N/A N/A None N/A (4)No

(1) See Section 2.4 in 79-018 report. Notes:

- (2) See Section 4.1.2 in 79-018 report.
- (3) All notes and other information not on these sheets are on the attached appendix sheets.

(4) See Section 3.0 and/or Appendix B in 79-01B report.

Prepared by: HD emonouskif

QA Acceptance:

(3)

Sheet No.

Revision

EEB-74-0040

System: 74 Unit: 3

Component: Cable 16/c #12 AWG Mark: WGI

Plant I. D. No.RoomFunction/ServiceCategoryOperating Time3ES35420FCV-74-52 ContA1 Year

3

\* ...

EEB-74-0040 Rev 0

1

## EEB \_ 74- 0040

Rev \_\_\_\_\_

## ATTACHMENT B

Mark WGI

Contract No. 73C7-84528 67C2-91618 70C7-54179-1 Type PJJ PNJ PNJ

1.1

Manufacturer

1

Rome Cable Plastic Wire & Cable Corp Brand-Rex

Sheet No: EEB- 74-0040

Revision: 0

#### ATTACHMENT C

C.1 Integrated Dose - 10 years plus accident

#### Beta Duse

References:

- W. W. Parkinson, O. Sisman, October 1970, The Use of Plastics and Elastomers in Nuclear Radiation.
- R. B. Blodgett, R. G. Fisher, June 1968, Insulations and Jackets for Control and Power Cables.
- M. Asaka, S. Yamamoto, 1973, Radiation Resistance of Plastic Insulating Materials for Cable.
- 4. Anaconda-Continental Test Report No. 79117 dated April 1979.
- 5. Wyle Laboratory Test Report 43854-3.
- 6. Franklin Institute Test Reports E-C4113 and FC-5120.
- 7. Rockbestos Company Test Report dated July 1977 amended 1979.

The TVA value of  $4 \times 10^9$  rads for the beta accident dose at the periphery of the containment is being reevaluated due to its high value. However, using this value and making reference to the 7901-B DOR guidelines section 4.2.1 and the depth dose penetration, which owing to the low penetrating power of beta particles gives a factor of 10 reduction for 40 mils of jacketing material, and a factor of 10 for an insulation thickness of 30 mils and which is conservative for TVA's 600-volt power and control cables and extremely conservative for TVA's triax and coax and signal cable due to their thickness and the presence of metallic shielding material, and assigning a factor of 5 for the installation shielding of metal trays, conduit, boxes, and flexible conduit, we arrive at a total effective dose of .8 x 10' rads of beta.

Since the energy dissipation of gamma radiation occurs via ionizing processes, one can add the accident dose of  $4 \times 10^7$  rads of gamma directly. The accumulated integrated gamma 10-year dose (the time presently assigned to connectors and penetrations) amounts to 2.5 x 10<sup>7</sup> rads which added directly gives a total dose of 7.3 x 10<sup>7</sup> rads. In addition, since the containment is inerted in operation, the scission rate and deterioration of the insulation and jacketing materials through oxidation will be much less than for tests conducted in air.

10

Sheet No: 74-0040

Revision: O

#### ATTACHMENT C (Continued)

C.1 (Continued)

Since the above value of 7.3 x  $10^7$  is less than the values for which we have in-air test data for SROAJ types  $(1.2 \times 10^8)$  and for XLPE types  $(2 \times 10^8)$ , it is concluded that the beta dose in an accident will not disqualify the cables presently installed, and the cables will remain operable in the service environment.

C.2 IPCEA S-61-402 Paragraph 3.9 and Appendix D

C.3 TVA Engineering Report No. 1943

Cable types: PJ, PN, PNJ, PJJ, PSJ

Room: 0

This class of cables was purchased under TVA Standard Specification No. 25.013, based on IPCEA S-61-402 (NEMA WC5). These standards provide a product with an operating rating of 75° C continuous,  $95^{\circ}$  C ( $203^{\circ}$  F), 500-hour overload rating total in a normal lifetime. They are constructed of polyethylene insulation with Nylon and PVC jacketing.

The jacket material has a higher retention of strength at elevated temperature. The in-containment SLB temperature and duration exceeds the cable ratings and the insulation and jacket distortion temperatures.

However, the service which these cable have seen thus far has exposed them to a gamma radiation dose of  $6.25 \times 10^6$  rads or more. This is sufficient to have cross-linked the polyethylene and PVC as well. Consequently, the insulation is now in fact a thermoset material and is capable of the same temperature that TVA's cross-linked polyechylene insulated cable has demonstrated and is capable of withstanding the LOCA/ SLB and the post-LOCA environment of 1 year. Thus, continued operation is justified.

TVA has prepared a LOCA/SLB, thermal aging, and radiation test procedure to be performed by Wyle Laboratories on camples of this cable to demonstrate the validity of this conclusion. Results of this testing program are expected to be available in April 1981.

C.4 Temperature Qualification Method

C.4.1 Standard material long-term overload temperature rating

C.4.2 Engineering analysis

Sheet No: EEB- 74-0040

vision No: 0

## ATTACHMENT C (Continued)

C.5 Because of the conservatism of the tests for XLPE and for silicone insulation, including the severity of the mandrel bend and dielectric test in water after the combined LOCA/SLB profile, it is our engineering judgment that there is sufficient margin to give reasonable assurance of continued operability more than a year in the post-LOCA environment.

13

Prepared	by:
Reviewed	by:
QA Accept	tance:

10

Facility: Browns Ferry Nuclear Plant Unit: 3 Docket: 50-296

10

SYSTEM COMPONENT EVALUATION WORK SHEET (Rev 2)

Date 10/22/80 OUTSTANDING **OUALIFICATION** DOCUMENTATION REF ENVIRONMENT ITEMS METHOD EQUIPMENT DESCRIPTION Qualifi-Specifi-Specifi-Oualification cation cation cation Parameter System: 74 None Engineering Attachment Operating Attachmenc A 1 Year Analysis C.4 Plant D No. Attachment A Time (1)Cable WGI Component 16/c. #12AWG. (PJ) Attachments Temperature None Manufacturer: Attachment B Attachment C.3 153 153 C.1 and C.2 (4) (°F) \* \* Pressure Model Number: N/A 15.0 (PSIA) (4)N/A None N/A N/A Function: Control/Power IPCEA 5-61-402 Standard par 3.9. 3.7.3 Material Relative None 6.7 Requirement Humidity (%) (4) 100 100 Accuracy: Reg'd: N/A Demon: N/A Chemical Spray (4) None Category: Attachment A N/A N/A N/A N/A NUREG-0588 Generic Service: Attachment A Materials Material Radiation 3 x 107 4x107 None (4) Test (RAD) List Location: Room 2 None (2) Attachment C.2 Oper. Experience N/A Aging 20 years Flood Level Elev: 552' Above Flood Level: Yes X N/A Submergence N/A N/A None N/A (4) No

See Section 2.4 in 79-018 report. Notes: (1)

- See Section 4.1.2 in 79-01B report. (2)
- (3) All notes and other information not on these sheets are on the attached appendix sheets.

(4) See Section 3.0 and/or Appendix B in 79-01B report.

Prepared by: H.D. Romanowski

Reviewed by: ABrakley

QA Acceptance:

(3)

EEB 74-0041

0

Sheet No.

Revision

System: 74 Unit: 3

Component: Cable 16/c #12 AWG Mark: WGI

Plant I. D. No.	Room	Function/Service	Category	Operating Time
3ES555-I 3ES568-I 3ES580-I 3ES593-I 3ES1153-I	2 2 2 2 2 2	FCV-74-1 Cont FCV-74-12 FCV-74-2 FCV-74-13 FCV-74-7	A	1 year

٠,

1

EEB-74-0041 Rev 0

## EEB \_74-0041

Rev O

## ATTACHMENT B

Mark WGI

Contract No. 73C7-84528 67C3-91618 70C7-54179-1 Type PJJ PNJ PNJ

ä

Manufacturer

Rome Cable Plastic Wire & Cable Corp Brand-Rex

Sheet No.: EEB-74-0041

Revision: 0

#### ATTACHMENT C

C.1 IPCEA S-61-402 Paragraph 3.9 and Appendix D

C.2 TVA Engineering Report No. 1943

Cable types: PJ, PN, PNJ, PJJ, PSJ

Rooms 1-18

This class of cables was purchased under TVA Standard Specification No. 25.013, based on IPCEA S-61-402 (NEMA WC5). These standards provide a product with an operating rating of 75° C continuous, 95° C (203° F), 500-hour overload rating total in a normal lifetime. They are constructed of polyethylene insulation with Nyion and PVC jacketing.

The jacket material has a higher retention of strength at elevated temperatures, as the material was subjected to air oven aging of 121°C (250°F) for 7 days. Only compartments 1, 2, 3, 6, 9, 10, and 11 show HELB profiles which more than briefly surpass the softening temperature of the insulation. However, owing to the thermal time laws in the cable material and cable installation, the insulation not even the jacket experience the temperature profile until some time has elapsed.

TVA has conducted tests (Chattanooga Central Laboratories Report No. 81L-81-6821 dated October 1980, of these cables under a temperature profile which envelopes all the HELB profiles. Following this exposure these samples sustained a dielectric test immersed in water of 660 mills ac for 6 minutes, 960 volts ac for 5 minutes, and 2200 volts for 5 minutes in succession.

It is therefore our engineering judgment that this test confirms the above and stiffies interim operation until these types can be fully qualified by our Wyle Laboratory tests to be concluded next April or replaced at the next refueling outage.

C.3 Temperature Qualification Method

C.3.1 Standard material long-term overload temperature rating

C.3.2 Engineering Analysis

C.4	The post-HELB conditions are les	is than the normal cable rating and,	
	in our judgment, the cables coul	d operate satisfactorily for a	
	post-accident of a year.		

Prepared by:\_\_\_\_\_

Reviewed by:

QA Acceptance:

öl,

Facility: Browns Ferry Nuclear Plant Unit: 3

\* 11

SYSTEM COMPONENT EVALUATION WORK SHEET (Rev 2)

Docket: 50-296

Date 10/22/20 OUTSTANDING QUALIFICATION DOCUMENTATION REF ENVIRONMENT METHOD ITEMS EQUIPMENT DESCRIPTION Qualifi-Specifi-Qualifi-Specification cation cation cation Parameter Engineering None Attachment 1 Year System: 74 Operating Attachment A C.4 Analysis Plant ID No. Attachment A me (1)Cable WGI Component 16/c. #12AWG. (PJ) Attachments Temperature (°F) None -Manufacturer: Attachment B C.1 and C.2 Attachment C.3 153 294 (4) \* .... Pressure Model Number: N/A 15.0 (PSIA) (4) N/A None -N/A N/A Function: Control/Power IPCEA S-61-402 Standard par 3.9, 3.7.3 Material Relative 6.7 Requirement None Humidity (%) (4) 100 100 Accuracy: Reg'd: N/A Demon: N/A Chemical Spray Category: Attachment A (4)None N/A N/A N/A N/A Service: Attachment A NUREG-0588 Generic Radiation Material Materials 3 x 10<sup>7</sup> 4x107 (4) None (RAD) Test List Location: Room 5 Attachment C.2 Oper, Experience (2) None N/A Aging 20 years Flood Level Elev: 552' Above Flood Level: Yes X Submergence N/A N/A N/A N/A None (4) No

(1) See Section 2.4 in 79-01B report. S:

warmen and war have been and

- (2) See Section 4.1.2 in 79-01B report.
- (3) All notes and other information not on these sheets are on the attached appendix sheets.
- (4) See Section 3.0 and/or Appendix B in 79-01B report.

(3)

Revision

Sheet No. EEB 74-0042

0

Prepared by: H.D. Rononousting

OA Acceptance:

System: 74 Unit: 3

Component: Cable 16/C #12 AWG Mark: WGI

Plant I. D. No.	Room	Function/Service	Category	Operating fime
3ES3055-II 3ES3068-II 3ES3080-II 3ES3093-II 3ES3638-II 3ES3664-II	5 5 5 5 5 5	FCV-74-24 Cont FCV-74-35 FCV-74-25 FCV-74-36 FCV-74-30 FCV-74-99	Å	l year

at de

 ${\mathfrak f}_{{\mathfrak f}_{1}}, \cdot$ 

EEB-74-0042 Rev 0

## EEB \_\_\_\_\_\_

Rev O

## ATTACHMENT B

## Mark WGI

1 1

10.14

Contract No.

73C7-84528 67C3-91618 70C7-54179-1

1.3

. .

.

11

· varia

÷

. .

PJJ PNJ PNJ

Per 1

1.

Туре

Manufacturer

1

Rome Cable Plastic Wire & Cable Corp Brand-Rex



36

Sheet No.: \_\_\_\_\_\_ EEB- 74-0042

Revision: 0

#### ATTACHMENT C

- C.1 IPCEA S-61-402 Paragraph 3.9 and Appendix D
- C.2 TYA Engineering Report No. 1943.

Cable types: PJ, PN, PNJ, PJJ, PSJ

Rooms 1-18

This class of cables was purchased under TVA Standard Specification No. 25.013, based on IPCEA S-61-402 (NEMA WC5). These standards provide a product with an operating rating of 75° C continuous, 95° C (203° F). 500-hour overload rating total in a normal lifetime. They are constructed of polyethylene insulation with Nylon and PVC jacketing.

The jacket material has a higher retention of strength at elevated temperatures, as the material was subjected to air oven aging of 121°C (250°F) for 7 days. Only compartments 1, 2, 3, 6, 9, 10, and 11 show HELB profiles which more than briefly surpass the softening temperature of the insulation. However, owing to the thermal time lass in the cable material and cable installation, the insulation for even the jacket experience the temperature profile until some time has elapsed.

TVA has conducted tests (Chattanooga Central Laboratories Report No. 81L-81-632: dated October 1980, of these cables under a temperature profile which envelopes all the HELB profiles. Following this exposure these samples sustained a dielectric test immersed in water of 660 yolts ac for 6 minutes, 960 yolts ac for 5 minutes, and 2200 yolts for 5 minutes in succession.

It is therefore our engineering judgment that this test confirms the above and totifies interim operation until these types can be fully qualified by our Wyle Laboratory tests to be concluded next April or replaced at the next refueling outage.

- C.3 Temperature Qualification Method
  - C.3.1 Standard material long-term overload temperature rating
  - C.3.2 Engineering Analysis
- C.4 The post-HELB conditions are less than the normal cable rating and, in our judgment, the cables could operate satisfactorily for a post-accident of a year.

Prepared by:\_\_\_\_\_

Reviewed by:

QA Acceptance:

Facility: Browns Ferry Nuclear Plant . Unit: 3 Docket: 50-296

14

S

SYSTEM COMPONENT EVALUATION WORK SHEET (Rev 2)

VALUATION WORK SHEET (Rev 2)

(3) Sheet No. <u>EEB 74-0043</u> Revision <u>O</u> Date 10/22/80

						manual Medicanophi	A The second sec	
EQUIDMENT DESCRIPTION	ENVIRONMENT			DOCUMENTATION REF		QUALIFICATION METHOD	OUTSTANDING ITEMS	
EQUIPMENT DESCRIPTION	Parameter	Specifi- cation	Qualifi- cation	Specifi- cation	Qualifi- cation			
System: 74 Plant ID No. Attacnment A	Operating Time	Attachment A	1 Year	(1)	Attachment C.4	Engineering Analysis	None	
Component Cable WGI 16/c, #12AWG, (PJ) Manufacturer:Attachment B	Temperature	220	153	. (4)	Attachments C.1 and C.2	Attachment C.3	None	
	(~F)	220	155	(4)	0.1 414 0.2	recounter start	Hone	
Model Number: N/A	Pressure (PSIA)	15.0	N/A	(4)	N/A	N/A	None	
Function: Control/Power	Relative Humidity (%)	100	100	(4)	IPCEA S-61-402 par 3.9, 3.7.3 6.7		None	
Accuracy: Req'd: N/A Demon: N/A Category: Attachment A	Chemical Spray	N/A	N/A	(4)	N/A	N/A	None	
Service: Attachment A	Radiation (RAD)	$3.1 \times 10^{7}$	4x10 <sup>7</sup>	(4)	NUREG-0588 Materials List	Generic Material Test	None	
Location: Room 6	Aging	N/A	20 years	(2)	Attachment C.2	Oper, Experience	None	
Flood Level Elev: 552' Above Flood Level: Yes X	Submergence	N/A	N/A	(4)	N/A	. N/A	None	

Notes: (1) See Section 2.4 in 79-01B report.

- (2) See Section 4.1.2 in 79-01B report.
- (3) All notes and other information not on these sheets are on the attached appendix sheets.
- (4) See Section 3.0 and/or Appendix B in 79-01B report.

1.1.1.4

Prepared by: H.D. Romonowskil

Reviewed by:

nak

QA Acceptance:

EEB-74-0043 System: 74 Rev O Unit: 3 Component: Cable 16/c #12 AWG Mark: WGI Operating Time 1 Year Category Plant I. D. <u>40.</u> 3ES678-1 3ES703-1 3ES691-1 Function/Service Room FCV-74-57 Cont 6 A . FCV-74-58 6 FCV-74-59 6 3ES3178-II 3ES3628-II 3ES3191-II FCV-74-71 6 .FCV-74-72 6 FCV-74-73

1

× ;

## EEB \_74-0043

Rev O

## ATTACHMENT B

## Mark WGI

Туре

PJJ PNJ PNJ

Contract No.	
73C7-84528 67C3-91618	
70C7-54179-1	

Rome Cable Plastic Wire & Cable Corp Brand-Rex

Manufacturer



Sheet	No.:	EEB-	74-0043
Revisi	ion:		0

### ATTACHMENT C

C.1 IPCEA S-61-402 Paragraph 3.9 and Appendix D

C.2 TVA Engineering Report No. 1943.

. Cable types: PJ, PN, PNJ, PJJ, PSJ

Rooms 1-18

This class of cables was purchased under TVA Standard Specification No. 25.013, based on IPCEA S-61-402 (NEMA WC5). These standards provide a product with an operating rating of 75° C continuous, 95° C (203° F), 500-hour overload rating total in a normal lifetime. They are constructed of polyethylene insulation with Nylon and PVC jacketing.

The jacket material has a higher retention of strength at elevated temperatures, as the material was subjected to air oven aging of 121°C ( $250^{\circ}$  F) for 7 days. Only compartments 1, 2, 3, 6, 9, 10, and 11 show HELB profiles which more than briefly surpass the softening temperature of the insulation. However, owing to the thermal time lags in the cable material and cable installation, the insulation nor even the jacket experience the temperature profile until some time has elapsed.

TVA has conducted tests (Chattanooga Central Laboratories Report No. 81L-81-6921 dated October 1980, of these cables under a temperature profile which envelopes all the HELB profiles. Following this exposure these temples sustained a dielectric test immersed in water of 650 colts ac for 6 minutes, 960 volts ac for 5 minutes, and 2200 volts for 5 minutes in succession.

It is therefore our engineering judgment that this test confirms the above and lustifies interim operation until these types can be fully qualified by our Wyle Laboratory tests to be concluded next April or replaced at the next refueling outage.

C.3 Temperature Qualification Method

C.3.1 Standard material long-term overload temperature rating

C.3.2 Engineering Analysis

C.4 The post-HELB conditions are less than the normal cable rating and, in our judgment, the cables could operate satisfactorily for a post-accident of a year.

Prepared by:\_\_\_\_\_

Reviewed by:

QA Acceptance:

SYSTEM COMPONENT EVALUATION WORK SHEET (Rev 2)

Facility: Browns Ferry Nuclear Plant . Unit: 3 Docket: 50-296

OUTSTANDING QUALIFICATION DOCUMENTATION REF ENVIRONMENT METHOD ITEMS EQUIPMENT DESCRIPTION Qualifi-Qualifi-Specifi-Specification Parameter cation cation cation System: 74 None Engineering 1 Year Attachment Operating Attachment A Analysis C.4 Plant ID No. Attachment A Time (1)Component Cable 'WGI 16/c, #12AWG, (PNJ)(PJJ) Attachments Temperature None Manufacturer: Attachment B C.1 and C.2 Attachment C.3 (°F) 157 153 (4). . Pressure Model Number: N/A (PSIA) (4)15.0 N/A N/A None N/A Function: Control/Power LPCEA S-61-402 Standard par 3.9, 3.7.3 Material Relative Requirement None 6.7 Humidity (%) (4) 100 100 Accuracy: Reg'd: N/A Demon: N/A Chemical Spray Category: Attachment A (4)None N/A N/A N/A N/A Service: Attachment A NUREG-0588 Generic Radiation Materials Materia]  $2.1 \times 10^{7}$ 4x107 (RAD) (4) Test None List Location: Room 8 Aging N/A (2) Attachment C.2 Oper, Experience None 20 years Flood Level Elev: 552' Above Flood Level: Yes X Submergence N/A N/A N/A None N/A (4) No

Notes: (1) See Section 2.4 in 79-01B report.

10

- (2) See Section 4.1.2 in 79-01B report.
- (3) All notes and other information not on these sheets are on the attached appendix sheets.
- (4) See Section 3.0 and/or Appendix B in 79-01B report.

Prepared by: H.D. Romonowak

(3)

Date 10/22/80

Revision

Sheet No. EFB 74-0044

0

Reviewed by:

EEB \_74-0044 Rev O

\*

System: 74 Unit: 3

5

Component: Cable 16/c #12 AWG Mark: WGI

Plant I. D. No. Room 3ES3664-II 8

FCV-74-99 Cont

Function/Service Category Operating Time A l year

3

\* ....

## EEB \_\_\_\_\_\_\_

Rev O

## ATTACHMENT B

### Mark WGI

Contract No. 73C7-84528 67C3-91618 70C7-54179-1 Type PJJ PNJ PNJ

.

Manufacturer

ł

Rome Cable Plastic Wire & Cable Corp Brand-Rex



 Sheet No.:
 EEB- 74-0044

 Revision
 0

#### ATTACHMENT C

- C.1 IPCEA S-61-402 Paragraph 3.9 and Appendix D
- C.2 TVA Engineering Report No. 1943.
  - · Cable types: PJ, PN, PNJ, PJJ, PSJ

Rooms 1-18

3B

This class of cables was purchased under TVA Standard Specification No. 25.013, bas d on IPCEA S-61-402 (NEMA WC5). These standards provide a product with an operating rating of 75° C continuous, 95° C (203° F). 500-hour overload rating total in a normal lifetime. They are constructed of polyethylene insulation with Nylon and PVC jacketing.

The jacket material has a higher retention of strength at elevated temperatures, as the material was subjected to air oven aging of 121°C ( $250^{\circ}$  F) for 7 days. Only compartments 1, 2, 3, 6, 9, 10, and 11 show HELB profiles which more than briefly surpass the softening temperature of the insulation. However, owing to the thermal time legs in the cable material and cable installation, the insulation hor oven the jacket experience the temperature profile until some time has elapsed.

TVA has conducted tests (Chattanooga Central Laboratories Report No. 81L-81-682) dated October 1980, of these cables under a temperature profile which includes all the HELB profiles. Following this exposure these subples sustained a dielectric test immersed in water of 66% south ac for 6 minutes, 960 volts ac for 5 minutes, and 2200 volts for 5 minutes in succession.

It is therefore our engineering judgment that this test confirms the above and justifies interim operation until these types can be fully qualified by our Wyle Laboratory tests to be concluded next April or replaced at the next refueling outage.

C.3 Temperature Qualification Method

C.3.1 Standard material long-term overload temperature rating

C.3.2 Engineering Analysis

C.4 The post-HELB conditions are less than the normal cable rating and, in our judgment, the cables could operate satisfactorily for a post-accident of a year.

Prepared by:\_\_\_\_\_

Reviewed by:

QA Acceptance:

Facility: Browns Ferry Nuclear Plant Unit: 3 Docket: 50-206

SYSTEM COMPONENT EVALUATION WORK SHEET (Rev 2)

(3) S.eet No. EEB 74-0045 Revision 0

10/22/00

Date

Docket: 50-296						Date 10/22/80		
	ENVIRONMENT			DOCUMEN	NTATION REF	QUALIFICATION METHOD	OUTSTANDING ITEMS	
EQUIPMENT DESCRIPTION	Parameter	Specifi- cation	Qualifi- cation	Specifi- cation	Qualifi- cation	nemos	inche .	
System: 74 Plant ID No. Attachment A	Operating Time	Attachment A	1 Year	(1)	Attachment C.4	Engineering Analysis	None	
Component Cable WGI 16/c, #12AWG, (PNJ)(PJJ) Manufacturer:Attachment B	Temperature (°F)	211	153	(4)	Attachments C.1 and C.2	Attachment C.3	None	
Model Number: N/A Function: Control/Power	Pressure (PSIA)	15.0	.N/A	(4)	N/A	N/A	None	
	Relative Humidity (%)	100	100	(4)	IPCEA S-6:-402 par 3.9, 3.7.3 6.7		None	
Accuracy: Req'd: N/A Demon: N/A Category: Attachment A	Chemical Spray	N/A	N/A	(4)	N/A	N/A	None	
Service: Attachment A	Radiation (RAD)	2.1 × 10 <sup>7</sup>	4x10 <sup>7</sup>	(4)	NUREG-0588 Materials List	Generic Material Test	None	
Location: Room 9	Aging	N/A	20 years	(2)	Attachment C.2	Oper, Experience	None	
Flood Level Elev: 552' Above Flood Level: Yes × No	Submergence	N/A	N/A	(4)	N/A	. N/A	None	

Notes: (1) See Section 2.4 in 79-018 rep rt.

- (2) See Section 4.1.2 in 79-01B report.
- (3) All notes and other information not on these sheets are on the attached appendix sheets.
- (4) See Section 3.0 and/or Appendix B in 79-018 report.

Prepared by: H. D. Romanua

Reviewed by:

QA Acceptance:

EEB \_74-0045\_

Rev O

Component: Cable 16/c #12 AWG

System: 74 Unit: 3

component:	CUDIO
Mark:	WGI

Plant I. D. No. Room		Function/Service	Category	Operating Time
3ES555-I	9	FCV-74-1 Cont	A	1 Year
3ES568-1	9	FCV-74-12 Cont	A	1 year
3ES580-1	9	FCV-74-2 Cont	A	1 Year
3ES593-1	9	FCV-74-13 Cont	A	1 Year
3ES1153-I	9	FCV-74-7 Cont	A	l year
3ES 678-I	à	FCV-74-57 Cont	A	1 Year
3ES3055-II	à	FCV-74-24 Cont	A	1 Year
3ES3068-II	9	FCV-74-35 Cont	A	1 Year
3ES3080-II	9	FCV-74-25 Cont	Α	1 Year
3ES3093-II	9	FCV-74-36 Cont	A	1 Year
3ES3638-II	9	FCV-74+30 Cont	A	1 Year
3ES703-1	9	FCV-74-58 Cont	A	l Year
3ES3664-II	9	FCV-74-99 Cont	A	1 Year
3ES691-I	9	FCV-74-59 Cont	A	1 Year
3ES3178-II	0	FCV-74-71 Cont	A	l Year
3ES3628-II	9	FCV-74-72 Cont	A	1 Year
3ES3191-II	9	FCV-74-73 Cont	A	l Year

•

## EEB \_74-0045

Rev O

#### ATTACHMENT B

## Mark WGI

.

Contract No. 73C7-84528 67C3-91618 70C7-54179-1 Type PJJ PNJ PNJ

1.

Manufacturer

1

Rome Cable Plastic Wire & Cable Corp Brand-Rex



Sheet	No.	:	EEB-	74-004;		
izivo	on:			0		

#### ATTACHMENT C

C.1 IPCEA S-61-402 Paragraph 3.9 and Appendix D

C.2 TVA Engineering Report No. 1943

. Cable types: PJ, PN, PNJ, PJJ, PSJ

Rooms 1-18

This class of cables was purchased under TVA Standard Specification No. 25.013, based on IPCEA S-61-402 (NEMA WC5). These standards provide a product with an operating rating of 75° C continuous,  $95^{\circ}$  C (203° F), 500-hour overload rating total in a normal lifetime. They are constructed of polyethylene insulation with Nylon and PVC jacketing.

The jacket material has a higher retention of strength at elevated temperatures, as the material was subjected to air oven aging of 121°C (250°F) for 7 days. Unly compartments 1, 2, 3, 6, 9, 10, and 11 show HELB profiles which more than briefly surpass the softening temperature of the insulation. However, owing to the thermal time lags in the cable material and cable installation, the insulation not oven the jacket experience the temperature profile until some time has elapsed.

TVA has conducted tests (Chattanooga Central Laboratories Report No. 81L-81-6521 dated October 1980, of these cables under a temperature profile which envelopes all the HELB profiles. Following this exposure these samples sustained a dielectric test immersed in water of 560 months ac for 6 minutes, 960 volts ac for 5 minutes, and 2200 volts for 5 minutes in succession.

It is therefore our engineering judgment that this test confirms the above and confirms interim operation until these types can be fully qualified by our Wyle Laboratory tests to be concluded next April or replaced at the next refueling outage.

C.3 Temperature Qualification Method

C.3.1 Standard material long-term overload temperature rating

C.3.2 Engineering Analysis

C.4 The post-HELB conditions are less than the normal cable rating and, in our judgment, the cables could operate satisfactorily for a post-accident of a year.

Prepared by:\_\_\_\_\_

Reviewed by:

QA Acceptance:

(3)SYSTEM COMPONENT EVALUATION WORK SHEET (Rev 2) Sheet No. EEB 74-0046 Facility: Browns Ferry Nuclear Plant Revision 0 Unit: 3 Date 10/22/80 Docket: 50-296 QUALIFICATION OUTSTANDING DOCUMENTATION REF ENVIRONMENT ITEMS METHOD EQUIPMENT DESCRIPTION Qualifi-Specifi-Oualifi-Specification cation cation cation Parameter System: 74 Engineering None Attachment Attachment A 1 Year Operating Analysis C.5 Plant ID No. Attachment A Time (1)Cable NGK Component 12/c, #12AWG, (PNJ) Attachments None Temperature Manufacturer:Attachment B Attachment C.4 (4) C.2 and C.3 (°F) 325 153 Pressure Model Number: N/A N/A (PSIA) N/A (4)None 69.7 N/A Function: IPCEA S-61-402 Standard 1.4.1 14.1 10 Control/Power Relative Material par 3.9, Humidity (%) (4)3.7.3. 6.7 Requirement None 100 100 Accuracy: Reg'd: N/A · Demon: N/A Chemical Spray Attachment A (4) N/A None Category: N/A N/A N/A 6.5x10 8 4x10 8 NUREG-0588 Service: Attachment A Generic Material Haterials None Radiation  $4 \times 10^{7}$ Test List (RAD) Attach C.1 (4) None Location: 0 Attachment C.3 10 years (2)Oper, Exper, N/A Aging Flood Level Elev: 552' N/A N/A None N/A Above Flood Level: Yes X Submergence N/A (4)No \*

Notes: See Section 2.4 in 79-018 report. (1)

1

See Section 4.1.2 in 79-01B report. (2)

(3) All notes and other information not on these sheets are on the attached appendix sheets.

(4) See Section 3.0 and/or Appendix B in 79-01B report.

Prepared by: A ARomenowski som

QA Acceptance:

System: 74 Unit: 3 EEB-74-0046 Rev 0

Component: Cable 12/c #12 AWG Mark: WGK

Plant I. D. No.	Room	Function/Service	Category	Operating Time
3ES3686-II 3ES3651-II	0	FCV-74-47 Cont FCV-74-47	Î	1 Year
3ES3039-11	0	FCV-74-66 ¥	•	

 $\mathbb{Z}_{+}$ 

EEB \_ 74-0046

.

Rev O

## ATTACHMENT B

## Mark WGK

Contract No.

67C3-91618 73C7-84528 70C7-54179-1 PNJ PJJ PNJ

Type

à

1

Manufacturer

Plastic Wire & Cable Corp Rome Cable Brand-Rex

Sheet No: EEB-74-0046

Revision: 0

## ATTACHMENT C

C.1 Integrated Dose - 10 years plus accident

#### Beta Dose

Refe: ences:

- W. W. Parkinson, O. Sisman, October 1970, The Use of Plastics and Elastomers in Nuclear Radiation.
- R. B. Blodgett, R. G. Fisher, June 1968, Insulations and Jackets for Control and Power Cables.
- M. Asaka, S. Yamamoto, 1973, Radiation Resistance of Plastic Insulating Materials for Cable.
- 4. Anaconda-Continental Test Report No. 79117 dated April 1979.
- 5. Wyle Laboratory Test Report 43854-3.
- 6. Franklin Institute Test Reports E-C4113 and FC-5120.
- 7. Rockbestos Company Test Report dated July 1977 amended 1979.

The TVA value of  $4 \times 10^9$  rads for the beta accident dose at the periphery of the containment is being reevaluated due to its high value. However, using this value and making reference to the 7901-B DOR guidelines section 4.2.1 and the depth dose penetration, which owing to the low penetrating power of beta particles gives a factor of 10 reduction for 40 mils of jacketing material, and a factor of 10 for an insulation thickness of 30 mils and which is conservative for TVA's 600-volt power and control cables and extremely conservative for TVA's triax and coax and signal cable due to their thickness and the presence of metallic shielding material, and assigning a factor of 5 for the installation shielding of metal trays, conduit, boxes, and flexible conduit, we arrive at a total effective dose of .8 x 10<sup>7</sup> rads of beta.

Since the energy dissipation of gamma radiation occurs via ionizing processes, one can add the accident dose of  $4 \times 10^7$  rads of gamma directly. The accumulated integrated gamma 10-year dose (the time presently assigned to connectors and penetrations) amounts to 2.5 x 10' rads which added directly gives a total dose of 7.3 x  $10^7$  rads. In addition, since the containment is inerted in operation, the scission rate and deterioration of the insulation and jacketing materials through oxidation will be much less than for tests conducted in air.

Sheet No: EEB - 74-0046

Revision: O

#### ATTACHMENT C (Continued)

C.1 (Continued)

Since the above value of 7.3 x  $10^7$  is less than the values for which we have in-air test data for SROAJ types (1.2 x  $10^8$ ) and for XLPE types (2 x  $10^8$ ), it is concluded that the beta dose in an accident will not disqualify the cables presently installed, and the cables will remain operable in the service environment.

C.2 IPCEA S-61-402 Paragraph 3.9 and Appendix D

C.3 TVA Engineering Report No. 1943

Cable types: PJ, PN, PNJ, PJJ, PSJ

Room: 0

This class of cables was purchased under TVA Standard Specification No. 25.013, based on IPCEA S-61-402 (NEMA WC5). These standards provide a product with an operating rating of 75° C continuous, 95° C (203° F), 500-hour overload rating total in a normal lifetime. They are constructed of polyethylene insulation with Nylon and PVC jacketing.

The jacket material has a higher retention of strength at elevated temperature. The in-containment SLB temperature and duration exceeds the cable ratings and the insulation and jacket distortion temperatures.

However, the service which these cable have seen thus far has exposed them to a gamma radiation dose of  $6.25 \times 10^6$  rads or more. This is sufficient to have cross-linked the polyethylene and PVC as well. Consequently, the insulation is now in fact a thermoset material and is capable of the same temperature that TVA's cross-linked polyethylene insulated cable has demonstrated and is capable of withstanding the LOCA/ SLB and the post-LOCA environment of 1 year. Thus, continued operation is justified.

TVA has prepared a LOCA/SLB, thermal aging, and radiation test procedure to be performed by Wyle Laboratories on samples of this cable to demonstrate the validity of this conclusion. Results of this testing program are expected to be available in April 1981.

C.4 Temperature Qualification Method

C.4.1 Standard material long-term overload temperature rating

C.4.2 Engineering analysis

Sheet No: EEB- 74-0046

Revision No: 0

# ATTACHMENT C (Continued)

C.5 Because of the conservatism of the tests for XLPE and for silicone insulation, including the severity of the mandrel bend and dielectric test in water after the combined LOCA/SLB profile, it is our engineering judgment that there is sufficient margin to give reasonable assurance of continued operability more than a year in the post-LOCA environment.

Prepared by: Reviewed by: QA Acceptance:

SYSTEM COMPONENT EVALUATION WORK SHEET (Rev 2) Facility: Browns Ferry Nuclear Plant

Unit: 3 Docket: 50-296

12

Docket: 50-296	Date 10/22/80							
FOULDWENT DESCRIPTION	ENVIRONMENT			DOCUMEN	NTATION REF	QUALIFICATION METHOD	OUTSTANE ING	
EQUIPMENT DESCRIPTION	Parameter	Specifi- cation	Qualifi- cation	Specifi- cation	Qualifi- cation	nemou		
System: 74 Plant ID No. Attachment A	Operating Time	Attachment A	1 Year	(1)	Attachment C.4	Engineering Analysis	None	
Component Cable WGK 12/c, #12AWG, (PNJ) Manufacturer:Attachment B	Temperature (°F)	158	153	(4)	Attachments C.1 and C.2	Attachment C.3	None	
Model Number: N/A	Pressure (PSIA)	15.0	N/A	(4)	N/A	N/A	None	
Function: Control/Power	Relative Humidity (%)	100	100	(4)	LPCEA S-61-402 par 3.9, 3.7.3 6.7		None	
Accuracy: Req'd: N/A Demon: N/A Category: Attachment A	Chemical Spray	N/A	N/A	(4)	N/A	N/A	None	
Service: Attachment A	Radiation (RAD)	3 x 10 <sup>7</sup>	4x10 <sup>7</sup>	(4)	NUREG-0588 Materials List	Generic Material Test	None	
Location: Room 2	Aging	N/A	20 years	(2)	Attachment C.2	Oper. Experience	None	
Flood Level Elev: 552' Above Flood Level: Yes X No	Submergence	N/A	N/A	(4)	N/A	. N/A	None	

Notes: (1) See Section 2.4 in 79-01B report.

(2) See Section 4.1.2 in 79-013 report.

(3) All notes and other information not on these sheets are on the attached appendix sheets.

(4) See Section 3.0 and/or Appendix B in 79-01B report.

Prepared by: H.D. Romonousk

Reviewed by:

(3)

Revision

Sheet No. EEB 74-0047

0

QA Acceptance:

System: 74 Unit: 3

Cumponent: Cable 12/c #12 AWG Mark: WGK

Plant I. D. No.	Room	Function/Service	Category	Operating Time
3ES551-I 3ES564-I 3ES1151-I 2ES3713 3ES3736	2 2 2 2 2 2	FCV-74-1 Cont FCV-74-12 FCV-74-7 FCV-74-96 FCV-74-97	Ĵ	l Year

2

EEB-74-0047 Rev 0

# EEB \_74-0047

0

Rev Q

## ATTACHMENT B

Mark WGK

Contract No.

Туре

Manufacturer

67C3-91618 73C7-84528 70C7-54179-1 PNJ PJJ PNJ Plastic Wire & Cable Corp Rome Cable Brand-Rex

1. 134

## Sheet No .: 57-74-0047

#### ATTACHMENT C

C.1 IPCEA S+61-402 Paragraph 3.9 and Appendix D

C.2 TVA Engineering Report No. 1943

Cable types: PJ, PN, PNJ, PJJ, PSJ Rooms 1-28

This class of cables was purchased under TVA Standard Specification No. 25.013, based on IPCEA S-61-402 (NEMA WC5). These standards provide a product with an operating rating of 75° C continuous, 95° C (203° F), 500-hour overload rating total in a normal lifetime. They are constructed of polyethylene insulation with Nylon and PVC jacketing.

The jacket material has a higher retention of strength at elevated temperatures, as the material was subjected to air oven aging of 121°C (250°F) for 7 days. Only compartments 1, 2, 3, 6, 9, 10, and 11 show HELB profiles which more than briefly surpass the softening tem mature of the insulation. However, owing to the thermal time lags in the cable material and cable installation, the insulation not even the jacket experience the temperature profile until some time has elapsed.

TVA has conducted tests (Chattanooga Central Laboratories Report No. 81L-81-0621 dated October 1980, of these cables under a temperature profile which evelopes all the HELB profiles. Following this exposure these samples sustained a dielectric test immersed in water of 650 mills ac for 6 minutes, 960 volts ac for 5 minutes, and 2200 volts for 5 minutes in succession,

It is therefore our engineering judgment that this test confirms the above and satifies interim operation until these types can be fully qualified by our Wyle Laboratory tests to be concluded next April or replaced at the next refueling outage.

C.3 Temperature Qualification Method

C.3.1 Standard material long-term overload temperature rating

C.3.2 Engineering Analysis

C.4 The post-HELB conditions are less than the normal cable rating and, in our judgment, the cables could operate satisfactorily for a post-accident of a year.

Prepared	pà:
Reviewed	by:

OA Acceptance:

Facility: Browns Ferry Nuclear Plant . Unit: 3

16.5

SYSTEM COMPONENT EVALUATION WORK SHEET (Rev 2)

(3) Sheet No. EEB 74-0048 Revision 0

Date 10/22/80

Docket: 50-296

22

\$18 H 20 + 31

FOUTDWENT DESCRIPTION	ENVIRONMENT			DOCUMENTATION REF		QUALIFICATION METHOD	OUTSTANDING ITEMS
EQUIPMENT DESCRIPTION	Parameter	Specifi- cation	Qualifi- cation	Specifi- cation	Qualifi- cation	HETHOD	incho ,
System: 74 Plant ID No. Attachment A	Operating Time	Attachment A	1 Year	(1)	Attachment C.4	Engineering Analysis	None
Component Cable WGK 12/c, #12AWG, (PNJ) Manufacturer:Attachment B	Temperature	294	153	(4)	Attachments C.1 and C.2	Attachment C.3	None .
Model Number: N/A	Pressura (PSIA)	15.0	N/A	(4)	N/A	N/ 1	None
Function: Control/Power	Relative Humidity (%)	100	100	(4)	IPCEA S-61-402 par 3.9, 3.7.3 6.7		None
Accuracy: Req'd: N/A Demon: N/A Category: Attachment A	Chemical Spray	N/A	N/A	(4)	N/A	N/A	None
Service: Attachment A	Radiation (RAD)	3 x 10 <sup>7</sup>	4x10 <sup>7</sup>	(4)	NUREG-0588 Materials List	Generic Material Test	None
Location: Room 5	Aging .	N/A	20 years	(2)	Attachment C.2	Oper. Experience	None
Flood Level Elev: 552' Abeve Flood Level: Yes × No	Submergence	N/A	N/A	(4)	N/A	. N/A	None

Notes: See Section 2.4 in 79-01B report. (1)

(2) See Section 4.1.2 in 79-01B report.

(3) All notes and other information not on these sheets are on the attached appendix sheets.

(4) See Section 3.0 and/or Appendix B in 79-01B report.

Prepared by: H. & Romenous

Reviewed by:

mention by here to all stands or other

QA Acceptance:

System: 74 Unit: 3				EEB-74-0048 Rev 0
Componenter	able K	12/c #12 AWG		
Plant I. J. No	. Room	Function/Service	Category	Operating Time
3ES3051-II 3ES3054-II 3ES3076-II 3ES3089-II 3ES3661-II	5 5 5 5	FCV-74-24 Cont FCV-74-35 FCV-74-25 FCV-74-36 FCV-74-99	Ì	1 Year

 $\tilde{f}_{1}$ 

\* ;

## EEB \_74-0048

0e .

 $\mathcal{F}_{\mathcal{H}}$ 

Rev 0

## ATTACHMENT B

Mark WGK

Contract No.

Type

Manufacturer

5

12

67C3-91618 73C7-84528 70C7-54179-1 PNJ PJJ PNJ Plastic Wire & Cable Corp Rome Cable Brand-Rex

Sheet No.: EEB-74-0048

Revision: 0

#### ATTACHMENT C

C.1 IPCEA S-61-402 Paragraph 3.9 and Appendix D

C.2 TVA Engineering Report No. 1943.

Cable types: PJ, PN, PNJ, PJJ, PSJ

Rooms 1-18

A sector and a hard a faith

A Ship De

80

This class of cables was purchased under TVA Standard Specification No. 25.013, based on IPCEA S-61-402 (NEMA WC5). These standards provide a product with an operating rating of 75° C continuous, 95° C (203° F), 500-hour overload rating total in a normal lifetime. They are constructed of polyethylene insulation with Nylon and PVC jacketing.

and the second second

The jacket material has a higher retention of strength at elevated temperatures, as the material was subjected to air oven aging of 121°C (250°F) for 7 days. Only compartments 1, 2, 3, 6, 9, 10, and 11 show HELB profiles which more than briefly surpass the softening temperature of the insulation. However, owing to the thermal time lags in the cable material and cable installation, the insulation nor even the jacket experience the temperature profile until some time has elapsed.

TVA has conducted tests (Chattanooga Central Laboratories Report No. 81L-81-6821 dated October 1980, of these cables under a temperature profile which envelopes all the HELB profiles. Following this exposure these samples sustained a dielectric test immersed in water of 650 volts ac for 6 minutes, 960 volts ac for 5 minutes, and 2200 volts for 5 minutes in succession.

It is therefore our engineering judgment that this test confirms the above and justifies interim operation until these typ s can be fully qualified by our Wyle Laboratory tests to be concluded next April or replaced at the next refueling outage.

C.3 Temperature Qualification Method

C.3.1 Standard material long-term overload temperature rating

C.3.2 Engineering Analysis

C.4 The post-HELB conditions are less than the normal cable rating and, in our judgment, the cables could operate satisfactorily for a post-accident of a year.

Prepared by:

Reviewed by:\_\_\_

QA Acceptance:\_\_\_\_\_

ry Nuclear Plant SYSTEM COMPONENT EVALUAT

SYSTEM COMPONENT EVALUATION WORK SHEET (Rev 2)

Facility: Browns Ferry Nuclear Plant Unit: 3 Docket: 50-296

11

Date 10/22/80 OUTSTANDING OUALIFICATION ENVIRONMENT DOCUMENTATION REF ITEMS METHOD EQUIPMENT DESCRIPTION Specifi-Qualifi-Qualifi-Specification cation Parameter cation cation System: 74 None Engineering Attachment Operating Attachment A 1 Year Analysis C.4 Time Plant ID No. Attachment A (1)Cable 'WGK Component 12/c, #12AWG, (PNJ) Attachments Temperature None Manufacturer: Attachment B Attachment C.3 C.1 and C.2 220 153 (4) $(^{\circ}F)$ . . Pressure Model Number: N/A (PSIA) (4) None N/A 15.0 N/A N/A Function: Control/Power IPCEA S-61-402 Standard par 3.9, 3.7.3 Material Relative Requirement None 6.7 Humidity (%) (4)100 100 Accuracy: Reg'd: N/A Demon: N/A Chemica] Spray Category: Attachment A (4) None N/A N/A N/A N/A Service: Attachment A Generic NUREG-0588 Material Radiation Materials  $3.1 \times 10^{7}$ 4x107 None (RAD) (4) Test List Location: Room 6 None (2) Attachment C.21 Oper, Experience Aging N/A 20 years Flood Level Elev: 552' N/A Above Flood Level: Yes X Submergence N/A N/A None N/A (4)No

Notes: (1) See Section 2.4 in 79-01B report.

(2) See Section 4.1.2 in 79-01B report.

(3) All notes and other information not on these sheets are on the attached appendix sheets.

(4) See Section 3.0 and/or Appendix B in 79-01B report.

Prepared by: A DRamonowski

(3)

Revision

Sheet No. EEB 74-0049

0

ABredley

QA Acceptance:

EEB-74-0049 System: 74 Rev O 3 Unit: 12/c #12 AWG Component: Cable WGK Mark: Operating Time Category Function/Service Plant I. D. No. Room 1 Year FCV-74-46 Cont A 6 3ES3681-II FCV-74-71 6 3ES3176-II FCV-74-72 FCV-74-73 6 3ES3626-II ۲ 6 3ES3189-II

3

\* 1

# EEB \_74-0049

0

Rev O

## ATTACHMENT B

Mark WGK

Contract No.

67C3-91618 73C7-84528 70C7-54179-1 PNJ PJJ PNJ

- 1

Manufacturer

Plastic Wire & Cable Corp Cable Brand Rex

Sheet	No.:	EEB-74-0049
Revisi	ion:	0

1.48

14. 1

## ATTACHMENT C

1200

and the second sec

C.1 IPCEA S-61-402 Paragraph 3.9 and Appendix D

C.2 TVA Engineering Report No. 1943.

Cable types: PJ, PN, PNJ, PJJ, PSJ

Rooms 1-18

80

This class of cables was purchased under TVA Standard Specification No. 25.013, based on IPCEA S-61-402 (NEMA WC5). These standards provide a product with an operating rating of 75° C continuous, 95° C (203° F), 500-hour overload rating total in a normal lifetime. They are constructed of polyeth tene insulation with Nylon and PVC jacketing.

A STATE AND A STATE AND A STATE AND A STATE

The jacket material has a higher retention of strength at elevated temperatures, as the material was subjected to air oven aging of  $121^{\circ}$  C (250° F) for 7 days. Only compartments 1, 2, 3, 6, 9, 10, and 11 show HELB profiles which more than briefly surpass the softening temperature of the insulation. However, owing to the thermal time lags in the cable material and cable installation, the insulation nor even the jacket experience the temperature profile until some time has elapsed.

TVA has conducted tests (Chattanooga Central Laboratories Report No. 81L-81-6821 dated October 1980, of these cables under a temperature profile which envelopes all the HELB profiles. Following this exposure these samples sustained a dielectric test immersed in water of 660 volts ac for 6 minutes, 960 volts ac for 5 minutes, and 2200 volts for 5 minutes in succession.

It is therefore our engineering judgment that this test confirms the above and justifies interim operation until these types can be fully qualified by our Wyle Laboratory tests to be concluded next April or replaced at the next refueling outage.

C.3 Temperature Qualification Method

C.3.1 Standard material long-term overload temperature rating

121

Sec. Street

C.3.2 Engineering Analysis

C.4 The post-HELB conditions are less than the normal cable rating and, in our judgment, the cables could operate satisfactorily for a post-accident of a year.

Prepared by:\_\_\_\_\_

Reviewed by:

QA Acceptance:

SYSTEM COMPONENT EVALUATION WORK SHEET (Rev 2)

Facility: Browns Ferry Nuclear Plant Unit: 3 Docket: 50-296

OUTSTANDING OUALIFICATION DOCUMENTATION REF ENVIRONMENT ITEMS METHOD EQUIPMENT DESCRIPTION Specifi-Oualifi-Specifi-Qualification cation cation cation Parameter System: 74 Engineering None Attachment 1 Year Operating Attachment Ai Analysis C.4 Plant ID No. Attachment A Time . (1)Component Cable WGK 12/c, #12AWG, (PHJ) Attachments Temperature None Manufacturer: Attachment B Attachment C.3 C.1 and C.2 153 (4) (°F) 157 . . Pressure Model Number: N/A (PSIA) (4) N/A N/A N/A · None 15.0 1PCEA 5-61-402 Standard Function: Control/Power par 3.9, 3.7.3 Material Relative None 6.7 Requirement Humidity (%) (4)100 100 Accuracy: Reg'd: N/A Demon: N/A Chemical Spray (4) None Category: Attachment A N/A N/A N/A N/A Service: Attachment A NUREG-0588 Generic Radiation Materials Material  $2.1 \times 10^{7}$ 4×107 (a) (RAD) Test None List Location: Room 8 (2) Attachment C.2 Oper, Experience None N/A Aging 20 years Flood Level Elev: 552' Above Flood Level: Yes X N/A N/A Submergence N/A None N/A (4)No

Notes: See Section 2.4 in 79-018 report. (1)

- (2) See Section 4.1.2 in 79-01B report.
- (3) All notes and other information not on these sheets are on the attached appendix sheets.

(4) See Section 3.0 and/or Appendix B in 79-01B report.

Prepared by: H. D. Rommon ale

(3)

Date 10/22/80

Revision

Sheet No. EEB 74-0050

Q

OA Acceptance:

1 8

Reviewed by:

EEB 74-0050

Rev O

System: 74 Unit: 3

Component: Cable 12/c #12AWG Mark: WGK

Plant I. D. No. Room		Function/Service	Category	Operating Time
3ES 3151-II	8	FCV-74-74 Cont	A	1 Year
3ES3681-II	8	r24-74-46 Cont	A	1 Year
3ES3686-II	8	FCV-74-47 Cont	A	1 Year
3ES3651-II	8	FCV-74-47 Cont	A	1 Year
3ES551-I	8	FCV-74-1 Cont	A	1 Year
3ES564-I	8	FCV-74-12 Cont	A	1 Year
3ES1151-I	8	FCV-74-7 Cont	A	1 Year
3ES3051-II	8	FCV-74-24 Cont	A	1 Year
3ES064-II	8	FCV-74-35 Cont	A	1 year
3ES3076-II	8	FCV-74-25 Cont	A	l year
3ES3089-11	8	FCV-74-36 Cont	A	l Year
3ES3661-II	8	FCV-74-99 Cont	A	1 Year
3ES3'76-II	8	FCV-74-71 Cont	A	1 year
	8	FCV-74-72 Cont	A	1 year
3ES3626-II	8	FCV-74-73 Cont	A	1 Year
3ES3189-II	8	FCV-74-66 Cont	A	1 Year
3ES3039-II	0	FCV-74-96 Cont	A	1 Year
2ES3713	8	FCV-74-97 Cont	A	1 Year
3ES3736	8	FCV-74-100 Cont	A	1 Year
3ES3726 3ES3164-II	8	FCV-74-75 Cont	A	1 Year

 $\mathbf{x}^{i}_{i,j+1}$ 

# EEB \_74-0050

0.

Rev O

## ATTACHMENT B

Mark WGK

Contract No. 67C3-91618

73C7-84528

70C7-54179-1

Туре

PNJ PJJ PNJ

11

Manufacturer

Plastic Wire & Cable Corp Rome Cable Brand-Rex

Sheet	No.	 EEB-	74	-00	50
Revisi	on:		0		

#### ATTACHMENT C

18 8.10

C.1 IPCEA S-61-402 Paragraph 3.9 and Appendix D

C.2 TVA Engineering Report No. 1943.

Cable types: PJ, PN, PNJ, PJJ, PSJ

Rooms 1-18

1.83

This class of cables was purchased under TVA Standard Specification No. 25.013, based on IPCEA S-61-402 (NEMA WC5). These standards provide a product with an operating rating of 75° C continuous, 95° C (203° F), 500-hour overload rating total in a normal lifetime. They are constructed of polyethylene insulation with Nylon and PVC jacketing.

The jacket material has a higher retention of strength at elevated temperatures, as the material was subjected to air oven aging of 121°C ( $250^{\circ}$  F) for 7 days. Only compartments 1, 2, 3, 6, 9, 10, and 11 show HELB profiles which more than briefly surpass the softening temperature of the insulation. However, owing to the thermal time lags in the cable material and cable installation, the insulation nor even the jacket experience the temperature profile until some time has elapsed.

TVA has conducted tests (Chattanooga Central Laboratories Report No. 81L-81-6821 dated October 1980, of these cables under a temperature profile which envelopes all the HELB profiles. Following this exposure these samples sustained a dielectric test immersed in water of 660 volts ac for 6 minutes, 960 volts ac for 5 minutes, and 2200 volts for 5 minutes in succession.

It is therefore our engineering judgment that this test confirms the above and justifies interim operation until these types can be fully qualified by our Wyle Laboratory tests to be concluded next April or replaced at the next refueling outage.

C.3 Temperature Qualification Method

C.3.1 Standard material long-term overload temperature rating

C.3.2 Engineering Analysis

C.4 The post-HELB conditions are less than the normal cable rating and, in our judgment, the cables could operate satisfactorily for a post-accident of a year.

Prepared by:\_\_\_\_\_

Reviewed by:\_\_\_\_\_

QA Acceptance:

80

SYSTEM COMPONENT EVALUATION WORK SHEET (Rev 2)

Facility: Browns Ferry Nuclear Plant Unit: 3 Docket: 50-296

1 8

1.1

OUTSTANDING **OUALIFICATION** DOCUMENTATION REF ENVIRORMENT ITEMS METHOD EQUIPMENT DESCRIPTION Oualifi-Specifi-Qualifi-Specification cation cation Parameter cation None System: 74 Engineering Attachment Operating Attachment Af 1 Year Analysis C.4 Time Plant ID No. Attachment A (1)Component Cable WGK 12/c, #12AWG, (PNJ) Attachments Temperature (°F) None Attachment C.3 C.1 and C.2 Manufacturer: Attachment B 153 (4) 211 Pressure Model Number: N/A (PSIA) (4) N/A None N/A 15.0 N/A Function: Control/Power IPCEA 5-61-402 Standard par 3.9, 3.7.3 Material Relative . None Requirement 6.7 Humidity (%) (4) 100 100 Accuracy: Reg'd: N/A Demon: N/A Chemical Spray (4) None N/A N/A Category: Attachment A N/A N/A Generic Service: Attachment A NUPEG-0588 Materials Material Radiation  $2.1 \times 10^{7}$ 4×107 None (4) List Test (RAD) Location: Room 9 Attachment C.2 Oper, Experience None (2) Aging 20 years N/A Flood Level Elev: 552' N/A N/A Above Flood Level: Yes X Submergence " ...ie N/A N/A (4) No

 $\tilde{m}_{\rm c}$ 

(1) See Section 2.4 in 79-018 report. Notes:

- (2) See Section 4.1.2 in 79-01B report.
- (3) All notes and other information not on these sheets are on the attac: opendix sheets.

(4) See Section 3.0 and/or Ap. B in 79-018 report.

(3)

Date 10/22/80

Revision

Sheet No. FEB 74-0051

0

Prepared by: N. R. Romanustif

QA Acceptance:

EEB . 74-0051

Rev O

System: 74 Unit: 3

Component: Cable 12/c #12 AWG Mark: WGK

Plant I. D. No.	Room	Function/Service	Category	Operating Time
3ES3164-II 3ES551-I 3ES564-I 3ES1151-I 3ES3089-II 3ES3189-II 3ES3151-II	9 9 9 9 9 9 9	FCV-74-75 Cont FCV-74-1 Cont FCV-74-12 Cont FCV-74-7 Cont FCV-74-36 Cont FCV-74-73 Cont FCV-74-74 Cont	A A A A A A	l Year l Year l Year l Year l Year l Year l Year

 $\| \Psi \|_{L^{\infty}}$ 

<u>ال</u>

EEB .. 74-0051

0

Rev 0

# ATTACHMENT B

Mark WGK

Contract No.

67C3-91618 73C7-84528 70C7-54179-1 PNJ PJJ PNJ

Type

Manufacturer

Plastic Wire & Cable Corp Rome Cable Brand-Rex

1.1.1

Sheet No.: EEB- 74-0051

Revisior: 0

#### ATTACHMENT C

C.1 IPCEA S-61-402 Paragraph 3.9 and Appendix D

C.2 TVA Engineering Report No. 1943.

Cable types: PJ, PN, PNJ, PJJ, PSJ

Rooms 1-18

This class of cables was purchased under TVA Standard Specification No. 25.013, based on IPCEA S-61-402 (NEMA WC5). These standards provide a product with an operating rating of 75° C continuous, 95° C (203° F), 500-hour overload rating total in a normal lifetime. They are constructed of polyethylene insulation with Nylon and PVC jacketing.

The jacket material has a higher retention of strength at elevated temperatures, as the material was subjected to air oven aging of 121°C (250°F) for 7 days. Only compartments 1, 2, 3, 6, 9, 10, and 11 show HELB profiles which more than briefly surpass the softening temperature of the insulation. However, owing to the thermal time lags in the cable material and cable installation, the insulation nor even the jacket experience the temperature profile until some time has elapsed.

TVA has conducted tests (Chattanooga Central Laboratories Report No. 21L-81-6821 dated October 1980, of these cables under a temperature profile which envelopes all the HELB profiles. Following this exposure these camples sustained a dielectric test immersed in water of 660 volts ac for 6 minutes, 960 volts ac for 5 minutes, and 2200 volts for 5 minutes in succession.

It is therefore our engineering judgment that this test confirms the above and justifies interim operation until these types can be fully qualified by our Wyle Laboratory tests to be concluded next April or replaced at the next refueling outage.

C.3 Temperature Qualification Method

C.3.1 Standard material long-term overload temperature rating

C.3.2 Engineering Analysis

C.4 The post-HELB conditions are less than the normal cable rating and, in our judgment, the cables could operate satisfactorily for a post-accident of a year.

Prepared by:\_\_\_\_\_

Reviewed by:

QA Acceptance:

80

SYSTEM COMPONENT EVALUATION WORK SHEET (Rev 2)

Facility: Browns Ferry Nuclear F. t Unit: 3.

(3) Sheet No. EEB 74-0054 Revision 0

Date 10/22/80

Docket: 50-296

	ENVIRONMENT			DOCUMENTATION REF		QUALIFICATION METHOD	OUTSTANDING ITEMS
EQUIPMENT DESCRIPTION	Parameter			Specifi- cation	Qualifi- cation	ME MOD	Tithe
System: 74 Plant ID No. Attachment A	Operating Time	Attachment A	1 year	(1)	Attachment C.5	Engineering Analysis	None
Component Cable NGM 16/c, #12AWG, (191) Manufacturer:Attachment B	Temperature (°F)	325	153	(4)	Attachments C.2 and C.3	Attachment C.4	None
Model Number: N/A	Pressure (PSIA)	69.7	N/A	(4)	N/A	N/A	None
Function: Control/Power	Relative Humidity (%)	100	100	(4)	IPCEA S-61-402 par 3.9, 3.7.3, 6.7	Standard Material Requirement	None
Accuracy: Req'd: N/A Demon: N/A Category: Attacnment A	Chemical Spray	N/A	N/A	(4)	N/A	N/A	None
Service: Attachment A	Radiation (RAD)	6.5x10 8 4x10 9 Attach. C.1	4×10 <sup>7</sup>	(4)	NUREG-0588 Materials List	Gene∵ic Material Test	None
Location: 0	Aging	N/A	10 years	(2)	Attachment (.3	Oper. Exper.	None
Flood Level Elev: 552' Above Flood Level: Yes X	Submergence	N/A	N/A	(4)	N/A	N/A	None

Notes: See Section 2.4 in 79-018 report. (1)

「日本の日本」にあるのである

- (2) See Section 4.1.2 in 79-01B roort.
- (3) All notes and other information not on these sheets are on the attached appendix sheets.
- (4) See Section 3.0 and/or Appendix B in 79-01B report.

Prepared by: H.D. Romanowski

Reviewed by

QA Acceptance:

System: 74 Unit: 3 EEB-74-0054 Rev O

Component: Cable 16/c #12 AWG Mark: WGM

Plant I. D. No.	Room	Function/Service	Category	Operating Time
3ES3907-II	0	FCV-74-67 Cont	A	l year

2

 $\left| \boldsymbol{y}^{i} \right|_{i}$ 

# EEB \_74-0054\_\_

## Rev O

## ATTACHMENT B

## Mark WGM

Contract No.	Туре	Manufacturer
TR 820500 XFR From 74C7- 85069-1	PJJ	Rome Cable .
72X7-74885-1 67C3-91618 72C7-75328-2 70C7-54179-1	PNJ PNJ PNJ PNJ	Brand-Rex Plastic Wire & Cable Tamaqua Brund-Rex

Sheet No: \_\_\_\_\_\_ EEB- 74-0054\_\_\_\_

Revision: 0

#### ATTACHMENT C

C.1 Integrated Dose - 10 years plus accident

#### Beta Dose

References:

- W. W. Parkinson, O. Sisman, October 1970, The Use of Plastics and Elastomers in Nuclear Radiation.
- R. B. Blodgett, R. G. Fisher, June 1968, Insulations and Jackets for Control and Power Cables.
- M. Asaka, S. Yamamoto, 1973, Radiation Resistance of Plastic Insulating Laterials for Cable.
- 4. Anaconda-Continental Test Report No. 79117 dated April 1979.
- 5. Wyle Laboratory Test Report 43854-3.
- 6. Franklin Institute Test Reports E-C4113 and FC-5120.
- 7. Rockbestos Company Test Report dated July 1977 amended 1979.

The TVA value of  $4 \times 10^9$  rads for the beta accident dose at the periphery of the containment is being reevaluated due to its high value. However, using this value and making reference to the 7901-B DOR guidelines section 4.2.1 and the depth dose penetration, which owing to the low penetrating power of beta particles gives a factor of 10 reduction for 40 mils of jacketing material, and a factor of 10 for an insulation thickness of 30 mils and which is conservative for TVA's 500-volt power and control cables and extremely conservative for TVA's triax and coax and signal cable due to their thickness and the presence of metallic shielding material, and assigning a factor of 5 for the installation shielding of metal trays, conduit, boxes, and flexible conduit, we arrive at a total effective dose of .8 x 10' rads of beta.

Since the energy dissipation of gamma radiation occurs via ionizing processes, one can add the accident dose of  $4 \times 10^7$  rads of gamma directly. The accumulated integrated gamma 10-year dose (the time presently assigned to connectors and penetrations) amounts to 2.5 x 10' rads which added directly gives a total dose of 7.3 x 10<sup>7</sup> rads. In addition, since the containment is inerted in operation, the scission rate and deterioration of the insulation and jacketing materials through oxidation will be much less than for tests conducted in air.

Sheet No: EEB 74-0054\_

Revision: O

#### ATTACHMENT C (Continued)

C.1 (Continued)

Since the above value of 7.3 x  $10^7$  is less than the values for which we have in-air test data for SROAJ types (1.2 x  $10^8$ ) and for XLPE types (2 x  $10^8$ ), it is concluded that the beta dose in an accident will not disqualify the cables presently installed, and the cables will remain operable in the service environment.

C.2 IPCEA S-61-402 Paragraph 3.9 and Appendix D

C.3 TVA Engineering Report No. 1943

Cable types: PJ, PN, PNJ, PJJ, PSJ

Room: 0

This class of cables was purchased under TVA Standard Specification No. 25.013, based on IPCEA S-61-402 (NEMA WC5). These standards provide a product with an operating rating of 75° C continuous, 95° C (203° F), 500-hour overload rating total in a normal lifetime. They are constructed of polyethylene insulation with Nylon and PVC jacketing.

The jacket material has a higher retention of strength at elevated temperature. The in-containment SLB temperature and duration exceeds the cable ratings and the insulation and jacket distortion temperatures.

However, the service which these cable have seen thus far has exposed them to a gamma radiation dose of  $6.25 \times 10^{\circ}$  rads or more. This is sufficient to have cross-linked the polyethylene and PVC as well. Consequently, the insulation is now in fact a thermoset material and is capable of the same temperature that TVA's cross-linked polyethylene insulated cable has demonstrated and is capable of withstanding the LOCA/ SLB and the post-LOCA environment of 1 year. Thus, continued operation is justified.

TVA has prepared a LOCA/SLB, thermal aging, and radiation test procedure to be performed by Wyle Laboratories on samples of this cable to demonstrate the validity of this conclusion. Results of this testing program are expected to be available in April 1981.

C.4 Temperature Qualification Method

C.4.1 Standard material long-term overload temperature rating

C.4.2 Engineering analysis

Sheet No: EEB- 74-0054

Revision No: 0

# ATTACHMENT C (Continued)

C.5 Because of the conservatism of the tests for XLP2 and for silicone insulation, including the severity of the mandrel bend and dielectric test in water after the combined LOCA/SLB profile, it is our engineering judgment that there is sufficient margin to give reasonable assurance of continued operability more than a year in the post-LOCA environment.

Prepared	by:	
Reviewed	by:	
QA Accept	tance:	

Facility: Browns Ferry Nuclear Plant Unit: 3

Docket: 50-296

DOCKEL. 30-230						Duce Idical	00	
FOULDWENT OF CONTACTOR	ENVIRONMENT			DOCUMENTATION REF		QUALIFICATION	OUTSTANDING ITEMS	
EQUIPMENT DESCRIPTION	Parameter	Specifi- cation	Qualifi- cation	Specifi- cation	Qualifi- cation	PIL 2100		
System: 74 Plant ID No. Attachment A	Operating Time	Attachment A	1 Year	(1)	Attachment C.4	Engineering Analysis	None	
Component Cable WGM 16/c, #12AWG, (PNJ) Manufacturer:Attachment B	Temperature (°F)	294 .	153	(4)	Attachments C.1 and C.2	Attachment C.3	None -	
Model Number: N/A	Pressure (PSIA)	15.0	. N/A	(4)	N/A	N/A	None	
Function: Control/Power	Relative Humidity (%)	100	100	(4)	IPCEA S-61-402 par 3.9, 3.7.3 6.7		None	
Accuracy: Req'd: N/A Demon: N/A Category: Attachment A	Chemical Spray	N/A	N/A	(4)	N/A	N/A	None	
Service: Attachment A	Radiation (RAD)	3 x 10 <sup>7</sup>	4x10 <sup>7</sup>	(4)	NUREG-0588 Materials List	Generic Material Test	None	
Location: Room 5	Aging	N/A	20 years	(2)	Attachment C.2	Oper. Experience	None	
Flood Level Elev: 552' Above Flood Level: Yes X	Submergence	N/A	N/A	(4)	N/A	. N/A	None	

SYSTEM COMPONENT EVALUATION WORK SHEET (Rev 2)

Notes: (1) See Section 2.4 in 79-01B report.

- (2) See Section 4.1.2 in 79-01B report.
- (3) All notes and other information not on these sheets are on the attached appendix sheets.

(4) See Section 3.0 and/or Appendix B in 79-01B report.

Prepared by: H. A. Romanuple

Reviewed by:

(3)

Revision

Date

Sheet No. EEB 74-0055

0/12/80

QA Acceptance:

System: 74 Unit: 3				EEB-74-0055 Rev 0
Component: Cable Mark: WGM		16/c #12 AWG		
Plant I. D. No.	Room	Function/Service	Category	Operating Time
3ES3636-II	5	FCV-74-30 Cont	A	l year

÷.,

# EEB 74-0055

Rev O

### ATTACHMENT B

Mark WGM

Contract No.	Туре	Manufacturer
TR 820500 XFR From 74C7- 85069-1	PJJ	Rome Cable
72X7-74885-1 67C3-91618 72C7-75328-2 70C7-54179-1	PNJ PNJ PNJ PNJ	Brand-Rex Plastic Wire & Cable Tamaqua Brand-Rex

Sheet No.: <u>EEB-74-0055</u> Revision: 0

#### ATTACHMENT C

C.1 IPCEA S-61-402 Paragraph 3.9 and Appendix D

C.2 TVA Engineering Report No. 1943.

Cable types: PJ, PN, PNJ, PJJ, PSJ

Rooms 1-18

This class of cables was purchased under TVA Standard Specification No. 25.013, based on IPCEA S-61-402 (NEMA WC5). These standards provide a product with an operating rating of 75° C continuous, 95° C (203° F), 500-hour overload rating total in a normal lifetime. They are constructed of polyethylene insulation with Nylon and PVC jacketing.

The jacket material has a higher retention of strength at elevated temperatures, as the material was subjected to air oven aging of  $121^{\circ}$  C ( $250^{\circ}$  F) for 7 days. Only compartments 1, 2, 3, 6, 9, 10, and 11 show HELB profiles which more than briefly surpass the softening temperature of the insulation. However, owing to the thermal time lags in the cable material and cable installation, the insulation nor even the jacket experience the temperature profile until some time has elapsed.

TVA has conducted tests (Chattanooga Central Laboratories Report No. 81L-81-6821 dated October 1980, of these cables under a temperature profile which envelopes all the HELB profiles. Following this exposure these samples sustained a dielectric test immersed in water of 660 volts ac for 6 minutes, 960 volts ac for 5 minutes, and 2200 volts for 5 minutes in succession.

It is therefore our engineering judgment that this test confirms the above and justifies interim operation until these types can be fully qualified by our Wyle Laboratory tests to be concluded next April or replaced at the next refueling outage.

C.3 Temperature Qualification Method

C.3.1 Standard material long-term overload temperature rating

C.3.2 Engineering Analysis

C.4 The post-HELB conditions are less than the normal cable rating and, in our judgment, the cables could operate satisfactorily for a post-accident of a year.

Prepared by:\_\_\_\_\_

Reviewed by:\_\_\_\_\_

QA Acceptance:

36

1.50

Facility: Browns Ferry Nuclear Plant . Unit: 3 SYSTEM COMPONENT EVALUATION WORK SHEET (Rev 2)

(3) (3) (3) Sheet No. Revision

Date

EEB 74-0056

10/22/80

Docket: 50-296

8

	ENVIRONMENT .			DOCUMENTATION REF		QUALIFICATION METHOD	OUTSTANDING ITEMS	
EQUIPMENT DESCRIPTION	Parameter	Specifi- cation	Qualifi- cation	Specifi- cation	Qualifi- cation	,		
System: 74 Plant ID No. Attachment A	Operating Time	Attachment A	1 Year	(1)	Attachment C.4	Engineering Analysis	None	
Component Cable WGM 16/c, #12AWG, (PNJ) Manufacturer:Attachment B	Temperature (°F)	157	153	(4)	Attachments C.1 and C.2	Attachment C.3	None ·	
Model Number: N/A	Pressure (PSIA)	15.0	, N/A	(4)	N/A	N/A	None	
Function: Control/Power	Relative Humidity (%)	100	100	(4)	IPCEA S-61-402 par 3.9, 3.7.3 6.7		None	
Accuracy: Req'd: N/A Demon: N/A Category: Attachment A	Chemical Spray	N/A	N/A	(4)	N/A	N/A	None	
Service: Attachment A	Radiation (RAD)	2.1 × 10 <sup>7</sup>	4x10 <sup>7</sup>	(4)	NUREG-0588 Materials List	Generic Material Test	None	
Location: Room 8	Aging	N/A	20 years	(2)	Attachment C.2	Oper, Experience	None	
Flood Level Elev: 552' Above Flood Level: Yes × No	Submergence	N/A	N/A	(4)	N/A	. N/A	None	

Notes: (1) See Section 2.4 in 79-01B report.

- (2) See Section 4.1.2 in 79-01B report.
- (3) All notes and other information not on these sheets are on the attached appendix sheets.

(4) See Section 3.0 and/or Appendix B in 79-01B report.

Prepared by: H. D. Romonowski,

Reviewed by:

QA Acceptance:

EEB <u>74-0056</u>

Rev O

System: 74 Unit: 3

Component: Cable 16/c #12 Mark: WGM

Plant I. D. No.	Room	Function/Service	Category	Operating Time
3ES3636-II	8	FCV-74-30 Cont	A	1 Year

\* in

## EEB \_\_\_\_\_\_\_

Rev O

## ATTACHMENT B

Mark WGM

C.itract No.	Туре	Manufacturer
TR 820500 XFR From 74C7- 85069-1	PJJ	Rome Cable
72X7-74885-1 67C3-91618 72C7-75328-2 70C7-54179-1	PNJ PNJ PNJ PNJ	Brand-Rex Plastic Wire & Cable Tamaqua Brand-Rex

Sheet No.: <u>EEB- 74-0056</u> Revision: <u>0</u>

#### ATTACHMENT C

C.1 IPCEA S-61-402 Paragraph 3.9 and Appendix D

C.2 TVA Engineering Report No. 1943.

Cable types: PJ, PN, PNJ, PJJ, PSJ

Rooms 1-18

12

intime."

This class of cables was purchased under TVA Standard Specification No. 25.013, based on IPCL- S-61-402 (NEMA WC5). These standards provide a product with an operating rating of 75° C continuous, 95° C (203° F), 500-hour overload rating total in a normal lifetime. They are constructed of polyethylene insulation with Nylon and PVC jacketing.

The jacket material has a higher retention of strength at elevated temperatures, as the material was subjected to air oven aging of 121°C ( $250^{\circ}$  F) for 7 days. Only compartments 1, 2, 3, 6, 9, 10, and 11 show HELB profiles which more than briefly surpass the softening temperature of the insulation. However, owing to the thermal time lags in the cable material and cable installation, the insulation nor even the jacket experience the temperature profile until some time lagsed.

TVA has conducted tests (Chattanooga Central Laboratories Report No. 81L-81-6821 dated October 1980, of these cables under a temperature profile which envelopes all the HELB profiles. Following this exposure these samples sustained a dielectric test immersed in water of 660 volts ac for 6 minutes, 960 volts ac for 5 minutes, and 2200 volts for 5 minutes in succession.

It is therefore our engineering judgment that this test confirms the above and justifies interim operation until these types can be fully qualified by our Wyle Laboratory tests to be concluded next April or replaced at the next refueling outage.

C.3 Temperature Qualification Method

C.3.1 Standard material long-term overload temperature rating

C.3.2 Engineering Analysis

C.4 The post-HELB conditions are less than the normal cable rating and, in our judgment, the cables could operate satisfactorily for a post-accident of a year.

Prepared by:\_\_\_\_\_

Reviewed by:

QA Acceptance:\_\_\_\_

Facility: Browns Ferry Nuclear Plant Unit: 3

SYSTEM COMPONENT EVALUATION WORK SHEET (Rev 2)

(3) Sheet No. EEB 74-0057 Revision' 0

10/22/80

Date

Docket: 50-296

8

CONTONENT DECONDITION	ENVIRONMENT			OCUMEN	TATION REF	QUALIFICATION METHOD	OUTSTANDING ITEMS	
EQUIPMENT DESCRIPTION	Parameter	Specifi- cation	Qualifi- cation	Specifi- cation	Qualifi- cation	nemos		
System: 74 Plant ID Ng. Attachment A	Operating Time	Attachment A	1 Year	(1)	Attachment C.4	Engineering Analysis	None -	
Component Cable WGM 16/c, #12AWG, (PNJ) Manufacturer:Attachment B	Temperature (°F)	157	153	(4)	Attachments C.1 and C.2	Attachment C.3	, None	
Model Number: N/A	Pressure (PSIA)	15.0	N/A	(4)	N/A	N/A	None	
Function: Control/Power	Relative Humidity (%)	100	100	(4)	IPCEA S-61-402 par 3.9, 3.7.3 6.7		None	
Accuracy: Req'd: N/A Demon: N/A Category: Attachment A	Chemical Spray	N/A	N/A	(4)	N/A	N/A	None	
Service: Att choest A	Radiation (RAD)	$2.1 \times 10^{7}$	4×10 <sup>7</sup>	(4)	NUREG-0588 Materials List	Generic Material Test	None	
Location: Room 9	Aging	N/A	20 years	(2)	Attachment C.2	Oper, Experience	None	
Flood Level Elev: 552' Above Flood Level: Yes X No	Submergence	N/A	N/A	(4)	N/A	N/A	None	
<ul><li>(2) See Section 4</li><li>(3) All notes and</li></ul>	2.4 in 79-018 m 1.2 in 79-018 d other informa n the attached	report. tion not on t	ts.			Reviewed by: 4	a Ronomitil	

- (2) See Section 4.1.2 in 79-01B report.
- (3) All notes and other information not on these sheets are on the attached appendix sheets.

(4) See Section 3.0 and/or Appendix B in 79-01B report.

QA Acceptance:

EEB \_\_\_\_\_\_\_

Rev O

System: 74 Unit: 3

16/c #12

Component: Cable Mark: WGM

Plant I. D. No.	Room	Function/Service	Category	Operating Time	
3ES3636-II	9	FCV-74-30 Cont	A	l year	

 $\mathbf{Y}_{2,0}^{-1}$ 

### EEB 14-0057

Rev O

# ATTACHMENT B

Mark WGM

Contract No.	Туре	Manufacturer
TR 820500 XFR From 7407- 85069-1	PJJ	Rome Cable .
72X7-74885-1 67C3-91618 72C7-75328-2 70C7-54179-1	PNJ PNJ PNJ PNJ	Brand-Rex Plastic Wire & Cable Tamaqua Brand-Rex

ŝ,

Sheet No.: EEB-74-0057

Revision: 0

#### ATTACHMENT C

C.1 IPCEA S-61-402 Paragraph 3.9 and Appendix D

C.2 TVA Engineering Report No. 1943.

Cable types: PJ, PN, PNJ, PJJ, PSJ

Rooms 1-18

This class of cables was purchased under TVA Standard Specification No. 25.013, based on IPCEA S-61-402 (NEMA WC5). These standards provide a product with an operating rating of 75° C continuous, 95° C (203° F), 500-hour overload rating total in a normal lifetime. They are constructed of polyethylene insulation with Nvlon and PVC jacketing.

The jacket material has a higher retention of strength at elevated temperatures, as the material was subjected to air oven aging of  $121^{\circ}$  C ( $250^{\circ}$  F) for 7 days. Only compartments 1, 2, 3, 6, 9, 10, and 11 show HELB profiles which more than briefly surpass the softening temperature of the insulation. However, owing to the thermal time lags in the cable material and cable installation, the insulation nor even the jacket experience the temperature profile until some time has elapsed.

TVA has conducted tests (Chattanooga Central Laboratories Report No. 81L-81-6821 dated October 1980, of these cables under a temperature profile which envelopes all the HELB profiles. Following this exposure these samples sustained a dielectric test immersed in water of 660 volts ac for 6 minutes, 960 volts ac for 5 minutes, and 2200 volts for 5 minutes in succession.

It is therefore our engineering judgment that this test confirms the above and justifies interim operation until these types can be fully qualified by our Wyle Laboratory tests to be concluded next April or replaced at the next refueling outage.

C.3 Temperature Qualification Method

C.3.1 Standard material long-term overload temperature rating

C.3.2 Engineering Analysis

C.4 The post-HELB conditions are less than the normal cable rating and, in our judgment, the cables could operate satisfactorily for a post-accident of a year.

Prepared by:\_\_\_\_\_

Reviewed by:

QA Acceptance:

Facility: Browns Ferry Nuclear Plant

Docket: 50-296

8

	ENVIRONMENT			DOCUMENTATION REF		QUALIFICATION METHOD	OUTSTANDING ITEMS	
EQUIPMENT DESCRIPTION	Parameter	Specifi- cation	Qualifi- cation	Specifi- cation	Qualifi- cation			
System: 74 Plant ID No. Attachment A	Operating Time	Attachment A	1 Year	(1)	Attachment C.4	Engineering Analysis	None	
Component Cable WHB 2/c, #14AWG, (PNJ)(PJJ) Manufacturer:Attachment B	Temperature (°F)	294	153	(4)	Attachments C.1 and C.2	Attachment C.3	None	
Model Number: N/A	Pressure (PSIA)	15.0	N/A	(4)	N/A	N/A	None	
Function: Control/Power	Relative Humidity (%)		100	(4)	IPCEA S-61-402 par 3.9, 3.7.3 6.7		None	
Accuracy: Req'd: N/A Demon: N/A Category: Attachment A	Chemical Spray	N/A	N/A	(4)	N/A	N/A	None	
Service: Attachment A	Radiation (RAD)	3 x 10 <sup>7</sup>	4x107	(4)	NUREG-0588 Materials List	Generic Material Test	None	
Location: Room 5	Aging	N/A	20 years	(2)	Attachment C.2	Oper, Experience	None	
Flood Level Elev: 552' Above Flood Level: Yes X	Submergence	N/A	N/A	(4)	N/A	N/A	None	

SYSTEM COMPONENT EVALUATION WORK SHEET (Rev 2)

Notes: (1) See Section 2.4 in 79-01B report.

- (2) See Section 4.1.2 in 79-01B report.
- (3) All notes and other information not on these sheets are on the attached appendix sheets.

(4) See Section 3.0 and/or Appendix B in 79-01B report.

Prepared by: A. D. Romanniski/

Reviewed by:

albrally

CA Acceptance:

(3)

Revision O

Date

Sheet No. EEB 74-0058

10/22/80

\*

EEB \_74-0058

Rev O

System: 74 Unit: 3				
Component: Cab Mark: WHE		2/c, #14 AWG		
Plant I. D. No.	Room	Function/Service	Category	Operating Time
3ES3648-II	5	FCV-74-30 CONT	A	1 Year

## EEB \_74-0058\_

Rev O

### ATTACHMENT B

Mark WHB

Contract No.	Туре	Manufacturer
67C3-91618	PNJ	Plastic Wire & Cable
87148 XFR From SQN 72C7- 75228-1	PJJ	Plastic Wire & Cable
75K7-86150-1 73C7-84528 75K5-86506-1 72C7-75328-2 70C7-54179-1	PJJ. PJJ PJJ PNJ PNJ	Cyprus Rome Cable AIW Tamaqua Brand-Rex

Sheet No.: EEB- 74-0058

Revision: 0

#### ATTACHMENT C

C.1 IPCEA S-61-402 Paragraph 3.9 and Appendix D

C.2 TVA Engineering Report No. 1943

D Cable types: PJ, PN, PNJ, PJJ, PSJ

Rooms 1-18

This class of cables was purchased under TVA Standard Specification No. 25.013, based on IPCEA S-61-402 (NEMA WC5). These standards provide a product with an operating rating of 75° C continuous, 95° C (203° F), 500-hour overload rating total in a normal lifetime. They are constructed of polyethylene insulation with Nylon and PVC jacketing.

The jacket material has a higher retention of strength at elevated temperatures, as the material was subjected to air oven aging of 121°C ( $250^{\circ}$  F) for 7 days. Only compartments 1, 2, 3, 6, 9, 10, and 11 show HELB profiles which more than briefly surpass the softening temperature of the insulation. However, owing to the thermal time lags in the cable material and cable installation, the insulation nor even the jacket experience the temperature profile until some time has elapsed.

TVA has conducted tests (Chattanooga Central Laboratories Report No. 81L-81-6821 dated October 1980, of these cables under a temperature profile which envelopes all the HELB profiles. Following this exposure these samples sustained a dielectric test immersed in water of 660 volts ac for 6 minutes, 960 volts ac for 5 minutes, and 2200 volts for 5 minutes in succession.

It is therefore our engineering judgment that this test confirms the above and justifies interim operation until these types can be fully qualified by our Wyle Laboratory tests to be concluded next April or replaced at the next refueling outage.

C.3 Temperature Qualification Method

C.3.1 Standard material long erm overload temperature rating

C.3.2 Engineering Analysis

C.4 The post-HELB conditions are less than the normal cable rating and, in our judgment, the cables could operate satisfactorily for a post-accident of a year.

Prepared by:\_\_\_\_\_

Reviewed by:\_\_\_\_\_

QA Acceptance:

38

Facility: Browns Ferry Nuclear Plant Unit: 3 SYSTEM COMPONENT EVALUATION WORK SHEET (Rev 2)

(3) Sheet No. <u>EEB 74-0059</u> Revision O

Date

10/22/80

Docket: 50-296

8

		ENVIRONMENT		DOCUMEN	TATION REF	QUALIFICATION METHOD	OUTSTANDING ITEMS
EQUIPMENT DESCRIPTION	Parameter	Specifi- cation	Qualifi- cation	Specifi- cation	Qualifi- cation	- 1	
System: 74 Plant ID No. Attachment A	Operating Time	Attachment A	1 Year	(1)	Attachment C.4	Engineering Analysis	None
Component Cable WHB 2/c, #14AWG, (PNJ)(PJJ) Manufacturer:Attachment B	Temperature	220	153	(4)	Attachments C.1 and C.2	Attachment C.3	None
Model Number: N/A	Pressure (PSIA)	15.0	N/A	(4)	N/A	N/A	None
Function: Control/Power	Relative Humidity (%)	100	100	(4)	IPCEA S-61-402 par 3.9, 3.7.3 6.7		None
Accuracy: Req'd: N/A Demon: N/A Category: Attachment A	Chemical Spray	N/A	N/A	(4)	N/A	N/A	None
Service: Attachment A	Radiation (RAD)	3.1 × 10 <sup>7</sup>	4x10 <sup>7</sup>	(4)	NUREG-0588 Materials List	Generic Material Test	None
Location: Room 6	Aging	N/A	20 years	(2)	Attachment C.2	Oper, Experience	None
Flood Level Elev: 552' Above Flood Level: Yes X No	Submergence	N/A	N/A	(4)	N/A	N/A	None

Notes: (1) See Section 2.4 in 79-018 report.

(2) See Section 4.1.2 in 79-018 report.

(3) All notes and other information not on these sheets are on the attached appendix sheets.

(4) See Section 3.0 and/or Appendix B in 79-01B report.

Prepared by: H. D. Romonoula kil

Reviewed by

QA Acceptance:

EEB 14-0059

Rev O

System: 74 Unit: 3				Kev
Component: Cable Mark: WHB		2/c, #14 AWG		
Plant I. D. No.	Room	Function/Service	Category	Operating Time
3ES1158-I 3ES3159-II 3ES3631-II	6 6 6	FCV-74-46 RHR SVS I LGC FCV-74-46 CONT FCV-74-72 CONT	A A A	l Year l Year l Year

Υ.,

# 

Rev 0

#### ATTACHMENT B

Mark WHB

Contract No.	Туре	Manufacturer
67C3-91618	PNJ	Plastic Wire & Cable
87148 XFR From SQN 72C7- 75228-1	PJJ	Plastic Wire & Cable
75K7-86150-1 73C7-84528 75K5-86506-1 72C7-75328-2 70C7-54179-1	PJJ. PJJ PJJ PNJ PNJ	Cyprus Rome Cable AIW Tamaqua Brand-Rex

ý.

Sheet No.: EEB- 74-0059

Revision: 0

#### ATTACHMENT C

C.1 IPCEA S-61-402 Paragraph 3.9 and Appendix D

C.2 TVA Engineering Report No. 1943.

. D Cable types: PJ, PN, PNJ, PJJ, PSJ

Rooms 1-18

This class of cables was purchased under TVA Standard Specification No. 25.013, based on IPCEA S-61-402 (NEMA WC5). These standards provide a product with an operating rating of 75° C continuous, 95° C (203° F), 500-hour overload rating total in a normal lifetime. They are constructed of polyethylene insulation with Nylon and PVC jacketing.

The jacket material has a higher retention of strength at elevated temperatures, as the material was subjected to air oven aging of  $121^{\circ}$  C ( $250^{\circ}$  F) for 7 days. Only compartments 1, 2, 3, 6, 9, 10, and 11 show HELB profiles which more than briefly surpass the softening temperature of the insulation. However, owing to the thermal time lags in the cable material and cable installation, the insulation nor even the jacket experience the temperature profile until some time has elapsed.

TVA has conducted tests (Chattanooga Central Laboratories Report No. 81L-81-6821 dated October 1980, of these cables under a temperature profile which envelopes all the HELB profiles. Following this exposure these samples sustained a dielectric test immersed in water of 660 volts ac for 6 minutes, 960 volts ac for 5 minutes, and 2200 volts for 5 minutes in succession.

It is therefore our engineering judgment that this test confirms the above and justifies interim operation until these types can be fully qualified by our Wyle Laboratory tests to be concluded next April or replaced at the next refueling outage.

C.3 Temperature Qualification Method

C.3.1 Standard material long-term overload temperature rating

C.3.2 Engineering Analysis

C.4 The post-HELB conditions are less than the normal cable rating and, in our judgment, the cables could operate satisfactorily for a post-accident of a year.

Prepared by:\_\_\_\_\_

Seviewed by:

QA Acceptance:\_\_\_

Facility: Browns Ferry Nuclear Plant

8

SYSTEM COMPONENT EVALUATION WORK SHEET (Rev 2)

Unit: 3 Docket: 50-296

OUTSTANDING QUALIFICATION DOCUMENTATION REF ENVIRONMENT ITEMS METHOD EQUIPMENT DESCRIPTION Qualifi-Specifi-Qualifi-Specification cation Parameter cation cation System: 74 Engineering None Attachment Attachment Af Operating 1 Year Analysis C.4 Time Plant ID No. Attachment A (1)Cable WHB Component 2/c, #14AWG, (PNJ)(PJJ) Attachments Temperature (°F) None . . Manufacturer: Attachment B Attachment C.3 (4) C.1 and C.2 153 157 8 ..... Pressure Model Number: N/A (PSIA) (4) None N/A N/A N/A 15.0 Standard Function: Control/Power IPCEA 5-61-402 bar 3.9. 3.7.3 Material Relative Requirement None 6.7 Humidity (%) (4)100 100 Accuracy: Reg'd: N/A Demon: N/A **Chemical** Spray (4) None Category: Attachment A N/A N/A N/A N/A Service: Attachment A NUREG-0588 Generic Materials Material Radiation  $2.1 \times 10^{7}$ 4×107 None Test (RAD) (4) List Location: Room 8 (2) None Oper. Experience Attachment C.2 Aging N/A 20 years Flood Level Elev: 552' Above Flood Level: Yes x N/A N/A Submergence N/A None N/A (4) No

(1) See Section 2.4 in 79-01B report. Notes:

- (2) See Section 4.1.2 in 79-01B report.
- (3) All notes and other information not on these sheets are on the attached appendix sheets.

(4) See Section 3.0 and/or Appendix B in 79-01B report.

Prepared by: H. D. Romenewiski,

Reviewed by: (

(3)

Date 10/22/80

Revision

Sheet No. EEB 74-0060

0

MBradle

QA Acceptance:

\*

1 4

EEB . 74-0060

Rev O

System: 74 Unit: 3				NEY
Component: Cable Mark: WHB		2/c, #14 AWC		
Plant I. D. No.	Room	Function/Service	Category	Operating Time
3ES3170-II 3ES3156-II 3ES1158-I 3ES3648-II 3ES656-I 3ES670-I 3ES3631-II	8 8 8 8 8 8 8	FCV-74-75 CONT FCV-74-75 CONT FCV-74-46 RHR SV3 I LGC FCV-74-30 CONT FCV-74-60 CONT FCV-74-61 CONT FCV-74-72 CONT	A A A A A A A	1 Year 1 Year 1 Year 1 Year 1 Year 1 Year 1 Year

# EEB <u>74-0060</u> Rev <u>0</u>

## ATTACHMENT B

Mark WHB

Contract No.	Туре	Manufacturer
67C3-91618	PNJ	Plastic Wire & Cable
87148 XFR From SQN 72C7- 75228-1	PJJ	Plastic Wire & Cable
75K7-86150-1 73C7-84528 75K5-86506-1 72C7-75328-2 70C7-54179-1	PJJ. PJJ PJJ PNJ PNJ	Cyprus Rome Cable AIW Tamaqua Brand-Rex

Sheet No.: EEB-74-0060

Revision: 0

#### ATTACHMENT C

C.1 IPCEA S-61-402 Paragraph 3.9 and Appendix D

C.2 TVA Engineering Report No. 1943.

State Cable types: PJ, PN, PNJ, PJJ, PSJ

Rooms 1-18

3030

1.6

This class of cables was purchased under TVA Standard Specification No. 25.013, based on IPCEA S-61-402 (NEMA WC5). These standards provide a product with an operating rating of 75° c continuous, 95° C (203° F), 500-hour overload rating total in a normal lifetime. They are constructed of polyethylene insulation with Nylon and PVC jacketing.

The jacket material has a higher retention of strength at elevated temperatures, as the material was subjected to air oven aging of 121°C (250° F) for 7 days. Only compartments 1, 2, 3, 6, 9, 10, and 11 show HELB profiles which more than briefly surpass the softening temperature of the insulation. However, owing to the thermal time lags in the cable material and cable installation, the insulation nor even the jacket experience the temperature profile until some time has elapsed.

TVA has conducted tests (Chattanooga Central Laboratories Report No. 81L-81-6821 dated October 1980, of these cables under a temperature profile which envelopes all the HELB profiles. Following this exposure these samples sustained a dielectric test immersed in water of 660 volts ac for 6 minutes, 960 volts ac for 5 minutes, and 2200 volts for 5 minutes in succession.

It is therefore our engineering judgment that this test confirms the above and justifies interim operation until these types can be fully qualified by our Wyle Laboratory tests to be concluded next April or replaced at the next refueling outage.

C.3 Temperature Qualification Method

C.3.1 Standard material long-term overload temperature rating

C.3.2 Engineering Analysis

C.4 The post-HELB conditions are less than the normal cable rating and, in our judgment, the cables could operate satisfactorily for a post-accident of a year.

Prepared by:\_\_\_\_\_

Reviewed by:

QA Acceptance:\_\_\_\_\_

Facility: Browns Ferry Nuclear Plant Unit: 3

8

SYSTEM COMPONENT EVALUATION WORK SHEET (Rev 2)

Docket: 50-296

Date 10/22/80 OUTSTANDING OUALIFICATION DOCUMENTATION REF ENVIRONMENT ITEMS METHOD EQUIPMENT DESCRIPTION Qualifi-Specifi-Qualifi-Specification cation cation cation Parameter System: 74 Engineering None Attachment 1 Year Attachment A Operating Analysis C.4 Plant ID No. Attachment A Time (1)Cable WH8 Component 2/c. #14AWG. (PNJ)(PJJ) Attachments Temperature (°F) None Manufacturer: Attachment B C.1 and C.2 211 Attachment C.3 153 (4). . Pressure Model Number: N/A (PSIA) (4) 15.0 None N/A N/A · N/A Function: Control/Power IPCEA S-61-402 Standard par 3.9. 3.7.3 Material Relative Requirement None 6.7 Humidity (%) (4) 100 100 Accuracy: Reg'd: N/A Demon: N/A Chemical. Spray (4) None Category: Attachment A N/A N/A N/A N/A Service: Attachment A NUREG-0588 Generic Radiation Material Materials  $2.1 \times 10^{7}$ 4x107 None (RAD) (4)List Test Location: Room 9 Attachment C.2 Oper, Experience None (2) Aging N/A 20 years Flood Level Elev: 552' Above Flood Level: Yes X Submergence N/A N/A N/A N/A None (4) No

(1) See Section 2.4 in 79-01B report. Notes:

- (2) See Section 4.1.2 in 79-01B report.
- (3) All notes and other information not on these sheets are on the attached appendix sheets.

(4) See Section 3.0 and/or Appendix B in 79-01B report.

Prepared by: H. A. Romanaulate

(3)

Revision

Sheet No. FFR 74-0061

0

Reviewed by:

QA Acceptance:

EEB \_74-0061\_\_\_\_

Rev O

System: 74 Unit: 3					
Component: Mark:	Cable WHB	2/c,	#14 AWG		
Plant I. D.	No. Room		Function/Service	Category	Operating Time
3ES3170-II 3ES3156-II 3ES1158-I 3ES3648-II 3ES656-I 3ES670-I 3ES3631-II	9 9 9 9 9 9 9		FCV-74-75 CONT FCV-74-75 CONT FCV-74-46 RHR SVS I LGC FCV-74-30 CONT FCV-74-60 CONT FCV-74-61 CONT FCV-74-61 CONT FCV-74-72 CONT	A A A A A A A	l Year 1 Year 1 Year 1 Year 1 Year 1 Year 1 Year

# EEB \_\_\_\_\_\_ Rev \_\_\_\_\_

### ATTACHMENT B

Mark WHB

Contract No.	Туре	Manufacturer
67C3-91618	PNJ	Plastic Wire & Cable
87148 XFR From SQN 72C7- 75228-1	PJJ	Plastic Wire & Cable
75K7-86150-1 7307-84528 75K5-86506-1 72C7-75328-2 70C7-54179-1	PJJ. PJJ PJJ PNJ PNJ	Cyprus Rome Cable AIW Tamaqua Brand-Rex

10	Sheet	No.:	EEB-74-0061
eranar Polici	Revis	ion:	0

A STATE OF A

#### ATTACHMENT C

\$194.2 ···

C.1 IPCEA S-61-402 Paragraph 3.9 and Appendix D

C.2 TVA Engineering Report No. 1943.

D Cable types: PJ, PN, PNJ, PJJ, PSJ

Rooms 1-18

Sheet the state

This class of cables was purchased under TVA Standard Specification No. 25.013, based on IPCEA S-61-402 (NEMA WC5). These standards provide a product with an operating rating of 75°C continuous, 95°C (203°F), 500-hour overload rating total in a normal lifetime. They are constructed of polyethylene insulation with Nylon and PVC jacketing.

The jacket material has a higher retention of strength at elevated temperatures, as the material was subjected to air oven aging of 121°C (250°F) for 7 days. Only compartments 1, 2, 3, 6, 9, 10, and 11 show HELB profiles which more than briefly surpass the softening temperature of the insulation. However, owing to the thermal time lags in the cable material and cable installation, the insulation nor even the jacket experience the temperature profile until some time has elapsed.

TVA has conducted tests (Chattanooga Central Laboratories Report No. 81L-81-6821 dated October 1980, of these cables under a temperature profile which envelopes all the HELB profiles. Following this exposure these samples sustained a dielectric test immersed in water of 660 volts ac for 6 minutes, 960 volts ac for 5 minutes, and 2200 volts for 5 minutes in succession.

It is therefore our engineering judgment that this test confirms the above and justifies interim operation until these types can be fully qualified by our Wyle Laboratory tests to be concluded next April or replaced at the next refueling outage.

C.3 Temperature Qualification Method

C.3.1 Standard material long-term overload temperature rating

C.3.2 Engineering Analysis

C.4 The post-HELB conditions are less than the normal cable rating and, in our judgment, the cables could operate satisfactorily for a post-accident of a year.

Prepared by:\_\_\_\_\_

Reviewed by:

QA Acceptance:\_\_\_\_

(3)SYSTEM COMPONENT EVALUATION WORK SHEET (Rev 2) Sheet No. EEB 74-0062 Facility: Browns Ferry Nuclear Plant Revision 0 Unit: 3 Date 10/22/80 Docket: 50-296 OUTSTANDING QUAL IFICATION DOCUMENTATION REF ENVIRONMENT ITEP'S METHOD EQUIPMENT DESCRIPTION Qualifi-Qualifi-Snecifi-Specification cation cation cation Parameter None Engineering System: 74 Attachment 1 Year Attachment A Operating Analysis C.4 Time Plant ID No. Attachment A (1)Component Cable WHD 4/c, #14AWG, (PNJ)(PJJ) Attachments Temperature (°F) None Attachment C.3 C.1 and C.2 220 (4) Manufacturer: Attachment B 153 4 L S I Pressure -Model Number: N/A (4) None (PSIA) N/A N/A 15.0 N/A Standard 1PCEA S-61-402 Function: Control/Power par 3.9, 3.7.3 Material Relative None Requirement 6.7 (4) Humidity (%) 100 100 Accuracy: Reg'd: N/A Chemical. Demon: N/A Spray None N/A (4) N/A Category: Attachment A N/A N/A Seneric NUREG-0588 Service: Attachment A Material Materials Radiation None  $3.1 \times 10^{7}$ 4x107 (4) Test List (RAD) Location: Room 6 Attachment C.2 Oper, Experience None (2) N/A 20 years Aging Flood Level Elev: 552' N/A Submergence N/A None N/A P' "A Flood Level: Yes x N/A (4) No

See Section 2.4 in 79-018 report.

8

nd other information not on these the attached appendix sheets.

and/or Appendix B in 79-01B report.

Prepared by: H.D. Romanuski

Reviewed by: Alba

QA Acceptance:

EEB \_74-0062\_

Rev \_\_\_\_\_O

System: 74 Unit: 3				
Component: Cab Mark: WHD		4/c, #14 AWG		
Plant I. D. No.	Room	Function/Service	Category	Operating Time
3ES679-I 3ES704-I 3ES692-I 3ES3179-II 3ES3629-II 3ES3192-II	6 6 6 6 6	FCV-74-57 CONT FCV-74-58 CONT FCV-74-59 CONT FCV-74-71 CONT FCV-74-72 CONT FCV-74-73 CONT	A A A A A A	l Year 1 Year 1 Year 1 Year 1 Year 1 Year

5 .

# EEB \_74-001-2\_\_\_

# Rev O

## ATTACHMENT B

Mark WHD

Contract No.	
67C3-91618	
74C7-825527-1	
75K7-86150-1	
72C7-75328-2	
7007-54179-1	

. \*

PNJ PJJ PJJ

PNJ

#### Manufacturer

. . .

Plastic Wire & Cable Continental Wire & Cable Cyprus Tamaqua Brand-Rex

Sheet	No.	:	EEB-	74	-0062
Revisi	on:			0	

#### ATTACHMENT C

C.1 IPCEA S-61-402 Paragraph 3.9 and Appendix D

C.2 TVA Engineering Report No. 1943.

) Cable types: PJ, PN, PNJ, PJJ, PSJ

Rooms 1-18

300

This class of cables was purchased a der TVA Standard Specification No. 25.013, based on IPCEA S-61-402 (NEMA WC5). These standards provide a product with an operating rating of  $75^{\circ}$  C continuous, 95° C (203° F), =00-hour overload rating total in a normal lifetime. They are constructed of polyethylene insulation with Nylon and PVC jacketing.

The jacket material has a higher retention of strength at elevated temperatures, as the material was subjected to air oven aging of 121°C (250°F) for 7 days. Only compartments 1, 2, 3, 6, 9, 10, and 11 show HELB profiles which more than briefly surpass the softening temperature of the insulation. However, owing to the thermal time lags in the cable material and cable installation, the insulation nor even the jacket experience the temperature profile until some time has elapsed.

TVA has conducted tests (Chattanooga Central Laboratories Report No. 81L-81-6821 dated October 1980, of these cables under a temperature profile which envelopes all the HELB profiles. Following this exposure these samples sustained a dielectric test immersed in water of 660 volts ac for 6 minutes, 960 volts ac for 5 minutes, and 2200 volts for 5 minutes in succession.

It is therefore our engineering judgment that this test confirms the above and justifies interim operation until these types can be fully qualified by our Wyle Laboratory tests to be concluded next April or replaced at the next refueling outage.

C.3 Temperature Qualification Method

C.3.1 Standard material long-term overload temperature rating

C.3.2 Engineering Analysis

C.4 The post-HELB conditions are less than the normal cable rating and, in our judgment, the cables could operate satisfactorily for a post-accident of a year.

Prepared by:

Reviewed by:

QA Acceptance:

Facility: Browns Ferry Nuclear Plant Unit: 3 Docket: 50-296

8

QUALIFICATION OUTSTANDING DOCUMENTATION REF ENVIRONMENT ITEMS METHOD EQUIPMENT DESCRIPTION Oualifi-Specifi-Qualifi-Specification cation cation cation Parameter None Engineering System: 74 Attachment 1 Year Attachment A Operating Analysis C.4 Time Plant ID No. Attachment A (1)Cable WHD Component 4/c, #14AWG, (PNJ)(PJJ) Attachments Temperature (°F) None. Manufacturer: Attachment B C.1 and C.2 Attachment C.3 153 (4) 211 . Pressure Model Number: N/A (PSIA) (4) N/A None 15.0 N/A N/A Function: Control/Power IPCEA S-61-402 Standard par 3.9, 3.7.3 Material Relative None Requirement 6.7 Humidity (%) (4) 100 100 Accuracy: Reg'd: N/A Demon: N/A Chemical Spray (4) None Category: Attachment A N/A N/A N/A N/A NUREG-0588 Generic Service: Attachment A Radiation Materials Material 4x107 (RAD) (4)List Test None 2.1×107 Location: Room 9 (2) Attachment C.2 Oper, Experience. None Aging N/A 20 years Flood Level Elev: 552' N/A Above Flood Level: Yes X N/A Submergence N/A None N/A (4) No

SYSTEM COMPONENT EVALUATION WORK SHEET (Ray 2)

Notes: (1) See Section 2.4 in 79-01B report.

- (2) See Section 4.1.2 in 79-01B report.
- (3) All notes and other information not on these sheets are on the attached appendix sheets.

(4) See Section 3.0 and/or Appendix B in 79-01B report.

Prepared by: H. D. Romanughe

(3)

Date 10/22/80

Revision

Sheet No. EEB 74-0063

Reviewed by: Abralle

QA Acceptance:

EEB \_74-0063

System: 74 Unit: 3				Rev
Component: Mark:	Cable WHD	4/c, #14 AWG		
<u>Plant I. D.</u>	No. Room	Function/Service	Category	Operating Time
3ES3179-II 3ES3629-II 3ES3192-II	9 9 9	FCV-74-71 CONT FCV-74-72 CONT FCV-74-73 CONT	A A A	l Year l Year l Year

5. 4

# EEB \_\_\_\_\_\_

Rev O

## ATTACHMENT B

Mark WHD

Contract No. 67C3-91618 74C7-825527-1 75K7-86150-1

7207-75328-2

70C7-54179-1

Type

PNJ PJJ PJJ PNJ PNJ Manutacturer

Plastic Wire & Cable Continental Wire & Cable Cyprus Tamaqua Brand-Rex

Sheet No.: \_\_\_\_\_\_ EEB-74-0063

Revision: 0

#### ATTACHMENT C

C.1 IPCEA S-61-402 Paragraph 3.9 and Appendix D

C.2 TVA Engineering Report No. 1943.

Cable types: PJ, PN, PNJ, PJJ, PSJ

Rooms 1-18

States - Caraly C

1.92

· Jenni

This class of cables was purchased under TVA Standard Specification No. 25.013, based on IPCEA S-61-402 (NEMA WC5). These standards provide a product with an operating rating of 75° C continuous, 95° C (203° F), 500-hour overload rating total in a normal lifetime. They are constructed of polyethylene insulation with Nylon and PVC jacketing.

The jacket material has a higher retention of strength at elevated temperatures, as the material was subjected to air oven aging of 121°C (250°F) for 7 days. Only compartments 1, 2, 3, 6, 9, 10, and 11 show HELB profiles which more than briefly surpass the softening temperature of the insulation. However, owing to the thormal time lags in the cable material and cable installation, the insulation nor even the jacket experience the temperature profile until some time has elapsed.

TVA has conducted tests (Chattanooga Central Laboratories Report No. 81L-81-6821 dated October 1980, of these cables under a temperature profile which envelopes all the HFLB profiles. Following this exposure these samples sustained a dielectric test immersed in water of 660 volts ac for 6 minutes, 960 volts ac for 5 minutes, and 2200 volts for 5 minutes in succession.

It is therefore our engineering judgment that this test confirmative above and justifies interim operation until these types can be fully qualified by our Wyle Laboratory tests to be concluded next April or replaced at the next refueling outage.

C.3 Temperature Qualification Meth d

C.3.1 Standard material long-term overload temperature rating

C.3.2 Engineering Analysis

C.4 The post-HELB conditions are less than the normal cable rating and, in our judgment, the cables could operate satisfactorily for a post-accident of a year.

Prepared by:\_\_\_\_\_

Reviewed by:\_\_\_\_\_

QA Acceptance:

SYSTEM COMPONENT EVALUATION WORK SHEET (Rev 2)

Facility: Browns Ferry Nuclear Plant Jnit: 3 Docket: 50-296

8

(3) Sheet No. <u>EEB 74-0067</u> Revision O

Date 10/22/80

FOULDMENT DECODED (ON	ENVIRONMENT			DOCUMENTATION REF		QUALIFICATION METHOD	OUTSTANDING ITEMS
EQUIPMENT DESCRIPTION	Parameter	Specifi- cation	Qualifi- cation	Specifi- cation	Qualifi- cation	AL THOU	arterio .
System: 74 Plant ID No. Attachment A	Operating Time	Attachment A	1 Year	(1)	Attachment C.4	Engineering Analysis	None
Component Cable WHJ 12/c, #14AWG, (PNJ) Marufacturer:Attachment B	Temperature (°F)	158	153	(4)	Attachments C.1 and C.2	Attachment C.3	None -
odel Number: N/A	Pressure (PSIA)	15.0	V/A	(4)	N/A	N/A	None
unction: Control/Power	Relative Humidity (%)	100	100	(4)	IPCEA S-61-402 par 3.9, 3.7.3 6.7		None
<pre>iccuracy: Req'd: N/A     Demon: N/A iategory: Attachment A</pre>	Chemical Spray	N/A	N/A	(4)	N/A	N/A	None
ervice: Attachment A	Radiation (RAD)	3 × 10 <sup>7</sup>	4x10 <sup>7</sup>	(4)	NUREG-0588 Materials List	Generic Material Test	None
.ocation: Room 2	Aging	N/A	20 years	(2)	Attachment C.2	Oper. Experience	None
lood Level Elev: 552' bove Flood Level: Yes X No	Submergence	N/A	N/A	(4)	N/A	N/A	None

lotes: (1) See Section 2.4 in 79-01B report.

- (2) See Section 4.1.2 in 79-018 report.
- (3) All notes and other information not on these sheets are on the attached appendix sheets.

(4) See Section 3.0 and/or Appendix B in 79-01B report.

Prepared by: H.D. Romanow

QA Acceptance:

Reviewed by:

EEB \_74-0067\_\_\_

Rev O

System: 74 Unit: 3

61

Component: Cable 12/c #14 AWG (PNJ) Mark: WHJ

Plant I. D. No.	Room	Function/Service	Category	Operating Time
3ES576-I	2 2	FCV-74-02 Cont.	A	l yr
3ES589-I		FCV-74-13 Cont.	A	1 yr

# EEB \_\_\_\_\_\_\_ Rev \_\_\_\_\_

# ATTACHMENT B

### Mark WHJ

Contract No. 67C3-91618 73C7-84528 70C7-54179-1 74C7-85069 Турс

PNJ PJJ PNJ PJJ

1.0

Manufacturer

Plastic Wire & Cable Rome Cable Brand-Rex Rome

Sheet No.: EEB-74-0067 Revision: 0

A. Conta . And States

Sec. Sec.

#### ATTACHMENT C

- wetter

C.3 IPCEA S-61-402 Paragraph 3.9 and Appendix D

C.2 TVA Engineering Report No. 1943.

D Cable types: PJ, PN, PNJ, PJJ, PSJ

Roor s 1-18

80

43%

der.

This class of cables was purchased under TVA Standard Specification No. 25.013, based on IPCEA S-61-402 (NEMA WC5). These standards provide a product with an operating rating of 75°C continuous, 95°C (203°F), 500-hour overload rating total in a normal lifetime. They are constructed of polyethylene insulation with Nylon and PVC jacketing.

The jacket material has a higher retention of strength at elevated temperatures, as the material was subjected to air oven aging of 121°C ( $250^{\circ}$  F) for 7 days. Only compartments 1, 2, 3, 6, 9, 10, and 11 show HELB profiles which more than briefly surpass the softening temperature of the insulation. However, owing to the thermal time lags in the cable material and cable installation, the insulation nor even the jacket experience the temperature profile until some time has elapsed.

TVA has conducted tests (Chattanooga Central Laboratories Report No. 81L-81-6821 d>ted October 1980, of these cables under a temperature profile which envelopes all the HELB profiles. Following this exposure these samples sustained a dielectric test immersed in water of 660 volts ac for 6 minutes, 960 volts ac for 5 minutes, and 2200 volts for 5 minutes in succession.

It is therefore our engineering judgment that this test confirms the above and justifies interim operation until these types car be fully qualified by our Wyle Laboratory tests to be conclude. next April or replaced at the next refueling outage.

C.3 Temperature Qualification Method

C.3.1 Standard material long-term overload temperature rating

C.3.2 Engineering Analysis

C.4 The post-HELB conditions are less than the normal cable rating and, in our judgment, the cables could operate satisfactorily for a post-accident of a year.

Prepared by:\_\_\_\_\_

Reviewed by:

QA Acceptance:\_\_\_\_\_

SYSTEM COMPONENT EVALUATION WORK SHEET (Rev 2)

Facility: Browns Ferry Nuclear Plant Unit: 3 Cocket: 50-296

Date 10/22/80 QUALIFICATION OUTSTANDING DOCUMENTATION REF ENVIRONMENT EQUIPMENT DESCRIPTION METHOD ITEMS Qualifi-Qualifi-Specifi-Specification cation Parameter cation cation None Engineering System: 74 Attachment Operating 1 Year Attachment A Analysis C.4 Plant ID No. Attachment A Time (1) Cable WHJ Component 12/c, #14AWG, (PNJ) Attachments Temperature (°F) None fanufacturer: Attachment B 220 C.1 and C.2 Attachment C.3 153 (4) k 4.1 Pressure 'odel Number: N/A (PSIA) 15.0 (4) N/A N/A None N/A Sunction: Control/Power IPCEA 5-61-402 Standard par 3.9, 3.7.3 Material Relative 6.7 Requirement None Humidity (%) (4) 100 100 Accuracy: Reg'd: N/A Demon: N/A Chemical Spray ategory: Attachment A N/A (4) None N/A N/A N/A ervice: Attachment A NUREG-0588 Generic Radiation Material Materials 4x107 (PAD) 3.1 × 107 (4) List Test None ocation: Room 6 (2) Acting N/A Attachment C.2 Oper, Experience None 20 years lood Level Elev: 552' bove Flood Level: Yes X Submergence N/A N/A N/A N/A . None (4) No

otes: (1) See Section 2.4 in 79-01B report.

- (2) See Section 4.1.2 in 79-018 report.
- (3) All notes and other information not on these sheets are on the attached appendix sheets.
- (4) See Section 3.0 and/or Appendix B in 79-01B report.

Prepared by: H. C. Rimonousk

Uprades Reviewed by:

QA Acceptance:

(3)

Revision

Sheet No. EEB 74-0068

0

EEB \_ 74-0068

Rev O

System: Unit:	74 3				Rev
Componen Mark:	t: Cab WHJ	le 12/c #14	AWG (PNJ)		
Plant I.	D. No.	Room	Function/Service	Category	Operating Time
3ES676-1 3ES701-1 3ES689-1	I.	6 6	FCV-74-57 Cont. FCV-74-58 Cont. FCV-74-59 Cont.	A A A	l yr 1 yr 1 yr

1 -

## FEB \_74-0068

Rev O

## ATTACHMENT B

Mark WHJ

1

Contract No. 67C3-91618 73C7-84528 70C7-54179-1 74C7-85069 Type PNJ PJJ

PNJ

PJJ

### Manufacturer

Plastic Wire & Cable Rome Cable Brand-Rex Rome

Sheet	No.	:_	EEB-	74	-0068
Revisi	07:			0	

W. B.

Harris Press

#### ATTACHMENT C

15. 24

C.1 IPCEA S-61-402 Paragraph 3.9 and Appendix D

1.0

C.2 TVA Engineering Report No. 1943.

Cable types: PJ, PN, PNJ, PJJ, PSJ

Rooms 1-18

This class of cables was purchased under TVA Standard Specification No. 25.013, based on IPCEA S-61-402 (NEMA WC5). These standards provide a product with an operating rating of 75° C continuous, 95° C (203° F), 500-hour overload rating total in a normal lifetime. They are constructed of polyethylene insulation with Nylon and PVC jacketing.

The jacket material has a higher retention of strength at elevated temperatures, as the material was subjected to air oven aging of 121°C ( $250^{\circ}$  F) for 7 days. Only compartments 1, 2, 3, 6, 9, 10, and 11 show HELB profiles which more than briefly surpass the softening temperature of the insulation. However, owing to the thermal time lags in the cable material and cable installation, the insulation nor even the jacket experience the temperature profile until some time has elapsed.

TVA has conducted tests (Chattanooga Central Laboratories Report No. 81L-81-6821 dated October 1980, of these cables under a temperature profile which envelopes all the HELB profiles. Following this exposure these samples sustained a dielectric test immersed in water of 660 volts ac for 6 minutes, 960 volts ac for 5 minutes, and 2200 volts for 5 minutes in succession.

It is therefore our engineering judgment that this test confirms the above and justifies interim operation until these types can be fully qualified by our wyle Laboratory tests to be concluded next April or replaced at the next refueling outage.

C.3 Temperature Qualification Method

C.3.1 Standard material long-term overload temperature rating

C.3.2 Engineering Analysis

C.4 The post-HELB conditions are less than the normal cable rating and, in our judgment, the cables could operate satisfactorily for a post-accident of a year.

Prepared by:\_\_\_\_\_

Reviewed by:

QA Acceptance:

(3) SYSTEM COMPONENT EVALUATION WORK SHEET (Rev 2) Facility: Browns Ferry Nuclear Plant Sheet No. EEB 74-0070 Unit: 3 Revision 0 Docket: 50-296 Date 10/22/80 ENVIRONMENT QUALIFICATION DOCUMENTATION REF OUTSTANDING EQUIPMENT DESCRIPTION METHOD **ITEMS** Specifi-Qualifi-Specifi-Qualifi-Parameter cation cation cation cation Engineering None Attachment 1 Year System: 74 Operating Analysis Attachment A C.4 Plant ID No. Attachment A Time (1) Component Cable WHJ 12/c, #14AWG, (PNJ) None Attachments arature Manufacturer: Attachment B 157 (°F) 153 (4)C.1 and C.2 Attachment C.3 4 \* . Pressure Addel Number: N/A (PSIA) (4) 15.0 N/A None N/A N/A Function: Control/Power **IPCEA S-61-402** Standard par 3.9, 3.7.3 Relative Material Humidity (%) 6.7 Requirement None (4)100 100 Reg'd: N/A iccuracy: Demon: N/A Chemical Spray ategory: Attachment A (4) N/A N/A N/A N/A None ervice: Attachment A NUREG-0588 Generic Radiation Materials Material 2.1 x 10' 4x107 (RAD) (4)List Test None ocation: Room 8 Aging N/A None (2) Attachment C.2 Oper, Experience 20 years lood Level Elev: 552' bove Flood Level: Yes X Submergence N/A N/A N/A N/A None No (4)

BLANDE STAND AND COMPANY OF MENT

otes: See Section 2.4 in 79-018 report. (1)

8

- See Section 4.1.2 in 79-01B report. (2)
- (3) All notes and other information not on these sheets are on the attached appendix sheets.
- (4) See Section 3.0 and/or Appendix B in 79-01B report.

Prepared by: A. A. Romenowski / 391 Reviewed by: Albrodley 1 59K

QA Acceptance:

EEB \_\_\_\_\_\_

Rev O

System: 74 Unit: 3

Component: Cable 12/c #14 AWG (PNJ) Mark: WHJ

Plant I. D. No.	Room	Function/Service	Category	Operating Time
3ES651-I	8	FCV-74-60 Cont.	A	l yr
3ES664-I	8	FCV-74-61 Cont.	A	1 yr
3ES576 I	8	FCV-74-2 Cont.	A	l yr
3ES589-1	8	FCV-74-13 Cont.	A	l yr
3ES676-I	8	FCV-74-57 Cont.	A	1 Jr
3ES701-1	8	FCV-74-58 Cont.	Α	l yr
3F.5689-1	8	PCV-74-59 Cont.	A	l yr

### EEB \_ 74-00 70

1

Rev 0\_\_\_

### ATTACHMENT B

Mark WHJ

Contract No. 67C3-91618 73C7-84528 70C7-54179-1 74C7-85069

ł

ς.

Type PNJ PJJ PNJ PJJ

4

### Manufacturer

Plastic Wire & Cable Rome Cable Brand-Rex Rome

Sheet No.: \_\_\_\_\_\_ EEB-74-0070

Revision: 0

#### ATTACHMENT C

C.1 IPCEA S-61-402 Paragraph 3.9 and Appendix D

C.2 TVA Engineering Report No. 1943.

Cable types: PJ, PN, PNJ, PJJ, PSJ

Rooms 1-18

This class of cables was purchased under TVA Standard Specification No. 25.013, based on IPCEA S-61-402 (NEMA WC5). These standards provide a product with an operating rating of 75° C continuous, 95° C (203° F), 500-hour overload rating total in a normal lifetime. They are constructed of polyethylene insulation with Nylon and PVC jacketing.

The jacket mater al has a higher retention of strength at elevated temperatures, as the material was subjected to air oven aging of 121°C (250°F) for 7 days. Only compartments 1, 2, 3, 6, 9, 10, and 11 show HELB profiles which more than briefly surpass the softening temperature of the insulation. However, owing to the thermal time lags in the cable material and cable installation, the insulation nor even the jacket experience the temperature profile until some time has elapsed.

TVA has conducted tests (Chattanooya Central Laboratories Report No. 81L-81-6821 dated October 1980, of these cables under a temperature profile which envelopes all the HELB profiles. Following this exposure these samples sustained a dielectric test immersed in water of 660 volts ac for 6 minutes, 960 volts ac for 5 minutes, and 2200 volts for 5 minutes in succession.

It is therefore our engineering judgment that this test confirms the above and justifies interim operation until these types can be fully qualified by our Wyle Laboratory tests to be concluded next April or replaced at the next refueling outage.

C.3 Temperature Qualification Method

C.3.1 Standard material long-term overload temperature rating

C.3.2 Engineering Analysis

C.4 The post-HELB conditions are less than the normal cable rating and, in our judgment, the cables could operate satisfactorily for a post-accident of a year.

Prepared by:\_\_\_\_\_

Reviewed by:\_\_\_\_\_

QA Acceptance:\_\_\_\_\_

SYSTEM COMPONENT EVALUATION WORK SHEET (Rev 2)

(3)			
No.	EEB.	74-007	11

0

10/22/80

Sheet

Date

Revision

Facility: Browns Ferry Nuclear Plant . Unit: 3 Docket: 50-296

8

	ENVIRONMENT			DOCUMENTATION REF		QUALIFICATION METHOD	OUTSTANDING ITEMS
EQUIPMENT DESCRIPTION	Parameter	Specifi- cation	Qualifi- cation	Specifi- cation	Qualifi- cation	,	
System: 74 Plant ID No. Attachment A	Operating Time	Attachment A	1 Year	(1)	Attachment C.4	Engineering Analysis	None .
Component Cable NHJ 12/c, #14AWG, (PNJ) Manufacturer:Attachment B	Temperature (°F)	211	153	(4)	Attachments C.1 and C.2	Attachment C.3	None -
odel Number: N/A	Pressure (PSIA)	15.0	N/A	(4)	NZA	N/A	None
Function: Control/Power	Relative Humidity (%)	100	100	(4)	IPCEA S-61-402 par 3.9, 3.7.3 6.7	Standard Material Requirement	None
Accuracy: Req'd: N/A Demon: N/A Category: Attachment A	Chemical Spray	N/A	N/A	(4)	N/A	N/A	None
iervice: Attachment A	Radiation (RAD)	2.1 × 10 <sup>7</sup>	4x10 <sup>7</sup>	(4)	NUREG-0588 Materials List	Generic Material Test	None
.ocation: Room 9	Aging	N/A	20 years	(2)	Attachment C.2	Oper, Experience	None
Hood Level Elev: 552' boyo Flood Level: Yes X	Submergence	N/A	N/A	(4)	N/A	. N/A	None

lotes: (1) See Section 2.4 in 79-01B report.

- (2) See Section 4.1.2 in 79-01B report.
- (3) All notes and other information not on these sheets are on the attached appendix sheets.
- (4) See Section 3.0 and/or Appendix B in 79-01B report.

Prepared by: H. A. Romenaus

Reviewed by:

QA Acceptance:

EEB \_74-0071\_\_\_

Rev \_\_\_\_\_Q

System: 74 Unit: 3

Component: Cable 12/c #14 AWG (PNJ) Mark: WHJ

Plant I. D. No.	Room	Function/Service	Category	Operating Time
3ES651-I	9	FCV-74-60 Cont.	А	l yr
3ES664-I	9	FCV-74-61 Cont.	A	1 yr
3ES1168-I	9	FCV-74-77 Cont.	A	l yr
3ES576-I	9	FCV-74-2 Cont.	A	1 yr
3ES589-I	9	FCV-74-13 Cont.	A	l yr
3ES676-I	9	FCV-74-57 Cont.	A	l yr
3ES701-I	9	FCV-74-58 Cont.	A	l yr
3ES689-I	9	FCV-74-59 Cont.	A	l yr

### EEB 74-0071

Rev Ø

### ATTACHMENT B

Mark WHJ

## Contract No.

67C3-91618 73C7-84528 70C7-54179-1 74C7-85069

\*

Туре

PNJ PJJ PNJ PJJ

. .

### Manufacturer

Plastic Wire & Cable Rome Cable Brand-Rex Rome

Sheet No .: EEB-74-0071

Revision: 0

### ATTACHMENT C

C.1 IPCEA S-61-402 Paragraph 3.9 and Appendix D

C.2 TVA Engineering Report No. 1943.

Cable types: PJ, PN, PNJ, PJJ, PSJ

Rooms 1-18

S. Ste

38

This class of cables was purchased under TVA Standard Specification No. 25.013, based on IPCEA S-61-402 (NEMA WC5). These standards provide a product with an operating rating of  $75^{\circ}$  C continuous,  $95^{\circ}$  C (203° F), 500-hour overload rating total in a normal lifetime. They are constructed of polyethylene insulation with Nylon and PVC jacketing.

The jacket material has a higher retention of strength at elevated temperatures, as the material was subjected to air oven aging of 121°C (250°F) for 7 days. Only compartments 1, 2, 3, 6, 9, 10, and 11 show HELB profiles which more than briefly surpass the softening temperature of the insulation. However, owing to the thermal time lags in the cable material and cable installation, the insulation nor even the jacket experience the temperature profile until some time has elapsed.

TVA has conducted tests (Chattanooga Central Laboratories Report No. 81L-81-6321 dated October 1980, of these cables under a temperature profile which envelopes all the HELB profiles. Following this exposure these samples sustained a dielectric test immersed in water of 660 volts ac for 6 minutes, 960 volts ac for 5 minutes, and 2200 volts for 5 minutes in succession.

It is therefore our engineering judgment that this test confirms the above and justifies interim operation until these types can be fully qualified by our Wyle Laboratory tests to be concluded next April or replaced at the next refueling outage.

C.3 Temperature Qualification Method

C.3.1 Standard material long-term overload temperature rating

C.3.2 Engineering Analysis

C.4 The post-HELB conditions are less than the normal cable rating and, in our judgment, the cables could operate satisfactorily for a post-accident of a year.

Prepared by:

Reviewed by:

QA Acceptance:

Unit: 3 Docket: 50-296						Sheet No. <u>EEB</u> Revision <u>O</u> Date <u>10/22/8</u>	0
EQUIPMENT DESCRIPTION		ENVIRONMENT		DOCUMEN	TATION REF	QUALIFICATION METHOD	OUTSTANDING ITEMS
	Parameter	Specifi- cation	Qualifi- cation	Specifi- cation	Qualifi- cation		-
System: 74 Plant ID No. Attachment A	Operating Time	Attachment A	1 Year	(1)	Attachment C.4	Engineering Analysis	None
Component Cable WHJ 12/c, #14AWG, (PNJ) Manufacturer:Attachment B	Temperature (°F)	199	153	(4)	Attachments C.1 and C.2	Attachment C.3	None .
odel Number: N/A	Pressure (PSIA)	15.0	N/A	(4)	NZA	N/A	None
couracy: Regid: N/A	Relative Humidity (%)	100	100	(4)	LPCEA S-61-402 par 3.9, 3.7.3 6.7	Standard	None
ccuracy: Req'd: N/A Demon: N/A ategory: Attachment A	Chemical Spray	N/A	N/A	(4)	N/A	N/A	None
ervice: Attachment A	Radiation (RAD)	3.1 × 10 <sup>4</sup>	4x10 <sup>7</sup>	(4)	NUREG-0588 Materials List	Generic Material Test	None
ocation: Room 12	Aging	N/A	20 years	(2)		Oper, Experience	None
lood Level Elev: 552' bove Flood Level: Yes x No	Submergence	N/A	N/A	(4)	N/A	N/A	None

ALL STATES AND STATES OF A CAMPAGE AND

stes: (1) See Section 2.4 in 79-01B report.

- (2) See Section 4.1.2 in 79-01B report.
- (3) All notes and other information not on these sheets are on the attached appendix sheets.
- (4) See Section 3.0 and/or Appendix B in 79-01B report.

Prepared by: H.D. Romenowski/ SHK Reviewed by: Albralley

QA Acceptance:

EEB 74-0072

Rev O

System: 74 Unit: 3

Component: Cable 12/c #14 AWG (PNJ) Mark: WHJ

۰.

Plant I. D. No. Room		Function/Service	Category	Operating Time
3ES1168-I 12		FCV-74-77 Cont.	A	1 yr

### EEB \_14-0012

Rev \_\_\_\_\_\_

### ATTACHMENT B

Mark WHJ

Contract No. 67C3-91618 73C7-84528 70C7-54179-1

74C7-85069

Type PNJ PJJ PNJ PJJ

.

#### Manufacturer

Plastic Wire & Cable Rome Cable Brand-Rex Rome

Sheet No.: EEB-74-0072 Revision: 0

#### ATTACHMENT C

a states

C.1 IPCEA S-61-402 Paragraph 3.9 and Appendix D

C.2 TVA Engineering Report No. 1943.

Cable types: PJ, PN, PNJ, PJJ, PSJ

Rooms 1-18

. .

Sider .

This class of cables was purchased under TVA Standard Specification No. 25.013, based on IPCEA S-61-402 (NEMA WC5). These standards provide a product with an operating rating of 75° C continuous, 95° C (203° F), 500-hour overload rating total in a normal lifetime. They are constructed of polyethylene insulation with Nylon and PVC jacketing.

The jacket material has a higher retention of strength at elevated temperatures, as the material was subjected to air oven aging of 121°C ( $250^{\circ}$  F) for 7 days. Only compartments 1, 2, 3, 6, 9, 10, and 11 show HELB profiles which more than briefly surpass the softening temperature of the insulation. However, owing to the thermal time lags in the cable material and cable installation, the insulation nor even the jacket experience the temperature profile until some time has elapsed.

TVA has conducted tests (Chattanooga Central Laboratories Report No. 81L-81-6821 dated October 1980, of these cables under a temperature profile which envelopes all the HELB profiles. Following this exposure these samples sustained a dielectric test immersed in water of 660 volts ac for 6 minutes, 960 volts ac for 5 minutes, and 2200 volts for 5 minutes in succession.

It is therefore our engineering judgment that this test confirms the above and justifies interim operation until these types can be fully qualified by our Wyle Laboratory tests to be concluded next April or replaced at the next refueling outage.

C.3 Temperature Qualification Method

C.3.1 Standard material long-term overload temperature rating

C.3.2 Engineering Analysis

C.4 The post-HELB conditions are less than the normal cable rating and, in our judgment, the cables could operate satisfactorily for a post-accident of a year.

Prepared by:\_\_\_\_\_

Reviewed by:\_\_\_\_\_

QA Acceptance:

Facility: Browns Ferry Nuclear Plant Unit: 3

SYSTEM COMPONENT EVALUATION WORK SHEET (Rev 2)

(3)EEB-74-0073 Sheet No. Revision 0

Date 10/22/80

Docket: 50-296

CONTRACT DESCRIPTION	ENVIRONMENT			DECUMENTATION REF		QUALIFICATION METHOD	OUTSTANDING ITEMS	
EQUIPMENT DESCRIPTION	Parameter	Specifi- cation	Qualifi- cation	Specifi- cation	Qualifi- cation	ni mou		
System: 74 Plant ID No. Attachment A	Operating Time	Attachment A	1 Year	(1)	Attachment C.5	Engineeri <b>ng</b> Analysis	None	
Component Cable - WHL 16/c, #14 AWG (PNJ) Manufacturer:Attachment B	Temperature (°F)	325	153	(4)	Attachments C.2 and C.3	Attachment C.4	None	
Model Number: N/A	Pressure (PSIA)	69.7	N/A	(4)	N/A	N/A	None	
Function: Control/Power	Relative Humidity (%)	100	100	(4)	IPCEA S-61-402 par 3.9, 3.7.3, 6.7	Standard Material Requirement	None	
Accuracy: Req'd: N/A Demon: N/A Category: Attachment A	Chemical Spray	N/A	N/A	(4)	N/A	N/A	None	
Service: Attachment A	Radiation (RAD)	6.5x10 <sup>7</sup> 8 4x10 <sup>9</sup> 8 Attach. C.1	4×10 <sup>7</sup>	(4)	NUREG-0588 Materials List	Generic Mat≁ al Test	None	
Location: 0	Aging	N/A	10 years	(2)	Attachment C.3	Doer. Experience	None	
Flood Level Elev: 552' Above Flood Level: Yes X No	Submargance	N/A	N/A	(4)	N/A	. N/A	None	

(1) See Section 2.4 in 79-01B report. Notes:

- (2) See Section 4.1.2 in 79-01B report.
- (3) All notes and other information not on these sheets are on the attached appendix sheets.

(4) See Section 3.0 and/or Appendix B in 79-01B report.

Prepared by: H. A. Romenaula

Reviewed by:

QA Acceptance:

. . .

EEB \_\_\_\_\_\_\_\_\_

Rev C

 System: 74

 Unit: 3

 Component: Cable 16/c #14 AWG (PNJ)

 Mark: WHL

 Plant I. D. No. Room
 Function/Service
 Category
 Operating Time

 3ES539-I
 0
 FCV-74-52 Cont.
 A
 1 yr

### EEB \_\_\_\_\_\_\_\_\_\_ REV \_\_\_\_\_

# ATTACHMENT B

Mark WHL

Contract No. 67C3-91618-1 72C7-75228-1 (SQN) PNJ PJJ

\$

Manufacturer

Plastic Wire & Company Plastic Wire & Cable

Sheet No: \_\_\_\_\_\_ EEB- 74-0073

Revision: 0

#### ATTACHMENT C

C.1 Integrated Dose - 10 years plus accident

#### Beta Dose

#### References:

- W. W. Parkinson, O. Sisman, October 1970, The Use of Plastics and Elastomers in Nuclear Radiation.
- R. B. Blodgett, R. G. Fisher, June 1968, Insulations and Jackets for Control and Power Cables.
- M. Asaka, S. Yamamoto, 1973, Radiation Resistance of Plastic Insulating Materials for Cable.
- 4. Anaconda-Continental Test Report No. 79117 dated April 1979.
- 5. Wyle Laboratory Test Report 43854-3.
- 6. Franklin Institute Test Reports E-C4113 and FC-5120.
- 7. Rockbestos Company Test Report dated July 1977 amended 1979.

The TVA value of  $4 \times 10^9$  rads for the beta accident dose at the periphery of the containment is being reevaluated due to its high value. However, using this value and making reference to the 7901-B DOR guidelines section 4.2.1 and the depth dose penetration, which owing to the low penetrating power of beta particles gives a factor of 10 reduction for 40 mils of jacketing material, and a factor of 10 for an insulation thickness of 30 mils and which is conservative for TVA's 600-volt power and control cables and extremely conservative for TVA's triax and coax and signal cable due to their thickness and the presence of metallic shielding material, and assigning a factor of 5 for the installation shielding of metal trays, conduit, boxes, and flexible conduit, we arrive at a total effective dose of .8 x 10' rads of beta.

Since the energy dissipation of gamma radiation occurs via ionizing processes, one can add the accident dose of  $4 \times 10^7$  rads of gamma directly. The accumulated integrated gamma 10-year dose (the time presently assigned to connectors and penetrations) amounts to 2.5 x 10<sup>7</sup> rads which added directly gives a total dose of 7.3 x 10<sup>7</sup> rads. In addition, since the containment 's inerted in operation, the scission rate and deterioration of the insulation and jacketing materials through oxidation will be much less than for tests conducted in air.

- 4

Sheet No: EEB 74-0073\_

Revision: O

#### ATTACHMENT C (Continued)

C.1 (Continued)

Since the above value of 7.3  $\times 10^7$  is less than the values for which we have in-air test data for SROAJ types (1.2  $\times 10^8$ ) and for XLPE types (2  $\times 10^8$ ), it is concluded that the beta dose in an accident will not disqualify the cables presently installed, and the cables will remain operable in the service environment.

C.2 IPCEA S-61-402 Paragraph 3.9 and Appendix D

C.3 TVA Engineering Report No. 1943

Cable types: PJ, PN, PNJ, PJJ, PSJ

Room: 0

This class of cables was purchased under TVA Standard Specification No. 25.013, based on IPCEA S-61-402 (NEMA WC5). These standards provide a product with an operating rating of 75° C continuous, 95° C (203° F), 500-hour overload rating total in a normal lifetime. They are constructed of polyethylene insulation with Nylon and PVC jacketing.

The jacket material has a higher retention of strength at elevated temperature. The in-containment SLB temperature and duration exceeds the cable ratings and the insulation and jacket distortion temperatures.

However, the service which these cable have seen thus far has exposed them to a gamma radiation dose of  $6.25 \times 10^{\circ}$  rads or more. This is sufficient to have cross-linked the polyethylene and PVC as well. Consequently, the insulation is now in fact a thermoset material and is capable of the same temperature that TVA's cross-linked polyethylene insulated cable has demonstrated and is capable of withstanding the LOCA/ SLB and the post-LOCA environment of 1 year. Thus, continued operation is justified.

TVA has prepared a LOCA/SLB, thermal aging, and radiation test procedure to be performed by Wyle Laboratories on samples of this cable to demonstrate the validity of this conclusior. Results of this testing program are expected to be available in April 1981.

C.4 Temperature Qualification Method

C.4.1 Standard material long-term overload temperature rating

C.4.2 Engineering analysis

Sheet No: EEB- 74-0073

Revision No: 0

### ATTACHMENT C (Continued)

C.5 Because of the conservatism of the tests for XLPE and for silicone insulation, including the severity of the mandrel bend and dielectric test in water after the combined LOCA/SLB profile, it is our engineering judgment that there is sufficient margin to give reasonable assurance of continued operability more than a year in the post-LOCA environment.

Prepared	by:
Reviewed	by:
QA Accept	tance:

Facility: Browns Ferry Nucl Unit: 3 Docket: 50-296	lear Plant		-	ATION WORK SH		Sheet No. EEB Revision O Date (0/22/8	74-0074 o
EQUIPMENT DESCRIPTION	ENVIRONMENT			DOCUMENTATION REF		QUALIFICATION METHOD	OUTSTANDING
	Parameter	Specifi- cation	Qualifi- cation	Specifi- cation	Qualifi- cation	Contractor.	ITEMS
System: 74 Plant ID No. Attachment A	Operating Time	Attachment A	1 Year	(1)	Attachment C.4	Engineering Analysis	None .
iodel Number: N/A P unction: Control/Power R ccuracy: Req'd: N/A C ategory: Attachment A ervice: Attachment A R ocation: Room 7	Temperature (°F)	308	153	(4)	Attachments C.1 and C.2	Attachment C.3	None
	Pressure (PSIA)	21.5	NZA	(4)	N/A	N/A	None
	Relative Humidity (%)	100	100	(4)	IPCEA S-61-402 par 3.9, 3.7.3 6.7	Standard	None
	Chemical Spray	N/A	N/A	(4)	N/A	N/A	None
	Radiation (RAD)	2 x 10 <sup>6</sup>	4x10 <sup>7</sup>	(4)	NUREG-0588 Materials List	Generic Material Test	None
	Aging	N/A	20 years	(2)	Attachment C.2	Oper. Experience	None
lood Level Elev: 552' bove Flood Level: Yes X No	Submergence	N/A	N/A	(4)	N/A	N/A	None

A CONTRACTOR OF S

has a set of the second life with the second s

otes: (1) See Section 2.4 in 79-01B report.

- (2) See Section 4.1.2 in 79-01B report.
- (3) All notes and other information not on these sheets are on the attached appendix sheets.
- (4) See Section 3.0 and/or Appendix B in 79-01B report.

Prepared by:

D. Kimonaw

QA Acceptance:

keviewed by:

EEB \_\_\_\_\_\_\_

Rev O

System: 74 Unit: 3

Component: Cable 16/c #14 AWG (PNJ) Mark: WHL

۲.

Plant I. ). No. Room		Function/Service	Category	Operating Time	
3ES539-I	7	FCV-74-52 Cont.	A	1 yr	
3ES527-I	7	FCV-74-53 Cont.	A	1 yr	

## EEB <u>74-0074</u> REV <u>0</u>

# ATTACHMENT B

Mark WHL

i.

Contract No.

67C3-91618-1 72C7-75228-1 (SQN) PNJ PJJ

۰.

Manufacturer

Plastic Wire & Company Plastic Wire & Cable

Sheet No.: <u>EEB-74-0074</u> Revision: <u>0</u>

#### ATTACHMENT C

C.1 IPCEA S-61-402 Paragraph 3.9 and Appendix D

C.2 TVA Engineering Report No. 1343.

. Cable types: PJ PN, PNJ, PJJ, PSJ

Rooms 1-18

14.

This class of cables was purchased under TVA Standard Specification No. 25.013 based on IPCEA S-61-402 (NEMA WC5). These standards provide a product with an operating rating of  $75^{\circ}$  C continuous, 95° C (203° F), 500-hour overload rating total in a normal lifetime. They are constructed of polyethylene insulation with Nylon and PVC jacketing.

The jacket material has a higher retention of strength at elevated temperatures, as the material was subjected to air oven aging of 121°C ( $250^{\circ}$  F) for 7 days. Only compartments 1, 2, 3, 6, 9, 10, and 11 show HELB profiles which more than briefly surpass the softening temperature of the insulation. However, owing to the thermal time lags in the cable material and cable installation, the insulation nor even the jacket experience the temperature profile until some time tags elapsed.

TVA has conducted tests (Chattanooga Central Laboratories Report No. 81L-81-6821 dated October 1980, of these cables under a temperature profile which envelopes all the HELB profiles. Following this exposure these samples sustained a dielectric test immersed in water of 660 volts ac for 6 minutes, 960 volts ac for 5 minutes, and 2200 volts for 5 minutes in succession.

It is therefore our engineering judgment that this test confirms the above and justifies interim operation until these types can be fully qualified by our Wyle Laboratory tests to be concluded next April or replaced at the next refueling outage.

C.3 Temperature Qualification Method

C.3.1 Standard material long-term overload temperature rating

C.3.2 Engineering Analysis

C.4 The post-HELB conditions are less than the normal cable rating and, in our judgment, the cables could operate satisfactorily for a post-accident of a year.

Frepared by:\_\_\_\_\_

Reviewed by:

QA Acceptance:

Facility: Browns Ferry Nucl Unit: 3 Docket: 50-296	lear Plant	SYSTEM COMP	ONENT EVALUA	TION WORK SH	HEET (Rev 2)	(3) Sheet No. <u>EEB</u> Revision <u>G</u> Date 10/22/8	
EQUIPMENT DESCRIPTION	ENVIRONMENT			DOCUMENTATION REF		QUALIFICATION	OUTSTANDING
EQUIPMENT DESCRIPTION	Parameter	Specifi- cation	Qualifi- cation	Specifi- cation	Qualifi- cation	METHOD	ITEMS
System: 74 Plant ID No. Attachment A	Operating Time	Attachment A	1 Year	(1)	Attachment C.4	Engineering Analysis	None
Component Cable NHL 16/c, #14AWG, (PNJ) Manufacturer:Attachment B	Temperature (°F)	157	153	(4)	Attachments C.1 and C.2	Attachment C.3	None .
iodel Number: N/A	Pressure (PSIA)	15.0	۱۹/A	(4)	N/A	NZA	None
ccuracy: Reg'd: N/A	Relative Humidity (%)	100	100	(4)	LPCEA S-61-402 par 3.9, 3.7.3 6.7	Standard	None
Demon: N/A ategory: Attachment A	Chemical Spray	N/A	N/A	(4)	N/A	N/A	Tiona
ervice: Attachment A	Radiation (RAD)	$2.1 \times 10^{7}$	4x10 <sup>7</sup>	(4)	NUREG-0588 Materials List	Generic Material Test	None
ocation: Room 8	Aging	N/A	20 years	(2)	Attachment C.2	Oper, Experience	None
lood Level Elev: 552' bove Flood Level: Yes X No	Jomergence	N/A	N/A	(4)	N/A	. N/A	None

A Same And a state of the second of the second of the

stes: (1) See Section 2.4 in 79-01B report.

- (2) See Section 4.1.2 in 79-01B report.
- (3) All notes and other information not on these sheets are on the attached appendix sheets.
- (4) See Section 3.0 and/or Appendix B in 79-01B report.

Prepared by: H. D. Romonoulad

R wed by:

QA Acceptance:

EEB \_74-0075

Rev O

System: 74 Unit: 3

ť

Component: Cable 16/c #14 AWG (PNJ) Mark: WHL

5.4

Plant I. D. No.	Room	Function/Service	Category	Operating Time	
3ES539-1	8	FCV-74-52 Cont.	А	l yr	
3ES527-1	8	* 7-74-53 Cont.	A	l yr	

# EEB <u>74-0075</u> REV <u>0</u>

# ATTACHMENT B Mark WHL

Contract No. 67C3-91618-1 72C7-75228-1 (SQN) Type PNJ PJJ

•

Manufacturer

Plastic Wire & Company Plastic Wire & Cable

Sheet No.: EEB-74-0075

Revision: 0

#### ATTACHMENT C

C.1 IPCEA S-61-402 Paragraph 3.9 and Appendix D

C.2 TVA Engineering Report No. 1943.

Cable types: PJ, PN, PNJ, PJJ, PSJ

Rooms 1-18

This class of cables was purchased under TVA Standard Specification No. 25.013, based on IPCEA S-61-402 (NEMA WC5). These standards provide a product with an operating rating of 75° C continuous, 95° C (203° F), 500-hour overload rating total in a normal lifetime. They are constructed of polyethylene insulation with Nylon and PVC jacketing.

The jacket material has a higher retention of strength at elevated temperatures, as the material was subjected to air oven aging of 121°C (250°F) for 7 days. Only compartments 1, 2, 3, 6, 9, 10, and 11 show HELB profiles which more than briefly surpass the softening temperature of the insulation. However, owing to the thermal time lags in the cable material and cable installation, the insulation nor even the jacket experience the temperature profile until some time has elapsed.

TVA has conducted tests (Chattanooga Central Laboratories Report No. 81L-81-6821 dated October 1980, of these cables under a temperature profile which envelopes all the HELB profiles. Following this exposure these samples sustained a dielectric test immersed in water of 660 volts ac for 6 minutes, 960 volts ac for 5 minutes, and 2200 volts for 5 minutes in succession.

It is therefore our engineering judgment that this test confirms the above and justifies interim operation until these types can be fully qualified by our Wyle Laboratory tests to be concluded next April or replaced at the next refueling outage.

C.3 Temperature Qualification Method

C.3.1 Standard material long-term overload temperature rating

C.3.2 Engineering Analysis

C.4 The post-HELB conditions are less than the normal cable rating and, in our judgment, the cables could operate satisfactorily for a post-accident of a year.

Prepared by:

Reviewed by:

QA Acceptance:

38

i de la como

- with

Facility: Browns Ferry Nucl Unit: 3 Docket:50-296	ear Plant	SYSTEM COMPONENT EVALUATION WORK SHEET (Rev 2)			Sheet No. EEB 74-0076 Revision O Date 10/22/80		
EQUIPMENT DESCRIPTION	ENVIRONMENT			DOCUMENTATION REF		QUALIFICATION METHOD	OUTST JING ITEMS
	Parameter	Specifi- cation	Qualifi- cation	Specifi- cation	Qualifi- cation	PIETINO	
System: 74 Plant ID No. Attachment A	Operating Time	Attachment A	1 Year	(1)	Attachment C.4	Engineering Analysis	None .
Component Cable WHL 16/c, #14AWG, (PNJ) Manufacturer:Attachment B	Temperature (°F)	211	153	(4)	Attachments C.1 and C.2	Attachment C.3	None
Addel Number: N/A Function: Control/Power Accuracy: Req'd: N/A Demon: N/A Category: Attachment A	Pressure (PSIA)		N/A	(4)	N/A	N/A	None
	Relative Humidity (%)	100	100	(4)	1PCEA S-61-402 par 3.9, 3.7.3 6.7	Standard	None
	Chemical Spray	N/A	N/A	(4)	N/A	N/A	None
Service: Attachment A	Radiation (RAD)	$2.1 \times 10^{7}$	4x10 <sup>7</sup>	(4)	NUREG-0588 Materials List	Generic Material Test	None
.ocation: Room 9	Aging	N/A	20 years	(2)	Attachment C.2	Oper, Experience	None
Flood Level Elev: 552' bove Flood Level: Yes X No	Submergence	N/A	N/A	(4)	N/A	N/A	None

lotes: (1) See Section 2.4 in 79-01B report.

- (2) See Section 4.1.2 in 79-01B report.
- (3) All notes and other information not on these sheets are on the attached appendix sheets.
- (4) See Section 3.0 and/or Appendix B in 79-01B report.

Prepared by: K. D. Romonoulaki

Reviewed by:

QA Acceptance:

EL. 14-0076

Rev O

System: 74 Unit: 3

Component: Cable 16/c #14 AWG (PNJ) Mark: WHL

Plant I. D. No.	Room	Function Service	Category	Operating Time	
3ES539-I	9	FCV-74-52 Cont.	A	l yr	
3ES527-1	9	FCV-74-53 Cont.	A	l yr	

### EEB \_74-0076

REV 0

# ATTACHMENT B

Mark WHL

1

Туре

PNJ

PJJ

•.

i

Contract No. 67C3-91618-1 72C7-75228-1 (SQN) Manufacturer

4

Plastic Wire & Company Plastic Wire & Cable

Sheet No.: EEB-74-0076

Revision: 0

#### ATTACHMENT C

C.1 IPCEA S-61-402 Paragraph 3.9 and Appendix D

C.2 TVA Engineering Report No. 1943.

The Cable types: PJ, 'N, PNJ, PJJ, PSJ

Rooms 1-18

a de

This class of cables was purchased under TVA Standard Specification No. 25.013, based on IPCEA S-61-402 (NEMA WC5). These standards provide a product with an operating rating of 75° C continuous, 95° C (203° F), 500-hour overload rating total in a normal lifetime. They are constructed of polyethylene insulation with Nylon and PVC jacketing.

The jacket material has a higher retention of strength at elevated temperatures, as the material was subjected to air oven aging of 121°C (250°F) for 7 days. Only compartments 1, 2, 3, 6, 9, 10, and 11 show HELB profiles which more than briefly surpass the softening temperature of the insulation. However, owing to the thermal time lags in the cable material and cable installation, the insulation nor even the jacket experience the temperature profile until some time-tas elapsed.

TVA has conducted tests (Chattanooga Central Laboratories Report No. 81L-81-6821 dated October 1980, of these cables under a temperature profile which envelopes all the HELB profiles. Following this exposure these samples sustained a dielectric test immersed in water of 660 volts ac for 6 minutes, 960 volts ac for 5 minutes, and 2200 volts for 5 minutes in succession.

It is therefore our engineering judgment that this test confirms the above and justifies interim operation until these types can be fully qualified by our Wyle Laboratory tests to be concluded next April or replaced at the next refueling outage.

C.3 Temperature Qualification Method

C.3.1 Standard material long-term overload temperature rating

C.3.2 Engineering Analysis

C.4 The post-HELB conditions are less than the normal cable rating and, in our judgment, the cables could operate satisfactorily for a post-accident of a year.

Prepared by:\_\_\_\_\_

Reviewed by:\_\_\_\_\_

QA Acceptance:\_\_\_\_

80

SYSTEM COMPONENT EVALUATION WORK SHEET (Rev 2)

cility	: Browns	Ferry	Nuclear	Plant	
nit: J					

,

-

locket: 50-296						Date		
		ENVIRONMENT	1	DOCUMEN	NTATION REF	QUALIFICATION METHOD	OUTSTANDING ITEMS	
EQUIPMENT DESCRIPTION	Parameter	Specifi- cation	Qualifi- cation	Specifi- cation	Qualifi- cation	ne moo		
System: 74 Plant ID No. Attachment A	Operating Time	Attachment A	l year	(1)	Attachment C.4	Engineering Analysis and Tests	None	
Component Cable WLC 3/c, #12AWG, (CPJJ) 'anufacturer:Attachment B	Temperature	325	325	(4)	Attachment C.2	Generic Simu <b>ltane</b> ous Test	None	
'odel Number: N/A	Pressure (PSIA)	69.7	N/A	(4)	N/A	N/A	None	
unction: Control/Power	Relative Humidity (%)	100	100	(4)	Attachment C.2	Generic Simultaneous Test	None	
Locuracy: Req'd: N/A Demon: N/A Lategory: Attachment A	Chemical Spray	N/A	N/A	(4)	N/A	N/A	None .	
Service: Attachment A	Radiation (RAD)	6.5x10 x 4x10 B Attach. C.1	6.9x10 <sup>7</sup>	(4)	Attachment C.2	Generic Sequential Test	None	
.ocation: 0	Aging	N/A	10 years	(2)	Attachment C.3	Generic Mat'l Test		
lood Level Elev: 552' bove Flood Level: Yes X	Submergence	N/A	N/A	(4)	N/A	N/A	None	

lotes: (1) See Section 2.4 in 79-01B report.

- (2) See Section 4.1.2 in 79-01B report.
- (3) All notes and other information not on these sheets are on the attached appendix sheets.
- (4) See Section 3.0 and/or Appendix B in /9-01B report.

Prepared by: H.A. Romonouski

Reviewed by:

(3)

EEB 74-0077

0

Sheet No.

Revision

QA Acceptance:

EEB 74-0077

Rev O

System: 74 Unit: 3

Component: Cable 3/c #12 AWG (CPJJ) Mark: WLC

١.,

Plant I. D. No.	Room	Function/Service	Category	Operating Time
3ES1137-I	0	FCV-74-78 Supply	A	l yr

# EEB \_\_\_\_\_\_

Rev O

## ATTACHMENT B

Mark WLC

÷.

Туре

CPJJ CPJJ

CPJJ CPJJ CPJJ

Contract No.	
2102 54517	
7107-54517	
73C7-84528 68C7-61920	
7207-75533-1	
7207-75228-1	

Manufacturer

Plastic Wire & Cable Plastic Wire & Cable Sumitomo Shoji Essex PWC

1. 193

### Sheet No: EEB.

Revision: 0

#### ATTACHMENT C

C.1 Integrated dose - 10 years plus accident

#### Beta Dose

#### References:

- W. W. Parkinson, O. Sisman, October 1970, The Use of Plastics and Elastomers in Nuclear Radiation.
- R. B. Blodgett, R. G. Fisher, June 1968, Insulations and Jackets for Control and Power Cables.
- M. Asaka, S. Yamamoto, 1973, Radiation Resistance of Plastic Insulating Materials for Cable.
- 4. Anaconda-Continental Test Report No. 79117 dated April 1979.
- 5. Wyle Laboratory Test Report 43854-3.
- 6. Franklin Institute Test Reports E-C4113 and FC-5120.
- 7. Rockbestos Company Test Report dated July 1977 amended 1979.

The TVA value of 4 : 10<sup>9</sup> rads for the beta accident dose at the periphery of the containment is being reevaluated due to its high value. However, using this value and making reference to the 7901-B DOR guidelines section 4.2.1 and the depth dose penetration, which owing to the low penetrating power of beta particles gives a factor of 10 reduction for 40 mils of jacketing material, and a factor of 10 for an insulation thickness of 30 mils and which is conservative for TVA's 600-volt power and control cables and extremely conservative for TVA's triax and coax and signal cable due to their thickness and the presence of metallic shielding material, and assigning a factor of 5 for the installation shielding of metal trays, conduit, boxes, and flexible conduit, we arrive at a total effective dose of .8 x 10<sup>7</sup> rads of beta.

Since the energy dissipation of gamma radiation occurs via ionizing processes, one can add the accident dose of 4 x  $10^7$  rads of gamma directly. The accumulated integrated gamma 10-year dose (the time presently assigned to connectors and penetrations) amounts to 2.5 x  $10^7$  rads which added directly gives a total dose of 7.3 x  $10^7$ rads. In addition, since the containment is inerted in operation, the scission rate and deterioration of the insulation and jacketing materials through oxidation will be much less than for tests conducted in air.

Since the above value of 7.3 x  $10^7$  is less than the values for which we have in-air test data for SROAJ types (1.2 x  $10^8$ ) and for XLPE types (2 x  $10^8$ ), it is concluded that the beta dose in an accident will not disqualify the cables presently installed, and the cables will remain operable in the service environment.

Sheet No: EEB 74-0077

Revision: 0

### ATTACHMENT C (con'd)

- C.2 Wyle Laboratory Report No. 43854-3
- C.3 NUREG-0588 Material List
- C.4 Because of the conservatism of the tests for XLPE and for silicone insulation, including the severity of the mandrel bend and dielectric test in water after the combined LOCA/SLB profile, it is our engineering judgment that there is sufficient margin to give reasonable essurance of continued operability more than a year in the post-LOCA environment.

Reviewed	by: _	 	
Prepared	Ъу: _		
QA Accep	tance:	 	

SYSTEM COMPONENT EVALUATION WORK SHEET (Rev 2)

Facility: Browns Ferry Nuclear Plant . Unit: 3 Docket: 50-296

Jocket: 50-296					Date 10/22/80			
	ENVIRONMENT			DOCUMEN	ITATION REF	QUALIFICATION METHOD	OUTSTANDING ITEMS	
EQUIPMENT DESCRIPTION	Parameter	Specifi- cation	Qualifi- cation	Specifi- cation	Qualifi- cation			
System: 74 Plant ID No. Attachment A	Operating Time	Attachment A	l year	(1)	Attachment C.3	Engineering Analysis and Test	None	
Component Cable WLC 3/c, #12AWG, (CPJJ) Manufacturer: Attachment B	Temperature (°F)	158	325	(4)	Attachment C.1	Generic Simultaneous Test	None	
del Number: N/A	Pressure (PSIA)	15.0	N/A	(4)	N/A	N/Á	None	
Function: Control/Power	Relative Humidity (%)	100	100	(4)	Attachment C.1	Generic Simultaneous Test	None	
Demon: N/A Category: Attachment A	Chemical Spray	N/A	N/A	(4)	N/A	N/A	None	
Service: Attachment A	Radiation (RAD)	$3 \times 10^7$	6.9x10 <sup>7</sup>	(4)	Attachment C.1	Generic Sequential Test	None	
.ocation: Room 2	Aging	N/A	40 years	(2)	Attachment C.2	Generic Mat'] Test	None	
Flood Level Elev: 552' Above Flood Level: Yes X	Submergence	N/A	N/A	(4)	N/A	N/A	None	

Notes: (1) See Section 2.4 in 79-01B report.

- (2) See Section 4.1.2 in 79-01B report.
- (3) All notes and other information not on these sheets are on the attached appendix sheets.
- (4) See Section 3.0 and/or Appendix B in 79-01B report.

Prepared by: H. D. Romanowsk

Reviewed by:

QA Acceptance:

(3)

Revision O

Sheet No. EEB 74-0078

EEB \_ 74-0078

Rev O

System: 74 Unit: 3

Component: Cable 3/c #12 AWG (CPJJ) Mark: WLC

S. ...

Plant I. D. No.	Room	Function/Service	Category	Operating Time
3ES1150-I	2	FCV-74-7 Supply	A	1 yr

### EEB \_\_\_\_\_\_\_

Rev O

## ATTACHMENT B

Mark WLC

Туре

CPJJ CPJJ

CPJJ CPJJ CPJJ

Contract No.	
7107-54517	
7307-84528	
6807-61920	
7207-75533-1	

Manufacturer

 $r \in \mathcal{T}_{p_i}$ 

į,

Plastic Wire & Cable Plastic Wire & Cable Sumitomo Shoji Essex PWC

. 5

Sheet No.: EEB- 74-00 78

Revision: 0

1.1.1

#### ATTACHMENT C

.

- C.1 Wyle Laboratory Report No. 43854-3.
- C.2 NUREG-0588 Material List.
- C.3 Because of the conservatism of the tests for XLPE and for silicone insulation, including the severity of the mandrel bend and dielectric test in water after the combined LOCA/SLB profile, it is our engineering judgment that there is sufficient margin to give reasonable assurance of continued operability more than a year in the post-LOCA environment.

Prepared	by: _		 
Reviewed	by: _		
QA Accept	tance:	-	 

EQUIPMENT DESCRIPTION		ENVIRONMENT		DOCUME	NTATION REF	Date 10/22/80 QUALIFICATION	OUTSTANDING
	Parameter	Specifi- cation	Qualifi- cation	Specifi- cation	Qualifi- cation	METHOD	ITEMS
System: 74 'lant ID No. Attachment A Component Cable WLC	Operating Time	Attachment A		(1)	Attachment C.3	Engineering Analysis and Test	None
3/c, #12AWG, (CPJJ) anufacturer: Attachment B	Temperature (°F)	220	325	(4)	Attachment C.1	Generic Simultaneous	None
odel Number: N/A uniction: Control/Power	Pressure (PSIA)	15.0	N/A	(4)	N/A	N/A	None
curacy: Reg'd: N/A	Relative Humidity (%)	100	100	(4)	Attachment C.1	Generic Simultaneous Test	None
Demon: N/A ategory: Attachment A	Chemical Spray	N/A	N/A	(4)	N/A	N/A	None
cation: Room 6	Radiation (RAD)	3. ' × 10 <sup>7</sup>	6.9x10 <sup>7</sup>	(4)	Attachment C.1	Generic Sequential Test	None
	Aging	N/A	40 years	(2)	Attachment C 2	Generic Mat'l Test	None
ove Flood Level: 552' No	Submergence	N/A	N/A	(4)	N/A	N/A	None

9

(1) See Section 2.4 in 79-018 report. tes:

- (2) See Section 4.1.2 in 79-01B report.
- (3) All notes and other information not on these sheets are on the attached appendix sheets.
- (4) See Section 3.0 and/or Appendix B in 79-01B report.

Prepared by: H. &. Remonwook

Reviewed by:

SAM

QA Acceptance:

EEB \_74-0079

Rev O

System: 74 Unit: 3

Cor.ponent: Cable 3/c #12 AWG (CPJJ) Mark: WLC

× ;

Plant I. D. No.	Room	Function/Service	Category	Operating Time
3ES700-1	6	FCV-74-58 Supply	A	l yr
3ES688-1	6	FCV-74-59 Supply	A	l yr

### EEB \_74-0079

Rev O

### ATTACHMENT B

Mark WLC

Туре

CPJJ

CPJJ

CPJJ

CPJJ

CPJJ

Contract No.	
71C7-54517 73C7-84528 68C7-61920 72C7-75533-1 72C7-75228-1	

Manufacturer

Plastic Wire & Cable Plastic Wire & Cable Sumitomo Shoji Essex PWC

Sheet No.: EEB- 74-00 79

Revision: 0

1 L S 1

#### ATTACHMENT C

.

C.1 Wyle Laboratory Report No. 43854-3.

- C.2 NUREG-0588 Material List.
- C.3 Because of the conservatism of the tests for XLPE and for silicone insulation, including the severity of the mandrel bend and dielectric test in water after the combined LOCA/SLB profile, it is our engineering judgment that there is sufficient margin to give reasonable assurance of continued operability more than a year in the post-LOCA environment.

Prepared	by:	 
Reviewed	by:	 <u></u>
QA Accept	tance:	

SYSTEM COMPONE	T EVALUATION	WORK	SHEET	(Rev	2)	1
----------------	--------------	------	-------	------	----	---

Facility: Browns Ferry Nuclear Plant Unit: 3 Jocket: 50-296

Date 10/22/80 OUTSTA" JING QUALIFICATION DOCI 'ENTATION REF ENVIRONME" METHOD ITEKS EQUIPMENT DESCRIPTION Qualifi-Qualifi-Specifi-Specification cation Parameter cation cation System: 74 Operating Attachment A Attachment C.3 Engineering None 1 year . Plant ID No. Attachment A Time Analysis and . (1)Test Component Cable WLC Generic 3/c, #12AWG, (CPJJ) Simultaneous Temperature (°F) None Manufacturer: Attachment B Attachment C. 1| Test 157 325 (4) \* 1 Pressure Model Number: N/A (PSIA) None (4) N/A N/A N/A 15.0 Function: Control/Power Generic Simultaneous Relative None Humidity (%) Attachment C.1 Test (4) 100 100 Accuracy: Reg'd: N/A Demon: N/A Chemical Spray None Lategory: Attachment A N/A N/A (4) N/A N/A Service: Attachment A Generic Radiation Sequential 2.1 × 107 Attachment C. 6.9x107 None (4) (RAD) Test .ocation: Room 8 (2) None Attachment C. 2Generic Mat'l Test Aging N/A 40 years Flood Level Elev: 552' None N/A N/A Above Flood Level: Yes X N/A Submergence N/A (4) No

٨.,

lotes: See Section 2.4 in 79-01B report. (1)

- See Section 4.1.2 in 79-01B report. (2)
- (3) All notes and other information not on these sheets are on the attached appendix sheets.
- See Section 3.0 and/or Appendix B in 79-01B report. (4)

Prepared by: H.D. Romannie 184

Reviewed by:

QA Acceptance:

(3)Sheet No. EEB 74-Q080

0

Revision

9

EEB \_74-0080

Rev O

System: 74 Unit: 3

Component: Cable 3/c #12 AWG (CPJJ) Mark: WLC

Χ.,

Plant I. D. No.	Room	Function/Service	Category	Operating Time
3ES1150-I	8	FCV-74-7 Supply	A	1 vr
3LS700-1	8	FCV-74-58 Supply	A	1 78
3ES688-I	8	FCV-74-59 Supply	A	r AL

### EEB \_\_\_\_\_\_\_\_\_

Rev O

### ATTACHMENT B

Mark WLC

Contract No. 71C7-54517 73C7-84528 68C7-61920 72C7-75533-1

7207-75228-1

CPJJ CPJJ CPJJ CPJJ CPJJ CPJJ Manufacturer

5

2.1

Plastic Wire & Cable Plastic Wire & Cable Sumitomo Shoji Essex PWC

Sheet No.: EEB- 74-0030

Revision: 0

. . \*

#### ATTACHMENT C

.

- C.1 Wyle Laboratory Report No. 43854-3.
- C.2 NUREG-0588 Material List.
- C.3 Because of the conservatism of the tests for XLPE and for silicone insulation, including the severity of the mandrel bend and dielectric test in water after the combined LOCA/SLB profile, it is our engineering judgment that there is sufficient margin to give reasonable assurance of continued operability more than a year in the post-LOCA environment.

Prepared	by:	-
Reviewed	by:	
QA Accept	tance	e:

90

Facility: Browns Ferry Nucl Unit: 3 Docket: 50-296	ear Plant	SYSTEM COMP	ONENT EVALUA	TION WORK SH	EET (Rev 2)	(3) Sheet No. EEB 7 Revision O Date 10/22/80	4-0081
		ENVIRONMENT		DOCUMEN	TATION REF	QUALIFICATION	OUTSTANDING ITEMS
EQUIPMENT DESCRIPTION	Parameter	Specifi- cation	Qualifi- cation	Specifi- cation	Qualifi- cation	, ,	
System: 74 Plant ID No. Attachment A	Operating Time	Attachment A	l year	(1)	Attachment C.3	Engineering Analysis and Test	None
Component Cable NLC 3/c, #12ANG, (CPJJ) Manufacturer: Attachment B	Temperature (°F)	211	325	(4)	Attachment C.1	Generic Simultaneous Test	None
Model Number: N/A	Pressure (PSIA)	15.0	N/A	(4)	N/A	N/Á	None
Function: Control/Power	Relative Humidity (%)	100	100	(4)	Attachment C.1	Generic Simultaneous Test	None .
Accuracy: Req'd: N/A Demon: N/A Category: Attachment A	Chemical Spray	N/A	N/A	(4)	N/A	N/A	None
Service: Attachment A	Radiation (RAD)	2.1 x 10 <sup>7</sup>	6.9x10 <sup>7</sup>	(4)	Attachment C.	Generic Sequential Test	None
.ocation: Room 9	Aging	N/A	40 years	(2)	Attachment C.	Generic Mat'l Test	None
Flood Level Elev: 552' Above Flood Level: Yes X No	Submergence	N/A	N/A	(4)	N/A	N/A	None

votes: (1) See Section 2.4 in 79-01B report.

- (2) See Section 4.1.2 in 79-01B report.
- (3) All notes and other information not on these sheets are on the attached appendix sheets.
- (4) See Section 3.0 and/or Appendix B in 79-01B report.

Prepared by . y. D. Romenousk Reviewed by:

QA Acceptance:

9

EEB \_74-0081

Rev O

Sy tem: 74 Urit: 3

Component: Cable 3/c #12 AWG (CPJJ) Mark: WLC

× ...

Plant I. D. No.	Room	Function/Service	Category	Operating Time
3ES1150-I	9	FCV-74-7 Supply	A	1 .r
3ES700-1	9	FCV-74-58 Supply	A	1 yr
3ES688-I	9	FCV-74-59 Supply	A	l yr

### EEB \_\_\_\_\_\_\_81\_\_\_

Rev O

### ATTACHMENT B

Mark WLC

1

Contract No. 71C7-54517 73C7-84528 68C7-61920 72C7-75533-1 72C7-75228-1 Туре

4

CPJJ CPJJ CPJJ CPJJ CPJJ CPJJ

# Manufacturer

14

5

Plastic Wire & Cable Plastic Wire & Cable Sumitomo Shoji Essex PWC

Sheet No.: EEB- 74-0081

1. S. M. I

Revision: 0

#### ATTACHMENT C

4

- C.1 Wyle Laboratory Report No. 43854-3.
- C.2 NUREG-0588 Material List.
- C.3 Because of the conservatism of the tests for XLPE and for silicone insulation, including the severity of the mandrel bend and dielectric test in water after the combined LOCA/SLB profile, it is our engineering judgment that there is sufficient margin to give reasonable assurance of continued operability more than a year in the post-LOCA environment.

Prepared	by:	
Reviewed	by:	
QA Accept	tance:	



SYSTEM COMPONENT EVALUATION WORK SHEET (Rev 2)

Facility: Browns Ferry Nuclear Plant . Init: 3 Docket: 50-296

2

locket: 50-296						Date 10/22/8	0
	ENVIRONMENT			DOCUMENTATION REF		QUALIFICATION METHOD	CUTSTANDING ITEMS
EQUIPMENT DESCRIPTION	Parameter	eter Specifi- Qualifi- Specifi- Qualifi- cation cation cation cation		TIL THOU			
Watem: 74 'lant ID No. Attachment A	Operating Time	Attachment A	1 yea.	(1)	Attachment C.4	Engineering Analysis and Tests	None
Component Cable WLG 7/c, #12 WWG CPJJ Manufacturer:Attachment B	Temperature	325	325	(4)	Attachment C.2	Generic Simultaneous Test	None
odel Number: N/A	Pressure (PSIA)	69.7	N/A	(4)	N/A	N/A	None
Sunction:	Relative Humidity (%)	100	100	(4)	Attachment C.2	Generic Simultaneous Test	None
Accuracy: Req'd: N/A Demon: N/A Category: Attachment A	Chemical Spray	N/A	N/A	(4)	N/A	N/A	None .
iervice: Attachment A	Radiation (RAD)	6.5x10 % 4x10 B Attach. C.1	6.9x10 <sup>7</sup>	(4)	Attachment C.2	And the second s	None
.ocation: 0	Aging	N/A	10 years	(2)	Attachment C.3	Generic Mat'l Test	None
lood Level Elev: 552' bove Flood Level: Yes X	Submergence	N/A	N/A	(4)	N/A	N/A	None

lotes: (1) See Section 2.4 in 79-01B report.

- (2) See Section 4.1.2 in 79-01B report.
- (3) All notes and other information not on these sheets are on the attached appendix sheets.

(4) See Section 3.0 and/or Appendix B in 79-01B report.

Prepared by: H.D. Bimanow

1 54

Reviewed by:

(3)

Sheet No. Revision EEB74-0082

0

QA Acceptance:

ille ar

EEB 74-0082

Rev 0

System: 74 Unit: 3

Component: Cable 7/c #12 AWG (CPJJ) Mark: WLG

Plant I. D. No.	Room	Function/Service	Category	Operating Time
3ES1139-I	0	FCV-74-78 Cont.	A	l yr

### EEB 74-0082

Rev O

### ATTACHMENT B

Mark WLG

Contract No. 68C7-61920 72C7-75228-1 CPJJ CPJJ

×

i

Manufacturer

 $C_{i}^{*}$ 

4

Sumitomo Shoji Essex

Sheet No: EEB 74-0082

Revision: 0

#### ATTACHMENT C

C.1 Integrated dose - 10 years plus accident

#### Beta Dose

#### References:

- 1. W. W. Parkinson, O. Sisman, October 1970, The Use of Plastics and Elastomers in Nuclear Radiation.
- R. B. Blodgett, R. G. Fisher, June 1968, Insulations and Jackets for Control and Power Cables.
- M. Asaka, S. Yamamoto, 1973, Radiation Resistance of Plastic Insulating Materials for Cable.
- 4. Anaconda-Continental Test Report No. 79117 dated April 1979.
- 5. Wyle Laboratory Test Report 43854-3.
- 6. Franklin Institute Test Reports E-C4113 and FC-5120.
- 7. Rockbestos Company Test Report dated July 1977 amended 1979.

The TVA value of 4 x 10<sup>9</sup> rads for the beta accident dose at the periphery of the containment is being reevaluated due to its high value. However, using this value and making reference to the 7901-B DOR guidelines section 4.2.1 and the depth dose penetration, which owing to the low penetrating power of beta particles gives a factor of 10 reduction for 40 mils of jacketing material, and a factor of 10 for an insulation thickness of 30 mils and which is conservative for TVA's 600-volt power and control cables and extremely conservative for TVA's triax and coax and signal cable due to their thickness and the presence of metallic shielding material, and assigning a factor of 5 for the installation shielding of metal trays, conduit, boxes, and flexible conduit, we arrive at a total effective dose of .8 x 10<sup>7</sup> rads of beta.

Since the energy dissipation of gamma radiation occurs via ionizing processes, one can add the accident dose of  $4 \times 10^7$  rads of gamma directly. The accumulated integrated gamma 10-year dose (the time presently assigned to connectors and penetrations) amounts to  $2.5 \times 10^7$  rads which added directly gives a total dose of  $7.3 \times 10^7$ rads. In addition, since the containment is inerted in operation, the scission rate and deterioration of the insulation and jacketing materials through oxidation will be much less than for tests conducted in air.

Since the above value of 7.3 x  $10^7$  is less than the values for which we have in-air test data for SROAJ types (1.2 x  $10^8$ ) and for XLPE types (2 x  $10^8$ ), it is concluded that the beta dose in an accident will not disqualify the cables presently installed, and the cables will remain operable in the service environment.

Sheet No: EEB 74-0082

Revision: 0

### ATTACHMENT C (con'd)

- C.2 Wyle Laboratory Report No. 43854-3
- C.3 NUREG-0588 Material List
- C.4 Because of the conservatism of the tests for XLPE and for silicone insulation, including the severity of the mandrel bend and dielectric test in water after the combined LOCA/SLB profile, it is our engineering judgment that there is sufficient margin to give reasonable assurance of continued operability more than a year in the post-LOCA environment.

Reviewed	by:
Prepared	by:
QA Accept	tance:

Facility: Browns Ferry Nuclear Plant Unit: 3

Docket: 50-296

OUTSTANDING OUALIFICATION DOCUMENTATION REF ENVIRONMENT METHOD ITEMS EQUIPMENT DESCRIPTION Qualifi-Qualifi-Specifi-Specific.tion cation cation cation Parameter System: 74 Operating Attachment A Engineering None Attachment C.3 1 year Plant ID No. Attachment A Time Analysis and 14 (1)Test Cable WLO Component 125 Generic 3/c. #10 AWG CPJJ Simultaneous Temperature None · Attachment C. il Test Manufacturer: Attachment B 325 158 (4) (°F) . . Pressure Model Number: N/A (PSIA) None (4)N/A N/A N/A 15.0 Function: Control/Power Generic Simultaneous Relative None Humidity (%) Attachment C. 1| Test (4)100 100 Req'd: N/A Accuracy: Chemical Demon: N/A Spray - None Category: Attachment A N/A N/A (4) N/A N/A Service: Attachment A Generic Radiation 3×107 Sequential 6.9x107 Attachment C. (RAD) (4) Test None Location: Room 2 (2) None Attachment C. 2Generic Mat'l Test Aging N/A 40 years Flood Level Elev: 552' None N/A N/A N/A Above Flood Level: Yes X Submergence N/A (4) NO

SYSTEM COMPONENT EVALUATION WORK SHEET (Rev 2)

See Section 2.4 in 79-01B report. Notes: (1)

- (2)See Section 4.1.2 in 79-01B report.
- (3) All notes and other information not on these sheets are on the attached appendix sheets.

See Section 3.0 and/or Appendix B in 79-01B report. (4)

Prepared by: H. D. Romanous

3 B 74-0083

0

Sheet No.

Revision

Date 10/22/80

Reviewed by: Albrad

QA Acceptance:

1

EEB 74-0083

Rev O

System: 74 Unit: 3				Kev
Component: Cab Mark: WLO		3/c, #10 AWG		
Plant I. D. No.	Room	Function/Service	Category	Operating Time
3ES550-I 3ES563-I 3ES575-II 3ES588-I 2ES3712 3ES3735	2 2 2 2 2 2 2 2	FCV-74-1 SUPPLY FCV-74-12 SUPPLY FCV-74-2 SUPPLY FCV-74-13 SUPPLY FCV-74-96 SUPPLY FCV-74-97 SUPPLY	A A A A A A	1 Year 1 Year 1 Year 1 Year 1 Year 1 Year

۲.,

# EEB \_ 74-0083 Rev O

U

### ATTACHMENT B

Mark WLO

Contract No. 71C7-54517

68C7-61920 72C7-75228-1 72C7-75533-1

Туре . CPJJ CPJJ CPJJ CPJJ

1.8

Manufacturer

14

Plastic Wire & Cable Sumitomo Shoji PWC Essex

Sheet No.: EEB- 74-0083

Revision: 0

1.55

#### ATTACHMENT C

- C.1 Wyle Laboratory Report No. 43854-3.
- C.2 NUREG-0588 Material List.
- C.3 Because of the conservatism of the tests for XLPE and for silicone insulation, including the severity of the mandrel bend and dielectric test in water after the combined LOCA/SLB profile, it is our engineering judgment that there is sufficient margin to give reasonable assurance of continued operability more than a year in the post-LOCA environment.

Prepared	by:	
Reviewed	by:	
QA Accept	tanc	e:

Facility: Browns Ferry Nuclear Plant Unit: 3 SYSTEM COMPONENT EVALUATION WORK SHEET (Rev 2)

(3) Sheet No. EEB 74-0084 Revision O Date 10/22/80

Docket: 50-296

14

DOCKEC. JO-LOU	ENVIRONMENT			DOCUMENTATION REF		QUALIFICATION	OUTSTANDING ITEMS	
EQUIPMENT DESCRIPTION -	Parameter			Specifi- cation	Qualifi- cation			
System: 74 Plant ID No. Attachment A	Operating Time	Attachment A	l year	(1)	Attachment C.3	Engineering Analysis and Test	None	
Component Cable WLO 3/c, #10 AWG CPJJ Manufacturer: Attachment B	Temperature (°F)	294	325	(4)	Attachment C.1	Generic Simultaneous Test	None	
Model Number: N/A	Pressure (PSIA)	15.0	N/A	(4)	N/A	N/A	None	
Function: Control/Power	Relative Humidity (%)	100	100	(4)	Attachment C.1	Generic Simultaneous Test	None	
Accuracy: Req'd: N/A Demon: N/A Category: Attachment A	Chemical Spray	N/A	N/A	(4)	N/A	N/A	None	
Service: Attachment A	Radiation (RAD)	3x10 <sup>?</sup>	6.9x10 <sup>7</sup>	(4)	Attachment C.	Generic Sequential Test	None	
Location: Room 5	Aging	N/A	40 years	(2)	Attachment C.	Generic Mat'l Test	None	
Flood Level Elev: 552' Above Flood Level: Yes X	Submergence	N/A	N/A	(4)	N/A	N/A	None	

Notes: (1) See Section 2.4 in 79-01B report.

- (2) See Section 4.1.2 in 79-01B report.
- (3) All notes and other information not on these sheets are on the attached appendix sheets.

(4) See Section 3.0 and/or Appendix B in 79-01B report.

Prepared by: H. D. Romonewsky

Reviewed by:

madel

QA Acceptance:

EEB \_\_\_\_\_\_\_

Rev O

System: 74 Unit: 3				
Component: Mark:	Cable WLO	3/c, #10 AWG		
Plant I. D. No	. Room	Function/Service	Category	Operating Time
3ES3650-II 3ES3063-II	5	FCV-74-101 SUPPLY FCV-74-35 SUPPLY	A A	1 Year 1 Year
3ES3075-II 3ES3088-II	5	FCV-74-25 SUPPLY FCV-74-36 SUPPLY	A A A	l Year l Year l Year
3ES3635-II 3ES3660-II	5	FCV-74-30 SUPPLY FCV-74-99 SUPPLY	A	1 Year

5 .

### EEB \_74-0084

Rev O

### ATTACHMENT B

Mark WLO

Contract No. 71C7-54517 68C7-61920 72C7-75228-1 72C7-75533-1 CPJJ CPJJ CPJJ CPJJ CPJJ

#### Manufacturer

Plastic Wire & Cable Sumitomo Shoji PWC Essex

Sheet No.: EEB- 74-0084

1. 1. 1.

Revision: 0

#### ATTACHMENT C

- C.1 Wyle Laboratory Report No. 43854-3.
- C.2 NUREG-0588 Material List.
- C.3 Because of the conservatism of the tests for XLPE and for silicone insulation, including the severity of the mandrel bend and dielectric test in water after the combined LOCA/SLB profile, it is our engineering judgment that there is sufficient margin to give reasonable assurance of continued operability more than a year in the post-LOCA environment.

Prepared	by:	 	
Reviewed	by:	 	
QA Accept	tance		1.1

SYSTEM COMPONENT EVALUATION WORK SHEET (Pev 2)

Facility: Browns Ferry Nuclear Plant . Unit: 3 Docket: 50-296

4

OUTSTANDING QUALIFICATION DOCUMENTATION REF ENVIRONMENT ITEMS METHOD EQUIPMENT DESCRIPTION Specifi-Qualifi-Qualifi-Specification cation cation Parameter cation System: 74 Operating Attachment A Attachment C.3 Engineering None 1 -ar Time Analysis and Plant ID No. Attachment A . (1) Test Cable WLO Component Generic 3/c. #10 AWG CPJJ Simultaneous Temperature (°F) None Attachment C. 1 Test Manufacturer: Attachment B 220 325 (4) . . Pressure Model Number: N/A None (PSIA) (4) N/A N/A 15.0 N/A Generic Simultaneous Relative None Attachment C. 11 Test Humidity (%) (4) 100 100 Reg' A Accuracy: Chemical Demos · None Spray N/A Category: Attachmant A N/A (4) N/A N/A Service: Attachment A Generic 3.1x10 Radiation Sequential Attachment C. 6.9x107 Test None (4) (RAD) Room 6 Location: None Attachment C. 2Generic Mat'l Test (2) 40 years Aging N/A Flood Level Elev: 552' None N/A N/A N/A Above Flood Level: Yes X Submergence N/A (4) No

×.,

Notes: (1) See Section 2.4 in 79-01B report.

- (2) See Section 4.1.2 in 79-01B report.
- (3) All notes and other information not on these sheets are on the attached appendix sheets.

(4) See Section 3.0 and/or Appendix B in 79-01B report.

Prepared by: H. D. Romanowskil

Reviewed by:

QA Acceptance:

(3)

Date 10/22/80

Sheet No.

Revision

EEB 74-0085

0

· Attachment A

EEB 74-0085

Rev O

System:	74
Unit:	3

Component: Cable 3/c, #10 AWG Mark: WLO

× .

Plant I. D. No.	Room	Function/Service	Category	Operating Time	
3ES675-1 3ES3175-II 3ES3625-II 3ES3188-II	6 6 6	FCV-74-57 SUPPLY FCV-74-71 SUPPLY FCV-74-72 SUPPLY FCV-74-73 SUPPLY	A A A A	l Year l Year l Year l Year	

# EEB \_74-0085

Rev O

### ATTACHMENT B

# Mark wLO

1.0

Contract No.	Туре
71C7-54517 68C7-61920 72C7-75228-1 72C7-75533-1	. CPJJ CPJJ CPJJ CPJJ

Manufacturer

Plastic Wire & Cable Sumitomo Shoji PWC Essex

Sheet No.: EEB- 74-0085

Revision: 0

### ATTACHMENT C

- C.1 Wyle Laboratory Report No. 43854-3.
- C.2 NUREG-0588 Material List.
- C.3 Because of the conservatism of the tests for XLPE and for silicone insulation, including the severity of the mandrel bend and dielectric test in water after the combined LOCA/SLB profile, it is our engineering judgment that there is sufficient margin to give reasonable assurance of continued operability more than a year in the post-LOCA environment.

Prepared	by:	 	
Reviewed	by:		
QA Accept	tance		

SYSTEM COMPONENT EVALUATION WORK SHEET (Rev 2)

Facility: Browns Ferry Nuclear Plant . Unit: 3 Docket: 50-296

Date 10/22/80 OUTSTANDING OUALIFICATION DOCUMENTATION REF ENVIRONMENT METHOD ITEMS EQUIPMENT DESCRIPTION Qualifi-Specifi-Qualifi-Specification cation Parameter cation cation System: 74 Operating Attachment A Attachment C.3 Engineering None 1 year . Time Plant ID No. Attachment A Analysis and ..... (1)Test Cable WEO Component Generic 3/c.#10 AWG CPJJ Simultaneous Temperature (°F) 157 None Manufacturer: Attachment B Attachment C.1 Test 325 (4)\* . Pressure Model Number: N/A (PSIA) None (4) 15.0 N/A N/A N/A Function: Control/Power Generic Relative Simultaneous Humidity (%) Attachment C. 1 Test None (4) 100 100 Reg'd: N/A Accuracy: Demon: N/A Chemical. Spray - None Category: Attachment A N/A N/A (4)N/A N/A Service: Attachment A Generic Radiation Sequertial 6.9x107 Attachment C. (RAD) 2.1x10' (4) None Location: Room 8 (2) None Attachment C. 2Generic Mat'l Test N/A 40 years Aging Flood Level Elev: 552' N/A None N/A Above Flood Level: Yes X N/A Submergence N/A (4) No

Notes: (1) See Section 2.4 in 79-01B report.

- (2) See Section 4.1.2 in 79-01B report.
- (3) All notes and other information not on these sheets are on the attached appendix sheets.

(4) See Section 3.0 and/or Appendix B in 79-01B report.

Prepared by: H.A. Romonowski

Reviewed by:

(3)

Revision

Sheet No. EEB 74-0086

C

QA Acceptance:

1

Attachment A

EEB 74-0086

Rev O

System: 74 Unit: 3				Kev <u>Q</u>
Component: Ca Mark: WI	ble O	3/c, #10, AWG		
Plant I. D. No.	Room	Function/Service	Category	Operating Time
3ES3650-II 3ES650-I 3ES663-I 3ES563-I 3ES550-I 3ES550-I 3ES575-II 3ES575-I 3ES3063-II 3ES3063-II 3ES3088-II 3ES3635-II 3ES3635-II 3ES3175-II 3ES3188-II 2ES3188-II 2ES3712 3ES3735 3ES3725	8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8	FCV-74-24 SUPPLY FCV-74-61 SUPPLY FCV-74-61 SUPPLY FCV-74-101 SUPPLY FCV-74-101 SUPPLY FCV-74-12 SUPPLY FCV-74-12 SUPPLY FCV-74-13 SUPPLY FCV-74-35 SUPPLY FCV-74-35 SUPPLY FCV-74-36 SUPPLY FCV-74-30 SUPPLY FCV-74-71 SUPPLY FCV-74-71 SUPPLY FCV-74-73 SUPPLY FCV-74-96 SUPPLY FCV-74-97 SUPPLY	A	1 Year

# EEB \_74-0086\_

Rev \_\_\_\_O

### ATTACHMENT B

# Fark WLO

Contract No. 71C7-54517 68C7-61920 72C7-75228-1

7207-75533-1

Type . CPJJ CPJJ CPJJ CPJJ

.

Manufacturer

Plastic Wire & Cable Sumitomo Shoji PWC Essex

Sheet No.: EEB- 74-0086 Revision: 0

1.1.1

### ATTACHMENT C

.

- C.1 Wyle Laboratory Report No. 43854-3.
- C.2 NUREG-0588 Material List.
- C.3 Because of the conservatism of the tests for XLPE and for silicone insulation, including the severity of the mandrel bend and dielectric test in water after the combined LOCA/SLB profile, it is our engineering judgment that there is sufficient margin to give reasonable assurance of continued operability more than a year in the post-LOCA environment.

Prepared	by:	 	 ÷
Reviewed	by: _		
QA Accept	tance:		

Facility: Browns Ferry Nuclear Plant . Unit: 3 Docket: 50-296 SYSTEM COMPONENT EVALUATION WORK SHEET (Rev 2)

T EVALUATION WORK SHEET (Rev 2)

(3) Sheet No. EEB 74-0087 Revision O Date 10/22/80

DUCKEC, as and						Ducc 10/2=/0	
	ENVIRONMENT			DOCUMEN	NTATION REF	QUALIFICATION METHOD	OUTSTANDING ITEMS
EQUIPMENT DESCRIPTION	Parameter	Specifi- cation	Qualifi- cation	Specifi- cation	Qualifi- cation	AL HOU	THE W
System: 74 Plant ID No. Attachment A	Operating Time	Attachment A	l year .	(1)	Attachment C.3	Engineering Analysis and Test	None
Component Cable WLO 3/c, #10 AWG CPJJ Manufacturer: Attachment B	Temperature (°F)	211	325	(4)	Attachment C.1	Generic Simultaneous Test	None
Model Number: N/A	Pressure (PSIA)	15.0	N/A	(4)	N/A	N/A	None ·
Function: Control/Power	Relative Humidity (%)	100	100	(4)	Attachment C.1	Generic Simultaneous Test	None
Accuracy: Req'd: N/A Demon: N/A Category: Attachment A	Chemical Spray	N/A	N/A	(4)	N/A	N/A	None
Service: Attachment A	Radiation (RAD)	2.1x10 <sup>7</sup>	6.9x10 <sup>7</sup>	(4)	Attachment C.	Generic Sequential Test	None
Location: Room 9	Aging	N/A	40 years	(2)	Attachment C.	Generic Mat'l Test	None
Flood Level Elev: 552' Above Flood Level: Yes X	Submergence	N/A	N/A	(4)	N/A	N/A	None

Notes: (1) See Section 2.4 in 79-01B report.

- (2) See Section 4.1.2 in 79-01B report.
- (3) All notes and other information not on these sheets are on the attached appendix sheets.

(4) See Section 3.0 and/or Appendix E in 79-01B report.

Prepared by: H. D. Romonous Alil

Reviewed by:

QA Acceptance:

Attachment A

EEB \_74-0087\_

Rev O

System: 74 Unit: 3				Rev O
Comporent: Ca Mark: WI	ible .0	3/c, #10 AWG		
Plant I. D. No.	Room	Function/Service	Category	Operating Time
3ES650-I	9	FCV-74-61 SUPPLY	A	1 Year
3ES663-I	9	FCV-74-61 SUPPLY	A	1 Year
3ES550-1	9	FCV-74-1 SUPPLY	Α	1 Year
3E5563-I	9	FTV-74-2 SUPPLY	A	1 Year
3ES575-II	9	FCV-74-2 SUPPLY	A	1 Year
3ES588-I	9	FCV-74-13 SUPPLY	A	l Year
3ES675-I	9	FCV-74-57 SUPPLY	A	l Year
3ES3635-11	A	FCV-74-30 SUPPLY	A	1 Year

1.

# EEB \_74-0087\_\_\_

Rev 0

2

### ATTACHMENT B

### Mark WLO

Contract No. 71C7-54517 68C7-61920 72C7-75228-1

7207-75533-1

Type

### CPJJ CPJJ CPJJ CPJJ

. .

Manufacturer

Plastic Wire & Cable Sumitomo Shoji PWC Essex

• Sheet No.: EEB- 74-0087

1.111

Revision: 0

### ATTACHMENT C

- C.1 Wyle Laboratory Report No. 43854-3.
- C.2 NUREG-0588 Material List.
- C.3 Because of the conservatism of the cests for XLPE and for silicone insulation, including the severity of the mandrel bend and dielectric test in water after the combined LOCA/SLB profile, it is our engineering judgment that there is sufficient margin to give reasonable assurance of continued operability more than a year in the post-LOCA environment.

Prepared	by: .		 
Reviewed	by:		
QA Accept	tance	:	

n. i

Facility: Browns Ferry Nuclear Plant Unit: 3 Docket . 50-296

SYSTEM COMPONENT EVALUATION WORK SHEET (Rev 2)

Sheet No. EFB 74-0088 Revision Date in Tayles

Docket: 50-290					Date 10/22/80		
EQUIDMENT DESCONDITION		ENVIRONMENT		DOCUMEN	NTATION REF	QUALIFICATION METHOD	OUTSTANDING ITEMS
EQUIPMENT DESCRIPTION	Parameter	Specifi- cation	Qualifi- cation	Specifi- cation	Qualifi- cation	HE MOD	
System: 74 Plant ID No. Attachment A	Operating Time	Attachment A	1 Yea.	(1)	Attachment C.3	Engineering Analysis and Test	None
Component Cable 'WNE 1/c, #400 MCM, CPSJ Manufacturer: Attachment B	Temperature (°F)	158	325	(4)	Attachment C.1	<ol> <li>Generic Simul- taneous Test</li> <li>Engr. analysis</li> </ol>	None .
Model Number: N/A	Pressure (PSIA)	15.0	N/A	(4)	N/A	N/A ·	None
Function: Power	Relative Humidity (%)	100	100	(4)	Attachment C.1	1. Generic Simul- taneous Test 2. Engr. analysis	None
Accuracy: Req'd: N/A Demon: N/A Category: Attachment A	Chemical Spray	N/A	N/2.	(4)	N/A	N/A	None
Service: Attachment A	Radiation (RAD)	3x10 <sup>7</sup>	6.9x10 <sup>7</sup>	(4)	Attachment C.	<ol> <li>Generic Sequen- tial Test</li> <li>Engr. analysis</li> </ol>	None
Location: Room 2	Aging	N/A	40 years	(2)	Attachment C.	Generic Mat'l Test	None
Flood Level Elev: 552' Atove Flood Level: Yes x No	Submergence	N/A	N/A	(4)	N/A	. N/A	None

Notes: See Section 2.4 in 79-01B report. (1)

- (2) See Section 4.1.2 in 79-01B report.
- (3) All notes and other information not on these sheets are on the attached a pendix sheets.

(4) See Section 3.0 and/or Appendix B in 79-01B report.

Prepared by: H. D. Romanales

Reviewed by:

(3)

0

QA Acceptance:

1'1

Attachment A

EEB \_74-0088

System: 74 Unit: 3				Rev O
Component: Cal Mark: WNN		c, #400 MCM		
Plant I. D. No.	Room	Function/Service	Category	Operating Time
3ES4070-II 3ES1570-I	2	RHR PMP 3D SUPPLY RHR PMP 3C SUPPLY	A A	1 Year 1 Year
3ES1560-I	2	RHR PMP 3A SUPPLY	A	1 Year

# EEB \_\_\_\_\_\_8

Rev Q

### ATTACHMENT B

Mark WNE

### Contract No.

Туре

71C7-54180 72C7-75212 CPSJ CPSJ

### Manufacturer

Phelps Dodge Cable & Wire General Cable

Sheet No. EEB 74-0088

Revision: 0

#### ATTACHMENT C

C.1 TVA Engineering Report No. 1944

Cable types: CP, CPJ, CPJJ, PXJ

Rooms: 0-18

The CP family of cables consists of cross-linked polyethylene insulation and polyvinyl chloride jacketing, and the PX family of cables consists of cross-linked polyethylene or ethylene propylene rubber, and the jacket is chlorosulfonated polyethylene or chloronated polyethylene. The following LOCA/SLB test apply:

- CP types Wyle Laboratory Test Report 43854-3 dated April 26, 1978, LOCA and SLB Qualification Test of Cables and Cable Splices.
- PX types Franklin Institute Test Report F-C4113 dated May 1975.

Rockbestos Company Test Report deted July 1977, amended 1979.

Franklin Institute Test Report F-C5120 dated May 1980.

These cable are qualified by the above for all HELB areas and the LOCA/SLB of the containment. Because of the conservatism of these tests including the severity of the mandrel bend and dielectric test in water after the combined LOCA/SLB profile, it is our engineering judgment that there is sufficient margin to give reasonable assurance of continued operability more than a year in the post-LOCA environment.

C.2 NUREG-0588 Material List

C.3 Because of the conservatism of the tests fc. XLPE and for silicone insulation, including the severity of the mandrel bend and dielectric test in water after the combined LOCA/SLB profile, it is our engineering judgment that there is sufficient margin to give reasonable assurance of cont used operability more than a year in the post-LOCA environment.

Reviewed by:

Prepared by:

QA Acceptance:

SYSTEM COMPONENT EVALUATION WORK SHEET (Rev 2)

Facility: Browns Ferry Nuclear Plant Unit: 3 Docket - 50-296

(3) Sheet No. EEB 74-0089 Revision

0

:6

Docket: 50-296						Date 10/22/80	)	
EQUIPMENT DESCRIPTION		ENVIRONMENT		DOCUME	NTATION REF	QUALIFICATION METHOD	OUTSTANDING ITEMS	
EQUITMENT DESCRIPTION	Parameter	Specifi- cation	Qualifi- cation	Specifi- cation	Qualifi- cation			
System: 74 Plant ID No. Attachment A	Operating Time	Attachment A	1 Year	(1)	Attachment C.	Engineering Analysis and Test	None	
Component Cable 'WNE 1/c, #400 MCM, CPSJ Manufacturer: Attachment B	Temperature	294	325	(4)	Attachment C.	<ol> <li>Generic Simul- taneous Test</li> <li>Engr. analysis</li> </ol>	None .	
Model Number: N/A	( <sup>o</sup> F) Pressure (PSIA)	15.0	N/A	(4)	N/A	N/A	None	
Function: Power	Relative Humidity (%)	100	100	(4)	Attachment C.	1. Generic Simul- taneous Test 2. Engr. analysis	None	
Accuracy: Req'd: N/A Demon: N/A Category: Attachment A	Chemical Spray	N/A	N/A	(4)	N/A	N/A	None	
Service: Attachment A	Radiation (RAD)	3x10 <sup>7</sup>	6.9x10 <sup>7</sup>	(4)	At'achment C.	<ol> <li>Generic Sequen- tial Test</li> <li>Engr. analysis</li> </ol>	None	
Location: Room 5	Aging	N/A	40 years	(2)	Attachment C.	Generic Mat'l Test	None	
Flood Level Elev: 552' Above Flood Level: Yes X No	Submergence	N/A	N/A	(4)	N/A	. N/A	None	

Notes: (1) See Section 2.4 in 79-01B report.

- (2) See Section 4.1.2 in 79-01B report.
- (3) All notes and other information not on these sheets are on the attached appendix sheets.
- (4) See Section 3.0 and/or Appendix B in 79-01B report.

Prepared by: H.D. Roman and

Reviewed by:

QA Acceptance:

10

Attachment A

5 .

EEB \_74-0089

System: 74 Unit: 3			Rev <u>O</u>
Component: Cable Mark: WNE	1/c, #400 MCM		
Plant I, D. No. Room	Function/Service	Category	Operating Time
3ES4070-II 5 3ES4060-I 5	RHR PMP 3D SUPPLY RHR PMP 3B SUFFLY	A A	l Year l Year

### EEB \_74-0089

Rev O

# ATTACHMENT B

Mark WNE

Туре

CPSJ

CPSJ

14

### Contract No.

71C7-54180 72C7-75212

### Manufacturer

Phelps Dodge Cable & Wire General Cable

Sheet No. EEB 74-0089

Revision: 0

#### ATTACHMENT C

C.1 TVA Engineering keport No. 1944

Cable types: CP, CPJ, CPJJ, PXJ

Rooms: 0-18

The CP family of cables consists of cross-linked polyethylene insulation and polyvinyl chloride jacketing, and the PX family of cables consists of cross-linked polyethylene or ethylene propylene rubber, and the jacket is chlorosulfonated polyethylene or chloronated polyethylene. The following LOCA/SLB test apply:

- CP types Wyle Laboratory Test Report 43854-3 dated April 26, 1978, LOCA and SLB Qualification Test of Cables and Cable Splices.
- PX types Franklin Institute Test Report F-C4113 dated May 1975.

Rockbestos Company Test Report dated July 1977, amended 1979.

Franklin Institute Test Report F-C5120 dated May 1980.

These cable are qualified by the above for all HELB areas and the LOCA/SLB of the containment. Because of the conservatism of these tests including the severity of the mandrel bend and dielectric test in water after the combined LOCA/SLB profile, it is our engineering judgment that there is sufficient margin to give reasonable assurance of continued operability more than a year in the post-LOCA environment.

- C.2 NUREG-0588 Material List
- C.3 Because of the conservatism of the tests for XLPE and for silicone insulation, including the severity of the mandrel bend and dielectric test in water after the combined LOCA/SLB profile, it is our engineering judgment that there is sufficient margin to give reasonable assurance of continued operability more than a year in the post-LOCA environment.

Reviewed by:

Prepared by:

QA Acceptance:

SYSTEM COMPONENT EVALUATION WORK SHEET (Rev 2)

Facility: Browns Ferry Nuclear Plant Unit: 3 50-296 Cocket:

OUTSTANDING DOCUMENTATION REF QUALIFICATION ENVIRONMENT ITEMS. METHOD EQUIPMENT DESCRIPTION Specifi-Qualifi-Specifi-Oualification cation cation Parameter cation System: 74 Attachment A Non Operating Engineering Attachment 1 Year Plant ID No. Attachment A Time Analysis C.3 . (1)Component Cable WUB Generic 2/c, #16 AWG, Copper/Const Simultaneous Temperature None Test Manufacturer: Attachment B Attachment C. 250 157 (4) (°F) N/A None N/A N/A Pressure Model Number: N/A 15.0 (PSIA) (4) Function: Generic Signal/Instrumentation Relative Simultaneous Attachment C.1 100 Humidity (%) (4) None 100 Test Accuracy: Reg'd: N/A Demon: N/A Chemical Spray Category: Attachment A None N/A (4)N/A N/A N/A Service: Attachment A Generic Radiation Sequential 5x10 Attachment C.1 2.1x107 None (RAD) (4) Test Attachment C.2 Generic Mat'l Test None .ocation: Room 8 40 years (2) N/A Aging 3 Flood Level Elev: 552' None N/A N/A Hove Flood Level: Yes X Submergance N/A N/A (4) No

iotes: See Section 2.4 in 79-018 report. (1)

- (2) See Section 4.1.2 in 79-018 report.
- (3) A'l notes and other information not on these sheets are on the attached appendix sheets.

(4) See Section 3.0 and/or Appendix B in 79-01B report.

Prepared by: H. A. Romonowskip Reviewed by: Albradley

QA Acceptance:

(3)

Revision

Date

Sheet No. FFR 74-0090

0

10/22/80

14

Attachment H

EEB \_ 74-0090

Rev O

System: 74 Unit: 3							
Component: Ca Mark: WU	ble B	2/c, ₿16 AW	IG				
Plant I. D. No.	Room	Function/S	ervice		Cat	egory	Operating Time
3R853	8	TE-74-82 R				A	l Year
3R851	8	TE-74-82 B		-	IMP	Α	1 Year
3R852	. 8	TE-74-81 B				٨	1 Year
3R850	8	TE-74-9 B	RHR HTX	A OT	TMP	A	1 Year
3R860	8	TE-74-32 F	RHR HTX	B OT	TMP	A	l Year
3R861	8	TE-74-43 F	RHR HTX	DOT	TMP	A	1 Year
3R862	8	TE-74-83 F	RHR HTX	BOT	TMP	A	1 Year
3R863	8	TE-74-84 F	RHR HTX	D OI	TMP	A	1 Year

### EEB \_ 74-0090

Rev O

# ATTACHMENT B

Mark WUB

### Contract No.

Type

\*...

PE/PE

Manufacturer

Continental Wire & Cable Continental Wire & Cable

68C7-51959 72C7-83014

Sheet No .: EEB- 74-0090

Revision: O

#### ATTACHMENT C

C.1 TVA Engineering Report No. 1947

Cable types: Coax, Triax, and Signal Cables of Cross-Linked Polyethylene Construction

Rooms: 0-18

For signal cables which utilize cross-linked polyethylene insulation, and the jacket is chlorosulfonated polyethylene or neoprene. The following LOCA/SLB tests apply:

Wyle Laboratory Test Report 43854-3 dated April 26, 1978, LOCA and SLB Qualification Test of Cables and Cable Splices.

Franklin Institute Test Report F-C4113 dated May 1975.

Rockbestos Company Test Report dated July 1977, amended 1979.

Franklin Institute Test Report F-C5120 dated May 1980.

These cable are qualified by the above for a!I HELB areas and the LOCA/SLB of the containment.

- C.2 NUREG-U588 Material List
- C.3 Because of the conservatism of the tests for XLPE and for silicone insulation, including the severity of the mandrel bend and dielectric test in water after the combined LOCA/SLB profile, it is our engineering judgment that there is sufficient margin to give reasonable assurance of continued operability more than a year in the post-LOCA environment.

Prepared	by:
Reviewed	by:
QA Accept	tance:

SYSTEM COMPONENT EVALUATION WORK SATET (Rev 2)

Facility: Browns Ferry Nuclear Plant . Unit: 3 Docket: 50-296

QUALIFICATION OUTSTANDING DOCUMENTATION REF ENVIRONMENT ITEMS METHOD EQUIPMENT DESCRIPTION Qualifi-Qualifi-Specifi-Specification cation cation Parameter cation None Engineering System: 74 Attachment C.3 1 year Operating Attachment A Analysis and Time Plant ID No. Attachment A Test (1) Component Cable WUB 180 . 18 Generic 2/c.#16 AWG, Copper/Const Simulineous Temperature (°F) Manufacturer: Attachment B 157 None Test (4) Attachment C.1 385 None N/A N/A N/A Pressure Model Number: N/A (PSIA) . (4) 15.0 Function: Generic Signal/Instrumentation Relative Simultaneous Humidity (%) (4) None 100 Test Attachment C.1 100 Accuracy: Reg'd: N/A **Chemical** Demon: N/A Spray Category: Attachment A (4) N/A N/A NIA None N/A Service: Attachment A Generic Radiation Sequential 2×10<sup>8</sup> 2.1x10 Attachment C. 1 None (RAD) (4) Test Generic Mat'l Test None .ocation: Attachment C.2 Room 8 N/A 40 years (2) Aging Flood Level Elev: 552' None N/A N/A Sove Flood Level: Yes X Submergence N/A N/A (4)No

Notes: (1) See Section 2.4 in 79-01B report.

- (2) See Section 4.1.2 in 79-01B report.
- (3) All notes and other information not on these sheets are on the attached appendix sheets.

(A) See Section 3.0 and/or Appendix B in 79-01B report.

Prepared by: A.D. Romanously

Reviewed by:

QA Acceptance:

(3)

Date 10/22/80

Revision

Sheet No. EEB 74-0091 .

0

13

Attachment A

EEB \_74-0091

Rev		m	
UG A	-	5	

System: 74 Unit: 3			NCY
Component: Cable Mark: WUB	2/c, #16 AWG		
Plant I. D. No. Room	Function/Service	Category	Operating Time
3R853 8	TE-74-82 RHR HTX C 01	TMP A	1 Year
3R851 8	TE-74-82 RHR HTX C 01	T TMP A	1 Year
3R852 8	TE-74-81 RHR HTX A OT	T TMP A	1 Year
3R850 8	TE-74-9 RHR HTX A OT	T TMP A	1 Year
	TE-74-32 RHR HTX B 01	TMP A	1 Year
3R861 8	TE-74-43 RHR HTX D OT	T TMP A	1 Year
3R860 8 3R861 8 3R862 8	TE-74-83 RHR HTX B OT	TMP A	1 Year
3R863 8	TE-74-84 RHR HTX D 01	T TMP A	1 Year

# EEB \_ 74-0091

Rev O

# ATTACHMENT B

# Mark WUB

Contract No.

68C7-51959 72C7-83014 Type PE/PE

.

4

.

2

Manufacturer

Continental Wire & Cable Continental Wire & Cable

÷.

1

-

Sheet No: EEB 74-0091

Revision: 0

#### ATTACHMENT C

C.1 TVA Engineering Report No. 1945

Cable types: Coax, Triax, and Signal Cables of Cross-Linked Polyethylene Construction

Rooms: 0-18

For signal cables which utilize cross-linked polyethylene insulation, and the jacket is chlorosulfonated polyethylene or neoprene. The following LOCA/SLB tests apply:

Wyle Laboratory Test Report 43854-3 dated April 26, 1978, LOCA and SLB Qualification Test of Cables and Cable Splices.

Franklin Institute Test Report F-C4113 dated May 1975.

Rockbestos Company Test Report dated July 1977, amended 1979.

Franklin Institute Test Report F-C5120 dated May 1980.

These cables are qualified by the above for all HELB areas and the LOCA/SLB of the containment.

- C.2 NUREG-0588 Material List
- C.3 Because of the conservatism of the tests for XLPE and for silicone insulation, including the severity of the mandrel bend and dielectric test in water after the combined LOCA/SLB profile, it is our engineering judgment that there is sufficient margin to give reasonable assurance of continued operability more than a year in the post-LOCA environment.

Reviewed by:	
Prepared by:	
QA Acceptance:	

Facility: Browns Ferry Nuclear Plant Unit: 3 Docket: 50-296

1 11

SYSTEM COMPONENT EVALUATION WORK SHEET (Rev 2)

(3) Sheet No. EEB 74-0092 Revision 0 Date 10/22/80

		ENVIRONMENT		DOCUMEN	TATION REF	QUALIFICATION METHOD	OUTSTANDING ITEMS
EQUIPMENT DESCRIPTION	Parameter Specifi- Qualifi- Specifi- Qualifi- cation cation cation cation		METHOD	11253			
System: 74 Plant ID No. Attachment A	Operating Time	Attachment A	1 Year	(1)	Attachment C.3	Engineering Analysis	None
Component Cable WUB 2/c, #16 AWG Copper/Const Manufacturer: Attachment B	Temperature	157	203	(4)	IPCEA S-61-402 par 3.9 and Attachment C.2	Attachment C.2	None
Model Number: N/A	Pressure (PSIA)	15.0	N/A	(4)	N/A	N/A	None
Function: Signal/Instrumentation	Relative Humidity (%)	100	100	(4)	IPCEA S-61-402 par 3.9, 3.7.3, 6.7	Standard Material Requirement	None
Accuracy: Req'd: N/A Demon: N/A Category: Attachment A	Chemical Spray	N/A	N/A	(4)	N/A	N/A	Nolie
Service: Attachment A	Radiation (RAD)	2.1×10 <sup>7</sup>	4x10 <sup>7</sup>	(4)	NUREG-0588 Material List	Generic Material Tests	None
Location: Room 8	Aging	N/A	20 years	(2)	Attachment C.1	Oper. Experience	None
Flood Level Elev: 552' Above Flood Level: Yes X	Submergence	N/A	N/A	(4)	N/A	. N/A	None

Votes: (1) See Section 2.4 in 79-018 report.

(2) See Section 4.1.2 in 79-01B report.

(3) All notes and other information not on these sheets are on the attached appendix sheets.

(4) See Section 3.0 and/or Appendix B in 79-01B report.

Prepared by: K.D. Romanow &

Reviewed by

QA Acceptance:

# EEB \_ 74-0092

Rev O

### ATTACHMENT B

### Mark WUB

Contract No.

68C7-51959

7207-83014

. .

PE/PE

Type

Manufacturer

Continental Wire & Cable Continental Wire & Cable

Attachment A

EEB 74-0092

Rev \_\_\_\_Q

System: 74 Unit: 3

Component: Cable Mark: WUB 2/c, #16 AWG

Plant I. D. No.	Room	Function/S	Servi	ce			Ca	tegory	<u>C</u>	perating Time
3R853	8	TE-74-82 H	RHR H	ITX	С	OT	TMP	A	1	Year
3R851	8	TE-74-82 H	RHR H	ITX	С	OT	TMP	Α	1	Year
3R852	8	TE-74-31 H	RHR H	TX	A	OT	TMP	A	1	Year
3R850	8	TE-74-9 H	RHR H	TX	A	OT	TMP	A	1	Year
3R860	8	TE-74-32 1	RHR H	TX	B	OT	TMP	A	1	Year
3R861	8	TE-74-43 H	RHR H	ITX	D	TO	TMP	A	1	Year
3R862	8	TE-74-83 H	RHR H	TX	B	OT	TMP	A	1	Year
3R863	8	TE-74-84 H	RHR H	TX	D	OT	TMP	Α	1	Year

Sheet No: EEB- 74-0092

Revision: 0

#### ATTACHMENT C

C.1 TVA Engineering Report No. 1942

### Coax, Triax, and Signal Cable

Coaxial and `miaxial cable installed at Browns Ferry were purchased in accordance with General Electric Company Specification 22A1181, and the appropriate MIL-C-17 specification. Signal cables, both twisted pair and multiconductor, were purchased in accordance with TVA specifications. Some cable were of cross-linked polyethylene and chloronated polyethylene construction while the same kind of cable furnished under other contracts were of high molecular weight, high density polyethylene/polyvinyl chloride construction and some even polyethylene/polyvinyl chloride construction. It is not possible to make a complete identification by contract as to which circuit and function they serve. Recent reclassification of some function: to 1E status has made it almost a certainty that some cables now in a safety category are of polyethylene/polyvinyl construction.

Accordingly, we have examined the 20 HELB temperature profiles and find that only compartments 1, 3, 6, and 9 show profiles which more than briefly surpass the softening temperature of the linear polyethylene. However, owing to the thermal time lag in the cable material and the cable installation including the heat sink of conduit, tray, and shield material, the insulation will not experience the HELB temperature profile until some time has elapsed and the temperature is lower. Further, no load heat rise need be taken into account for these signal cables.

TVA has conducted tests (Chattanooga Central Laboratories Report No. L81-81-6821 dated October 1980, of PE, PVC cables under a temperature profile which envelops all the HELB profiles. Following this exposure, these cables sustained a dielectric test while immersed in water of 660 volts for 5 minutes, 960 volts for 5 minutes, and 220 volts ac for 5 minutes in succession.

It is therefore our engineering judgment that this test confirms the above and justifies interim operation until these types can be fully qualified by our Wyle Laboratory tests to be concluded next April, or replaced at the next refueling outage.

For those cables located in compartment 0 (the containment), the service which these cables have seen thus far has exposed them to a gamma radiation dose of 6.25 x 10<sup>6</sup> rads or more. This is sufficient to have cross-linked the polyethylene and PVC as well. Consequently, the insulation is now in fact a thermoset material and is capable of the same temperature that TVA's cross-linked polyethylene cable has demonstrated and is capable of withstanding the LOCA/SLB and the post-LOCA environment for a year.

Sheet No: EEB- 74-0092

Revision: 0

ATTACHMENT C (Continued)

C.1 (Continued)

Continued operation is justified, and TVA has prepared a LOCA/SLB, thermal aging, and radiation test procedure to be performed by Wyle Laboratories on samples of this cable to demonstrate the validity of this conclusion. Results of this testing program are expected to be available in April 1981.

One cable RG-114A/U has the possibility of being sensitive to pressure changes owing to its partial air dielectric; however, an analysis of this effect has indicated that the change in dielectric constant can be tolerated. Consequently for this cable too, there is justification for continued operation. The compression effect on the dielectric will be likewise tested at Wyle Laboratories along with the other cable tests and results are expected to be available by April 1981.

- C.2 Standard Material Long-Term Overload Temperature Rating
- C.3 The post-HELB conditions are less than the normal cable rating and, in our judgment, the cables could operate satisfactorily for a post-accident of a year.

Prepared	by:
Reviewed	by:
QA Accept	tance:

110

SYSTEM COMPONENT EVALUATION WORK SHEET (Rev 2)
--

Facility: Browns Ferry Nuclear Plant Unit: 3

EET	(Rev	2)	Sheet No	1
			Revision	i
			Date	1

(3) No.

EEB 74-0093

0

10/22/80

Docket: 50-296

	ENVIRONMENT			DOCUMEN	TATION REF	QUALIFICATION METHOD	OUTSTANDING ITEMS
EQUIPMENT DESCRIPTION	Parameter	Specifi- cation	Qualifi- cation	Specifi- cation	Qualifi- cation	ne moo	
System: 74 Plant ID No. Attachment A	Operating Time	Attachment A	l year	(1)	Attachment C.3	Engineering Analysis and Test	None
Component Cable WVA 2/c, #16 AWG, PE Manufacturer: Attachment B	Temperature (°F)	158	335	(4)	Attachment C-1	Generic Simultaneous Test	None ·
Model Number: N/A	Pressure (PSIA)	15.0	N/A	(4)	N/A	N/A	None
Function: Signal/Instrumentation	Relative Humidity (%)	100	100	(4)	Attachment C.1	Generic Simultaneous Test	None
Accuracy: Req'd: N/A Demon: N/A Category:Attachment A	Chemical Spray	N/A	N/A	(4)	N/A	N/A	None
Service: Attachment A	Radiation (RAD)	3x10 <sup>7</sup>	2×10 <sup>8</sup>	(4)	Attachment C.1		None
.ocation: Room 2	Aging	N/A	40 years	(2)	Attachment C.2	Generic Mat'l Test	None
Flood Level Elev: 552' bove Flood Level: Yes X	Submergence	N/A	N/A	(4)	N/A	N/A	None

votes: See Section 2.4 in 79-01B report. (1)

(2) See Section 4.1.2 in 79-01B report.

(3) All notes and other information not on these sheets are on the attached appendix sheets.

(4) See Section 3.0 and/or Appendix B in 79-01B report.

Prepared by: H.D. Romonowak

Reviewed by:

Beall

QA Acceptance:

EEB \_74-0093

Rev \_\_\_\_O

System: 74 Unit: 3

Component: Cable, 2/c, #16AWG Mark: WVA

Plant I. D. No.	Room	Function/Service	Category	Operating Time	
3R3282 3R1656 3R1651	2 2 2	TTS-74-136A Cont FT-74-50 Flow Trans FT-74-56 Flow Trans	A A	l year l year	

# EEB \_74-0093

Rev O

### ATTACHMENT B

Mark WVA

Type

### Contract No.

77K5-823265 72C7-83944 69C3-64863-1 72C7-74910-1 FRXLPE/CSPE FRXLPE/CSPE PE/PVC XLPE/CSPE

TR 822676 from SQN 76K5-87232

- TR 827773 from BLN 78K5-824447
- TR 826953 from BLN 78K5-824447

77K5-820991 73C7-84211

### Manufacturer

Rockbestos Continental Wire & Cable Rockbestos Continental Wire & Cable

Continental Wire & Cable

Anaconua

Anaconda

Boston Ins. Wire

FREP/CPE

FREP/CPE

FREP/CPE

Sheet No: EEB- 74-0093

Revision: 0

### ATTACHMENT C

C.1 TVA Engineering Report No. 1945

Cable types: Coax, Triax, and Signal Cable of Cross-Linked Polyethylene Construction

Rooms: 0-18

For signal cables which utilize cross-linked polyethylene insulation, and the jacket is chlorosulfonated polyethylene or neoprene. The following LOCA/SLB tests apply:

Wyle Laboratory Test Report 43854-3 dated April 26, 1978, LOCA and SLB Qualification Test of Cables and Cable Splices.

Franklin Institute Test Report F-C4113 dated May 1975.

Rockbestos Company Test Report dated July 1977, amended 1979.

Franklin Institute Test Report F-C5120 dated May 1980.

These cables are qualified by the above for all HELB areas and the LOCA/SLB of the containment.

- C.2 NUREG-0588 Material List
- C.3 Because of the conservatism of the tests for XLPE and for silicone insulation, including the severity of the mandrel bend and dielectric test in water after the combined LOCA/SLB profile, it is our engineering judgment that there is sufficient margin to give reasonable assurance of continued operability more than a year in the post-LOCA environment.

Reviewed	by:	
Prepared	by:	
QA Accept	tanc	e:

SYSTEM COMPONENT EVALUATION WORK SHEET (Rev 2)

ENVIRONMENT

3x10<sup>7</sup>

N/A

N/A

DOCUMENTATION REF

Facility: Browns Ferry Nuclear Plant Unit: 3 Docket: 50-296

Specifi-Qualifi-Specifi-Qualification cation cation cation Parameter Attachment C.3 Engineering Operating 1 year Attachment A Analysis and Plant ID No. Attachment A Time Test (1)Component Cable WVA Generic 2/c, #16 AWG, XLPE Simultaneous Temperature Manufacturer: Attachment B 294 Attachment C.1 Test (4) 385 (°F) N/A N/A Pressure N/A Model Number: N/A (PSIA) (4) 15.0 Generic Signal/Instrumentation Relative Simultaneous Humidity (%) (4) 100 100 Attachment C.1| Test Accuracy: Reg'd: N/A Demon: N/A **Chemical** Spray Category: Attachment A N/A (4) N/A N/A N/A

2×10<sup>8</sup>

N/A

40 years

(4)

(2)

(4)

 $\mathbf{h}_{i,i}$ 

votes: (1) See Section 2.4 in 79-01B report.

No

- (2) See Section 4.1.2 in 79-01B report.
- (3) All notes and other information not on these sheets are on the attached appendix sheets.

Submergence

Radiation

(RAD)

Aging

(4) See Section 3.0 and/or Appendix B in 79-01B report.

Prepared by: H. D. Remonowsky

Generic

Attachment C.1

Attachment C.2

N/A

Sequential Test

Generic Mat'l Test

N/A

(3)

Date 10/22/80

OUALIFICATION

METHOD

Revision

Sheet No. EEB 74-0094

0

OUTSTANDING

ITEMS

None

None

None

None

None

None

None

None

Reviewed by: Monally

QA Acceptance:

System: 74

Function:

.ocation:

Service: Attachment A

Flood Level Elev: 552'

Shove Flood Level: Yes X

Room 5

EQUIPMENT DESCRIPTION

System: 74 Unit: 3

Component: Cable, 2/c, #16AWG Mark: WVA

Plant I. D. Ko.	Room	Function/Service	Category	Operating Time	
3R3281	5	TTS-74-136B Cont	А	l year	

#### EEB \_74-0094

Rev O

#### ATTACHMENT B

Mark WVA

#### Contract No.

Туре

77K5-823265 72C7-83944 69C3-64863-1 72C7-74910-1 FRXLPE/CSPE FRXLPE/CSPE PE/PVC XLPE/CSPE

FREP/CPE

FREP/CPE

- TR 822676 from SQN FREP/CPE 76%5-87232
- TR 827773 from BLN 78K5-824447
- TR 826953 from BLN 78K5-824447

77K5-820991 73C7-84211

#### Manufacturer

Rockbestos Continental Wire & Cable Rockbestos Continental Wire & Cable

Continental Wire & Cable

Anaconda

Anaconda

Boston Ins. Wire

Sheet No: KEB - 74-0094

Revision: 0

#### ATTACHMENT C

C.1 TVA Engineering Report No. 1945

Cable types: Coax, Triax, and Signal Cables of Cross-Linked Polyethylene Construction

Rooms: 0-18

For signal cables which utilize cross-linked polyethylene insulation, and the jacket is chlorosulfonated polyethylene or neoprene. The following LOCA/SLB tests apply:

Wyle Laboratory Test Report 43854-3 dated April 26, 1978, LOCA and SLB Qualification Test of Cables and Cable Splices.

Franklin Institute Test Report F-C4113 dated May 1975.

Rockbestos Company Test Report dated July 1977, amended 1979.

Franklin Institute Test Report F-C5120 dated May 1980.

These cables are qualified by the above for all HELB areas and the LOCA/SLB of the containment.

- C.2 NUREG-0588 Material List
- C.3 Because of the conservatism of the tests for XLPE and for silicone insulation, including the severity of the mandrel bend and dielectric test in water after the combined LOCA/SLB profile, it is our engineering judgment that there is sufficient margin to give reasonable assurance of continued operability more than a year in the post-LOCA environment.

Reviewed	by:		 
Prepared	by:		 
OA Accep	tanc	e:	

Facility: Browns Ferry Nuclear Plant . Unit: 3 Docket: 50-296

SYSTEM COMPONENT EVALUATION WORK SHEET (Rev 2)

(3) Sheet No. EEB 74-0095 Revision 0 Date 10/22/80

EQUIPMENT DESCRIPTION		ENVIRONMENT		DOCUME	NTATION REF	QUALIFICATION METHOD	OUTSTANDING ITEMS	
EQUITALIA DESCRIPTION	Parameter	Specifi- cation	Qualifi- cation	Specifi- cation	Qualifi- cation	AL HOD	11Lho	
System: 74 Plant ID No. Attachment A	Operating Time	Attachment A	1 Year	(1)	Attachment C.3	Eng <b>ineering</b> Analysis	None	
Component Cable WVA . 2/c, #16 AWG, PE Manufacturer: Attachment B	Temperature (°F)	158	203	(4)	IPCEA S-61-402 par 3.9 and Attachment C.2	Attachment C.2	None	
Model Number: N/A	Pressure (PSIA)	15.0	N/A	(4)	N/A	N/A	None	
Function: Signal/Instrumentation	Relative Humidity (%)		100	(4)	IPCEA S-61-402 par 3.9, 3.7.3, 6.7	Standard Material Requirement	Njne	
Accuracy: Req'd: N/A Demon: N/A Category: Attachment A	Chemical Spray	N/A	N/A	(4)	N/A	N/A	None	
Service: Attachment A	Radiation (RAD)	3x10 <sup>7</sup>	4x10 <sup>7</sup>	(4)	NUREG-0588 Material List	Generic Material Tests	None	
Location: Room 2	Aging	N/A	20 years	(2)	Attachment C.1	Oper. Experience	None	
Flood Level Elev: 552' Above Flood Level: Yes X	Submergence	N/A	N/A	(4)	N/A	. N/A	None	

Notes: (1) See Section 2.4 in 79-018 report.

- (2) See Section 4.1.2 in 79-01B report.
- (3) All notes and other information not on these sheets are on the attached appendix sheets.

(4) See Section 3.0 and/or Appendix B in 79-01B report.

Prepared by: H.D. Roman au) A

Reviewed by:

QA Acceptance:

1 11

Attachment A

EEB \_ 74- 0095

Rev O

System: 74 Unit: 3

Component: Cable, 2/c, #16AWG Mark: WVA

3 . e

Plant I. D. No.	Room	Function/Service	Category	Operating Time	
3R3282 3R1656 3R1651	2 2 2	TTS-74-136A Cont FT-74-50 Flow Trans FT-74-56 Flow Trans	A A	l year l year	

### EEB \_ 74-0095

Rev O

## ATTACHMENT B

#### Mark WVA

Contract No.

77K5-823265 72C7-83944 69C3-64863-1 72C7-74910-1

- TR 822676 from SQN 76K5-87232
- TR 827773 from BLN 78K5-824447
- TR 826953 from BLN 78K5-824447

77K5-820991 73C7-84211 Туре

FRXLPE/CSPE FRXLPE/CSPE PE/PVC XLPE/CSPE

FREP/CPE

FREP/CPE

FREP/CPE

#### Manufacturer

Rockbestos Continental Wire & Cable Rockbestos Continental Wire & Cable

Continental Wire & Cable

Anaconda

Anaconda

Boston Ins. Wire ITT

Sheet No: EEB- 74-0095

Revision: 0

#### ATTACHMENT C

C.1 TVA Engineering Report No. 1942

#### Coax, Triax, and Signal Cable

Coaxial and Triaxial cable installed at Browns Ferry were purchased in accordance with General Electric Company Specification 22A1181, and the appropriate MIL-C-17 specification. Signal cables, both twisted pair and multiconductor, were purchased in accordance with TVA specifications. Some cable were of cross-linked polyethylene and chloronated polyethylene construction while the same kind of cable furnished under other contracts were of high molecular weight, high density polyethylene/polyvinyl chloride construction and some even polyethylene/polyvinyl chloride construction. It is not possible to make a complete identification by contract as to which circuit and function they serve. Recent reclassification of some functions to 1E status has made it almost a certainty that some cables now in a safety category are of polyethylene/polyvinyl construction.

Accordingly, we have examined the 20 HELB temperature profiles and find that only compartments 1, 3, 6, and 9 show profiles which more than briefly surpass the softening temperature of the linear polyethylene. However, owing to the thermal time lag in the cable material and the cable installation including the heat sink of conduit, tray, and shield material, the insulation will not experience the HELB temperature profile until some time has elapsed and the temperature is lower. Further, no load heat rise need be taken into account for these signal cables.

TVA has conducted tests (Chattanooga Central Laboratories Report No. L81-81-6821 dated October 1980, of PE, PVC cables under a temperature profile which envelops all the HELB profiles. Following this exposure, these cables sustained a dielectric test while immersed in water of 660 volts for 5 minutes, 960 volts for 5 minutes, and 220 volts ac for 5 minutes in succession.

It is therefore our engineering judgment that this test confirms the above and justifies interim operation until these types can be fully qualified by our Wyle Laboratory tests to be concluded next April, or replaced at the next refueling outage.

For those cables located in compartment 0 (the containment), the service which these cables have seen thus far has exposed them to a gamma radiation dose of  $6.25 \times 10^{6}$  rads or more. This is sufficient to have cross-linked the polyethylene and PVC as well. Consequently, the insulation is now in fact a thermoset material and is capable of the same temperature that TVA's cross-linked polyethylene cable has demonstrated and is capable of withstanding the LOCA/SLB and the post-LOCA environment for a year.

Sheet No: EEB- 74-0095

Revision: 0

#### ATTACHMENT C (Continued)

C.1 (Continued)

Continued operation is justified, and TVA has prepared a LOCA/SLB, thermal aging, and radiation test procedure to be performed by Wyle Laboratories on samples of this cable to demonstrate the validity of this conclusion. Results of this testing program are expected to be available in April 1981.

One cable RG-114A/U has the possibility of being sensitive to pressure changes owing to its partial air dielectric; however, an analysis of this effect has indicated that the change in dielectric constant can be tolerated. Consequently for this cable too, there is justification for continued operation. The compression effect on the dielectric will be likewise tested at Wyle Laboratories along with the other cable tests and results are expected to be available by April 1981.

- C.2 Standard Material Long-Term Overload Temperature Rating
- C.3 The post-HELB conditions are less than the normal cable rating and, in our judgment, the cables could operate satisfactorily for a post-accident of a year.

Prepared	by:
Reviewed	by:
QA Accept	tance:

#### Facility: Browns Ferry Nuclear Plant Unit: 3 Docket:

SYSTEM COMPONENT EVALUATION WORK SHEET (Rev 2)

(3) EEB 74-0096 Sheet No. Revision 0

Date 10/22/80

50-296

EQUIPMENT DESCRIPTION	ENVIRONMENT			DOCUMENTATION REF		QUALIFICATION METHOD	OUTSTANDING ITEMS	
	Parameter	Specifi- cation	Qualifi- cation	Specifi- cation	Qualifi- cation	nemoo	11Ch3	
System: 74 Plant ID No. Attachment A	Operating Time	Attachment A	1 Year	(1)	Attachment C.3	Engineering Analysis	None	
Component Cable WVA 2/c, #16 AWG, PE Manufacturer: Attachment B	Temperature (°F)	158	203	(4)	IPCEA S-61-402 par 3.9 and Attachment C.2	Attachment C.2	None	
Model Number: N/A	Pressure (PSIA)	15.0	N/A	(4)	N/A	N/A.	None	
Function: Signal/Instrumentation	Relative Humidity (%)	100	100	(4)	IPCEA S-61-402 par 3.9, 3.7.3, 6.7	Standard Material Requirement	None	
Accuracy: Req'd: N/A Demon: N/A Category: Attachment A	Chemical Spray	N/A	N/A	(4)	N/A	N/A	None	
Service: Attachment A	Radiation (RAD)	3x10 <sup>7</sup>	4x107	(4)	NUREG-0588 Material List	Generic Material Tests	None	
Location: Room 5	Aging	N/A	20 years	(2)	Attachment C.1	Oper. Experience	None	
Flood Level Elev: 552' Above Flood Level: Yes X No	Submergence	N/A	N/A	(4)	N/A	. N/A	None	

(1) See Section 2.4 in 79-018 report. Notes:

(2) See Section 4.1.2 in 79-018 report.

(3) All notes and other information not on these sheets are on the attached appendix sheets.

(4) See Section 3.0 and/or Appendix B in 79-01B report.

Prepared by: KA Romonowsk

Reviewed by:

QA Acceptance:

. .

Attachment A

EEB <u>74-0096</u> Rev <u>0</u>

System: 74 Unit: 3

Component: Cable, 2/c, #16AWG Mark: WVA

. .

Plant I. D. No.	Room	Function/Service	Category	Operating Time	
3R3281	5	TTS-74-1361 Cont	А	l year	

### EEB \_74-0096

Rev O

## ATTACHMENT B

#### Mark WVA

Contract No.

77K5-823265 72C7-83944 69C3-64863-1 72C7-74910-1

- TR 822676 from SQN 76K5-87232
- TR 827773 from BLN 78K5-824447
- TR 826953 from BLN 78K5-824447

77K5-820991 73C7-84211

#### Type

FRXLPE/CSPE FRXLPE/CSPE PE/PVC XLPE/CSPE

FREP/CPE

FREP/CPE

FREP/CPE

#### Manufacturer

Rockbestos Continental Wire & Cable Rockbestos Continental Wire & Cable

Continental Wire & Cable

Anaconda

Anaconda

Boston Ins. Wire ITT

Sheet No: EEB- 74-0096\_\_

Revision: 0

#### ATTACHMENT C

#### C.1 TVA Engineering Report No. 1942

#### Coax, Triax, and Signal Cable

Coaxial and Triaxial cable installed at Browns Ferry were purchased in accordance with General Electric Company Specification 22A1181, and the appropriate MIL-C-17 specification. Signal cables, both twisted pair and multiconductor, were purchased in accordance with TVA specifications. Some cable were of cross-linked polyethylene and chloronated polyethylene construction while the same kind of cable furnished under other contracts were of high molecular weight, high density polyethylene/polyvinyl chloride construction and some even polyethylene/polyvinyl chloride construction. It is not possible to make a complete identification by contract as to which circuit and function they serve. Recent reclassification of some functions to 1E status has made it almost a certainty that some cables now in a safety category are of polyethylene/polyvinyl construction.

Accordingly, we have examined the 20 HELB temperature profiles and find that only compartments 1, 3, 6, and 9 show profiles which more than briefly surpass the softening temperature of the linear polyethylene. However, owing to the thermal time lag in the cable material and the cable installation including the heat sink of conduit, tray, and shield material, the insulation will not experience the HELB temperature profile until some time has elapsed and the temperature is lower. Further, no load heat rise need be taken into account for these signal cables.

TVA has conducted tests (Cnattanooga Central Laboratories Report No. L81-81-6821 dated October 1980, of PE, PVC cables under a temperature profile which envelops all the HELB profiles. Following this exposure, the cables sustained a dielectric test while immersed in water of 66 polts for 5 minutes, 960 volts for 5 minutes, and 220 volts ac for 5 minutes in succession.

It is therefore our engineering judgment that this test confirms the above and justifies interim operation until these types can be fully qualified by our Wyle Laboratory tests to be concluded next April, or replaced at the next refueling outage.

For those cables located in compartment 0 (the containment), the service which these cables have seen thus far has exposed them to a gamma radiation dose of  $6.25 \times 10^6$  rads or more. This is sufficient to have cross-linked the polyethylene and PVC as well. Consequently, the insulation is now in fact a thermoset material and is capable of the same temperature that TVA's cross-linked polyethylene cable has demonstrated and is capable of withstanding the LOCA/SLB and the post-LOCA environment for a year.

Sheet No: EEB- 74-0096

Revision: 0

ATTACHMENT C (Continued)

C.1 (Continued)

Continued operation is justified, and TVA has prepared a LOCA/SLB, thermal aging, and radiation test procedure to be performed by Wyle Laboratories on samples of this cable to demonstrate the validity of this conclusion. Results of this testing program are expected to be available in April 1981.

One cable RG-114A/U has the possibility of being sensitive to pressure changes owing to its partial air dielectric; however, an analysis of this effect has indicated that the change in dielectric constant can be tolerated. Consequently for this cable too, there is justification for continued operation. The compression effect on the dielectric will be likewise tested at Wyle Laboratories along with the other cable tests and results are expected to be available by April 1981.

- C.2 Standard Material Long-Term Overload Temperature Rating
- C.3 The post-HELB conditions are less than the normal cable rating and, in our judgment, the cables could operate satisfactorily for a post-accident of a year.

Prepared	by:
Reviewed	by:
QA Accept	ance:

SYSTEM COMPONENT EVALUATION WORK SHEET (Rev 2)

Facility: Browns Ferry Nuclear Plant Unit: 3 Cocket: 50-296

14

(3) Sheet No. EEB 74-0097. Revision O

Date 10/22/80

EQUIPMENT DESCRIPTION	ENVIRONMENT			DOCUMENTATION REF		QUALIFICATION METHOD	OUTSTANDING ITEMS
	Parameter	Specifi- cation	Qualifi- cation	Specifi- cation	Qualifi- cation	nemos	
System: 74 Plant ID No. Attachment A	Operating Time	Attachment A	1 Year	(1)	Attachment C.3	Engineering Analysis	None
Component Cable WVA 2/c, #16 AWG, CSPE Manufacturer: Attachment B	Temperature (°F)	158	250	(4)	Attachment C.1	Generic Simultaneous Test	None
Model Number: N/A	Pressure (PSIA)	15.0	N/A	(4)	N/A	N/A	None
Function: Signal/Instrumentation	Relative Humidity (%)	100	100	(4)	Attachment C.1	Generic Simultaneous Test	None
Accuracy: Req'd: N/A Demon: N/A Category: Attachment A	Chemical Spray	N/A	N/A	(4)	N/A	N/A	None
Service: Attachment A	Radiation (RAD)	3x10 <sup>7</sup>	5×10 <sup>7</sup>	(4)	Attachment C.1	1621	None
.ocation: Room 2	Aging	N/A	40 years	(2)	Attachment C.2	Generic Mat'l Test	* None
Flood Level Elev: 552' Above Flood Level: Yes X	Submergence	N/A	N/A	(4)	N/A	N/A	, None

(1) See Section 2.4 in 79-01B report. votes:

(2) See Section 4.1.2 in 79-01B report.

(3) All notes and other information not on these sheets are on the attached appendix sheets.

(4) See Section 3.0 and/or Appendix B in 79-01B report.

Prepared by: H.D. Romonouis

Reviewed b

QA Acceptance:

ALLALIMENT IT

EEB 74-0097

Rev O

System: 74 Unit: 3

Component: Cable, 2/c, #16A2G Mark: WVA

4 +

Plant I. D. No.	Room	Function/Service	Category	Operating Time
3R3282 3R1656 3R1651	2 2 2	TTS-74-136A Cont FT-74-50 Flow Trans FT-74-56 Flow Trans	A A	l year 1 year

## EEB \_74-0097\_

Rev O

#### ATTACHMENT B

Mark WVA

#### Contract No.

#### Type

77K5-823265 72C7-83944 69C3-64863-1 72C7-74910-1

- TR 822676 from SQN 76K5-87232
- TR 827773 from BLN 78K5-824447
- TR 826953 from BLN 78K5-824447

77K5-820991 73C7-84211 FRXLPE/CSPE FRXLPE/CSPE PE/PVC XLPE/CSPE

FREP/CPE

FREP/CPE

FREP/CPE

#### Manufacturer

Rockbestos Continental Wire & Cable Rockbestos Continental Wire & Cable

Continental Wire & Cable

Anaconda

Anaconda

Boston Ins. Wire

Sheet No.: EEB-74-0097

Revision: O

#### ATTACHMENT C

C.1 TVA Engineering Report No. 1947

Cable types: Coax, Triax, and Signal Cables of Cross-Linked Polyethylene Construction

Rooms: 0-18

For signal cables which utilize cross-linked polyethylene insulation, and the jacket is chlorosulfonated polyethylene or neoprene. The following LOCA/SLB tests apply:

Wyle Laboratory Test Report 43854-3 dated April 26, 1978, LOCA and SLB Qualification Test of Cables and Cable Splices.

Franklin Institute Test Report F-C4113 dated May 1975.

Rockbestos Company Test Report dated July 1977, amended 1979.

Franklin Institute Test Report F-C5120 dated May 1980.

These cable are qualified by the above for all HELB areas and the LOCA/SLB of the containment.

- C.2 NUREG-0588 Material List
- C.3 Because of the conservatism of the tests for XLPE and for silicone insulation, including the severity of the mandrel bend and dielectric test in water after the combined LOCA/SLB profile, it is our engineering judgment that there is sufficient margin to give reasonable assurance of continued operability more than a year in the post-LOCA environment.

Prepared	by:
Reviewed	by:
QA Accept	tance:

Facility: Erowns Ferry Nuclear Plant Unit: 3

SYSTEM COMPONENT EVALUATION WORK SHEET (Rev 2)

Docket: 50-296

Date 10/22/80 OUTSTANDING QUALIFICATION ENVIRONMENT DOCUMENTATION REF METHOD ITEMS EQUIPMENT DESCRIPTION Specifi-Oualifi-Qualifi-Specification Parameter cation cation cation System: 74 Attachment A Operating Attachment Engineering None 1 Year Time Plant ID No. Attachment A Analysis C.3 (1)Component Cable WVA Generic 2/c, #16 AWG, CSPE Simultaneous Temperature Manufacturer: Attachment B None Test 294 Attachment C. L 250 (4)(°F) None N/A N/A N/A Pressure Model Number: N/A (PSIA) (4)15.0 Function: Generic Signal/Instrumentation Relative Simultaneous Attachment C.1 Humidity (%) 100 100 (4) Test None Accuracy: Reg'd: N/A Demon: N/A Chemical Spray Category: Attachment A (4)None N/A N/A N/A N/A Service: Attachment A Generic Radiation Sequential 5×10<sup>7</sup> 3x107 Attachment C.1 (RAD) (4)None Test Attachment C.2|Generic Mat'l Test \_ocation: None Room 5 40 years (2) Aging N/A Flood Level Elev: 552' None N/A N/A Above Flood Level: Yes x Submergence N/A N/A (4) No

votes: (1) See Section 2.4 in 79-01B report.

(2) See Section 4.1.2 in 79-01B report.

(3) All notes and other information not on these sheets are on the attached appendix sheets.

(4) See Section 3.0 and/or Appendix B in 79-01B report.

Prepared by: H. D. Romonowa

Reviewed by: ABrall

QA Acceptance:

(3)

Revision

Sheet No. EEB 74-0098

EEB 11-0978

Rev O

System: 74 Unit: 3

Component: Cable, 2/c, #16AWG Mark: WVA

Plant I. D. No.	Room	Function/Service	Category	Operating Time	
3R3281	5	TTS-74-136B Cont	A	l year	

# EEB \_74-0098\_

Rev O

## ATTACHMENT B

Mark WVA

77K5-823265 ,2C7-83944 69C3-64863-1 72C7-74910-1

Contract No.

TR 822676 from SQN 76K5-87232

- TR 827773 from BLN 78K5-824447
- TR 826953 from BLN 78K5-824447

77K5-820991 73C7-84211 FRXLPE/CSPE FRXLPE/CSPE PE/PVC XLPE/CSPE

Type

FREP /CT2

FREP/CPE

FREP/CPE

#### Manufacturer

Rockbestos Continental Wire & Cable Rockbestos Continental Wire & Cable

Continental Wire & Cable

Anaconda

Anaconda 👘 📜

Boston Ins. Wire ITT

Sheet No.: EEB 74-0098

Revision: O

#### ATTACIMENT C

C.1 TVA Engineering Report No. 1947

Cable types: Coax, Triax, and Signal Cables of Cross-Linked Polyethylene Construction

Rooms: 0-18

For signal cables which utilize cross-linked polyethylene insulation, and the jacket is chlorosulfonated polyethylene or neoprene. The following LOCA/SLB tests apply:

Wyle Laboratory Test Report 43854-3 dated April 26, 1978, LOCA and SLB Qualification Test of Cables and Cable Splices.

Franklin Institute Test Report F-C4113 dated May 1975.

Rockbestos Company Test Report dated July 1977, amended 1979.

Franklin Institute Test Report F-C5120 dated May 1980.

These cable are qualified by the above for all HELB areas and the LOCA/SLB of the containment.

- C.2 NUREG-0588 Material List
- C.3 Because of the conservatism of the tests for XLPE and for silicone insulation, including the severity of the mandrel bend and dielectric test in water after the combined LOCA/SLB profile, it is our engineering judgment that there is sufficient margin to give reasonable assurance of continued operability more than a year in the post-LOCA environment.

Prepared	by:
Reviewed	by:
QA Accept	tance:

Facility: Browns Ferry Nuclear Plant Unit: 3 Docket: 50-296

SYSTEM COMPONENT EVALUATION WORK SHEET (Rev 2)

(3)Sheet No. FFB 74-0099 Revision 0

10/22/80

Date

11

						Duce 10/22/00		
EQUIPMENT DESCRIPTION	ENVIRONMENT			DOCUMENTATION REF		QUALIFICATION METHOD	OUTSTANDING	
Equinent Description	Parameter	Specifi- Qualifi- cation cation		Specifi- Qualifi- cation cation		ALTION	ITEMS .	
System: 74 Plant ID No. Attachment A	Operating Time	Attachment A	l year	(1)	Attachment C.3	Engineering Analysis and Test	None	
Component Cable WVA-1 2/c, #18 AWG, XLPE Manufacturer: Attachment B	Temperature (°F)	158	385	(4)	Attachment C-1	Generic Simultaneous Test	None ·	
Model Number: N/A	Pressure (PSIA)	15.0	N/A	(4)	N/A	N/A	None	
Function: Signal/Instrumentation Accuracy: Reg'd: N/A	Relative Humidity (%)	100	100	(4)	Attachment C.1	Generic Simultaneous Test	None	
Demon: N/A Category:Attachment A	Chemical Spray	N/A	N/A	(4)	N/A	N/A	None	
Service: Attachment A	Radiation (RAD)	3x10 <sup>7</sup>	2×10 <sup>8</sup>	(4)	Attachment C.1	Generic Sequential	None	
_ocation: Room 2	Aging	N/A	40 years	(2)	Attachment C.2	Generic Mat'l Test	None	
Flood Level Elev: 552' Shove Flood Level: Yes X No	Submergence	N/A	N/A	(4)	N/A	N/A	, None	

votes: (1) See Section 2.4 in 79-01B report.

(2) See Section 4.1.2 in 79-01B report.

(3) All notes and other information not on these sheets are on the attached appendix sheets.

(4) See Section 3.0 and/or Appendix B in 79-01B report.

Prepared by: H.D. Rominauskil Reviewed by

QA Acceptance:

Attachment A

EEB \_74-0099\_

Rev O

System: 74 Unit: 3

Component: Cable, 2/c, #18AWG Mark: WVA-1

5 +

Plant I. D. No.	Room	Function/Service	Category	Operating Time	
3A2436	2	TTS-74-136A Cont	A	l year	

## EEB \_ 74-0099

Rev O

4

## ATTACHMENT B

\* \*

Mark WVA-1

	Contract No.	Туре	Manufacturer
	68C7-61986 78K5-824171 72C7-83944 72C7-74910-1	PE/PVC XLPE/CSPE XLPE/CSPE XLPE/CSPE	Continental Wire & Cable Rockbestos Continental Wire & Cable Continental Wire & Cable
TR	From SQN 73C7-84211	XLPE/CSPE	· · m
TR	85255 from SQN 72C7-83944	XLPE/CSPE	Continental Wire & Cable
TR	87049 from SQN 73C7-84211	XLPE/CSPE	ш
TR	86757 from SQN 73C7-84211	XLPO/CSPE	ITT
TR	823079 from WBN 74C7-85259	XLPE/CSPE	8e1den

ŝ

....

× \*

Facility: Browns Ferry Nuclear Plant . Unit: 3 Docket: 50-296

SYSTEM COMPONENT EVALUATION WORK SHEET (Rev 2)

(3) Sheet No.EEB 74-0100 Revision O Date 10/12/00

DOCKEL. 30-290						Date 10/22/80	2	
EQUIPMENT DESCRIPTION	ENVIRONMENT			DOCUMENTATION REF		QUALIFICATION METHOD	OUTSTANDING ITEMS	
EQUIFMENT DESCRIPTION	Parameter	Specifi- cation	Qualifi- cation	Specifi- cation	Qualifi- cation	nemos	1100	
System: 74 Plant ID No. Attachment A	Operating Time	Attachment A	l year	(1)	Attachment C3	Engineering Analysis and Test	None	
Component Cable WVA-1 2/c, #18 AWG, XLPE Manufacturer: Attachment B	Temperature (°F)	294	385	(4)	Attachment C-1	Generic Simultaneous Test	None	
Model Number: N/A	Pressure (PSIA)	15.0	N/A	(4)	N/A	N/A	None	
Function: Signal/Instrumentation	Relative Humidity (%)	100	100	(4)	Attachment C.1	Generic Simultaneous Test	None	
Accuracy: Req'd: N/A Demon: N/A Category:Attachment A	Chemical Spray	N/A	N/A	(4)	N/A	N/A	None	
Service: Attachment A	Radiation (RAD)	3x10 <sup>7</sup>	2×10 <sup>8</sup>	(4)	Attachment C.1		None	
Location: Room 5	Aging	N/A	40 years	(2)	Attachment C.2	Generic Mat'l Test	None	
Flood Level Elev: 552' Above Flood Level: Yes X	Submergence	N/A	N/A	(4)	N/A	N/A	, None	

votes: (1) See Section 2.4 in 79-01B report.

- (2) See Section 4.1.2 in 79-01B report.
- (3) All notes and other information not on these sheets are on the attached appendix sheets.

(4) See Section 3.0 and/or Appendix B in 79-01B report.

Prepared by: H. D. Romanalale

Reviewed by: Marale

QA Acceptance

EEB \_14-0100

Rev O

System: 74 Unit: 3

\*\*

Component: Cable, 2/c, #18AWG Mark: WVA-1

Plant I. D. No.	Room	Function/Service	Category	Operating Time
3A2427	5	TTS-136B Cont	A	1 year

## EEB \_ 74-0100

Rev \_\_\_\_

## ATTACHMENT B

#### Mark WVA-1

#### Contract No.

### Туре

#### Manufacturer

	and and a second s		Constitution on the local data		Contract Charles and Charles and	and the subject of the stands	
	68C7-61986 78K5-824171 72C7-83944 72C7-74910-1		PE/PVC XLPE/CSPE XLPE/CSPE XLPE/CSPE		Continental Rockbestos Continental Continental	Wire &	Cable
TR	From SQN 73C7-84211		XLPE/CSPE		ITT		
TR	85255 from SQN 72C7-83944	¥.	XLPE/CSPE		Continental	Wire &	Cable
TR	87049 from SQN 73C7-84211		XLPE/CSPE	*	ITT		
TR	86757 from SQN 73C7-84211		XLPO/CSPE		ITT		
TR	823079 from WBN 74C7-85259		XLPE/CSPE		Belden		

Sheet No: EEB - 74 -0100

Revision: 0

#### ATTACHMENT C

C.1 TVA Engineering Report No. 1945

Cable types: Coax, Triax, and Signal Cables of Cross-Linked Polyethylene Construction

Rooms: 0-18

For signal cables which utilize cross-linked polyethylene insulation, and the jacket is chlorosulfonated polyethylene or neoprene. The following LOCA/SLB tests apply:

Wyle Laboratory Test Report 43854-3 dated April 26, 1978, LOCA and SLB Qualification Test of Cables and Cable Splices.

Franklin Institute Test Report F-C4113 dated May 1975.

Rockbestos Company Test Report dated July 1977, amended 1979.

Franklin Institute Test Report F-C5120 dated May 1980.

These cables are qualified by the above for all HELB areas and the LOCA/SLB of the containment.

- C.2 NUREG-0588 Material List
- C.3 Because of the conservatism of the tests for XLPE and for silicone insulation, including the severity of the mandrel bend and dielectric test in water after the combined LOCA/SLB profile, it is our engineering judgment that there is sufficient margin to give reasonable assurance of continued operability more than a year in the post-LOCA environment.

Reviewed	by:	
Prepared	by:	
QA Accept	ance:	

Facility: Browns Ferry Nuclear Plant Unit: 3 Docket: 50-296

SYSTEM COMPONENT EVALUATION WORK SHEET (Rev 2)

Sheet No. EEB 74-0101. Revision

DUCKEE. 00 COU						Uate 10/22	80
EQUIPMENT DESCRIPTION	ENVIRONMENT			DOCUMENTATION REF		QUALIFICATION	OUTSTANDING ITEMS
	Parameter	Parameter Specifi- Qualifi- Specifi- Qualifi- cation cation cation		METHOD			
System: 74 Plant ID No. Attachment A	Operating Time	Attachment A	1 Year	(1)	Attachment C.3	Engineering Analysis	None
Component Cable WVA-1 2/c, #18 AWG, PE Manufacturer: Attachment B	Temperature	158	203	-	IPCEA S-61-402 par 3.9 and Attachment C.2		None
	( <sup>0</sup> F)	150		(4)	fictuerine etc.	Accounter of the	
Model Number: N/A	Pressure (PSIA)	15.0	N/A	(4)	N/A	N/A	None
Function: Signal/Instrumentation	Relative Humidity (%)	100	100	(4)	IPCEA S-61-402 par 3.9, 3.7.3, 6.7	Standard Material Requirement	None
Accuracy: Req'd: N/A Demon: N/A Category: Attachment A	Chemical Spray	N/A	N/A	(4)	N/A	N/A	None
Service: Attachment A	Radiation (RAD)	3x10 <sup>7</sup>	4x107	(4)	NUREG-0588 Material List	Generic Material Tests	None
Location: Room 2	Aging	N/A	20 years	(2)	Attachment C.1	Oper. Experience	None
Flood Level Elev: 552' Above Flood Level: Yes X No	Submergence	N/A	N/A	(4)	N/A	. N/A	, None

Notes: (1) See Section 2.4 in 79-01B report.

- (2) See Section 4.1.2 in 79-01B report.
- (3) All notes and other information not on these sheets are on the attached appendix sheets.

(4) See Section 3.0 and/or Appendix B in 79-01B report.

Prepared by: H.D. Rimmawski

Reviewed by: (

(3)

Dato

0

10/12/00

makel

QA Acceptance:

Attachment A

EEB \_74-0101

Rev O

System: 74 Unit: 3

Component: Cable, 2/c, #18AWG Mark: WVA-1

5 ×

Plant I. D. No.	Room	Function/Service	Category	Operating Time
3A2436	2	TTS-74-136A Cont	A	1 year

## EEB \_74-0101

Rev \_\_\_\_\_

## ATTACHMENT B

Mark WVA-1

	Contract No. Type		Manufacturer	
	6SC7-61986 78K5-824171 72C7-83944 72C7-74910-1	•	PE/PVC XLPE/CSPE XLPE/CSPE XLPE/CSPE	Continental Wire & Cable Rockbestos Continental Wire & Cable Continental Wire & Cable
TR	From SQN 73C7-84211		XLPE/CSPE	ITT
TR	85255 from SQN 72C7-83944	•	XLPE/CSPE	Continental Wire & Cable
TR	87049 from SQN 73C7-84211		XLPE/CSPE	ITT
TR	86757 from SQN 73C7-84211		XLPO/CSPE	ITT
TR	823079 from WBN 74C7-85259		XLPE/CSPE	Belden

Sheet No: EEB- 74-0101

Revision: 0

#### ATTACHMENT C

C.1 TVA Engineering Report No. 1942

#### Coax, Triax, and Signal Cable

Coaxial and Triaxial cable installed at Browns Ferry were purchased in accordance with General Electric Company Specification 22A1181, and the appropriate MIL-C-17 specification. Signal cables, both twisted pair and multiconductor, were purchased in accordance with TVA specifications. Some cable were of cross-linked polyethylene and chloronated polyethylene construction while the same kind of cable furnished under other contracts were of high molecular weight, high density polyethylene/polyvinyl chloride construction and some even polyethylene/polyvinyl chloride construction. It is not possible to make a complete identification by contract as to which circuit and function they serve. Recent reclassification of some functions to 1E status has made it almost a certainty that some cables now in a safety category are of polyethylene/polyvinyl construction.

Accordingly, we have examined the 20 HELB temperature profiles and find that only compartments 1, 3, 6, and 9 show profiles which more than briefly surpass the softening temperature of the linear polyethylene. However, owing to the thermal time lag in the cable material and the cable installation including the heat sink of conduit, tray, and shield material, the insulation will not experience the HELB temperature profile until some time has elapsed and the temperature is lower. Further, no load heat rise need be taken into account for these signal cables.

TVA has conducted tests (Chattanooga Central Laboratories Report No. L81-81-6821 dated October 1980, of PE, PVC cables under a temperature profile which envelops all the HELB profiles. Following this exposure, these cables sustained a dielectric test while immersed in water of 660 volts for 5 minutes, 960 volts for 5 minutes, and 220 volts ac for 5 minutes in succession.

It is therefore our engineering judgment that this test confirms the above and justifies interim operation until these types can be fully qualified by our Wyle Laboratory tests to be concluded next April, or replaced at the next refueling outage.

For those cables located in compartment 0 (the containment), the service which these cables have seen thus far has exposed them to a gamma radiation dose of  $6.25 \times 10^{9}$  rads or more. This is sufficient to have cross-linked the polyethylene and PVC as well. Consequently, the insulation is now in fact a thermoset material and is capable of the same temperature that TVA's cross-linked polyethylene cable has demonstrated and is capable of withstanding the LOCA/SLB and the post-LOCA environment for a year.

Sheet No: EEB- 74-0101

Revision: 0

ATTACHMENT C (Continued)

C.1 (Continued)

Continued operation is justified, and TVA has prepared a LOCA/SLB, thermal aging, and radiation test procedure to be performed by Wyle Laboratories on samples of this cable to demonstrate the validity of this conclusion. Results of this testing program are expected to be available in April 1981.

One cable RG-114A/U has the possibility of being sensitive to pressure changes owing to its partial air dielectric; however, an analysis of this effect has indicated that the change in dielectric constant can be tolerated. Consequently for this cable too, there is justification for continued operation. The compression effect on the dielectric will be likewise tested at Wyle Laboratories along with the other cable tests and results are expected to be available by April 1981.

- C.2 Standard Material Long-Term Overload Temperature Rating
- C.3 The post-HELB conditions are less than the normal cable rating and, in our judgment, the cables could operate satisfactorily for a post-accident of a year.

Prepared by:	
Reviewed by:	
QA Acceptance:	

Facility: Browns Ferry Nuclear Plant Unit: 3

SYSTEM COMPONENT EVALUATION WORK SHEET (Rev 2)

(3)Sneet No. EEB 74-0102 Revision 0

Date 10/22/80

Docket: 50-296

EQUIPMENT DESCRIPTION	ENVIRONMENT			DOCUMENTATION REF		QUALIFICATION METHOD	OUTSTANDING ITEMS
	Parameter	Specifi- cation	Qualifi- cation	Specifi- cation	Qualifi- cation	hemou	TTENS
System: 74 Plant ID No. Attachm	Operating Time	Attachment A	1 Year	(1)	Attachment C.3	Engineering Analysis	None
Component Cable WVA-1 2/c, #18 AWG, PE Manufacturer: Attachment B	Temperature (°F)	294	203	(4)	IPCEA S-61-402 par 3.9 and Attachment C.2	Attachment C.2	None
Model Number: N/A Function: Signal/Instrumentation Accuracy: Req'd: N/A Demon: N/A Category: Attachment A	Pressure (PSIA)	15.0	N/A	(4)	N/A	N/A	None
	Relative Humidity (%)	100	100	(4)	IPCEA S-61-402 par 3.9, 3.7.3, 6.7	Standard Material Requirement	None
	Chemical Spray	N/A	N/A	(4)	N/A	N/A	None
Service: Attachment A	Radiation (RAD)	3x10 <sup>7</sup>	4x107	(4)	NUREG-0588 Material List	Generic Material Tests	None
Location: Room 5	Aging	N/A	20 years	(2)	Attachment C.1	Oper. Experience	None
Flood Level Elev: 552' Above Flood Level: Yes X No	Submergence	N/A	N/A	(4)	N/A	. N/A	, None

Votes: (1) See Section 2.4 in 79-01B report.

- (2) See Section 4.1.2 in 79-015 report.
- (3) All notes and other information not on these sheets are on the attached appendix sheets.

(4) See Section 3.0 and/or Appendix B in 79-01B report.

Prepared by: H. & Romenaus

Bradley

QA Acceptance:

Reviewed by

Attachment A

EEB \_74- 1102\_\_\_\_

Rev O

System: 74 Unit: 3

Component: Cable, 2/c, #18AWG Mark: WVA-1

8.1

Plant I. D. No.	Room	Function/Service	Category	Operating Time	
3A2427	5	TTS-136B Cont	A	l year	

# EEB \_\_\_\_\_\_\_

Rev \_\_\_\_\_

# ATTACHMENT B

Mark WVA-1

Contract No.		Туре	Manufacturer
	68C7-61986 78K5-824171 72C7-83944 72C7-74910-1	PE/PVC XLPE/CSPE XLPE/CSPE XLPE/CSPE	Continental Wire & Cable Rockbestos Contirental Wire & Cable Continental Wire & Cable
Т	R From SQN 73C7-84211	XLPE/CSPE	III
T	R 85255 from SQN 72C7-83944	, XLPE/CSPE	Continental Wire & Cable
T	R 87049 from SQN 73C7-84211	XLPE/CSPE	ITT
Т	R 86757 from SQN 73C7-84211	XLP0/CSPE	ITT
Т	R 823079 from WBN 74C7-85259	XLPE/CSPE	Belden

Sheet No: EEB- 74-0:02

Revision: 0

#### ATTACHMENT C

#### C.1 TVA Engineering Report No. 1942

### Coax, Triax, and Signal Cable

Coaxial and Triaxial cable installed at Browns Ferry were purchased in accordance with General Electric Company Specification 22A1181, and the appropriate MIL-C-17 specification. Signal cables, both twisted pair and multiconductor, were purchased in accordance with TVA specifications. Some cable were of cross-linked polyethylene and chloronated polyethylene construction while the same kind of cable furnished under other contracts were of high molecular weight, high density polyethylene/polyvinyl chloride construction and some even polyethylene/polyvinyl chloride construction. It is not possible to make a complete identification by contract as to which circuit and function they serve. Recent reclassification of some functions to 1E status has made it almost a certainty that some cables now in a safety category are of polyethylene/polyvinyl construction.

Accordingly, we have examined the 20 HELB temperature profiles and find that only compartments 1, 3, 6, and 9 show profiles which more than briefly surpass the softening temperature of the linear polyethylene. However, owing to the thermal time lag in the cable material and the cable installation including the heat sink of conduit, tray, and shield material, the insulation will not experience the HELB temperature profile until some time has elapsed and the temperature is lower. Further, no load heat rise need be taken into account for these signal cables.

TVA has conducted tests (Chattanooga Central Laboratories Report No. L81-81-6821 dated October 1980, of PE, PVC cables under a temperature profile which envelops all the HELB profiles. Following this exposure, these cables sustained a diel ctric test while immersed in water of 660 volts for 5 minutes, 960 volts for 5 minutes, and 220 volts ac for 5 minutes in succession.

It is therefore our engineering judgment that this test confirms the above and justifies interim operation until these types can be fully qualified by our Wyle Laboratory tests to be concluded next April, or replaced at the next refueling outage.

For those cables located in compartment 0 (the containment), the service which these cables have seen thus far has exposed them to a gamma radiation dose of 6.25 x 10<sup>6</sup> rads or more. This <sup>4</sup> sufficient to have cross-linked the polyethylene and PVC as well. Consequently, the insulation is now in fact a thermoset material and is capable of the same temperature that TVA's cross-linked polyethylene cable has demonstrated and is capable of withstanding the LOCA/SLB and the post-LOCA environment for a year.

Sheet No: EEB- 74-0102

Revision: 0

ATTACHMENT C (Continued)

C.1 (Continued)

Continued operation is justified, and TVA has prepared a LOCA/SLB, thermal aging, and radiation test procedure to be performed by Wyle Laboratories on samples of this cable to demonstrate the validity of this conclusion. Results of this testing program are expected to be available in April 1981.

One cable RG-114A/U has the possibility of being sensitive to pressure changes owing to its partial air dielectric; however, an analysis of this effect has indicated that the change in dielectric constant can be tolerated. Consequently for this cable too, there is justification for continued operation. The compression effect on the dielectric will be likewise tested at Wyle Laboratories along with the other cable tests and results are expected to be available by April 1981.

- C.2 Standard Material Long-Term Overload Temperature Rating
- C.3 The post-HELB conditions are less than the normal cable rating and, in our judgment, the cables could operate satisfactorily for a post-accident of a year.

Prepared	by:
Reviewed	by:
QA Accept	tance:

11C

Facility: Browns Ferry Nuclear Plant Unit: 3

SYSTEM COMPONENT EVALUATION WORK SHEET (Rev 2)

Docket: 50-296

DUCKEC: 00-100						Date 10/22/30	
EQUIPMENT DESCRIPTION	ENVIRONMENT		DOCUMENTATION REF		QUALIFICATION METHOD	OUTSTANDING ITEMS	
EQUIPMENT DESCRIPTION	Parameter	Specifi- cation	Qualifi- cation	Specifi- cation	Qualifi- cation	NETHOD	TTENS .
System: 74 Plant ID No Attachment A	Operating Time	Attachment A	1 Year	(1)	Attachment C.3	Engine <b>ering</b> Analys <b>is</b>	None
Component Cable WVA-1 2/c, #18 AWG, CSPE Manufacturer: Attachment B	Temperature (°F)	158	250	(4)	Attachment C.1	Generic Simultaneous Test	None ·
Model Number: N/A	Pressure (PSIA)	15.0	N/A	(4)	N/A	N/A	None
Function: Signal/Instrumentation	Relative Humidity (%)	100	100	(4)	Attachment C.1	Generic Simultaneous Test	None
Accuracy: Req'd: N/A Demon: N/A Category: Attachment A	Chemical Spray	N/A	N/A	(4)	N/A	N/A	None
Service: Attachment A	Radiation (RAD)	3x107	5x10 <sup>7</sup>	(4)	Attachmen: C.1	1656	None
_ocation: Room 2	Aging	N/A	40 years	(2)	Attachment C.2	Generic Mat'l Test	None
Flood Level Elev: 552' Above Flood Level: Yes X	Submergence	N/A	N/A	(4)	N/A	N/A	, None

votes: (1) See Section 2.4 in 79-018 report.

- (2) See Section 4.1.2 in 79-01B report.
- (3) All notes and other information not on these sheets are on the attached appendix sheets.

(4) See Section 3.0 and/or Appendix B in 79-01B report.

(3)

Revision

Date

Sheet No. EEB 74-0103

0

10/22/80

Prepared by: K. & Romenewskips

QA Acceptance

Attachment A

EEB 74-0103

Rev O

System: 74 Unit: 3

Component: Cable, 2/c, #18AWG Mark: WVA-1

Plant I. D. No.	Room	Function/Service	Category	Operating Time	
3A2436	2	TTS-74-136A Cont	A	1 year	

# EEB \_74-0103

Rev \_\_\_\_\_O

# ATTACHMENT B

# Mark WVA-1

Contract No.			Туре	Manufacturer
	68C7-61986 78K5-824171 72C7-83944 72C7-74910-1		PE/PVC XLPE/CSPE XLPE/CSPE XLPE/CSPE	Continental Wire & Cable Rockbestos Continental Wire & Cable Continental Wire & Cable
TR	From SQN 73C7-84211		XLPE/CSPE	ITT
TR	85255 from SQN 72C7-83944	i.	XLPE/CSPE	Continental Wire & Cable
TR	87049 from SQN 73C7-84211		XLPE/CSPE	ITT
TR	86757 from SQN 73C7-84211		XLPO/CSPE	ITT
TR	823079 from WBN 74C7-85259		XLPE/CSPE	Belden

Sheet No.: EEB-74-0103

Revision: O

#### ATTACHMENT C

C.1 TVA Engineering Report No. 1947

Cable types: Coax, Triax, and Signal Cables of Cross-Linked Polyethylene Construction

Rooms: 0~18

For signal cables which utilize cross-linked polyethylene insulation, and the jacket is chlorosulfonated polyethylene or neoprene. The following LOCA/SLB tests apply:

Wyle Laboratory Test Report 43854-3 dated April 26, 1978, LOCA and SLB Qualification Test of Cables and Cable Splices.

Franklin Institute Test Report F-C4113 dated May 1975.

Rockbestos Company Test Report dated July 1977, amended 1979.

Franklin Institute Test Report F-C5120 dated May 1980.

These cable are qualified by the above for all HELB areas and the LOCA/SLB of the containment.

- C.2 NUREG-0588 Material List
- C.3 Because of the conservatism of the tests for XLPE and for silicone insulation, including the severity of the mandrel bend and dielectric test in water after the combined LOCA/SLB profile, it is our engineering judgment that there is sufficient margin to give reasonable assurance of continued operability more than a year in the post-LOCA environment.

Prepared	by:
Reviewed	by:
QA Accept	tance:

SYSTEM COMPONENT EVALUATION WORK SHEET (Rev 2)

Facility: Browns Ferry Nuclear Plant Unit: 3 Docket: 50-296

(3) Sheet No. EEB 74-0104 Revision O

Date 10/22/80

OUTSTANDING **OUALIFICATION** DOCUMENTATION REF ENVIRONMENT ITEMS METHOD EQUIPMENT DESCRIPTION Specifi-Qualifi-Specifi-Qualification Parameter cation cation cation System: 74 Attachment A Operating None Engineering Attachment 1 Year Time Plant ID No. Attachment A Analysis C.3 (1) Component Cable WVA-1 Generic 2/c, #18 AWG, CSPE Simultaneous Temperature None Manufacturer: Attachment B Test 294 Attachment C. 1 250 (4) (°F) None N/A N/A N/A Pressure Model Number: N/A (PSIA) (4) 15.0 Function: Generic Signal/Instrumentation Relative Simultaneous Attachment C.1 Humidity (%) 100 (4) 100 Test None Accuracy: Reg'd: N/A Demon: N/A Chemical Spray Category: Attachment A None N/A N/A (4) N/A N/A Service: Attachment A Generic Radiation Sequential 5x107 Attachment C.1 (4) None (RAD) Test 3x107 None Room 5 Generic Mat'l Test \_ocation: Attachment C.2 40 years (2) Aging N/A 3 Flood Level Elev: 552' None N/A N/A

N/A

(4)

totes: (1)See Section 2.4 in 79-018 report.

No

Above Flood Level: Yes X

- (2) See Section 4.1.2 in 79-01B report.
- (3) All notes and other information not on these sheets are on the attached appendix sheets.

Submergence

N/A

(4) See Section 3.0 and/or Appendix B in 79-01B report.

QA Acceptance:

Prepared by: H. D. Romenwakifson Reviewed by: Albrally

ALLALIMENL A

EEB 74-0104

Rev O

System: 74 Unit: 3

Component: Cable, 2/c, #18AWG Mark: WVA-1

Plant I. D. No.	Room	Function/Service	Category	Operating lime	
3A2427	5	TTS-136B Cont	A	l year	

# EEB \_\_\_\_\_\_

Rev O

# ATTACHMENT B

Mark WVA-1

	Contract No. Type		Manufacturer	
	68C7-61986 78K5-824171 72C7-83944 72C7-74910-1		PE/PVC XLPE/CSPE XLPE/CSPE XLPE/CSPE	Continental Wire & Cable Rockbestos Continental Wire & Cable Continental Wire & Cable
TR	From SQN 73C7-84211		XLPE/CSPE	ITT
TR	85255 from SQN 72C7-83944		XLPE/CSPE	Continental Wire & Cable
TR	87049 from SQN 73C7-84211		XLPE/CSPE	ITT
TR	86757 from SQN 73C7-84211		XLPO/CSPE	ITT
TR	823079 from WBN 74C7-85259		XLPE/CSPE	Belden

Sheet No .: EEB -74-0104

Revision: O

#### ATTACHMENT C

C.1 TVA Engineering Report No. 1947

Cable types: Coax, Triax, and Signal Cables of Cross-Linked Polyethylene Construction

Rooms: 0-18

For signal cables which utilize cross-linked polyethylene insulation, and the jacket is chlorosulfonated polyethylene or neoprene. The following LOCA/SLB tests apply:

Wyle Laboratory Test Report 43854-3 dated April 26, 1978, LOCA and SLB Qualification Test of Cables and Cable Splices.

Franklin Institute Test Report F-C4113 dated May 1975.

Rockbestos Company Test Report dated July 1977, amended 1979.

Franklin Institute Test Report F-C5120 dated May 1980.

These cable are qualified by the above for all HELB areas and the LOCA/SLB of the containment.

- C.2 NUREG-0588 Material List
- C.3 Because of the conservatism of the tests for XLPE and for silicone insulation, including the severity of the mandrel bend and dielectric test in water after the combined LOCA/SLB profile, it is our engineering judgment that there is sufficient margin to give reasonable assurance of continued operability more than a year in the post-LOCA environment.

Prepared	by:
Reviewed	by:
QA Accept	tance:

SYSTEM COMPONENT EVALUATION WORK SHEET (Rev 2)

Facility: Browns Ferry Nuclear Plant Unit: 3 Docket: 50-296

(3)Sheet No. FFB 74-0105 Revision 0

Date 10/22/80

**C**IALIFICATION OUTSTANDING DOCUMENTATION REF ENVIRONMENT METHOD ITEMS EQUIPMENT DESCRIPTION Qualifi-Qualifi-Specifi-Specification cation cation Parameter cation System: 74 Engineering None Attachment C.3 1 year Operating Attachment A Analysis and Plant ID No. Attachment A Time Test (1)Component Cable WVB 3/c, #16 AWG, XLPE Generic Simultaneous Temperature (°F) 158 Manufacturer: Attachment B None Attachment C.1| Test (4) 385 None N/A N/A Pressure N/A Model Number: N/A 15.0 (PSIA) (4) Function: Generic Signal/Instrumentation Relative Simul taneous Humidity (%) (4) None Attachment C.1| Test 100 100 Accuracy: Reg'd: N/A Demon: N/A Chemical Spray Category: Attachment A (4) None N/A N/A N/A N/A Service: Attachment A Generic Radiation Sequential 2x10<sup>8</sup> 3×107 Attachment C.1 (RAD) (4) None Test Generic Mat'l Test Room 2 \_ocation: None Attachment C.2 (2) 40 years N/A Aging Flood Level Elev: 552' None N/A N/A N/A bove Flood Level: Yes X N/A Submergence

(4)

votes: (1) See Section 2.4 in 79-018 report.

No

(2) See Section 4.1.2 in 79-01B report.

(3) All notes and other information not on these sheets are on the attached appendix sheets.

See Section 3.0 and/or Appendix B in 79-01B report. (4)

Prepared by: H. D. Romenowski

Reviewed by: MBrall

OA Acceptance:

# EEB \_74-0105

Rev O

## ATTACHMENT B

Mark WVB

1

### Contract No.

72C7-83849 72C7-74910-2 69C3-64863-1

TR 822675 from WBN 74C7-85259

TR 820907 from 74C7-85259

73C7-84211

2.1

11

CSPE/CSPE

Type

XLPE/CSPE

XLPE/CSPE

XLPE/CSPE

x

PE/PVC

Manufacturer

BIW Okonite Rockbestos

Belden Corporation

Belden Corporation

-11-

ITT Surp.

Sheet No: EEB - 74-0105

Revision: 0

#### ATTACHMENT C

C.1 TVA Engineering Report No. 1945

Cable types: Coax, Triax, and Signal Cables of Cross-Linked Polyethylene Construction

Rooms: 0-18

For signal cables which utilize cross-linked polyethylene insulation, and the jacket is chlorosulfonated polyethylene or neoprene. The following LOCA/SLB tests apply:

Wyle Laboratory Test Report 43854-3 dated April 26, 1978, LOCA and SLB Qualification Test of Cables and Cable Splices.

Franklin Institute Test Report F-C4113 dated May 1975.

Rockbestos Company Test Report dated July 1977, amended 1979.

Franklin Institute Test Report F-C5120 dated May 1980.

These cables are qualified by the above for all HELB areas and the LOCA/SLB of the containment.

- C.2 NUREG-0588 Material List
- C.3 Because of the conservatism of the tests for XLPE and for silicone insulation, including the severity of the mandrel bend and dielectric test in water after the combined LOCA/SLB profile, it is our engineering judgment that there is sufficient margin to give reasonable assurance of continued operability more than a year in the post-LOCA environment.

Reviewed by:
Prepared by:
QA Acceptance:

13C

Facility: Browns Ferry Nucl Unit:3 Cocket: 50-296	ear Plant	SYSTEM COMP	ONENT EVALUA	TION WORK SH	HEET (Rev 2)	(3) Sheet No. EEB 74 Revision O Date 10/22/80	
CONTRACT DECONDITION		ENVIRONMENT		DOCUMEN	TATION REF	QUALIFICATION METHOD	OUTSTANDING ITEMS
EQUIPMENT DESCRIPTION	Parameter	Specifi- cation	Qualifi- cation	Specifi- cation	Qualifi- cation	ne moo	
System: 74 Plant ID No. Attachment A	Operating Time	Attachment A	l year	(1)	Attachment C.3	Engineering Analysis and Test	None
Component Cable WVB· 3/x, #16 AWG, XLPE	Tomocratume					Generic Simultaneous	
Manufacturer: Attachment B	Temperature (°F)	294	385	(4)	Attachment C.1	Test	None '
todel Number: M/A	Pressure (PSIA)	15.0	N/A	(4)	N/A	N/A	None
Function: Signal/Instrumentation	Relative Humidity (%)	100	100	(4)	Attachment C.1	Generic Simultaneous Test	None
Accuracy: Req'd: N/A Demon: N/A Category:Attachment A	Chemical Spray	N/A	N/A	(4)	N/A	N/A	None
Service: Attachment A	Radiation (RAD)	3×10 <sup>7</sup>	2×10 <sup>8</sup>	(4)	Attachment C.1		None
_ocation: Room 5	Aging	N/A	40 years	(2)	Attachment C.2	Generic Mat'l Test	None
Flood Level Elev: 552' Sove Flood Level: Yes X No	Submergence	N/A	N/A	(4)	N/Å	N/A	None

votes: (1) See Section 2.4 in 79-01B report.

- (2) See Section 4.1.2 in 79-01B report.
- (3) All notes and other information not on these sheets are on the attached arpendix sheets.

(4) See Section 3.0 and/or Appendix B in 79-01B report.

Prepared by: H. D. Romanowia

Reviewed by: (

QA Acceptance:

Attachment A

EEB 74-0106

Rev \_\_\_\_O

System: 74 Unit: 3

Component: Cable, 3/c, #16AWG Mark: WVB

3 +

Plant I. D. No.	Room	Function/Service	Category	Operating Time	
3R2267	5	TE-74-95B Steam Line		1 year	
3R2277	5	TE-74-95G Steam Line		1 year	

.....

### EEB 74-0106

Rev O

## ATTACHMENT B

Mark WVB

## Contract No.

#### Type

### Manufacturer

72C7-83849 72C7-74910-2 69C3-64863-1

- TR 822675 from WBN 74C7-85259
- TR 820907 from 74C7-85259

R

11

1

73C7-84211

CSPE/CSPE XLPE/CSPE PE/PVC

XLPE/CSPE

## XLPE/CSPE

Belden Corporation

11

 $k_{\rm H} = k_{\rm H} +$ 

Belden Corporation

ITT Surp.

BIW

Okonite

Rockbestos

Sheet No: EEB 74-0106

Revision: 0

#### ATTACHMENT C

C.1 TVA Engineering Report No. 1945

Cable types: Coax, Triax, and Signal Cables of Cross-Linked Polyethylene Construction

Rooms: 0-18

For signal cables which utilize cross-linked polyethylene insulation, and the jacket is chlorosulfonated polyethylene or neoprene. The following LOCA/SLB tests apply:

Wyle Laboratory Test Report 43854-3 dated April 26, 1978, LOCA and SLB Qualification Test of Cables and Cable Splices.

Franklin Institute Test Report F-C4113 dated May 1975.

Rockbestos Company Test Report dated July 1977, amended 1979.

Franklin Institute Test Report F-C5120 dated May 1980.

These cables are qualified by the above for all HELB areas and the LOCA/SLB of the containment.

- C.2 NUREG-0588 Material List
- C.3 Because of the conservatism of the tests for XLPE and for silicone insulation, including the severity of the mandrel bend and dielectric test in water after the combined LOCA/SLB profile, it is our engineering judgment that there is sufficient margin to give reasonable assurance of continued operability more than a year in the post-LOCA environment.

Reviewed by:
Prepared by:
QA Acceptance:

SYSTEM COMPONENT EN	VALUATION WORK	SHEET (	Rev	21
---------------------	----------------	---------	-----	----

Facility: Browns Ferry Nuclear Plant Unit: 3 Docket: 50-296

(3) Sheet No. EEB 74-0107 Revision 0

Date 10/22/80

o o o no o n						0000 10/00/00	
EQUIPMENT DESCRIPTION	ENVIRONMENT		DOCUMENTATION REF		QUALIFICATION METHOD	OUTSTANDING ITEMS	
EQUIPMENT DESCRIPTION	Parameter	Specifi- cation	Qualifi- cation	Specifi- cation	Qualifi- cation	ALTION	
System: 74 Plant ID No. Attachment A	Operating Time	Attachment A	l year	(1)	Attachment C3	Engineering Analysis and Test	None
Component Cable WVB 3/x, #16 AWG, XLPE Manufacturer: Attachment B	Temperature (°F)	157	385	(4)	Attachment C-1	Generic Simultaneous Test	None ·
Model Number: N/A	Pressure (PSIA)	15.0	N/A	(4)	N/A	N/A	None
Function: Signal/Instrumentation	Relative Humidity (%)	100	100	(4)	Attachment C.1	Generic Simultaneous Test	None
Accuracy: Req'd: N/A Demon: N/A Category:Attachment A	Chemical Spray	N/A	N/A	(4)	N/A	N/A	None
Service: Attachment A	Radiation (RAD)	2.1x10 <sup>7</sup>	2x10 <sup>8</sup>	(4)	Attachment C.1	- 1 had be and a second second	None
_ocation: Room 8	Aging	N/A	40 years	(2)	Attachment C.2	Generic Mat'l Test	None
Flood Level Elev: 552' Above Flood Level: Yes X No	Submergence	N/A	N/A	(4)	N/A	N/A	, None

Notes: (1) See Section 2.4 in 79-01B report.

(2) See Section 4.1.2 in 79-01B report.

(3) All notes and other information not on these sheets are on the attached appendix sheets.

(4) See Section 3.0 and/or Appendix B in 79-018 report.

Prepared by: H. D. Roman and ABidley Reviewed by

QA Acceptance:

EEB 77-0107

Rev O

System: 74 Unit: 3

Component:Cable, 3/c, #16AWC Mark: WVB

Plant I. D. No.	Room	Function/Service	Category	Operating Time
3R2268	8	TE-74-95C Steam Line		l year
3R2269	8	TE-74-95D Steam Line		l year

-----

# EEB \_74-0107

Rev O

## ATTACHMENT B

Mark WVB

# Contract No.

72C7-83849

7207-74910-2

69C3-64863-1

## Type

CSPE/CSPE

XLPE/CSPE

XLPE/CSPE

XLPE/CSPE

PE/PVC

#### Manufacturer

BIW Okonite Rockbestos

Belden Corporation

Belden Corporation

ITT Surp.

74C7-85259

TR 820907 from

TR 822675 from WBN 74C7-85259

1

12

73C7-84211

Sheet No: EEB 74-0107

Revision: 0

#### ATTACHMENT C

C.1 TVA Engineering Report No. 1945

Cable types: Coax, Triax, and Signal Cables of Cross-Linked Polyethylene Construction

Rooms: 0-18

For signal cables which utilize cross-linked polyethylene insulation, and the jacket is chlorosulfonated polyethylene or neoprene. The following LOCA/SLB tests apply:

Wyle Laboratory Test Report 43854-3 dated April 26, 1978, LOCA and SLB Qualification Test of Cables and Cable Splices.

Franklin Institute Test Report F-C4113 dated May 1975.

Rockbestos Company Test Report dated July 1977, amended 1979.

Franklin Institute Test Report F-C5120 dated May 19-0.

These cables are qualified by the above for all HELB areas and the LOCA/SLB of the containment.

- C.2 NUREG-0588 Material List
- C.3 Because of the conservatism of the tests for XLPE and for silicone insulation, including the severity of the mandrel bend and dielectric test in water after the combined LOCA/SLB profile, it is our engineering judgment that there is sufficient margin to give reasonable assurance of continued operability more than a year in the post-LOCA environment.

Reviewed	by:
Prepared	by:
QA Accep	tance:

SYSTEM COMPONENT EVALUATION WORK SHEET (Rev 2)

Facility: Browns Ferry Nuclear Plant Unit: 3 Docket: 50-296

OUTSTANDING QUALIFICATION ENVIRONMENT DOCUMENTATION REF METHOD ITEMS EQUIPMENT DESCRIPTION Qualifi-Specifi-Qualifi-Specification cation Parameter cation cation System: 74 Attachment C.3 Engineering None Operating Attachment A 1 year Analysis and Time Plant ID No. Attachment A . . . . Test (1)Component Cable WVB Generic 3/c. #16 AWG, XLPE Simultaneous Temperature (°F) Manufacturer: Attachment B 199 None (4) Attachment C.1| Test 385 None N/A N/A Pressure N/A Model Number: N/A (PSIA) 15.0 (4) Function: Generic Signal/Instrumentation Relative Simultaneous Humidity (%) (4) Attachment C.1| Test None 100 100 Accuracy: Reg'd: N/A Demon: N/A Chemical Spray Category: Attackment A (4) N/A None N/A N/A N/A Service: Attachment A Generic Radiation Sequential 2×10<sup>8</sup> 3.1x107 (4) Attachment C. 1 (RAD) Test None Generic Mat'l Test .ocation: None Attachment C.2 Room 12 40 years (2) Aging N/A Flood Level Elev: 552' None N/A N/A Sove Flood Level: Yes X Submergence N/A N/A (4) No

votes: (1) See Section 2.4 in 79-01B report.

- (2) See Section 4.1.2 in 79-01B report.
- (3) All notes and other information not on these sheets are on the attached appendix sheets.
- (4) See Section 3.0 and/or Appendix B in 79-01B report.

Prepared by: H.D. Kommonowski

(3)

Date 10/22/80

Revisi n O

Sheet No. EEB 74-0108 .

Reviewed by:

13

OA Acceptance:

EEB <u>17-010 X</u> Rev 0

System: 74 Unit: 3

Component: Cable, 3/c, \$16AWG Mark: WVB

Plant I. D. No. Room		Function/Service	Category	Operating Time
3R2275	12	TE-74-95E Steam Line		l year
3R2276	12	TE-74-95F Steam Line		l year

EEB \_ 74-0108

Rev O

#### ATTACHMENT B

Mark WVB

## Contract No.

## Type

## Manufacturer

72C7-83849 72C7-74910-2 69C3-64863-1

TR 822675 from WBN 74C7-85259

TR 820907 from 74C7-85259

11

73C7-84211

CSPE/CSPE XLPE/CSPE PE/PVC XLPE/CSPE

# XLPE/CSPE

Belden Corporation

11

Belden Corporation

ITT Surp.

BIW

Okonite

Rockbestos

Sheet No: EEB 74-0108

Revision: 0

#### ATTACHMENT C

C.1 TVA Engineering Report No. 1945

Cable types: Coax, Triax, and Signal Cables of Cross-Linked Polyethylene Construction

Rooms: 0-18

For signal cables which utilize cross-linked polyethylene insulation, and the jacket is chlorosulfonated polyethylene or neoprene. The following LOCA/SLB tests apply:

Wyle Laboratory Test Report 43854-3 dated April 26, 1978, LOCA and SLB Qualification Test of Cables and Cable Splices.

Franklin Institute Test Report F-C4113 dated May 1975.

Rockbestos Company Test Report dated July 1977, amended 1979.

Franklin Institute Test Report F-C5120 dated May 1980.

These cables are qualified by the above for all HELB areas and the LOCA/SLB of the containment.

- C.2 NUREG-0588 Material List
- C.3 Because of the conservatism of the tests for XLPE and for silicone insulation, including the severity of the mandrel bend and dielectric test in water after the combined LOCA/SLB profile, it is our engineering judgment that there is sufficient margin to give reasonable assurance of continued operability more than a year in the post-LOCA environment.

Reviewed	by:
Prepared	by:
QA Accept	tance:

Facility: Browns Ferry Nuclear Plant . Unit: 3

SYSTEM COMPONENT EVALUATION WORK SHEET (Rev 2)

(3) Sheet No. EEB 74-0109 Revision O Date 10/22/80

Docket: 50-296

11

EQUIPMENT DESCRIPTION	ENVIRONMENT			DOCUMENTATION REF		QUALIFICATION METHOD	OUTSTANDING ITEMS
Equinant Description	Parameter	Specifi- cation	Qualifi- cation	Specifi- cation	Qualifi- cation	AL MOD	1100
System: 74 Plant ID No. Attachment A	Operating Time	Attachment A	1 Year	(1)	Attachment C.3	Engineering Analysis	None
Component Cable WVB <sup>.</sup> 3/c, #16 AWG, PE Manufacturer: Attachment B	Temperature (°F)	158	203	(4)	IPCEA S-61-402 par 3.9 and Attachment C.2	Attachment C.2	None .
Model Number: N/A	Pressure (PSIA)	15.0	N/A	(4)	N/A	N/A	None
Function: Signal/Instrumentation	Relative Humidity (%)	100	100	(4)	IPCEA S-61-402 par 3.9, 3.7.3, 6.7	Standard Material Requirement	None
Accuracy: Req'd: N/A Demon: N/A Category: Attachment A	Chemical Spray	N/A	N/A	(4)	N/A	N/A	None
Service: Attachment A	Radiation (RAD)	3x10 <sup>7</sup>	4x107	(4)	NUREG-0588 Material List	Generic Material Tests	None
Location: Room 2	Aging	N/A	20 years	(2)	Attachment C.1	Oper. Experience	None
Flood Level Elev: 552' Above Flood Level: Yes X No	Submergence	N/A	N/A	(4)	N/A	. N/A	, None

Notes: (1) See Section 2.4 in 79-01B report.

(2) See Section 4.1.2 in 79-01B report.

(3) All notes and other information not on these sheets are on the attached appendix sheets.

(4) See Section 3.0 and/or Appendix B in 79-01B report.

Prepared by: H. D. Romanuck

Reviewed by:

QA Acceptance:

Attachment A

EEB 74-0109

Rev O

System: 74 Unit: 3

Component: Cable, 3/c, #16AWG Mark: WVB

1 .

Plant I. D. No. Room		Function/Service		Category		Operating Time	
3R2266 3R2278	2 2	TE-74-95A Steam TE-74-95H Steam				l year 1 year	

# EEB \_74-0109

Rev O

## ATTACHMENT B

## Mark WVB

## Contract No.

## Type

### Manufacturer

72C7-83849 72C7-74910-2 69C3-64863-1

TR 822675 from WBN 74C7-85259

TR 820907 from 74C7-85259

24

73C7-84211

CSPE/CSPE XLPE/CSPE PE/PVC

XLPE/CSPE

## XLPE/CSPE

Belden Corporation

- 11

 $\dot{r}_{\rm A}$ 

Belden Corporation

ITT Surp.

BIW

Okonite

Rockbestos

Sheet No: EEB- 74-0109\_

Revision: 0

#### ATTACHMENT C

C.1 TVA Engineering Report No. 1942

### Coax, Triax, and Signal Cable

Coaxial and Triaxial cable installed at Browns Ferry were purchased in accordance with General Electric Company Specification 22A1181, and the appropriate MIL-C-17 specification. Signal cables, both twisted pair and multiconductor, were purchased in accordance with TVA specifications. Some cable were of cross-linked polyethylene and chloronated polyethylene construction while the same kind of cable furnished under other contracts were of high molecular weight, high density polyethylene/polyvinyl chloride construction and some even polyethylene/polyvinyl chloride construction. It is not possible to make a complete identification by contract as to which circuit and function they serve. Recent reclassification of some functions to 1E status has made it almost a certainty that some cables now in a safety category are of polyethylene/polyvinyl construction.

Accordingly, we have examined the 20 HELB temperature profiles and find that only compartments 1, 3, 6, and 9 show profiles which more than briefly surpass the softening temperature of the linear polyethylene. However, owing to the thermal time lag in the cable material and the cable installation including the heat sink of conduit, tray, and shield material, the insulation will not experience the HELB temperature profile until some time has elapsed and the temperature is lower. Further, no load heat rise need be taken into account for these signal cables.

TVA has conducted tests (Chattanooga Central Laboratories Report No. L81-81-6821 dated October 1980, of PE, PVC cables under a temperature profile which envelops all the HELB profiles. Following this exposure, these cables sustained a dielectric test while immersed in water of 660 volts for 5 minutes, 960 volts for 5 minutes, and 220 volts ac for 5 minutes in succession.

It is therefore our engineering judgment that this test confirms the above and justifies interim operation until these types can be fully qualified by our Wyle Laboratory tests to be concluded next April, or replaced at the next refueling outage.

For those cables located in compartment O (the containment), the service which these cables have seen thus far has exposed them to a gamma radiation dose of  $6.25 \times 10^{\circ}$  rads or more. This is sufficient to have cross-linked the polyethylene and PVC as well. Consequently, the insulation is now in fact a thermoset material and is capable of the same temperature that TVA's cross-linked polyethylene cable has demonstrated and is capable of withstanding the LOCA/SLB and the post-LOCA environment for a year.

Sheet No: EEB- 74-0109

Revision: 0

#### ATTACHMENT C (Continued)

#### C.1 (Continued)

Continued operation is justified, and TVA has prepared a LOCA/SLB, thermal aging, and radiation test procedure to be performed by Wyle Laboratories on samples of this cable to demonstrate the validity of this conclusion. Results of this testing program are expected to be available in April 1981.

One cable RG-114A/U has the possibility of being sensitive to pressure changes owing to its partial air dielectric; however, an analysis of this effect has indicated that the change in dielectric constant can be tolerated. Consequently for this caple too, there is justification for continued operation. The compression effect on the dielectric will be likewise tested at Wyle Laboratories along with the other cable tests and results are expected to be available by April 1981.

- C.2 Standard Material Long-Term Overload Temperature Rating
- C.3 The post-HELB conditions are less than the normal cable rating and, in our judgment, the cables could operate satisfactorily for a post-accident of a year.

Prepared	by:
Reviewed	by:
QA Accept	tance:

Facility: Browns Ferry Nuclear Plant Unit: 3 Docket: 50-296

SYSTEM COMPONENT EVALUATION WORK SHEET (Rev 2)

(3)Sheet No. EEB 74-0110 . Revision 0 Date 10/22/80

EQUIPMENT DESCRIPTION	ENVIRONMENT			DOCUMEN	NTATION REF	QUALIFICATION METHOD	OUTSTANDING	
Equineri Description	Parameter	Specifi- cation	Qualifi- cation	Specifi- cation	Qualifi- cation	HETHOD	TICHS	
System: 74 Plant ID No. Attachment A	Operating Time	Attachment A	1 Year	(1)	Attachment C.3	Engineering Analysis	None	
Component Cable WVB <sup>.</sup> 3/x, #16 AWG, PE Manufacturer: Attachment B	Temperature (°F)	294	203	(4)	IPCEA S-61-402 par 3.9 and Attachment C.2	Attachment C.2	None .	
Model Number: N/A	Pressure (PSIA)	15.0	N/A	(4)	N/A	N/A	None	
Function: Signal/Instrumentation	Relative Humidity (%)	100	100	(4)	IPCEA S-61-402 par 3.9, 3.7.3, 6.7	Standard Material Requirement	None	
Accuracy: Req'd: N/A Demon: N/A Category: Attachment A	Chemical Spray	N/A	N/A	(4)	N/A	N/A	None	
Service: Attachment A	Radiation (RAD)	3x10 <sup>7</sup>	4x107	(4)	NUREG-0588 Material List	Generic Material Tests	None	
Location: Room 5	Aging	N/A	20 years	(2)	Attachment C.1	Oper. Experience	None	
Flood Level Elev: 552' Above Flood Level: Yes X No	Submergence	N/A	N/A	(4)	N/A	. N/A	None	

Notes: (1) See Section 2.4 in 79-01B report.

(2) See Section 4.1.2 in 79-01B report.

(3) All notes and other information not on these sheets are on the attached appendix sheets.

(4) See Section 3.0 and/or Appendix B in 79-01B report.

Prepared by: H.B. Romanow

Reviewed by:

QA Acceptance:

11

. .

Attachment A

10110-14

EEB \_74-0110

Rev O

System: 74 Unit: 3

Component: Cab<sup>-</sup>, 3/c, #16AWG Mark: WVB

Plant I. D. No.	Room	Function/Service	Category	Operating Time	
3R2267	5	TE-74-95B Steam Line I		l year	
3R2277	5	TE-74-95G Steam Line I		1 year	

# EFB 74-0110

Rev O

## ATTACHMENT B

Mark WVB

.

# Contract No.

#### Type

Manufacturer

72C7-83849 72C7-74910-2 69C3-64863-1

TR 822675 from WBN 74C7-85259

TR 820907 from 74C7-85259

::

7307-84211

.

CSPE/CSPE XLPE/CSPE PE/PVC

XLPE/CSPE

## XLPE/CSPE

Belden Corporation

4 . A.

Belden Corporation

ITT Surp.

BIW

Okonite

Rockbestos

Sheet No: EEB- 74-0110

Revision: 0

#### ATTACHMENT C

### C.1 TVA Engineering Report No. 1942

#### Coax. Triax, and Signal Cable

Coaxial and Triaxial cable installed at Browns Ferry were purchased in accordance with General Electric Company Specification 22A1181, and the appropriate MIL-C-17 specification. Signal cables, both twisted pair and multiconductor, were purchased in accordance with TVA specifications. Some cable were of cross-linked polyethylene and chloronated polyethylene construction while the same kind of cable furnished under other contracts were of high molecular weight, high density polyethylene/polyvinyl chloride construction and some even polyethylene/polyvinyl chloride construction. It is not possible to make a complete identification by contract as to which circuit and function they serve. Recent reclassification of some functions to 1E status has made it almost a certainty that some cables now in a safety category are of polyethylene/polyvinyl construction.

Accordingly, we have examined the 20 HELB temperature profiles and find that only compartments 1, 3, 6, and 9 show profiles which more than briefly surpass the softening temperature of the linear polyethylene. However, owing to the thermal time lag in the cable material and the cable installation including the heat sink of conduit, tray, and shield material, the insulation will not experience the HELB temperature profile until some time has elapsed and the temperature is lower. Further, no load heat rise need be taken into account for these signal cables.

TVA has conducted tests (Chattanooga Central Laboratories Report No. L81-81-6821 dated October 1980, of PE, PVC cables under a temperature profile which envelops all the HELB profiles. Following this exposure, these cables sustained a dielectric test while immersed in water of 660 volts for 5 minutes, 960 volts for 5 minutes, and 220 volts ac for 5 minutes in succession.

It is therefore our engineering judgment that this test confirms the above and justifies interim operation until these types can be fully qualified by our Wyle Laboratory tests to be concluded next April, or replaced at the next refueling outage.

For those cables located in compartment 0 (the containment), the service which these cables have seen thus far has exposed them to a gamma radiation dose of  $6.25 \times 10^{\circ}$  rads or more. This is sufficient to have cross-linked the polyethylene and PVC as well. Consequently, the insulation is now in fact a thermoset material and is capable of the same temperature that TVA's cross-linked polyethylene cable has demonstrated and is capable of withstanding the LOCA/SLB and the post-LOCA environment for a year.

Sheet No: EEB- 74-0110

Revision: 0

#### ATTACHMENT C (Continued)

#### C.1 (Continued)

Continued operation is justified, and TVA has prepared a LOCA/SLB, thermal aging, and radiation test procedure to be performed by Wyle Laboratories on samples of this cable to demonstrate the validity of this conclusion. Results of this testing program are expected to be available in April 1981.

One cable RG-114A/U has the possibility of being sensitive to pressure changes owing to its partial air dielectric; however, an analysis of this effect has indicated that the change in dielectric constant can be tolerated. Consequently for this cable too, there is justification for continued operation. The compression effect on the dielectric will be likewise tested at Wyle Laboratories along with the other cable tests and results are expected to be available by April 1981.

- C.2 Standard Material Long-Term Overload Temperature Rating
- C.3 The post-HELB conditions are less than the normal cable rating and, in our judgment, the cables could operate satisfactorily for a post-accident of a year.

Prepared	by :
Reviewed	by :
QA Acceptance:	

Facility: Browns Ferry Nuclear Plant . Unit: 3 SYSTEM COMPONENT EVALUATION WURK SHEET (Rev 2)

(3) Sheet No. EEB 74-0111. Revision O Date 10 44/80

Docket: 50-296

1 11

	and the second				and the second		
EQUIPMENT DESCRIPTION	ENVIRONMENT			DOCUME	TATION REF	QUALIFICATION METHOD	OUTSTANDING ITEMS
Equinent Descrittur	Parameter	Specifi- cation	Qualifi- cation	Specifi- cation	Qualifi- cation	ALTROD	TERO
System: 74 Plant ID No. Attachment A	Operating Time	Attachment A	1 Year	(1)	Attachment C.3	Engineering Analysis	None
Component Cable WVB <sup>*</sup> 3/c, #16 AWG, PE Manufacturer: Attachme B	Temperature (°F)	157	203	(4)	IPCEA S-61-402 par 3.9 and Attachment C.2	Attachment C.2	None .
Model Number: N/A	Pressure (PSIA)	15.0	N/A	(4)	N/A	N/A	None
Function: Signal/Instrumentation	Relative Humidity (2)	100	100	(4)	IPCEA S-61-402 par 3.9, 3.7.3, 6.7	Standard Material Requirement	None
Accuracy: Req'd: N/A Demo N/A Category: Attackment A	Chemical Spray	N/A	N/A	(4)	N/A	N/A	None
Service: Attachment A	Radiation (RAD)	2.1x10 <sup>7</sup>	4x107	(4)	NUREG-0588 Material List	Generic Material Tests	None
Location: Room 8	Aging	N/A	20 years	(2)	Attachment C.1	Oper. Experience	' None
Flood Level Elev: 552' Above Flood Level: Yes X	Submergence	N/A	N/A	(4)	N/A	. N/A	None

Votes: (1) See Section 2.4 in 79-01B report.

- (2) See Section 4.1.2 in 79-018 report.
- (3) All notes and other information not on these sheets are on the attached appendix sheets.

(4) See Section 3.0 and/or Appendix B in 79-01B report.

Prepared by: H. D. Romanual

Reviewad by:

QA Acceptance

Attachment A

÷

EEB \_14-0/11

Rev \_\_\_\_\_

System: 74 Unit: 3

Component:Cable, 3/c, #16AWG Mark: WVB

1 +

Plant I. D. No.	Room	Function/Service	Category	Operating Time
3R2268 3R2269	8	TE-74-95C Steam Line TE-74-95D Steam Line		l year l year

# EEB \_74-0111

Rev O

## ATTACHMENT B

Mark WVB

#### Contract No.

# Type

72C7-83849 72C7-74910-2 69C3-64863-1

TR 822675 from WBN 74C7-85259

TR 820907 from 74C7-85259

7307-84211

1 ...

22

CSPE/CSPE XLPE/CSPE PE/PVC

XLPE/CSPE

#### XLPE/CSPE

Manufacturer

BIW Okonite Rockbestos

Belden Corporation

Belden Corporation

- 11

ITT Surp.

Sheet No: EEB- 74-011!

Revision: 0

#### ATTACHMENT C

C.1 TVA Engineering Report No. 1942

Coax, Triax, and Signal Cable

Coaxial and Triaxial cable installed at Browns Ferry were purchased in accordance with General Electric Company Specification 22A1181, and the appropriate MIL-C-17 specification. Signal cables, both twisted pair and multiconductor, were purchased in accordance with TVA specifications. Some cable were of cross-linked polyethylene and chloronated polyethylene construction while the same kind of cable furnished under other contracts were of high molecular weight, high density polyethylene/polyvinyl chloride construction and some even polyethylene/polyvinyl chloride construction. It is not possible to make a complete identification by contract as to which circuit and function they serve. Recent reclassification of some functions to 1E status has made it almost a certainty that some cables now in a safety category are of polyethylene/polyvinyl construction.

Accordingly, we have examined the 20 HELB temperature profiles and find that only compartments 1, 3, 6, and 9 show profiles which more than briefly surpass the softening temperature of the linear polyethylene. However, owing to the thermal time lag in the cable material and the cable installation including the heat sink of conduit, tray, and shield material, the insulation will not experience the HELB temperature profile until some time has elapsed and the temperature is lower. Further, no load heat rise need be taken into account for these signal cables.

TVA has conducted tests (Chattanooga Central Laboratories Report No. L81-81-6821 dated October 1980, of PE, PVC cables under a temperature profile which envelops all the HELB profiles. Following this exposure, these cables sustained a dielectric test while immersed in water of 660 volts for 5 minutes, 960 volts for 5 minutes, and 220 volts ac for 5 minutes in succession.

It is therefore our engineering judgment that this test confirms the above and justifies interim operation until these types can be fully qualified by our Wyle Laboratory tests to be concluded next April, or replaced at the next refueling outage.

For those cables located in compartment 0 (the containment), the service which these cables have seen the far has exposed them to a gamma radiation dose of  $6.25 \times 10^{\circ}$  rads or more. This is sufficient to have cross-linked the polyethylene and PVC as well. Consequently, the insulation is now in fact a thermoset material and is capable of the same temperature that TVA's cross-linked polyethylene cable has demonstrated and is capable of withstanding the LOCA/SLB and the post-LOCA environment for a year.

110

Sheet No: EEB- 74-0111

Revision: 0

#### ATTACHMENT C (Continued)

#### C.1 (Continued)

Continued operation is justified, and TVA has prepared a LOCA/SLB, thermal aging, and radiation test procedure to be performed by Wyle Laboratories on samples of this cable to demonstrate the validity of this conclusion. Results of this testing program are expected to be available in April 1981.

One cable RG-114A/U has the possibility of being sensitive to pressure changes owing to its partial air dielectric; however, an analysis of this effect has indicated that the change in dielectric constant can be tolerated. Consequently for this cable too, there is justification for continued operation. The compression effect on the dielectric will be likewise tested at Wyle Laboratories along with the other cable tests and results are expected to be available by April 1981.

- C.2 Standard Material Long-Term Overload Temperature Rating
- C.3 The post-HELB conditions are less than the normal cable rating and, in our judgment, the cables could operate satisfactorily for a post-accident of a year.

Prepared	by:
Reviewed	by:
QA Accept	ance:

SYSTEM COMPONENT EVALUATION WORK SHEET (Rev 2)

Facility: Browns Ferry Nuclear Plant Unit: 3 Docket: 50-296

Date 10/22/80 OUTSTANDING ENVIRONMENT DOCUMENTATION REF QUALIFICATION EQUIPMENT DESCRIPTION METHOD ITEMS Specifi-Qualifi-Specifi-Qualifi-Parameter cation cation cation cation System: 74 Operating Attachment A Engineering None 1 Year Attachment Plant ID No. Attachment A Time Analysis C. 3 140 (1)Component Cable WVB IPCEA S-61-402 3/c, #16 AWG, PE par 3.9 and None Temperature Manufacturer: Attachment B Attachment C.2 199 203 Attachment C.2 (4) (°F) . . Pressure N/A Model Number: N/A N/A None N/A (PSIA) (4)15.0 Function: IPCEA S-61-402 Standard Signal/Instrumentation Material par 3.9, Relative None Requirement Humidity (%) 100 (4)3.7.3, 6.7 100 Accuracy: Reg'd: N/A Demon: N/A Chemical Spray Category: Attachment A (4) N/A None N/A N/A N/A Service: Attachment A NUREG-0588 Generic Material Radiation Material 4×107 list (RAD) 3.1x104 (4) None Tests Location: Room 12 None Oper. Experience Attachment C. 20 years (2) N/A Aging Flood Level Elev: 552' Above Flood Level: Yes X Submergence N/A N/A None N/A N/A (4) No

κ.

Notes: (1) See Section 2.4 in 79-01B report.

- (2) See Section 4.1.2 in 79-01B report.
- (3) All notes and other information not on these sheets are on the attached appendix sheets.

(4) See Section 3.0 and/or Appendix B in 79-01B report.

Prepared by: H.D. Romanusaling

OA Acceptance:

· · 11

× \*

(3)Sheet No. EEB 74-0112 Revision O

Attachment A

EEB \_74-0112\_\_\_

Rev O

System: 74 Unit: 3

Component: Cable, 3/c, #16AWG Mark: WVB

١.

Plant I. D. No.	Room	Function/Service	Category	Operating Time
3R2275	12	TE-74-95E Steam Line		l year
3R2276	12	TE 74-95F Steam Line		l year

## EEB \_74-0112

Rev \_\_\_\_\_

## ATTACHMENT B

Mark WVB

Contract No.

Type

Manufacturer

72C7-83849 72C7-74910-2 69C3-64863-1

- TR 822675 from WBN 74C7-85259
- TR 820907 from 74C7-85259

73C7-84211

.

CSPE/CSPE XLPE/CSPE PE/PVC

XLPE/CSPE

XLPE/CSPE

÷

2.6 \* \*

Belden Corporation

Belden Corporation

ITT Surp.

. \*

BIW

Okonite

Rockbestos

110.

1

. ...

SYSTEM COMPONENT EVALUATION WORK SHEET (Rev 2)

Facility: Browns Ferry Nuclear Plant Unit: 3 50-296 Docket:

10-22-80 Date OUTSTANDING QUALIFICATION DOCUMENTATION REF ENVIRONMENT METHOD ITEMS EQUIPMENT DESCRIPTION Qualifi-Specifi-Qualifi-Specification Parameter cation cation cation System: 74 Attachment A Operating Attachment Engineering None 1 Year Time C.3 Analysis Plant ID No. Attachment A (1)Component Cable WVB Generic 3/C, #16 AWG (CSPE) Simultaneous Temperature (°F) 158 Manufacturer: Attachment B None Test Attachment C. 250 (4) A 14 Pressure dodel Number: N/A 15.0 (PSIA) (4)N/A None N/A N/A Function: Generic Signal/Instrumentation. Relative Simultaneous Attachment C.1 Humidity (%) 100 100 (4)None Test Accuracy: Reg'd: N/A Demon: N/A Chemical Spray Category: Attachment A (4)N/A None N/A N/A N/A Service: Attachment A Generic Radiation Sequential 5×107 3×10 Attachment C.1 (RAD) (4)None Test .ocation: Room 2 Generic Mat'l Test None Attachment C.2 40 years (2) Aaing N/A Flood Level Elev: 552' None N/A N/A Above Flood Level: Yes X N/A N/A Submergence (4)No

votes: (1) See Section 2.4 in 79-01B report.

- (2) See Section 4.1.2 in 79-01B report.
- (3) All notes and other information not on these sheets are on the attached appendix sheets.
- (4) See Section 3.0 and/or Appendix B in 79-01B report.

(3)

FFR-74-0113

0

Sheet No.

Revision

Prepared by: 20 Pomannuck: Reviewed by: Albudly

QA Acceptance:

14

Attachment A

EEB -74-0113

Rev Ø

System: 74 Unit: 3

Component: Cable, 3/c, #16AWG Mark: WVB

Plant I. D. No.	Room	Function/Service	Category	Operating Time
3R2266 · · · · · · · · · · · · · · · · · ·	2 2	TE-74-95A Steam Line TE-74-95H Steam Line		l year l year

# EEB -74-0113

Rev 0

### ATTACHMENT B

Mark WVB

Contract No.

Type

CSPE/CSPE

XLPE/CSPE

XLPE/CSPE

XLPE/CSPE

8

PE/PVC

Manufacturer

72C7-83849 72C7-74910-2 69C3-64863-1

TR 822675 from WBN 74C7-85259

TR 820907 from 74C7-85259

14

7307-84211

BIW Okonite Rockbestos

Belden Corporation

Belden Corporation

11

14 14

ITT Surp.

Sheet .: EER 74-0113

Revision: O

#### ATTACHMENT C

C.1 TVA Engineering Report No. 1947

Cable types: Coax, Triax, and Signal Cables of Cross-Linked Polyethylene Construction

Rooms: 0-18

For signal cables which utilize cross-linked polyethylene insulation, and the jacket is chlorosulfonated polyethylene or neoprene. The following LOCA/SLB tests apply:

Wyle Laboratory Test Report 43854-3 dated April 26, 1978, LOCA and SLB Qualification Test of Cables and Cable Splices.

Franklin Institute Test Report F-C4113 dated May 1975.

Rockbestos Company Test Report dated July 1977, amended 1979.

Franklin Institute Test Report F-C5120 dated May 1980.

These cable are qualified by the above for all HELB areas and the LOCA/SLB of the containment.

- C.2 NUREG-0588 Material List
- C.3 Because of the conservatism of the tests for XLPE and for silicone insulation, including the severity of the mandrel bend and dielectric test in water after the combined LOCA/SLB profile, it is our engineering judgment that there is sufficient margin to give reasonable assurance of continued operability more than a year in the post-LOCA environment.

Prepared	by:
Reviewed	by:
QA Accept	tance:

Facility: Browns Ferry Nuclear Plant Unit: 3 Docket:

SYSTEM COMPONENT EVALUATION WORK SHEET (Rev 2)

(3) EEB 74-0114 Sheet No. Revision 0

Date 10/22/80

50-296

14

EQUIPMENT DESCRIPTION	ENVIRONMENT			DOCUMENTATION REF		QUALIFICATION METHOD	OUTSTANDING ITEKS	
EQUIPMENT DESCRIPTION	Parameter	Specifi- cation	Qualifi- cation	Specifi- cation	Qualifi- cation	METROD	11005	
System: 74 Plant ID No. Attachment A	Operating Time	Attachment A	1 Year	(1)	Attachment C.3	Enginee <b>ring</b> Analy <b>sis</b>	None	
Component Cable WVB 3/c, #16 AWG, CSPE Manufacturer: Attachment B	Temperature (°F)	294	250	(4)	Attachment C.1	Generic Simultaneous Test	None -	
Model Number: N/A	Pressure (rSIA)	15.0	N/A	(4)	N/A	N/A	Hone	
Function: Signal/Instrumentation	Relative Humidity (%)	100	100	(4)	Attachment C.1	Generic Simultaneous Test	None	
Accuracy: Req'd: N/A Demon: N/A Category: Attachment A	Chemical Spray	N/A	N/A	(4)	N/A	N/A	" None	
Service: Attachment A	Radiation (:AD)	3x10 <sup>7</sup>	5x10 <sup>7</sup>	(4)	Attachment C.1	1636	None	
_ocation: Room 5	Aging	N/A	40 years	(2)	Attachment C.2	Generic Mat'l Test	' None	
Flood Level Elev: 552' Above Flood Level: Yes x	Submergence	N/A	N/A	(4)	N/A	N/A	, None	

votes: (1) See Section 2.4 in 79-01B report.

- (2) See Section 4.1.2 in 79-01B report.
- (3) All notes and other information not on these sheets are on the attached appendix sheets.
- (4) See Section 3.0 and/or Appendix B in 79-01B report.

Prepared by: H. & Romanau

Reviewed Ly:

QA Acceptance:

Attachment A

EEB 74-0114

Rev O

System: 74 Unit: 3

Component: Cable, 3/c, #16AWG Mark: WVB

Plant I. D. No.	Room	Function/Service	Operating Time	8	
3R2267	5	TE-74-95B Steam Line	Leakage A	l year	
3R2277	5	TE-74-95G Steam Line	Leakage A	l year	

and water a bran with the set of the

A REAL PROPERTY OF

# EEB \_74-0114

Rev O

#### ATTACHMENT B

Mark WVB

+;

#### Contract No.

72C7-83849

7207-74910-2

69C3-64863-1

Type

CSPE/CSPE

XLPE/CSPE PE/PVC

XLPE/CSPE

XLPE/CSPE

#### Manufacturer

BIW Okonite

TR 822675 from WBN 74C7-85259

TR 820907 from 74C7-85259

, (

14

73C7-84211

Rockbestos

Belden Corporation

Belden Corporation

11

 $r_{0} = r_{1}$ 

ITT Surp.

Sheet No .: EEB-74-0114

Revision: O

#### ATTACHMENT C

C.1 TVA Engineering Report No. 1947

Cable types: Coax, Triax, and Signal Cables of Cross-Linked Polyethylene Construction

Rooms: 0-18

For signal cables which utilize cross-linked polyethylene insulation, and the jacket is chlorosulfonated polyethylene or neoprene. The following LOCA/SLB tests apply:

Wyle Laboratory Test Report 43854-3 dated April 26, 1978, LOCA and SLB Qualification Test of Cables and Cable Splices.

Franklin Institute Test Report F-C4113 dated May 1975.

Rockbestos Company Test Report dated July 1977, amended 1979.

Franklin Institute Test Report F-C5120 dated May 1980.

These cable are qualified by the above for all HELB areas and the LOCA/SLB of the containment.

- C.2 NUREG-0588 Material List
- C.3 Because of the conservatism of the tests for XLPE and for silicone insulation, including the severity of the mandrel bend and dielectric test in water after the combined LOCA/SLB profile, it is our engineering judgment that there is sufficient margin to give reasonable assurance of continued operability more than a year in the post-LOCA environment.

Prepared	by:
Reviewed	by:
QA Accept	tance:

SYSTEM COMPONENT EVALUATION WORK SHEET (Rev 2)

Facility: Browns Ferry Nuclear Plant . Unit: 3 Docket: 50-296 (3) Sheet No. EEB 74-0115. Revision 0

Date 10/22/80

FOUTDWENT DESCRIPTION	ENVIRONMENT			DOCUMENTATION REF		QUALIFICATION METHOD	OUTSTANDING ITEMS	
EQUIPMENT DESCRIPTION	Parameter	Specifi- cation	Qualifi- cation	Specifi- cation	Qualifi- cation	P.E. THOD	TENO	
System: 74 Plant ID No. Attachment A	úperating Time	Attachment A	1 Year	(1)	ctachment C.3	Engineer <b>ing</b> Analysis	None	
Component Cable WVB 3/c, #16 AWG, CSPE Manufacturer: Attachment B	Temperature (°F)	157	250	(4)	Attachment C.1	Generic Simultaneous Test	None	
Model Number: N/A	Pressure (PSIA)	15.0	N/A	(4)	N/A	N/A	None	
Function: Signal/Instrumentation	Relative Humidity (%)	100	100	(4)	Attachment C.1	Generic Simultaneous Test	None	
Accuracy: Req'd: N/A Demon: N/A Category: Attachment A	Chemical Spray	N/A	N/A	(4)	N/A	N/A	None	
Service: Attachment A	Radiation (RAD)	2.1x10 <sup>7</sup>	5x10 <sup>7</sup>	(4)	Attachment C.1	1620	None	
_ocation: Room 8	Aging	N/A	40 years	(2)	Attachment 0.2	Generic Mat'l Test	None	
Flood Level Elev: 552' Above Flood Level: Yes X No	Submergence	N/A	N/A	(4)	N/A	N/A	, None	

Notes: (1) See Section 2.4 in 79-01B report.

- (2) See Section 4.1.2 in 79-01B report.
- (3) All notes and other information not on these sheets are on the attached appendix sheets.
- (4) See Section 3.0 and/or Appendix B in 79-01B report.

Prepared by: H. D. Romonoulakil

Reviewed by

QA Acceptance:

EEB 14-0115

Rev 0

System: 74 Unit: 3

Component:Cable, 3/c, #16AWG Mark: WVB

Plant I. D. No.	Room	Function/Service	Category	Operating Time
3R2268	8	TE-74-95C Steam Line	Leakage A	1 year
3R2269	8	TE-74-95D Steam Line	Leakage A	1 year

------

# EEB \_74-0115

Rev O

#### ATTACHMENT B

#### Mark WVB

#### Contract No.

# Type

Manufacturer

72C7-83849 72C7-74910-2 69C3-64863-1

TR 822675 from WBN 74C7-85259

TR 820907 from 74C7-85259

73C7-84211

1. 1

· ..

CSPE/CSPE XLPE/CSPE PE/PVC

XLPE/CSPE

XLPE/CSPE

4

12.24

Belden Corporation

11.

1. 1.

Belden Corporation

ITT Surp.

BIW

Okonite

Rockbestos

Sheet No .: EEB -74-0115

Revision: O

#### ATTACHMENT C

C.1 TVA Engineering Report No. 1947

Cable types: Coax, Triax, and Signal Cables of Cross-Linked Polyethylene Construction

Rooms: 0-18

For signal cables which utilize cross-linked polyethylene insulation, and the jack is chlorosulfonated polyethylene or neoprene. The following LOCA/SLB tests apply:

Wyle Laboratory Test Report 43854-3 dated April 26, 1978, LOCA and SLB Qualification Test of Cables and Cable Splices.

Franklin Institute Test Report F-C4113 dated May 1975.

Rockbestos Company Test Report dated July 1977, amended 1979.

Franklin Institute Test Report F-C5120 dated May 1980.

These cable are qualified by the above for all HELB areas and the LOCA/SLB of the containment.

- C.2 NUREG-0588 Material List
- C.3 Because of the conservatism of the tests for XLPE and for silicone insulation, including the severity of the mandrel bend and dielectric test in water after the combined LOCA/SLB profile, it is our engineering judgment that there is sufficient margin to give reasonable assurance of continued operability more than a year in the post-LOCA environment.

Prepared b	by:
Reviewed b	by:
QA Accepta	ince:

SYSTEM COMPONENT EVALUATION WORK SHEET (Rev 2)

Facility: Browns Ferry Nuclear Plant . Unit: 3 Docket: 50-296

Date 10/22/80 OUTSTANDING DOCUMENTATION REF QUALIFICATION ENVIRONMENT ITEMS EQUIPMENT DESCRIPTION METHOD Oualifi-Specifi-Qualifi-Specification Parameter cation cation cation System: 74 Attachment A Operating Engineering None Attachment 1 Year Plant ID No. Attachment A Time C.3 Analysis (1)Component Cable WVB Generic 20. JUN 3/c. #16 AWG, CSPE Simultaneous Temperature Manufacturer: Attachment B None 199 Attachment C. Test 250 (4) $(^{\circ}F)$ None N/A Pressure N/A N/A Model Number: N/A (PSIA) (4) 15.0 Function: Generic Signal/Instrumentation Relative Simultaneous Attachment C.1 Humidity (%) 100 100 (4) Test None Accuracy: Reg'd: N/A Demon: N/A Chemical Spray Category: Attachment A (4) None N/A N/A N/A N/A Service: Attachment A Generic Radiation 3.1x104 Sequential 5x107 Attachment C.1 (4)(RAD) None Test Room 12 .ocation: Attachment C.2 Generic Mat'l Test None 40 years (2) Aging N/A 3 Flood Level Elev: 552' None N/A Above Flood Level: Yes x N/A Submergence N/A N/A (4)No

Notes: (1) See Section 2.4 in 79-01B report.

- (2) See Section 4.1.2 in 79-01B report.
- (3) All notes and other information not on these sheets are on the attached appendix sheets.

(4) See Section 3.0 and/or Appendix B in 79-01B report.

Prepared by: H. D. Romanewski

Reviewed by:

QA Acceptance

(3)

Revision

Sneet No. EEB 74-0116

0

14

EEB \_\_\_\_\_ UIL6

Rev o

System: 74 Unit: 3

Component: Cable, 3/c, #16AWG Mark: WVB

Plant I. D. No.	Room	Function/Service	Category	Operating Time	
3R2275 3R2276	12 12	TE-74-95E Steam Line Les TE-74-95F Steam Line Les		l year l year	

# EEB \_74-0116

Rev O

# ATTACHMENT B

# Mark WVB

	Contract No.		Туре	Manufacturer
	72C7-83849 72C7-74910-2 69C3-64863-1		CSPE/CSPE XLPE/CSPE PE/PVC	BIW Okonite Rockbestos
TR	822675 from WBN 74C7-85259		XLPE/CSPE	Belden Corporation
TR	820907 from 74C7-85259		XLPE/CSPE	Belden Corporation
	73C7-84211	1		ITT Surp.

 ${}^{*_{j}}$ 

11

 $r_{\rm R} = r_{\rm c}$ 

1

 $\mathbf{x}^{k}$ 

Sheet No .: EEB - 74 - 0116

Revision: O

#### ATTACHMENT C

C.1 TVA Engineering Report No. 1947

Cable types: Coax, Triax, and Signal Cables of Cross-Linked Polyethylene Construction

Rooms: 0-18

For signal cables which utilize cross-linked polyethylene insulation, and the jacket is chlorosulfonated polyethylene or neoprene. The following LOCA/SLB tests apply:

Wyle Laboratory Test Report 43854-3 dated April 26, 1978, LOCA and SLB Qualification Test of Cables and Cable Splices.

Franklin Institute Test Report F-C4113 dated May 1975.

Rockbestos Company Test Report dated July 1977, amended 1979.

Franklin Institute Test Report F-C5120 dated May 1980.

These cable are qualified by the above for all HELB areas and the LOCA/SLB of the containment.

- C.2 NUREG-0588 Material List
- C.3 Because of the conservatism of the tests for XLPE and for silicone insulation, including the severity of the mandrel bend and dielectric test in water after the combined LOCA/SLB profile, it is our engineering judgment that there is sufficient margin to give reasonable assurance of continued operability more than a year in the post-LOCA environment.

Prepared	by:
Reviewed	by:
QA Accept	tance:

POOR ORIGINAL

SYSTEM COMPONENT EVALUATION WORK SHEET (Rev 2)

icility: Browns Ferry Nuclear Plant iit: 3 cket: 50-296

(3) Sheet No. EEB 74-0117 Revision 0

Date 10-22-80 CUTSTANDING QUALIFICATION DOCUMENTATION REF ENVIRONMENT METHOD ITEMS EQUIPMENT DESCRIPTION Qualifi-Specifi-Qualifi-Specification cation cation Parameter cation 74 /stem: Operating Engineering lant ID No. EA. Time Analysis None Attachment C (1) 1 Year Attach, A omponent lectrical Penetrations Simultaneous Assembly anufacturer: Temperature None · /\*tachment B.5 Test 325 Attach. B.2 (4) (°F) General Electric Company Simultaneous Pressure odel Number: NS04 Attachment B.5! Test None (PSIA) 67 Attach. B.3 (4) unction: Low voltage power and control primary Simultaneous Relative containment penetration None Attachment B.5 Test Humidity (%) 100 (4) 100 ccuracy: Req'd: N/A Demon: N/A Chemical Spray ategory: See Attach. A " None N/A (4) N/A N/A N/A ervice: See Attachment A 6.5x107 6.5x107 4x109 Attachment B.6 1. Test 4x10<sup>9</sup> 2. Engineering Radiation Attachment C Attach. B. Analysis None (RAD) (4)Attachment B.7 Attachment B.8 None ocation: 0 Attach. B.4 (2) N/A Aging lood Level Elev: 552' N/A None N/A bove Flood Level: Yes X Submergence N/A N/A (4)

(1) See Section 2.4 in 79-01B report. lotes:

No

(2) See Section 4.1. in 79-01B report.

(3) All notes and other information not on these sheets are on the attached appendix sheets.

(4) See Section 3.0 and/or Appendix B in 79-01B report.

Prepared by: 20 Reviewed by: Allague

QA Acceptance:

21

System: 74		생은 것 같은 것이 같아. 한번		EEB - 74-0117
Unit: 3				Rev O
Component: Mark:	Penetration EA			
Plant I. D	. No. Room	Function/Service	Category	Operating Time

1 Year

Α

(1) (1) (1) (1)		

FCV-74-78 Control

0

EA

Attachment B

EEB

Rev

1. Integrated dose - 10 years normal operations plus one LOCA.

- 2. Penetrations 352 Connectors - 325 Cable - 340
- 3. Penetrations 136.7 Connectors - 93 Cable - 77.7

2

- 4. Penetrations 40 years Connectors - 10 years Cable - 40 years
- 5. Penetrations GE Report EPAQ-055, Low Voltage, Emergency Environmental Test and Cable GE Report EPAQ-060, Maximum Emergency Environmental Test-Signal GE R-port EPAQ-061, Maximum Emergency Environmental Test-Low Voltage
  - Connectors Wyle Laboratory Report 43854-2, Browns Ferry Connectors Sandia Report
- 6. Penetrations TVA Engineering Report EEB 1921
   Connectors IVA Engineering Report EE5 1921
   Cable TVA Engineering Report EEB 1921
- 7. Penetrations GE Prototype Test Data Epoxy Life Tests Connectors - Wyle Laboratory Report 4385-2, Browns Ferry Connectors Cable - NRC o588 Materials List (Crosslinked Polyethylene)
- Penetrations Material tests
   Connectors Sequential tests
   Cable Generic Material tests

EEB - 74 -0117

Rev O

#### ATTACHMENT C

#### TVA Engineering Report EEB 1921

This report is to update the documentation of the qualification of the General Electric canister type electrical penetration assemblies used at Browns Ferry Unit 3 for Class IE low voltage power and control service into the drywell. TVA designations for these units are EA, EB, EC, ED, EE, and EF.

The penetration assemblies inside the drywell consist of four pertinent features; the penetration conductor seals, the conductor pigtails, the connectors affixed to the ends of the pigtails, and the junction box which is bolted to the header plate and encloses the foregoing items.

The junction boxes are fabricated from 0.104-inch-thick steel. This thickness is sufficient to essentially completely shield the box contents from beta radiation and to reduce the total gamma dose by about 25 percent. Therefore, the integrated 40-year normal operation plus one LOCA dose seen by the box contents will be approximately 1.05 x 10<sup>8</sup> rads gamma and the 10-year plus LOCA dose would be about 4.9 x 10<sup>7</sup> rads gamma. GE report EPAQ-046 indicates this level should cause no change in the epoxy sealant. The GE Vulkene cable (cross-linked polyethylene) is also known to be little affected by 1 x 10<sup>8</sup> rads gamma (see the NRC 0588 materials list for acknowledgement of this). The connectors have been qualified for 6.9 x 10<sup>7</sup> rads (see Wyle report 43854-2) which exceeds the 10-year plus LOCA dose they would receive by about 40 percent.

Regarding thermal aging, GE report "Prototype Test Data, Epoxy Life Tests," indicates the epoxy is suitable for 40 years service and the Vulkene cable is known to also be suitable for 40 years service. Since the Browns Ferry containment is inerted a large portion of the time, thermal aging effects should be greatly reduced from what it would be in a normal air environment. The connectors have been qualified for 10 years (see Wyle report 43854-2).

The combined LOCA-HELB profile for Browns Ferry causes thermal aging equivalent to less than 30 days normal operation, as calculated by the 10<sup>0</sup> C rule. Therefore, the thermal aging effects of a LOCA-HELB can be neglected. Aging due to any one LOCA or HELB would be considerably less.

The long-term humidity resistance of the epoxy is satisfactory (see GE report EPAQ-037, Epoxy Insulation Resistance Tests) and that of the cable is well documented. Therefore, they will remain fully functional for a year after a LOCA or HELB since neither the radiation, thermal, or humidity effects of an accident have any significant effect on the materials. The connectors show adequate insulation resistance at the end of a combined LOCA-HELB event (see Wyle report 43854-2) to indicate the ability to function for a year after an accident. Note also the Wyle test was for a combined LOCA-HELB which is thermally more severe than any one event would be, and the pressures were 25 psi higher than is expected to actually occur.

Rev o

## ATTACHMENT C (Continued)

In conclusion, the penetration and cable are qualified for 39 years service plus a year of post-accident operation. The connectors are qualified for 10 years service plus a year of post-accident operation, and they should be replaced with qualified heat shrink splices at the end of 10 years operation. SYSTEM COMPONENT EVALUATION WORK SHEET (Rev 2)

acility: Browns Ferry Nuclear Plant nit: 3

(3) Sheet No. EEB 74-0118

Revision 0

ocket: 50-296						Date 10-2	2-80
EQUIPMENT DESCRIPTION		ENVIRONMENT	1	DOCUMENTATION REF		QUALIFICATION METHOD	OUTSTANDING ITEMS
	Parameter	Specifi- cation	Qualifi- cation	Specifi- cation	Qualifi- cation	nemou	TTEND .
ystem: 74 lant ID No. EF.	Operating Time	Attach. A	1 Year	(1)	Attachment C	Engineering Analysis	None
omponent Flectrical Penetrations Assembly anufacturer: General Electric	Temperature (°F)	325	Attach. B.2	(4)	Attachment B.5	Simultaneous Test	None ·
Company odel Number: NSO4 unction: Low voltage power and control primary containment penetration	Pressure (PSIA)	67	Attach. B.3	(4)	Attachment B.5	Simultaneous Test	None
	Relative Humidity (%)	100	100	(4)	Attachment B.5	Simultaneous Test	None
ccuracy: Req'd: N/A Demon: N/A ategory: See Attach. A	Chemical Spray	N/A	N/A	(4)	N/A	N/A	" None
ervice: See Attachment A	Radiation (RAD)	6.5x107 4x109 Attach. B.	6.5x10 4x10 <sup>9</sup>	(4)	Attachment B.6 Attachment C	2. Engineering Analysis	None
ocation: 0	Aging	N/A	Attach. B.4	(2)	Attachment B.7	Attachment B.8	• None
lood Level Elev: 552' bove Flood Level: Yes X No	Submergence	N/A	N/A	(4)	N/A	N/A	, Nona

lotes: (1) See Section 2.4 in 79-01B report.

(2) See Section 4.1. in 79-01B report.

(3) All notes and other information not on these sheets are on the attached appendix sheets.

(4) See Section 3.0 and/or Appendix B in 79-01B report.

Prepared by: 2D Romanous 10/2/80

Reviewed by anu

QA Acceptance:

# Attachment A

System: 74		EEB -74-0118
Unit: 3	netration	Rev
Component: Per Mark: EB		영상 가 있는 것은 가지 않는다.

Plant 1. D. No.	Room	Function/Service	Category	Operating Time
EB	0	FCV-74-78 Control	Α	1 Year

Attachment B

EEB

Rev

1. Integrated dose - 10 years normal operations plus one LOCA.

- 2. Penetrations 352 Connectors - 325 Cable - 340
- 3. Penetrations 136.7 Connectors - 93 Cable - 77.7
- 4. Penetrations 40 years Connectors - 10 years Cable - 40 years
- 5. Penetrations and Cable GE Report EPAQ-055, Low Voltage, Emergency Environmental Test GE Report EPAQ-060, Maximum Emergency Environmental Test-Signal GE Report EPAQ-061, Maximum Emergency Environmental Test-Low Voltage
  - Connectors Myle Laboratory Report 43854-2, Browns Ferry Connectors Sandia Report
- 6. Penetrations TVA Engineering Report EEB 1921
   Connectors TVA Engineering Report EEB 1921
   Cable TVA Engineering Report EEB 1921
- 7. Penetrations GF type Test Data Epoxy Life Tests Connectors - ' Jratory Report 4385-2, Browns Ferry Connectors Cable - New US88 Materials List (Crosslinked Polyethylene)
- Penetrations Material tests
   Connectors Sequential tests
   Cable Generic Material tests

it

## EEB -74-0118

Rev O

#### ATTACHMENT C

#### TVA Engineering Report EEB 1921

This report is to update the documentation of the qualification of the General Electric canister type electrical penetration assemblies used at Browns Ferry Unit 3 for Class IE low voltage power and control service into the drywell. TVA designations for these units are EA, EB, EC, ED, EE, and EF.

The penetration assemblies inside the drywell consist of four pertinent features; the penetration conductor seals, the conductor pigtails, the connectors affixed to the ends of the pigtails, and the junction box which is bolted to the header plate and encloses the foregoing items.

The junction boxes are fabricated from 0.104-inch-thick steel. This thickness is sufficient to essentially completely shield the box contents from beta radiation and to reduce the total gamma dose by about 25 percent. Therefore, the integrated 40-year normal operation plus one LOCA dose seen by the box contents will be approximately  $1.05 \times 10^8$  rads gamma and the 10-year plus LOCA dose would be about  $4.9 \times 10^7$  rads gamma. GE report EPAQ-046 indicates this level should cause no change in the epoxy sealant. The GE Vulkene cable (cross-linked polyethylene) is also known to be little affected by  $1 \times 10^8$  rads gamma (see the NRC 0588 materials list for acknowledgement of this). The connectors have been qualified for  $6.9 \times 10^7$  rads (see Wyle report 43854-2) which exceeds the 10-year plus LOCA dose they would receive by about 40 percent.

Regarding thermal aging, GE report "Prototype Test Data, Epoxy Life Tests," indicates the epoxy is suitable for 40 mars service and the Vulkene cable is known to also be suitable for 40 years service. Since the Browns Ferry containment is inerted a large portion of the time, thermal aging effects should be greatly reduced from what it would be in a normal air environment. The connectors have been qualified for 10 years (see Wyle report 43854-2).

The combined LOCA-HELB profile for Browns Ferry causes thermal aging equivalent to less than 30 days normal operation, as calculated by the 10° C rule. Therefore, the thermal aging effects of a LOCA-HELB can be neglected. Aging due to any one LOCA or HELB would be considerably less.

The long-term humidity resistance of the epoxy is satisfactory (see GE report EPAQ-037, Epoxy Insulation Resistance Tests) and that of the cable is well documented. Therefore, they will remain fully functional for a year after a LOCA or HELB since neither the radiation, thermal, or humidity effects of an accident have any significant effect on the materials. The connectors show adequate insulation resistance at the end of a combined LOCA-HELB event (see Wyle report 43854-2) to indicate the ability to function for a year after an accident. Note also the Wyle test was for a combined LOCA-HELB which is thermally more severe than any one event would be, and the pressures were 25 psi higher than is expected to actually occur.

Rev O

#### ATTACHMENT C (Continued)

In conclusion, the penetration and cable are qualified for 39 years service plus a year of post-accident operation. The connectors are qualified for 10 years service plus a year of post-accident operation, and they should be replaced with qualified heat shrink splices at the end of 10 years operation. Facility: Browns Ferry Nuclear Plant Unit: 1 Docket: 50-259

OUTSTANDING QUALIFICATION DOCUMENTATION REF ENVIRONMENT ITEMS METHOD EQUIPMENT DESCRIPTION Specifi-Qualifi-Specifi-Qualification cation cation Parameter cation System: 74 Engineering None Operating Attachment A 1 Year Attachment Plant ID No. Attachment A Time C.3 Analysis (1)Component Cable WBB IPCEA S-61-403 Standard Mat'l 1/C #12 AWG (PN) (PNJ) Long-Term Temp. par 3.9 and Temperature None Manufacturer: Attachment B (4) Appendix C.2 Rating (°F) 203 325 Pressure Model Number: N/A N/A N/A None 69.7 A/H (4) (PSIA) 100 IPCEA S-61-403 Standard Function: Material par 3.9. Relative Signal/Instrumentation 3.7.3, & 6.7 Requirement None Humidity (%) 100 100 (4)Accuracy: Reg'd: N/A Chemical Demon: N/A Spray N/A None N/A Category: (4) Attachment A N/A N/A NUREG-0588 Generic 6.5x10'Y Attachment A Service: . . Material 4×109B Material Radiation None Tests 4x107 List (4) Attach. C.1 (RAD) Location: 0 Oper. Experience None Attachment C.2 10 years (2) Aging N/A Flood Level Elev: 552' Above Flood Level: Yes\* Submergence N/A N/A N/A None (4) N/A No

SYSTEM COMPONENT EVALUATION WORK SHEET (Rev 2)

Notes: See Section 2.4 in 79-018 report. (1)

- (2) See Section 4.1. 2 in 79-01B report.
- (3) All notes and other information not on these sheets are on the attached appendix sheets.
- (4) See Section 3.0 and/or Appendix B in 79-01B report.

Prepared by: TA Marche

Reviewed by: A Twagen (22/ Sh

QA Acceptance:

(3) Sheet No. EEB74-0119 Revision O

Date 10-22-80

Attachment A

EEB <u>24-D119</u> Rev 0

System: 74 Unit: 1

1.43

Component: CABLE 1/c #12 (PNJ) Mark: WBB

Plant I. D. No.	Room	Function/Service	Category	Operating time
1ES1182-I	1ES1182-I 0	FCV-74-47 CONT	A	1 Year
1ES3687-II		FCV-74-47 CONT	A	1 Year

Sheet No: EEB -74-0119

#### ATTACHMENT C (Con'd)

Revision: 0

Since the above value of  $7.3 \times 10^7$  is less than the values for which we have in-air test data for SROAJ types (1.2 x 10<sup>8</sup>) and for XLPE types (2 x 10<sup>8</sup>), it is concluded that the beta dose in an accident will not disqualify the cables presently installed, and the cables will remain operable in the service environment.

1.2 TVA Engineering Report No. 1943

Cable types: Coax, Triax, and Signal Cables of Cross-Linked Polyethylene Construction

Rooms: 0-18

For signal cables which utilize cross-linked polyethylene insulation, and the jacket is chlorosulfonated polyethylene or neoprene. The following LOCA/SLB tests apply:

Wyle Laboratory Test Report 43854-3 dated April 26, 1978, LOCA and SLB Qualification Test of Cables and Cable Splices.

Franklin Institute Test Report F-C4113 dated May 1975.

Rockbestos Company Test Report dated July 1977, amended 1979.

Franklin Institute Test Report F-C5120 dated May 1980.

These cable are qualified by the above for all HELB areas and the LOCA/SLB of the containment.

Reviewed	by:	
Prepared	by:	



Facility: Growns Ferry Nuclear Plant Unit: 1 Docket: 50-259

8

SYSTEM COMPONENT EVALUATION WORK SHEET (Rev 2)

(3)Sheet No. EEB74-0120 Revision

						Date 10-22-80		
EQUIPMENT DESCRIPTION	ENVIRONALIT			DOCUMENTATION REF		QUALIFICATION	OUTSTANDING	
	Parameter	Specifi- cation	Qualifi- cation	Specifi- cation	Qualifi- cation	METHOD	ITEMS	
System: 74 Plant ID No. Attachment A	Operating Time	Attachment A	1 Year	(1)	Attachmer C.4	t Engineering Analysis	None	
Component Cable WBB 1/C #12 AWG (PN)(PNJ) Manufacturer:Attachment B	Temperature	292	153	(4)	Attachments C.1 and C.2	Attachment C.3	None	
odel Number: N/A	Pressure (PGIA)	15.0	NZA	(4)	N/A	N/A	None	
unction: Control/Power ccuracy: Reg'd: N/A	Relative Humidity (%)	100	100	(4)	1PCEA S-61-402 par 3.9, 3.7.3 6.7	Standard	None	
Demon: N/A ategory: Attachment A	Chemical Spray	N/A	N/A	(4)	N/A	NZA	None	
ervice: Attachment A	Radiation (RAD)	3x10 <sup>7</sup>	4x107	(4)	NUREG-0588 Materials List	Generic Material Test	None	
Cocacion. Room 2	Aging	N/A	20 years	(2)	Attachment C.2	Oper, Experience	None	
lood Level Elev: 552' bove Flood Level: Yes* No	Submergence	N/A	N/A	(4)	N/A	. N/A	None	

(1) See Section 2.4 in 79-01B report. otes:

- (2) See Section 4.1.2 in 79-013 report.
- (3) All notes and other information not on these sheets are on the attached appendix sheets.

(4) See Section 3.0 and/or Appendix B in 79-01B report.

Prepared by: TA Mand

0

Data

10/24/80 Reviewed by:

EEB 74-020

Rev O

1

System: 74 Unit: 1

Component: CABLE 1/c #12 (PNJ) Mark: WBB

Plant I. D. No.	Room	Function/Service	Category	Operating Time
1R3264	2	MIS-74-137A PMP RM Humidity	CONT A	1 Year
1R3263 1K3256	2	ME-74-137A MIS-74-137B	A	l Year
1R3255 1R3262	2	ME-74-137B TTS-74-136A A/C TEMP CONT		
10000	÷.,	113-74-1300 N/O 1140 0001	$\checkmark$	$\downarrow$

## EEB 74-0120

Rev O

### ATTACHMENT B

### Mark WBB

1

WAR I T

### Contract No. 67C3-91618 73C7-84528 72C7-75328-1 70C7-54179-1

PN PN PN

PN

## Manufacturer

Brand-Rex Plastic Wire & Cable Corp Brand-Rex Brand-Rex

Sheet No.: <u>EEB-74-0120</u> Revision: 0

ATTACHMENT C

C.1 IPCEA S-61-402 Paragraph 3.9 and Appendix D

C.2 TVA Engineering Report No. 1943

Cable types: PJ, PN, PNJ, PJJ, PSJ

Rooms 1-18

This class of cables was purchased under TVA Standard Specification No. 25.013, based on IPCEA S-61-402 (NEMA WC5). These standards provide a product with an operating rating of  $75^{\circ}$  C continuous,  $95^{\circ}$  C (203° F), 500-hour overload rating total in a normal lifetime. They are constructed of polyethylene insulation with Nylon and PVC jacketing.

The jacket material has a higher retention of strength at elevated temperatures, as the material was subjected to air oven aging of  $121^{\circ}$  C ( $250^{\circ}$  F) for 7 days. Only compartments 1, 2, 3, 6, 9, 10, and 11 show HELB profiles which more than briefly surpass the softening temperature of the insulation. However, owing to the thermal time lags in the cab'e material and cable installation, the insulation nor even the jacket experience the temperature profile until some time has elapsed.

TVA has conducted tests (Chattanooga Central Laboratories Report No. 81L-81-6821 dated October 1980, of these cables under a temperature profile which envelopes all the HELB profiles. Following this exposure these samples sustained a dielectric test immersed in water of 660 volts ac for 6 minutes, 960 volts ac for 5 minutes, and 2200 volts for 5 minutes in succession.

It is therefore our engineering judgment that this test confirms the above and justifies interim operation until these types can be fully qualified by our Wyle Laboratory tests to be concluded next April or replaced at the next refueling outage.

- C.3 Temperature Qualification Method
  - C.3.1 Standard material long-term overload temperature rating

C.3.2 Engineering Analysis

C.4 The post-HELB conditions are less than the normal cable rating and, in our judgment, the cables could operate satisfactorily for a post-accident of a year.

Prepared by:

Reviewed by:\_\_\_\_\_

QA Acceptance:



SYSTEM COMPONENT EVALUATION WORK SHEET (Rev 2)

Facility: Browns Ferry Nuclear Plant Unit: 1 Cocket: 50-259

18

Revision O Date 10-22-80 ENVIRONMENT DOCUMENTATION REF OUALIFICATION OUTSTANDING EQUIPMENT DESCRIPTION METHOD ITEN'S Specifi-Qualifi-Specifi-Qualifi-Parameter cation cation cation cation System: 74 1 Year Attachment Engineering Operating None Attachment A C.4 Analysis Plant ID No. Attachment A Time (1)Component Cable WBB 1/C #12 AWG (PN) Attachments Temperature (°F) Sanufacturer: Attachment B None 153 (4) C.1 and C.2 Attachment C.3 294 Pressure todel Number: N/A (PSIA) (4)15.0 N/A N/A N/A None unction: Control/Power IPCEA S-61-402 Standard Relative par 3.9, 3.7.3 Material Humidicy (%) 6.7 Requirement None (4)100 100 .ccuracy: Reg'd: N/A Demon: N/A Chemical. 1.0 Spray ategory: Attachment A (4) N/A N/A N/A N/A None arvice: Attachment A NUREG-0588 Generic Radiation Materials Material 3x107 4×107 (RAD) (4)List Test None ocation: Room 5 Aging (2) N/A 20 years Attachment C.21 Oper, Experience None lood Level Elev: 552' bove Flocd Level: Yes \* Submergence N/A N/A N/A N/A None No (4)

otes: (1) See Section 2.4 in 79-01B report.

- (2) See Section 4.1.2 in 79-018 report.
- (3) All notes and other information not on these sheets are on the attached appendix sheets.
- (4) See Section 3.0 and/or Appendix 8 in 79-018 report.

Prepared by: TA Maishel

(3)

Sheet No. EEB74-0121

Ferlaque Reviewed by:

EEB 74-0121

Rev O

System: 74 Unit: 1

1

Component: CABLE 1/c #12 (PNJ) Mark: WBB

Plant I. D. No.	Room	Function/Service	Category	Operating Time
1R3254	5	TTS-74-136B B/D TEMP CONT	А	l Year

.\*

## EEB 74-0121

Rev O

### ATTACHMENT B

### Mark WBB

\* ...

\*

den de

ž

## Contract No.

67	C3	-	91	6	18	
73	C7	-	84	5	28	
72	C7	-	75	3	28	- 1
70	C7	-	54	1	79.	-1

.

Ny.

PN PN PN PN PN

.

### Manufacturer

Brand-Rex Plastic Wire & Cable Corp Brand-Rex Brand-Rex

Sheet No.: EEB-74-0121

Revision: 0

### ATTACHMENT C

C.1 IPCEA S-61-402 Paragraph 3.9 and Appendix D

C.2 TVA Engineering Report No. 1943

Cable types: PJ, PN, PNJ, PJJ, PSJ

Rooms 1-18

This class of cables was purchased under TVA Standard Specification No. 25.013, based on IPCEA S-61-402 (NEMA WC5). These standards provide a product with an operating rating of 75° C continuous,  $95^{\circ}$  C (203° F), 500-hour overload rating total in a normal lifetime. They are constructed of polyethylene insulation with Nylon and PVC jacketing.

The jacket material has a higher retention of strength at elevated temperatures, as the material was subjected to air oven aging of  $121^{\circ}$  C (250° F) for 7 days. Only compartments 1, 2, 3, 6, 9, 10, and 11 show HELB profiles which more than briefly surpass the softening temperature of the insulation. However, owing to the thermal time lags in the cable material and cable installation, the insulation nor even the jacket experience the temperature profile until some time has elapsed.

TVA has conducted tests (Chattanooga Central Laboratories Report No. 81L-81-6821 dated October 1980, of these cables under a temperature profile which envelopes all the HELB profiles. Following this exposure these samples sustained a dielectric test immersed in water of 660 volts ac for 6 minutes, 960 volts ac for 5 minutes, and 2200 volts for 5 minutes in succession.

It is therefore our engineering judgment that this test confirms the above and justifies interim operation until these types can be fully qualified by our Wyle Laboratory tests to be concluded next April or replaced at the next refueling outage.

C.3 Temperature Qualification Method

C.3.1 Standard material long-term overload temperature rating

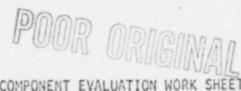
C.3.2 Engineering Analysis

C.4 The post-HELB conditions are less than the normal cable rating and, in our judgment, the cables could operate satisfactorily for a post-accident of a year.

Prepared by:

Reviewed by:\_\_\_\_

QA Acceptance:



SYSTEM COMPONENT EVALUATION WORK SHEET (Rev 2)

.cility: Browns Ferry Nuclear Plant it: 1 ----

:cket: 50-259						Date 10-22-9	Q
	ENVIRONMENT			DOCUMEN	NTATION REF	QUALIFICATION METHOD	OUTSTANDING ITEMS
EQUIPMENT DESCRIPTION	Parameter	Specifi- cation	Qualifi- cation	Specifi- cation	Qualifi- cation	HETHOD	
stem: 74 ant ID No. Attachment A	Operating Time	Attachment A	1 Year	(1)	Attachment C.4	Engineering Analysis	None .
<pre>imponent Cable WBB 1/C #12 AWG (PN)(PNJ) .nufacturer:Attachment B</pre>	Temperature (°F)	147	153	(4)	Attachments C.1 and C.2	Attachment C.3	None .
odal Number: N/A	Pressure (PSIA)	15.0	N/A	(4)	N/A	N/A	None
inction: Control/Power	Relative Humidity (%)	100	100	(4)	IPCEA S-61-402 par 3.9, 3.7.3 6.7		None
.curacy: Req'd: N/A Demon: N/A .tegory: Attachment A	Cheminal Spray	N/A	N/A	(4)	N/A	N/A	None
rvice: Attachment A	Radiation (RAD)	2.1x10 <sup>7</sup>	4×10 <sup>7</sup>	(4)	NUREG-0588 Materials List	Generic Material Test	None
cation: Room 8	Aging	N/A	20 years	(2)	Attachment C.2	Oper, Experience	None
ood Level Elev: 552' ove Flood Level: Yes X No	Submergence	N/A	N/A	(4)	N/A	N/A	None

: ites: (1) See Section 2.4 in 79-018 report.

- (2) See Section 4.1.2 in 79-01B report.
- (3) All notes and other information not on these sheets are on the attached appendix sheets.
- (4) See Section 3.0 and/or Appendix B in 79-01B report.

Prepared by: TA Main all

Reviewed by:

QA Acceptance:

(3)

Revision

Data.

Sheet No. EEB74-0122

0

22-00

LEB 24-0122

Rev O

System: 74 Unit: 1

Component: CABLE 1/c #12 (PNJ) Mark: WBB

Plant I. D. No.	Room	Function/Service	Category	Operating Time
1ES3687-II	8	FCV-74-47 CONT	A	l Year

## EEB 74-0122

Rev O

. it's

### ATTACHMENT B

## Mark WBB

Туре

PN

PN

PN

1.1

### Contract No.

70C7-54179-1

67C3-91618 73C7-84528 72C7-75328-1

## Manufacturer

Brand-Rex Plastic Wire & Cable Corp Brand-Rex Brand-Rex

Sheet No.: \_\_\_\_\_\_ EEB-74-0122\_

Revision: 0

### ATTACHMENT C

C.1 IPCEA S-61-402 Paragraph 3.9 and Appendix D

C.2 TVA Engineering Report No. 1943

Cable types: PJ, PN, PNJ, PJJ, PSJ

Rooms 1-18

This class of cables was purchased under TVA Standard Specification No. 25.013, based on IPCEA S-61-402 (NEMA WC5). These standards provide a product with an operating rating of  $75^{\circ}$  C continuous,  $95^{\circ}$  C (203° F), 500-hour overload rating total in a normal lifetime. They are constructed of polyethylene insulation with Nylon and PVC jacketing.

The jacket material has a higher retention of strength at elevated temperatures, as the material was subjected to air oven aging of 121°C ( $250^{\circ}$  F) for 7 days. Only compartments 1, 2, 3, 6, 9, 10, and 11 show HELB profiles which more than briefly surpass the softening temperature of the insulation. However, owing to the thermal time lags in the cable material and cable installation, the insulation nor even the jacket experience the temperature profile until some time has elapsed.

TVA has conducted tests (Chattanooga Central Laboratories Report No. 81L-81-6821 dated October 1980, of these cables under a temperature profile which envelopes all the HELB profiles. Following this exposure these samples sustained a dielectric test immersed in water of 660 volts ac for 6 minutes, 960 volts ac for 5 minutes, and 2200 volts for 5 minutes in succession.

It is therefore our engineering judgment that this test confirms the above and justifies interim operation until these types can be fully qualified by our Wyle Laboratory tests to be concluded next April or replaced at the next refueling outage.

- C.3 Temperature Qualification Method
  - C.3.1 Standard material long-term overload temperature rating

C.3.2 Engineering Analysis

C.4 The post-HELB conditions are less than the normal cable rating and, in our judgment, the cables could operate satisfactorily for a post-accident of a year.

Prepared by:\_\_\_\_\_

Reviewed by:

QA Acceptanci

EEB 24-0123

Rev O

System: 74 Unit: 1

\*\*\*\*

Component: CABLE 1/c #14AWG (PN) Mark: WCA

Plant I. D. No.	Room	Function/Service	Category	Operating Time
1ES540-1	0	FCV-74-52 CONT	А	1 Year
1ES541-I	0	FCV-74-52 CONT		PLL ALTER .
1ES529-11	0	FCV-74-53 CONT		
1ES547-I	0	FCV-74-52 CONT		이 것 같은 것이 같은 것
1ES3040-II	0	FCV-74-66 CONT	1.	민준은 감독 모양을 다 나라 나는 것이 같이
1ES.\029-II	0	FCV-74-67 CONT	- T	
1ES:028-II	0	FCV-74-67 CONT		
1ES0041-11	0	FCV-74-66 CONT	$\checkmark$	V

# EEB 74-0123

,

Constant of the second

Rev O

## ATTACHMENT B

Mark WCA

(-)

ť )

)

Contract No.	Туре	Manufacturer	
72C7-75128 72X7-74885-1	PN	Plastic Wire & Cable Corp Brand-Rex	
7307-34528 6703-91618 7207-75328-1	PN PN	Plastic Wire & Cable Corp Brand-Rex	
70C7-54179-1 R 822378)	PN. PN	Brand-Rex Brand-Rex	
822639) Sequoyah 822915) 72C7-75228-1	PN	Plastic Wire & Cable Corp	
72C7-83874-1		Plastic Wire & Cable Corp	

÷

- 11 A

×

Sheet No: EEB -74-0/23

Revision: 0

#### ATTACHMENT C

C.1 Integrated dose - 10 years plus accident

Beta Dave

#### References:

- W. W. Parkinson, O. Sisman, October 1970, The Use of Plastics and Elastomers in Nuclear Radiation.
- R. B. Blodgett, R. G. Fisher, June 1968, Insulations and Jackets for Control and Power Cables.
- M. Asaka, S. Yamamoto, 1973, Radiation Resistance of Plastic Insulating Materials for Cable.
- 4. Ans.onda-Continental Te t Report No. 79117 dated April 1979.
- 5. Wyle Laboratory Test Report 43854-3.
- 6. Franklin Institute Test Reports E-C4113 and FC-5120.
- 7. Rockbestos Company Test Report dated July 1977 amended 1979.

The TVA value of  $(\pi, 10)^9$  rads for the beta accident dose at the periphery of the intrainment is being reevaluated due to its high value. However, this value and making reference to the 7901-B DOR guidelines section 4.2.1 and the depth dose penetration, which owing to the low penetrating power of beta particles gives a rector of 10 reduction for 40 mills of jacketing material, and a factor of 10 for the insulation thickness of 30 mills and which is conservative for the 400-volt power and control cables and extremely conservative for the insulation of metallic shielding material, and a ssigning a factor of 1 for the installation shielding of metal trays, conduit, hoxes, and flexible conduit, we arrive at a total effective dose of the issues of beta.

Since the energy dissipation of gamma radiation occurs via ionizing processes, one can add the accident dose of 4 x 10' rads of gamma directly. The accumulated integrated gamma 10-year dose (the time presently assigned to connectors and penetrations) amounts to 72.5 x 10' rads which added directly gives a total dose of 7.3 x 10' rads. In addition, since the containment is inerted in operation, the scission rate and deterioration of the insulation and jacketing materials through oxidation will be much less than for tests conducted in air.

Sheet No: EEB-74-0123

### ATTACHMENT C (Con'd)

Revision: 0

Since the above value of 7.3 x 10' is less than the values for which we have in-air test data for SROAJ types  $(1.2 \times 10^{\circ})$  and for XLPE types  $(2 \times 10^{\circ})$ , it is concluded that the beta dose in an accident will not disqualify the cables presently installed, and the cables will remain operable in the service environment.

C.2 IVA Englamering Report No. 1942

Cable types: Coax, Triax, and Signal Cables of Cross-Linked Polyethylene Construction

Rooms: 0-18

For signal cables which utilize cross-linked polyethylene insulation, and the jacket is chlorosulfonated polyethylene or neoprene. The following LOCA/SLB tests apply:

Wyle Laboratory Test Report 43854-3 dated April 26, 1978, LOCA and SLB Qualification Test of Cables and Cable Splices.

Franklin Institute Test Report F-C4113 dated May 1975.

Rockbestos Company Test Report dated July 1977, amended 1979.

Franklin Institute Test Report F-C5120 dated May 1980.

These cable are qualified by the above for all HELB areas and the LOCA/SLE of the containment.

Reviewed	by:	
Prepared	by:	<u></u>



SYSTEM COMPONENT EVALUATION WORK SHEET (Rev 2)

1.0

:cket: 50-259 Date 10-22-80 OUTSTANDING QUALIFICATION ENVIRONMENT DOCUMENTATION REF EQUIPMENT DESCRIPTION METHOD **ITEMS** Specifi-Qualifi-Specifi-Qualification cation cation cation Parameter 1 Year Engineering None stem: 74 Attachment Operating Attachment A' C.4 Analysis ant IG No. Attachment A Time (1)Troponent Cable WEA Attachments Temperature None .nufacturar: Attachment B C.1 and C.2 Attachment C.3 153 (4) 292 (°F) Pressure idal Number: N/A (PSIA) (4) N/A 15.0 N/A N/A None inction: Control/Power IPCEA 5-61-402 Standard par 3.9, 3.7.3 Material Relative 6.7 Requirement None Humidity (%) (4)100 100 :curacy: Reg'd: N/A Demon: N/A Chemical 1. Spray :tegory: Attachment A (4) N/A N/A N/A N/A None :rvice: Attachment A NUREG-0588 Generic Radiation Material Materials 4x107 3x107 (RAD) (4)None List Test :cation: Room 2 Attachment C.2 Oper, Experience None Aging N/A 20 years (2) ood Level Elev: 552' ove Flood Level: YesX Submergence N/A N/A N/A N/A None (4) No

stes: (1) See Section 2.4 in 79-013 report.

(2) See Section 4.1.2 in 79-01B report.

(3) All notes and other information not on these sheets are on the attached appendix sheets.

(4) See Section 3.0 and/or Appendix B in 79-01B report.

Prepared by: TA Marsholl

Flagne 1/20 Reviewed by:/

QA Acceptance;

(3)

Revision D

Sheet No. EEB74-0124

EEB 74-0124

Rev O

System: 74 Unit: 1

Component: CABLE 1/c #14AWG (PN) Mark: WCA

Plant I. D. No.	Room	Function/Service	Category	Operating Time
1ES552-II	2	FCV-74-1 CONT	А	1 Year
1ES553-I	2	FCV-74-1 CONT	1	ja.e
1ES554-I	2	FCV-74-1 CONT	1.1.1	
1ES565-I	2	FCV-74-12 CONT		
1ES566-I	2	FCV-74-12 CONT		
1ES567-I	2	FCV-74-12 CONT		그는 아님은 그가 봐요? 하는
1ES577-1	2	FCV-74-2 CONT		
1ES578-1	2	FCV-74-2 CONT		
1ES579-I	2	FCV-74-2 CONT		1.
1ES590-I	2	FCV-74-13 CONT		
1ES591-1	2	FCV-74-13 CONT		
1ES592-I	2	FCV-74-13 CONT	1.1	and shear
1ES1152-I	2	FCV-74-7 CONT	[[[[[]]] [[[]] [[]] [[]] [[]] [[]] [[]	
1ES1155-I	2 .	FCV-74-7 CONT	2월 전에 환자하고	1 A. A. A.
1ES1156-1	2	FCV-74.7 CONT	$\checkmark$	V.

## EEB 74-0124

Rev O

-

------

....

## ATTACHMENT B

Mark WCA

	Contract No.	Туре	-	Manufacturer
	72C7-75128 72X7-74885-1 73C7-84528 67C3-91618 72C7-75328-1 70C7-54179-1	PN PN PN PN PN		Plastic Wire & Cable Corp Brand-Rex Plastic Wire & Cable Coro Brand-Rex Brand-Rex Brand-Rex
TR	822378) Sequoyah 822639) 72C7-75228-1 822915) 72C7-83874-1	PN		Plastic Wire & Cable Corp Plastic Wire & Cable Corp

Sheet No.: EEB-74-0124

Revision: 0

### ATTACHMENT C

C.1 IPCEA S-61-402 Paragraph 3.9 and Appendix D

C.2 TVA Engineering Report No. 1943

Cable types: PJ, PN, PNJ, PJJ, PSJ

Rooms 1-18

This class of cables was purchased under TVA Standard Specification No. 25.013, based on IPCEA S-61-402 (NEMA WCS). These standards provide a product with an operating rating of 75° C continuous, 95° C (203° F), 500-hour overload rating total in a normal lifetime. They are constructed of polyethylene insulation with Nylon and PVC jacketing.

The jacket material has a higher retention of strength at elevated temperatures, as the material was subjected to air oven aging of 121°C ( $250^{\circ}$  F) for 7 days. Only compartments 1, 2, 3, 6, 9, 10, and 11 show HELB profiles which more than brief'y surpass the softening temperature of the insulation. However, owing to the thermal time lags in the cable material and cable installation, the insulation nor even the jacket experience the temperature profile until some time has elapsed.

TVA has conducted tests (Chattanooga Central Laboratories Report No. 81L-81-6821 dated October 1980, of these cables under a temperature profile which envelopes all the HELB profiles. Following this exposure these samples sustained a dielectric test immersed 1.1 water of 660 volts ac for 6 minutes, 960 volts ac for 5 minutes, and 2200 volts for 5 minutes in succession.

It is therefore our engineering judgment that this test confirms the above and justifies interim coeration until these types can be fully qualified by our Wyle Laboratory tests to be concluded next April or replaced at the next refueling outage.

C.3 Temperature Qualification Method

C.3.1 Standard material long-term overload temperature rating

C.3.2 Engineering Analysis

C.4 The post-HELB conditions are less than the normal cable rating and, in our judgment, the cables could operate satisfactorily for a post-accident of a year.

Prepared by:

Reviewed by:

QA Acceptance:

SYSTEM COMPONENT EVALUATION WORK SHEET (Rev 2)

acility: Browns Ferry Nuclear Plant nit: 1 ocket: 50-260

14

JUNCL 50-260				Duce N-24-12			
FOULDWENT OFFCOLOTION		ENVIRONMENT		DOCUMEN	TATION REF	QUALIFICATION METHOD	OUTSTANDING ITEMS
EQUIPMENT DESCRIPTION	Parameter	Specifi- cation	Qualifi- cation	Specifi- cation	Qualifi- cation	heriou	
rstem: 74 lant ID No. Attachment A	Operating Time	Attachment A	1 Year	(1)	Attachment C.4	Engineering Analysis	None .
mponent Cable WCA 1/C #14 AWG (PN) inufacturer:Attachment B	Temperature	139	153	(4)	Attachments C.1 and C.2	Attaciment C.3	None .
del Number: N/A	Pressure (PSIA)	15.0	N/A	(4)	N/A	N/A	None
nction: Control/Power	Relative Humidity (%)	100	100	(4)	IPCEA S-61-402 par 3.9, 3.7.3 6.7		None
curacy: Req'd: N/A Demon: N/A tegory: Attachment A	Chemical Spray	N/A	N/A	(4)	N/A	N/A	None
ervice: Attachment A	Radiation (RAD)	3×10 <sup>7</sup>	4×107	(4)	NUREG-0588 Materials List	Generic Material Test	None
cation: Room 5	Aging	N/A	20 years	(2)	Attachment C.2	Oper, Experience	None
lood Level Elev: 552' pove Flood Level: YesX No	Submergence	N/A	N/A	(4)	N/A	N/A	None

stes: (1) See Section 2.4 in 79-018 report.

- (2) See Section 4.1.2 in 79-01B report.
- (3) All notes and other information not on these sheets are on the attached appendix sheets.

(4) See Section 3.0 and/or Appendix B in 79-01B report.

Prepared by: TA Marshell

Reviewed by:

QA Acceptance:

(3)

Date 12-24-50

Revision

Sheet No. EEB74-0125

EEB 74 - 0125

Rev O

1 10 1

System: 74 Unit: 1

ם.

2

Component: CABLE 1/c #14AWG (PN) Mark: WCA

Plant I. D. No.	Room	Fur	rvice	Category	Operating Time
1ES3052-II	5	FCV	T	А	1 Vear
1ES3053-II	5	FCV	Т		
1ES3054-II	5	FCV-			
1ES3065-11	5	FCV-	1000		
1ES3066-II	5	FCV-7	.sT		
1ES3067-II -	5	FCV-7	CONT		
-1ES3077-11	5	FCV-74-25	CONT		
1ES3078-11	5	FCV-74-25	CONT		
1ES3079-II	5	FCV-74-25	CONT		
1ES3090-II	5	FCV-74-36	CONT		
1ES3091-II	5	FCV-74-36	CONT		
1ES3092-II	5	FDC-74-36	CONT		
1ES3662-II	5	FCV-74-98	B COLT		
1ES3663-II	5	FCV-74-98	3 CONT	V	$\checkmark$

# EEB <u>74-0125</u> Rev 0

## ATTACHMENT B

Mark WCA

	Contract No.	Туре	•	Manufacturer
	72C7-75128	PN		Plastic Wire & Cable Corp
	72X7-74885-1	PN		Brand-Rex
	73C7-84528	PN		Plastic Wire & Cable Corp
	67C3-91618	PN		Brand-Rex
	7207-75328-1	PN.		Brand-Rex
	70C7-54179-1	PN		Brand-Rex
R	822378) Sequoyah 822639) 72C7-75228-1	PN		Plastic Wire & Cable Corp
	7207-83874-1			Plastic Wire & Cable Corp

TR

ť

1.1.4

Sheet No.: EEB-74-0/25 Revision: 0

#### ATTACHMENT C

- C.1 IPCEA S-61-402 Paragraph 3.9 and Appendix D
- C.2 TVA Engineering Report No. 1943

Cable types: PJ, PN, PNJ, PJJ, PSJ

Rooms 1-18

This class of cables was purchased under TVA Standard Specification No. 25.013, based on IPCEA S-61-402 (NEMA WC5). These standards provide a product with an operating rating of  $75^{\circ}$  C continuous, 95° C (203° F), 500-hour overload rating total in a normal lifetime. They are constructed of polyethylene insulation with Nylon and PVC jacketing.

The jacket material has a higher retention of strength at elevated temperatures, as the material was subjected to air oven aging of 121°C ( $250^{\circ}$  F) for 7 days. Only compartments 1, 2, 3, 6, 9, 10, and 11 show HELB profiles which more than briefly surpass the softening temperature of the insulation. However, owing to the thermal time lags in the cable material and cable installation, the insulation nor even the jacket experience the temperature profile until some time has elapsed.

TVA has conducted tests (Chattanooga Central Laboratories Report No. 81L-81-6821 dated October 1980, of these cables under a temperature profile which envelopes all the HELB profiles. Following this exposure these samples sustained a dielectric test immersed in water of 660 volts ac for 6 minutes, 960 volts ac for 5 minutes, and 2200 volts for 5 minutes in succession.

It is therefore our engineering judgment that this test confirms the above and justifies interim operation until these types can be fully qualified by our Wyle Laboratory tests to be concluded next April or replaced at the next refueling outage.

- C.3 Temperature Qualification Method
  - C.3.1 Standard material long-term overload temperature rating

C.3.2 Engineering Analysis

C.4 The post-HELB conditions are less than the normal cable rating and, in our judgment, the cables could operate satisfactorily for a post-accident of a year.

Prepared by:

Reviewed by:

QA Acceptance:



SYSTEM COMPONENT EVALUATION WORK SHEET (Rev 2)

(3) Sheet No. <u>EEB74-0126</u> Revision O

Dute 10-22-80

icility: Browns Ferry Nuclear Plant
iit: 1
ocket: 50-259

8

FOULDWENT DESCOTOTION	ENVIRONMENT			DOCUMENTATION REF		QUALIFICATION METHOD	OUTSTANDING ITEMS	
EQUIPMENT DESCRIPTION	Parameter	Specifi- cation	Qualifi- cation	Specifi- cation	Qualifi- cation	hemou		
/stem: 74 lant ID No. Attachment A	Operating Time	Attachment A	1 Year	(1)	Attachment C.4	Engineering Analysis	None	
mponent Cable WCA 1/C #14 AWG (PN) enufacturer:Attachment B	Temperature (°F)	217	153	(4)	Attachments C.1 and C.2	Attachment C.3	None .	
ddel Number: N/A	Pressure (PSIA)	15.0	N/A	(4)	N/A	N/A	None	
unction: Control/Power	Relative Humidity (%)	100	100	(4)	IPCEA S-61-402 par 3.9, 3.7.3 6.7		None	
ccuracy: Req'd: N/A Demon: N/A ategory: Attachment A	Chemical Spray	N/A	N/A	(4)	N/A	N/A	None	
ervice: Attachment A	Radiation (RAD)	3.1x10 <sup>7</sup>	4×107	(4)	NUREG-0588 Materials List	Generic Material Test	None	
ocation: Room 6	Aging	N/A	20 years	(2)	Attachment C.2	Oper, Experience	None	
lood Level Elev: 552' bove Flood Level: Yes× No	Submergence	N/A	N/A	(4)	N/A	. N/A	None	

ä.,

otes: (1) See Section 2.4 in 79-018 report.

(2) See Section 4.1.2 in 79-018 report.

(3) All notes and other information not on these sheets are on the attached appendix sheets.

(4) See Section 3.0 and/or Appendix B in 79-01B report.

Prepared by: TA Maishall

Reviewed by:

EEB 74-026

Rev O

System: 74 Unit: 1

Component: CABLE 1/c #14AWG (PN) Mark: WCA

Plant I. D. No.	Room	Function/Service	Category	Operating Time
1V2253	6	FSV-74-102 SUPPLY	A/B	1 HR/1 YR
1V2254	6	FCV-74-102 CONT	A	1 Year
1v2255	6	FCV-74-102 CONT	1	
1V2264	6	FCV-74-103 CONT		
1V2265	6	FCV-74-103 CONT		1
1V2266	6	FCV-74-103 CONT		
1V2256	6	FCV-74-119 CONT		
1V2257	6	FCV-74-119 CONT		
1V2258	6	FCV-74-119 CONT		
1V2267	6	FCV-74-103 CONT		
1V2268	6	FCV-74-120 CONT		
1V2269	6	FCV-74-120 CONT		
1ES677-I	6	FCV-74-57 CONT		
1ES702-1	6	FCV-74-58 CONT		
1ES690-I	6	FCV-74-59 CONT		
1ES3177-II	6	FCV-74-71 CONT		
1ES3627-II	6	FCV-74-72 CCNT	1	V

## EEB 74-0126

「ちっちちち」を いいれいと

\* \*\*

Rev O

## ATTACHMENT B

Mark WCA

	Contract No.	Туре	Manufacturer
	7207-75128	PN	Plastic Wire & Cable Corp Brand-Rex
	72X7-74885-1 73C7-84528	PN PN	Plastic Wire & Cable Coro
	67C3-91618 72C7-75328-1	PN PN	Brand-Rex Brand-Rex
TR	70C7-54179-1 822378)	PN	Brand-Rex
10	822639) Sequoyah 822915) 72C7-75228-1	PN	Plastic Wire & Cable Corp
	72C7-83874-1		Plastic Wire & Cable Corp

 Sheet No.:
 EEB-74-0126

 Revision:
 0

### ATTACHMENT C

- C.1 IPCEA S-61-402 Paragraph 3.9 and Appendix D
- C.2 TVA Engineering Report No. 1943

Cable types: PJ, PN, PNJ, PJJ, PSJ

Rooms 1-18

This class of cables was purchased under TVA Standard Specification No. 25.013, based on IPCEA S-61-402 (NEMA WC5). These standards provide a product with an operating rating of  $75^{\circ}$  C continuous,  $95^{\circ}$  C (203° F), 500-hour overload rating total in a normal lifetime. They are constructed of polyethylene insulation with Nyion and PVC jacketing.

The jacket material has a higher retention of strength at elevated temperatures, as the material was subjected to air oven aging of 121°C ( $250^{\circ}$  F) for 7 days. Only compartments 1, 2, 3, 6, 9, 10, and 11 show HELB profiles which more than briefly surpass the softening temperature of the insulation. However, owing to the thermal time lags in the cable material and cable installation, the insulation nor even the jacket experience the temperature profile until some time has elapsed.

TVA has conducted tests (Chattanooga Central Laboratories Report No. 81L-81-6821 dated October 1980, of these cables under a temperature profile which envelopes all the HELB profiles. Following this exposure these samples sustained a dielectric test immersed in water of 660 volts ac for 6 minutes, 960 volts ac for 5 minutes, and 2200 volts for 5 minutes in succession.

It is therefore our engineering judgment that this test confirms the above and justifies interim operation until these types can be fully qualified by our Wyle Laboratory tests to be concluded next April or replaced at the next refueling outage.

- C.3 Temperature Qualification Method
  - C.3.1 Standard material long-term overload temperature rating

C.3.2 Engineering Analysis

C.4 The post-HELB conditions are less than the normal cable rating and, in our judgment, the cables could operate satisfactorily for a post-accident of a year.

Prepared by .\_\_\_\_

Reviewed by:\_\_\_\_\_

C1 / optance:



FOUTDWENT DECODIDATON		ENVIRONMENT		DOCUMEN	NTATION REF	QUALIFICATION METHOD	OUTSTANDING ITEMS
EQUIPMENT DESCRIPTION	Parameter	Specifi- cation	Qualifi- cation	Specifi- cation	Qualifi- cation	The mod	-
stem: 74 ant ID No. Attachment A	Operating Time	Attachment A	l Year	(1)	Attachment C.4	Engineering Analysis	None
mponent Cable WCA 1/C #14 AWG (PN) nufacturer:Attachment B	Temperature (°F)	308	153	(4)	Attachments C.1 and C.2	Attachment C.3	None
del Number: N/A	Pressure (PSIA)	21.5	N/A	(4)	N/A	N/A	None
nction: Control/Power	Relative Humidity (%)	100	100	(4)	IPCEA S-61-402 par 3.9, 3.7.3 6.7		None
curacy: Req'd: N/A Demon: N/A tegory: Attachment A	Chemical Spray	N/A	N/A	(4)	N/A	N/A	None
rvice: Attachment A	Radiation (RAD)	2×10 <sup>6</sup>	4×107	(4)	NUREG-0588 Materials List	Generic Material Test	None
cation: Room 7	Aging	N/A	20 years	(2)	Attachment C.2	Oper, Experience	None
ood Level Elev: 552' ove Flood Level: YesX	Submergence	N/A	N/A	(4)	N/A	. N/A	None

8

sheets are on the attached appendix sheets.

(4) See Section 3.0 and/or Appendix B in 79-01B report.

EEB 74-0127 Rev O

System: 74 Unit: 1

ĺ

Component: CABLE 1/c #14AWG (PN) Mark: WCA

Plant I. D. No.	Room	Function/Service	Category	Operating Time
1ES528-1	7	FCV-74-53 CONT	A	1 Year
1ES5211	7	FCV-74-53 CONT	1 A A A	
1ES534-I	7	FCV-74-53 CONT		
			4	$\sim$

## EEB \_74-0127

Rev O

1. A.

## ATTACHMENT B

Mark WCA

	Contract No.	Туре	-	Manufacturer
	7207-75128	PN		Plastic Wire & Cable Corp
	72X7-74885-1 73C7-84528	PN		Brand-Rex Plastic Wire & Cable Corp
	67C3-91618 72C7-75328-1	PN PN		Brand-Rex Brand-Rex
-	70C7-54179-1	PN		Brand-Rex
TR	822378) Sequoyah 822639) 72C7-75228-1	PN		Plastic Wire & Cable Corp
	72C7-83874-1			Plastic Wire & Cable Corp

Sheet No.: <u>EEB-74-0127</u> Revision: <u>0</u>

### ATTACHMENT C

C.1 IPCEA S-61-402 Paragraph 3.9 and Appendix D

C.2 TVA Engineering Report No. 1943

Cable types: Pi, PN, PNJ, PJJ, PSJ

Rooms 1-18

This class of cables was purchased under TVA Standard Specification No. 25.013, based on IPCEA S-61-402 (NEMA WC5). These standards provide a product with an operating rating of  $75^{\circ}$  C continuous,  $95^{\circ}$  C (203° F), 500-hour overload rating total in a normal lifetime. They are constructed of polyethylene insulation with Nylon and PVC jacketing.

The jacket material has a higher retention of strength at elevated temperatures, as the material was subjected to air oven aging of 121°C ( $250^{\circ}$  F) for 7 days. Only compartments 1, 2, 3, 6, 9, 10, and 11 show HELB profiles which more than briefly surpass the softening temperature of the insulation. However, owing to the thermal time lags in the cable material and cable installation, the insulation nor even the jacket experience the temperature profile until some time has elapsed.

TVA has conducted tests (Chattanooga Central Laboratories Report No. 81L-81-6821 dated October 1980, of these cables under a temperature profile which envelopes all the HELB profiles. Following this exposure these samples sustained a dielectric test immersed in water of 660 volts ac for 6 minutes, 960 volts ac for 5 minutes, and 2200 volts for 5 minutes in succession.

It is therefore our engineering judgment that this test confirms the above and justifies interim operation until these types can be fully qualified by our Wyle Laboratory tests to be concluded next April or replaced at the next refueling outage.

- C.3 Temperature Qualification Method
  - C.3.1 Standard material long-term overload temperature rating

C.3.2 Engineering Analysis

C.4 The post-HELB conditions are less than the normal cable rating and, in our judgment, the cables could operate satisfactorily for a post-accident of a year.

Prepared by:

Reviewed by:\_\_\_\_

QA Acceptance:



(3)

cility: Browns Ferry Nuc it: 1 cket: 50-259	-			Revision 0			
EQUIPMENT DESCRIPTION		ENVIRONMENT		DOCUMEN	TATION REF	QUALIFICATION !	OUTSTANDING
	Parameter	Specifi- cation	Qualifi- cation	Specifi- cation	Qualifi- cation	METHOD	ITEMS
stem: 74 ant ID No. Attachment A	Operating Time	Attachment A	1 Year	(1)	Attachment C.4	Engineering Analysis	None
imponent Cable WCA 1/C #14 AWG (PN) inufacturer:Attachment B	Temperature (°F)	147	153	(4)	Attachments C.1 and C.2	Attachment C.3	None
del Number: N/A	Pressure (PSIA)	15.0	N/A	(4)	N/A	N/A	None
curacy: Reg'd: N/A	Relative Humidity (%)	100	100	(4)	LPCEA S-61-402 par 3.9, 3.7.3 6.7	Standard	None
tegory: Attachment A	Chemical Spray	N/A	N/A	(4)	N/A	N/A	None
rvice: Attachment A	Radiation (RAD)	2.1x10 <sup>7</sup>	4x107	(4)	NUREG-0588 Materials List	Generic Material Test	None
cation: Room 8	Aging	N/A	20 years	(2)	Attachment C.2	Oper Experience	None
lood Level Elev: 552' bove Flood Level: Yes× No	Submergence	N/A	N/A	(4)	N/A	N/A	None

SYSTEM COMPONENT EVALUATION WORK SHEET (Rev 2)

stes: (1) See Section 2.4 in 79-018 report.

8

ailiture Dura

ma En

- (2) See Section 4.1.2 in 79-01B report.
- (3) All notes and other information not on these sheets are on the attached appendix sheets.
- (4) See Section 3.0 and/or Appendix B in 79-018 report.

Prepared by: TA Maisfall. Reviewed by: 011/2010/10/10/10/10/10 Reviewed by:

EEB 74-0128

System: 74 Unit: 1

÷

Component: CABLE 1/c #14AWG (PN) Mark: WCA

Plant I. D. No.	Room	Function/Service	Category	Operating Time
1ES3165-II	8	FCV-74-75 CONT	А	1 Year
1ES3152-11	3	FCV-74-74 CONT	1 1	
1ES540-1	8	FCV-74-52 CONT		
1ES541- I	8	FCV-74-52 CONT		
1ES528-1	8	FCV-74-53 CONT		
1ES529-II	8	FCV-74-53 CONT		1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1
1ES652-I	8	FCV-74-60 CONT		No. Contraction
1ES665-I	8	FCV-74-61 CONT		
1ES3040-11	8	FCV-74-66 CONT		
1ES3029-II	8	FCV-74-67 CONT		
1ES3028-II	8	FCV-74-67 CONT		
1ES3041-11	8	FCV-74-66 CONT		· · · · · ·
			~	
				1.

Rev 0

# EEB 74-0128

Rev O

## ATTACHMENT B

Mark WCA

	Contract No.	Туре -	Manufacturer
	72C7-75128 72X7-74885-1 73C7-84528 67C3-91618	PN PN PN PN	Plastic Wire & Cable Corp Brand-Rex Plastic Wire & Cable Coro Brand-Rex
	72C7-75328-1 70C7-54179-1	PN. PN	Brand-Rex Brand-Rex
TR	822378) Sequoyah 822639) 72C7-75228-1 822915)	PN	Plastic Wire & Cable Corp
	72C7-83874-1		Plastic Wire & Cable Corp

Sheet No .: EEB-74-0128 Revision: 0

### ATTACHMENT C

C.1 IPCEA S-61-402 Paragraph 3.9 and Appendix D

C.2 TVA Engineering Report No. 1943

Cable types: PJ, PN, PNJ, PJJ, PSJ

Rooms 1-18

This class of cables was purchased under TVA Standard Specification No. 25.013, based on IPCEA S-61-402 (NEMA WC5). These standards provide a product with an operating rating of 75° C continuous, 95° C (203° F), 500-hour overload rating total in a normal lifetime. They are constructed of polyethylene insulation with Nylon and PVC jacketing.

The jacket material has a higher retention of strength at elevated temperatures, as the material was subjected to air oven aging of  $1^{21}$  C (250° F) for 7 days. Only compartments 1, 2, 3, 6, 9, 10, and 11 show HELB profiles which more than briefly surpass the softening temperature of the insulation. However, owing to the thermal time lags in the cable material and cable installation, the insulation nor even the jacket experience the temperature profile until some time has elapsed.

TVA has conducted tests (Chattanooga Central Laboratories Report No. 81L-81-6821 dated October 1980, of these cables under a temperature profile which envelopes all the HELB profiles. Following this exposure these samples sustained a dielectric test immersed in water of 660 volts ac for 6 minutes, 960 volts ac for 5 minutes, and 2200 volts for 5 minutes in succession.

It is therefore our engineering ju gment that this test confirms the above and justifies interim operation until these types can be fully qualified by our Wyle Laboratory tests to be concluded next April or replaced at the next refueling outage.

- C.3 Temperature Qualification Method
  - C.3.1 Standard material long-term overload temperature rating

C.3.2 Engineering Analysis

C.4 The post-HELB conditions are less than the normal cable rating and, in our judgment, the cables could operate satisfactorily for a post-accident of a year.

Prepared by:

Reviewed by:\_\_\_\_\_ QA Acceptance:\_\_\_\_\_



cility: Browns Ferry Nuclear Plant . .it:1 cket: 50-259

8

SYSTEM COMPONENT EVALUATION WORK SHEET (Rev 2)

(3) Sheet No. <u>EEB74-0129</u> Revision <u>O</u> Date /0-22-80

50-259	ENVIRONMENT			DOCUME	NTATION REF	QUALIFICATION	OUTSTANDING	
EQUIPMENT DESCRIPTION	Parameter	Specifi- cation	Qualifi- cation	Specifi- cation	Qualifi- cation	METHOD	ITEMS	
stem: 74 ant ID No. Attachment A	Operating Time	Attachment A	1 Year	(1)	Attachment C.4	Engineering Analysis	None	
<pre>imponent Cable WCA     1/C #14 AWG (PN) inufacturer:Attachment B</pre>	Temperature (°F)	214	153	(4)	Attachments C.1 and C.2	Attachment C.3	None	
.del Number: N/A inction: Control/Power	Pressure (PSIA)	15.0	N/A	(4)	N/A	N/A	None	
	Relative Humidity (%)	100	100	(4)	IPCEA S-61-402 par 3.9, 3.7.3 6.7		None .	
:curacy: Req'd: N/A Demon: N/A .tegory: Attachment A	Chemical Spray	N/A	N/A	(4)	N/A	N/A	None	
:rvice: Attachment A	Radiation (RAD)	2.1×10 <sup>7</sup>	4×107	(4)	NUREG-0588 Materials List	Generic Material Test	None	
cation: Room 9	Aging	N/A	20 years	(2)	Attachment C.2	Oper, Experience	None	
lood Level Elev: 552' bove Flood Level: YesX No	Submergence	N/A	N/A	(4)	N/A	. N/A	None	

stes: (1) See Section 2.4 in 79-01B report.

(2) See Section 4.1.2 in 79-01B report.

(3) All notes and other information not on these sheets are on the attached appendix sheets.

(4) See Section 3.0 and/or Appendix B in 79-01B report.

Prepared by: IA Marchell

Reviewed by

EEB 74-0129

Rev O

-

System: 74 Unit: 1

1

Component: CABLE 1/c #14AWG (PN) Mark: WCA

Plant I. D. No.	Room	Function/Service	Category	Operating Time
1ES3152-II	9	FCV-74-74 CONT	A	1 Year
1ES652-L	9	FCV-74-60 CONT		
1ES665-1	9	FCV-74-61 CONT		
1ES553-I	9	FCV-74-1 CONT	~	V.

EEB 74-0129

Rev Q

## ATTACHMENT B

Mark WCA

Туре

PN

PN PN PN

PN.

PN

PN

	oner	ract	NO	2.	
3	7207-	751	28		
	72X7-	748	85-	1	

	/30/-84528	
	67C3-91618	
	72C7-75328-1	
	70C7-54179-1	
TR	822378)	
	822639) Sequoyah	
	822915) 72C7-75228-1	
	72C7-83874-1	

Manufacturer

Plastic Wire & Cable Corp Brand-Rex Plastic Wire & Cable Corp Brand-Rex Brand-Rex Brand-Rex

Plastic Wire & Cable Corp Plastic Wire & Cable Corp

Sheet No.: <u>EEB-74-0129</u> Revision: <u>0</u>

### ATTACHMENT C

C.1 IPCEA S-61-402 Paragraph 3.9 and Appendix D

C.2 TVA Engineering Report No. 1943

Cable types: PJ, PN, PNJ, PJJ, PSJ

Rooms 1-18

This class of cables was purchased under TVA Standard Specification No. 25.013, based on IPCEA S-61-402 (NEMA WC5). These standards provide a product with an operating rating of  $75^{\circ}$  C continuous,  $95^{\circ}$  C (203° F), 500-hour overload rating total in a normal lifetime. They are constructed of polyethylene insulation with Nylon and PVC jacketing.

The jacket material has a higher retention of strength at elevated temperatures, as the material was subjected to air oven aging of 121° C ( $250^{\circ}$  F) for 7 days. Only compartments 1, 2, 3, 6, 9, 10, and 11 show HELB profiles which more than briefly surpass the softening temperature of the insulation. However, owing to the thermai time lags in the cable material and cable installation, the insulation nor even the jacket experience the temperature profile until some time has elapsed.

TVA has conducted tests (Chattanooga Central Laboratories Report No. 81L-81-6821 dated October 1980, of these cables under a temperature profile which envelopes all the HELB profiles. Following this exposure these samples sustained a dielectric test immersed in water of 660 volts ac for 6 minutes, 960 volts ac for 5 minutes, and 2200 volts for 5 minutes in succession.

It is therefore our engineering judgment that this test confirms the above and justifies interim operation until these types can be fully qualified by our Wyle Laboratory tests to be concluded next April or replaced at the next refueling outage.

C.3 Temperature Qualification Method

C.3.1 Standard material long-term overload temperature rating

C.3.2 Engineering Analysis

C.4 The post-HELB conditions are less than the normal cable rating and, in our judgment, the cables could operate satisfactorily for a post-accident of a year.

Prepared by:

Reviewed by:

QA Acceptance:

8		and and the fill					
dility: Browns Ferry Nucl it: 1 dket: 50-259	lear Plant	SYSTEM COMP	ONENT EVALUA	TION WORK SH	HEET (Rev 2)	(3) Sheet No. EEB74- Revision 0 Date 0-22-5	
	ENVIRONMENT			DOCUMENTATION REF		QUALIFICATION	OUTSTANDING ITEMS
EQUIPMENT DESCRIPTION	Parameter	Specifi- cation	Qualifi- cation	Specifi- cation	Qualifi- cation	METHOD	
stem: 74 ant ID No. Attachment A	Operating Time	Attachment A	1 Yea	(1)	Attachme C.4	nt Engineering Analysis	None .
imponent Cable WCA 1/C #14 AWG (PN) inufacturer:Attachment B	Temperature (°F)	174	153	(4)	Attachments C.1 and C.2	Attachment C.3	None
del Number: N/A	Pressure (PSIA)	15.0	N/A	(4)	N/A	N/A	None
motion: Control/Power	Relative Humidity (%)	100	100	(4)	IPCEA S-61-402 par 3.9, 3.7.3 6.7		None
curacy: Req'd: N/A Demon: N/A tegory: Attachment A	Chemical Spray	N/A	N/A	(4)	N/A	N/A	None
ervice: Attachment A	Radiation (RAD)	3.1×10 <sup>4</sup>	4×107	(4)	NUREG-0588 Materials List	Generic Material Test	None
cation: Room 12	Aging	N/A	20 years	(2)	Attachment C.2	Oper, Experience	None
lood Level Elev: 552' hove Flood Level: YesX No	Submergence	N/A	N/A	(4)	N/A	N/A	None

stes: (1) See Section 2.4 in 79-01B report.

P

(2) See Section 4.1.2 in 79-018 report.

(3) All notes and other information not on these sheets are on the attached appendix sheets.

(4) See Section 3.0 and/or Appendix B in 79-01B report.

Prepared is: TA Marchael

10/2/8 Reviewed by: Atulag

EEB 74-0130

Rev O

1

System: 74 Unit: 1

1

-

Component: CABLE 1/c #14AWG (PN) Mark: WCA

Plant I. D. No.	Room	Function/Service	Category	Operating Time
1ES1169-I	12	FCV-74-77 CONT	A	1 Year
1ES1170-I	12	FCV-74-77 CONT	A	1 Year

## EEB \_74-0130

Kev O

## ATTACHMENT B

0

Mark WCA

Contract No.		Туре	11 <b>-</b> 11	Manufacturer
TR	72C7-75128 72X7-74885-1 73C7-84528 67C3-91618 72C7-75328-1 70C7-54179-1 822378)	PN PN PN PN PN		Plastic Wire & Cable Corp Brand-Rex Plastic Wire & Cable Coro Brand-Rex Brand-Rex Brand-Rex
IN .	822639) Sequoyah 822915) 72C7-75228-1 72C7-83874-1	PN		Plastic Wire & Cable Corp Plastic Wire & Cable Corp