

# FOR INFORMATION ONLY

ES-412  
ATTACHMENT I  
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REVISION 1

SUBJECT CODE 8 4 9		SOUTH CAROLINA & ELECTRIC AND GAS COMPANY CALCULATION RECORD		PAGE 1 OF 4	
CALC TITLE Thermal Analysis - Cable Tray 3088		CALC NO. DC08490-004		REV 1	STAT A
PARENT DOCUMENT MRF 31971		SYSTEM ES	SAFETY CLASS NN QR <u>SR</u>	CALC. CLASS I II III <u>IV</u> V VI	
ORIGINATOR M. C. LYNN	DISC EE	ORGANIZATION SCE&G	DATE 11/ 19/92	XREF NO DC-849-004	

## A. CALCULATION INFORMATION

CONTENT DESCRIPTION: ☐ SEE REVISION Determines heat load of cables and verifies  
That the temperatures do not exceed the thermal limits of the insulation.

AFFECTED COMPONENTS/ANALYSIS: Cable / Cable Tray

CONTAINS PRELIMINARY DATA/ASSUMPTIONS:

X NO YES, PAGES

COMPUTER PROGRAM USED: X NO

YES, VALIDATION NOT REQ'D [REF. 3.5]

YES, VALIDATED [ES-412]

YES, VALIDATED [OTHERS]

PROGRAM VALIDATION CALCULATION

## B. VERIFICATION

☐ CONTINUED, ATTACHMENT

VERIFICATION SCOPE: VERIFY THAT THE CLASSIFICATIONS AND TITLE REFLECT THE CONTENTS  
OF THE CALCULATION.

VERIFIER: K. J. ROGERS

ASSIGN BY: S.G. CARROLL

Melanie C. Lynn 11/19/92  
LEAD ENGINEER (DESIGNEE)/DATE

VERIFIER/DATE

K. J. Rogers 23 NOV 92

APPROVAL/DATE

B. J. Rogers 11/30/92

## C. RECORDS

TO PRS:

12/2/92  
INIT/DATE

9604020139 960329  
PDR ADDCK 05000395  
PDR

REEL

FRAME

ORIGINAL MAINTAINED BY:

X SCE&G DE  
SCE&G

VENDOR

DISTRIBUTION:

CALC FILE [ORIGINAL]

DSE SGC /SYSTEM ENGR Slon /DE FILE 20 6602 [ATTACH. I ONLY, COPY]

SOUTH CAROLINA ELECTRIC & GAS COMPANY  
REVISION SUMMARY

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CALCULATION NO.

REV NO.

SUMMARY DESCRIPTION

[ ] CONTINUED ON PAGE \_\_\_\_

MSH 11/20/92

	POWER AND INDUSTRIAL SYSTEMS DIVISION - READING CALCULATION - DC-849-004			PAGE <i>X23</i> OF 4
	PROJECT: <i>V.C. SUMMER NUCLEAR STATION</i>			IDENTIFIER <i>DC-722001/153</i>
	SUBJECT: <i>WRAP CABLE TRAY 3088 (MRF 31971)</i>			CLASSIFICATION <i>NSR</i>
	SECTION NAME AND NUMBER <i>ELECTRICAL ENGINEERING 0421</i>			W.O. <i>04-5440-722</i>
REVISION	0	1	2	3
ITEM(S) REVISED				
ORIGINATOR	<i>S.N. Mawala</i>			
DATE	<i>10-29-85</i>			
REVIEWER/VERIFIER	<i>J.M. Smith</i>			
DATE	<i>10-30-85</i>			
APPROVAL	<i>A. Harman</i>			
DATE	<i>10/30/85</i>			
ASSUMPTIONS/PRELIMINARY DATA	<i>NO</i>			
PAGES REFERENCE				
THIS CALCULATION REQUIRES <input type="checkbox"/> REVIEW PER E-1 NO. 9 RESULTS ARE NOTED BELOW. <input checked="" type="checkbox"/> VERIFICATION PER DCP 2.05				

	REMARKS	REMARKS	REMARKS	REMARKS
THE REVIEW OF THE CALCULATION INCLUDED EVALUATION AGAINST THE FOLLOWING QUESTIONS:				
WERE INPUTS, INCLUDING CODES, STANDARDS, AND REGULATORY REQUIREMENTS, CORRECTLY SELECTED AND APPLIED?				
ARE ASSUMPTIONS REASONABLE AND ADEQUATELY IDENTIFIED?				
HAVE APPLICABLE CONSTRUCTION AND OPERATING EXPERIENCES BEEN CONSIDERED?				
WAS AN APPROPRIATE CALCULATION METHOD USED?				
IS THE OUTPUT REASONABLE COMPARED TO INPUTS?				



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MICROFILMED

ORIGINATOR SWM

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10-29-85

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PURPOSE: TO CHECK THE ADEQUACY OF THE AMPACITY OF CABLES IN RANDOM LAY POWER TRAY 3088 WITH A ONE-HOUR FIRE BARRIER WRAP OF THEIZMO-LAG 3304. THE TRAY IS BEING WRAPPED TO PROVIDE ASSURANCE THAT AT LEAST ONE DIVISION CABLES REQUIRED FOR SHUT DOWN WILL SURVIVE A POSTULATED FIRE.

DESIGN INPUT: DI-722001/153 REV.0

COMPUTER PROGRAMS: NONE

ASSUMPTION/PRELIMINARY DATA: NONE

REFERENCES: 1. MEMO TO S.N. MARUVADA FROM I.M. SOMMERVILLE, DATED 10/28/85.

CALCULATION: THE CIRCUITS IN TRAY 3088 AND THEIR PARAMETERS ARE LISTED ON P.3. BASED ON THE TOTAL HEAT LOAD (WATTS PER FT.), TRAY GEOMETRY AND PROPERTIES OF CABLE INSULATION AND FIRE

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CALCULATION		MICROFILMED								4	
		ORIGINATOR SNM								PAGES	
		DATE 10-29-85									
CKT. NO.	EQUIP. TAG NO.	DUTY		CABLE B/W	CABLE SIZE	CABLE DIA. IN.	CABLE LB./FT.	CONDUCTORS AMPS	IMPED. $\Omega$ /FT.	WATTS PER FT.	CABLE AREA IN. <sup>2</sup>
		INT.	LONG TERM								
AHC 561A	XFN 38A		X	EKA3H	1-3-8	.79	.533	12.5	.0024	.375	.6241
AHC 571A	XFN 39A		X	EKA3B	1-2-6	.82	.501	0.1	.001	—	.6724
CCE 11A	XES2001A		X	EKA3D	1-2-10	.61	.274	6.0	.0026	.094	.3721
CCE 21A	XET2001C		X	EKA3B	1-2-6	.82	.501	10.4	.001	.108	.6724
CEE 1A	XPN7200A		X	EKA3A	1-2-2	1.09	.858	41.7	.0004	.696	1.1881
CEK 1A	XPN7200A		X	EKA3D	1-2-10	.61	.274	0.4	.0026	.0004	.3721
CRE 1A	XSW 1		X	EKA3C	1-2-8	.74	.363	0.7	.0016	.001	.5476
CRK 11A	XCA 1A		X	EKA3D	1-2-10	.61	.274	11.9	.0026	—	.3721
DGE 1A	XCX 5201		X	EKA3C	1-2-8	.74	.363	.01	.0016	.227	.5476
DGE 11A	XPN5504		X	EKA3A	1-2-2	1.09	.858	10.4	.0004	.043	1.1881
DGE 21A	XES0006		X	EKA3C	1-2-12	.61	.191	1.0	.0042	.004	.3721
DGE 25A	XEX 4201		X	EKA3D	1-3-3/0	1.66	2.409	85.9	.00024	1.771	2.7556
DGE 27A	XPN5248		X	EKA3C	1-2-4/0	1.68	2.095	—	.000128	.32	2.8224
EDE 3XA	DPN804A		X	EKA3A	1-2-1/0	1.22	1.084	70.0	.000256	1.254	1.4884
EDE 6A	XPN5248		X	EKA3B	1-2-2	1.09	.858	60.0	.0004	.922	1.1881
EDN 21A	XPN5248		X	EKA3D	1-2-10	.61	.274	30.0	.0026	.36	.3721
EMC 83A	XBC 1A		X	EKA3B	1-2-6	.82	.501	19.0	.001	.003	.6724
EMC 86A	XBC 1A-1B	X					18.144			7.2784	
EMK 3A	XPN5259		X	EKA3A							
ESE 31A	XSW 1DA		X	EKA3D							
ESE 32A	XSW 1DA1		X	EKA3B							
ESE 33A	XSW 1DA2		X								
ESE 101A	XPN6011		X								
MCE 1A	XPN7106		X								





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## CALCULATION

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BARRIER MATERIAL, THERMAL ANALYSES WERE PERFORMED BY APPLIED ENGINEERING ANALYSIS DEPT. THE RESULTS OF THE THERMAL ANALYSIS ARE LISTED IN REF. 1

THE MAX. TEMPERATURE OCCURS IN A 12" WIDE HORIZONTAL TRAY SECTION AND IS 151.1°F OR 66.2°C. AN ACCEPTABLE VALUE FOR TEMP. RISE, BELOW WHICH FURTHER DERATING OF CABLES IS NOT NEEDED, IS DERIVED AS FOLLOWS:

PER VCS PROJECT DESIGN CRITERIA (SECTION 4.7), THE TYPES OF CABLES IN TRAY 3088 ARE SIZED FOR 125% OVERLOAD. THIS IS EQUIVALENT TO APPLICATION AT NO MORE THAN 80% OF THEIR AMPACITY AT WHICH TEMP. RISE WILL BE LIMITED TO 50°C PER ICEA PS4-440. WITH CURRENT EQUAL TO .8 AMPACITY, HEAT LOAD AND TEMP. RISE WILL BE  $(.8)^2$  OR .64 OF THEIR REFERENCE VALUE. TEMP. RISE OVER 40°C AMBIENT SHOULD THEREFORE BE LIMITED TO  $.64 \times 50 = 32^\circ\text{C}$

$$\text{MAX. TEMP. TO AVOID DERATING} = 40 + 32 = 72^\circ\text{C}$$

CONCLUSION: THE STEADY STATE TEMP. OF THE HOTTEST PART OF THE TRAY, 66.2°C, BEING WELL BELOW THE PERMISSIBLE VALUE OF 72°C, IS ACCEPTABLE AND NO CABLE DERATING IS NECESSARY FOLLOWING THE INSTALLATION OF THE PROPOSED FIRE BARRIER

# memorandum



Gilbert/Commonwealth

DC-722001/153  
REV. 0 . 10/30/55  
REF. 1

to: [REDACTED]

from: I. M. Sommerville

subject: V.C. Summer Nuclear Station  
W.O. 04-5440-722/31971  
Wrap Cable Tray 3088  
Thermal Analysis - Rev 1

October 23, 1985

Ref: Memo to S.N. Maruvada from I. M. Sommerville, Cable Tray 3088 Thermal Analysis, 10/11/85.

The thermal analysis for cable tray 3088 with the 1/2" of Thermo-Lag 330-1 has been re-done to determine the temperatures at a lower heat load.

The analysis is identical to that of the reference memo with the exception of the heat load.

Results are given in figure 1 which show two curves of heat load vs peak cable temperature.

The temperature is 151.1°F and 145.6°F for the 12" and 18" trays respectively for the heat load of 7.28 watts/ft.

It should be noted that the analyses were performed for a horizontal tray; the temperatures will be slightly lower if the trays are vertical.

I. M. SOMMERVILLE

IMS:jpb

cc: T. F. Mackay  
A. L. Hartman  
K. E. Nodland  
R. C. Heck





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CALCULATION

SUBJECT *V.C. SUMMER  
WRAP CABLE TRAY 3088  
THERMAL ANALYSIS*

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*2.4.10*

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*10-25-85*

FIGURE

DEAK TEMPERATURE VS CABLE TRAY HEAT LOAD

12 X 18 INCH TRAY MID-POINT

170

160

150

140

TEMPERATURE - °F

TRAY

12 INCH

18 INCH

TRAY

7.0

8.0

9.0

10.0

11.0

12.0

13.0

CABLE TRAY HEAT LOAD - WATTS/FT