The Light company
Houston Lighting & Power South Texas Project Electric Generating Station P. O. Box 289 Wadsworth, Texas 77483

November 6, 1996
ST-HL-AE-5508
File No.: G03.08
10CFR50.54(f)

U. S. Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, DC 20555

South Texas Project
Units 1 and 2
Docket Nos. STN 50-498, STN 50-499
Response to Request for Additional Information Regarding
Generic Letter 92-08, "Thermo-Lag Fire Barriers"

References:
1. Correspondence from Thomas W. Alexion, NRC, to William T. Cottle, South Texas Project, dated September 11, 1996
2. Correspondence from T. H. Cloninger to Document Control Desk, dated September 14, 1995 (ST-HL-AE-5165)

Pursuant to your request of September 11, 1996 (Reference 1), the South Texas Project submits the attached additional information regarding Generic Letter 92-08, "Thermo-Lag 330-1 Fire Barriers." The response addresses the Nuclear Regulatory Commission staff's concerns regarding the effect of use of Thermo-Lag on ampacity of South Texas Project cables.

Addendum A to this letter provides sufficient data to support the conclusion that Thermo-Lag installations at the South Texas Project pose no adverse impact relative to cable ampacity derating. Addendum A provides a detailed reanalysis based on derating values of 50% for conduits and 32% and 48% for trays for 1-hour and 3-hour ratings, respectively. These values are obtained from Texas Utilities and Tennessee Valley Authority test results. The results indicate that all cables at the South Texas Project are operating within design limits and that no reduction in cable life has been or will be experienced. In addition, the following information provides the South Texas Project strategy for addressing all remaining concerns from Generic Letter 92-08.

A029
1/1

The South Texas Project was constructed using approximately 13,000 linear feet of Thermo-Lag 330-1 to ensure that both a primary and a secondary post-fire safe shutdown pathway would be available for each fire area. This design exceeded the requirements of Section III.G of Appendix R to 10 CFR 50, which specifies that one train of systems necessary to achieve and maintain hot shutdown conditions remain free of fire damage. However, Generic Letter 92-08 identified a number of concerns related to Thermo-Lag including:

1) fire endurance capabilities of Thermo-Lag,
2) ampacity derating of cables enclosed by Thermo-Lag,
3) evaluation and application of tests related to fire endurance capabilities and ampacity derating.

Additional issues such as combustible loading impacts of Thermo-Lag and seismic stability of Thermo-Lag installations, and questionable vendor test practices have also surfaced. All of these concerns have raised significant questions regarding the viability of continued Thermo-Lag use.

Recently, the South Texas Project performed a compliance-based reanalysis of all safe shutdown circuits to determine whether continued Thermo-Lag protection is required. This reanalysis confirmed that, with the exception of approximately 40 linear feet of Thermo-Lag in Fire Area 7, Thermo-Lag protection is not required for the South Texas Project to achieve compliance with Section III.G of Appendix R.

As such, Thermo-Lag installations at the South Texas Project will be removed from use with the exception of Fire Area 07. A Request for Deviation from suppression requirements has been requested for Fire Area 07. See Reference 2. Modifications have been initiated, approved, and funded for both South Texas Project units to remove the Thermo-Lag no longer required. Removal from Unit 2 will begin during the next refueling outage, currently scheduled to begin in February, 1997. Removal from Unit 1 will begin during its next refueling outage, currently scheduled for September, 1997. Removal from both units is currently expected to be completed by the end of 1998.

The current Fire Hazards Analysis Report credits two trains of equipment, a primary and a redundant train, as being available to achieve a post-fire safe shutdown. This capability exceeds the requirements of 10CFR50 Appendix R, Section III.G.1. The South Texas Project has revised the Fire Hazards Analysis Report position under 10CFR50.59 to credit availability of a single train of equipment in each fire area as being sufficient to achieve post-fire safe shutdown.

Upon completion of Thermo-Lag removal and NRC approval of the Fire Area 07 suppression deviation, Thermo-Lag concerns will no longer pertain to the South Texas Project, and STP will remain in full compliance with its commitments to 10CFR50 Appendix R.

If there are any questions, please contact either Mr. P. L. Walker at (512) 972-8392 or me at (512) 972-8787.

T. H. Cloninger
Vice President,
Nuclear Engineering

PLW/lf

Attachment: Addendum A - Reanalysis of Cable Life in Thermo-Lag Wrapped Applications

Leonard J. Callan
Regional Administrator, Region IV
U. S. Nuclear Regulatory Commission
611 Ryan Plaza Drive, Suite 400
Arlington, TX 76011-8064

Thomas W. Alexion
Project Manager, Mail Code 13H3
U. S. Nuclear Regulatory Commission
Washington, DC 20555-0001

David P. Loveless
Sr. Resident Inspector
c/o U. S. Nuclear Regulatory Comm.
P. O. Box 910
Bay City, TX 77404-0910

J. R. Newman, Esquire
Morgan, Lewis & Bockius
1800 M Street, N.W.
Washington, DC 20036-5869

M. T. Hardt/W. C. Gunst
City Public Service
P. O. Box 1771
San Antonio, TX 78296

J. C. Lanier/M. B. Lee
City of Austin
Electric Utility Department
721 Barton Springs Road
Austin, TX 78704

Central Power and Light Company
ATTN: G. E. Vaughn/C. A. Johnson
P. O. Box 289, Mail Code: N5012
Wadsworth, TX 77483

Rufus S. Scott
Associate General Counsel
Houston Lighting & Power Company
P. O. Box 61067
Houston, TX 77208

Institute of Nuclear Power
Operations - Records Center
700 Galleria Parkway
Atlanta, GA 30339-5957

Dr. Bertran Wolfe
15453 Via Vaquero
Monte Sereno, CA 95030

Richard A. Ratliff
Bureau of Radiation Control
Texas Department of Health
1100 West 49th Street
Austin, TX 78756-3189

U. S. Nuclear Regulatory Comm.
Attn: Document Control Desk
Washington, DC 20555-0001

J. R. Egan, Esquire
Egan & Associates, P.C.
2300 N Street, N.W.
Washington, D.C. 20037

J. W. Beck
Little Harbor Consultants, Inc.
44 Nichols Road
Cohassett, MA 02025-1166

AFFIDAVIT

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

In the Matter of	)	
	)	
Houston Lighting & Power	)	Docket Nos. 50-498
Company, et al.,	)	50-499
	)	
South Texas Project	)	
Units 1 and 2	)	

AFFIDAVIT

I, T. H. Cloninger, being duly sworn, hereby depose and say that I am Vice President, Nuclear Engineering, of Houston Lighting & Power Company; that I am duly authorized to sign and file with the Nuclear Regulatory Commission the attached response to a request for additional information regarding Generic Letter 92-08, "Thermo-Lag Fire Barriers"; that I am familiar with the content thereof; and that the matters set forth therein are true and correct to the best of my knowledge and belief.

T.H. Cloninger
Vice President,
Nuclear Engineering

STATE OF TEXAS)
)
COUNTY OF MATAGORDA)

Subscribed and sworn to before me, a Notary Public in and for the State of Texas, this 6th day of November, 1996.

LINDA RITTENBERRY
Notary Public, State of Texas
My Commission Expires 10/9/97

Linda Rittenberry
Notary Public in and for the
State of Texas

ADDENDUM A

REANALYSIS OF CABLE LIFE IN

THERMO-LAG WRAPPED APPLICATIONS

REANALYSIS OF CABLE LIFE IN THERMO-LAG WRAPPED APPLICATIONS

Introduction

Thermal Sciences Inc. ampacity testing results have become questionable as a basis for determining the derating of cables wrapped with the Thermo-Lag 330 system As a result, the qualified life of the wrapped power cables is in question. The following analysis addresses this concern. The method of cable sizing used at the South Texas Project is explained and an analysis of the existing installation is provided. This analysis provides the rationale for the South Texas Project position that the existing Thermo-Lag 330 configurations have not degraded the enclosed safe shutdown cables.

Thermo-Lag 330 is installed on cable trays as 1 and 3-hour Appendix R wraps, on conduit as 1 and 3-hour wraps, as Regulatory Guide 1.75 barrier on wrapped trays[1], as a gap filler where a free air cable enters a cable tray as part of the Sealtemp cable wrap, and where Regulatory Guide 1.75 tray cover gaps are greater than 1/2-inch.

The South Texas Project has completed re-analysis of the Appendix R safe shutdown circuits. This analysis shows the Thermo-Lag 330 material in all but one fire area is not required. The South Texas Project plans on removing the Thermo-Lag 330 material from the cable trays and conduits, except in that one area. This exception is the subject of an Appendix R deviation request submitted separately as Reference 3. Removal of the Thermo-Lag will resolve the ampacity concerns on future cable life. The following analysis addresses the impact on cable life resulting from installation of the fire wrap material to the time the wrap is removed.

Method Used To Determine Cable Ampacity

The method used by the South Texas Project to determine cable ampacities has been examined in detail by NRC reviewers during the Appendix R review prior to issuance of the South Texas Project operating license and during the Electrical Distribution System Functional Inspection conducted several years later. The following is an overview of the method used to select cable sizes by design engineers at the South Texas Project.

Cable ampacities used by South Texas Project Design Engineering are assigned to cables from cable ampacity tables and allowable cable length tables provided by South Texas Project Electrical calculations. Examples of these tables are attached. These calculations are :

1) STP Calculation EC5004: Cable Ampacities,
2) STP Calculation EC5036: DC Cable Sizing,
3) STP Calculation EC5037: Maximum Allowable Length of AC Power Cable,
4) STP Calculation EC5044: Minimum Cable Size Based on Short Circuit

and are verified under

5) STP Calculation EC5038: Power Cable Sizing Verification and
6) STP Calculation EC5046: Power Cable Sizing Verification in Fire Wrapped Trays.

These calculations are available for review at the South Texas Project.

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[1]Where a tray was covered for Regulatory Guide 1.75, the Thermo-Lag panel was used in place of the cover.

The ampacities in these calculations are based on IEEE-ICEA Standards P-54-440 and P-46-426 and the allowable voltage drops to ensure sufficient operating voltage at equipment locations. Ampacity derating tables are provided for various tray fills, for cable passing through a fire penetration, for cable trays with covers, for cables in conduit, for different normal room temperatures (normal room temperatures are taken from equipment qualification design criteria), etc. A cable and raceway program (EE580: Control and Tracking System) is used when routing cables in raceways to ensure train separation, maintain correct raceway fill, determine raceway weight for raceway support design, determine Appendix R combustible loading, etc.

Amperage values used for loads are taken from motor/transformer/equipment nameplates, from vendor supplied information, or from actual test of the equipment during startup or at operating conditions. This value is then adjusted by a factor of 1.25 for all loads except transformers and pressurizer heaters, where a factor of 1.00 is used. This value is then used to find a suitable cable size from the calculation table which matches the installation conditions (tray, conduit, normal room temperature). Where the cable passes through a fire stop penetration, an additional derating of 25% is applied. In a large number of cases at the South Texas Project, the limiting cable sizing criterion is voltage drop rather than ampacity derating. Thus, many of the cables at the South Texas Project are sized one or two cable sizes above the cable size that could adequately carry the load current.

Ampacity Derating For Thermo-Lag 330

After routing the cables using the EE580 program, the power and control power circuits routed in raceways wrapped with Thermo-Lag 330 fire barriers are verified to meet the ampacity derating required by use of an additional companion computer program and Calculation EC5046: Power Cable Sizing Verification in Fire Wrapped Trays. This computer program analyzes the low voltage cables in cable trays, based on the Thermo-Lag 330 fire rating (1 hour or 3 hour), the cable tray/raceway fill, and the total heat load of the cables in the raceway. The results of this computer analysis and hand calculations of the medium voltage cable trays and conduit wrapped with Thermo-Lag are addressed in EC5046.

Description of South Texas Project Calculation EC5046

The EE580 database is used to determine raceway size, circuit numbers, room temperatures, and cable sizes in conjunction with given raceways that are wrapped using Thermo-Lag 330 fire barrier material. The ampacities used in this analysis for circuits routed in trays are based on actual tray fill and the usable depth of the tray, unless tray fill is less than 25 percent, in which case the ampacity is based on 25 percent fill. Cable impedance values used in the program are obtained from EC5037 and cable diameters are obtained from EC5004 (cable information comes from IEEE and vendor information). Intermittent loads such as motor-operated valves are not considered to add long term heating. The following assumptions are used in this calculation.

- Conductor temperature is 90°C
- The maximum allowable heat generation figure is based on 50% tray fill
- Conductor resistance values are taken at 90°C

- Control and instrumentation circuits carry negligible current (heat contribution is considered zero)
- The maximum heat dissipation figure represents the average heat dissipation for that particular percentage fill using cable sizes from No. 12 AWG to 750 KMCIL
- Ampacity values used to calculate the maximum allowable heat generation for each tray fill percentage are based on a 5-inch usable depth tray

Circuits in each low voltage tray wrapped with Thermo-lag 330 material are analyzed using computer-based technique as follows:

STEP 1:

Calculate the total load current of each circuit in the tray as follows:

Type of Load	Total Load Current
All loads (except transformers, control & pressurizer heaters)	1.25 X Full Load Current
Transformers & pressurizer heaters	1.0 X Full Load Current
Control devices	0

Compare the calculated total load current of each circuit with the maximum allowable current for the circuit wire size after applying the appropriate derating factor using the actual tray fill per EE580. If the total load current is less than or equal to the derated maximum allowable ampacity for its wire size, no further analysis is required. Otherwise, continue to Step 2.

STEP 2:

Calculate the heat generation per foot of cable or each circuit, excluding intermittent power loads, using the total load currents from Step 1. Total the heat generation for all circuits in the tray with the maximum allowable heat generation per foot of tray based on a 50 percent fill (that fill which leaves no available space below the side rails) after applying the appropriate derating. If the total heat generation is less than or equal to the derated maximum allowable heat generation, no further analysis is required. If the total heat generation is greater than the derated maximum allowable, continue to Step 3.

STEP 3:

Compare the total heat generation per foot of tray calculated in Step 2 with the maximum allowable heat generation per foot of tray based on the actual tray fill per EE580 after applying the appropriate derating. If the total heat generation is less than or equal to the derated maximum allowable heat generation, no additional analysis is required. If the total heat generation is greater, the cable tray fails the ampacity analysis and alternate means needs to be used to resolve the issue. Some of the available alternatives are:

- Reroute some of the circuits into a lightly loaded tray.
- Increase the cable size of the failing circuit or circuits.
- Manually evaluate the failing circuits.

The medium voltage cable trays and conduits are analyzed using similar techniques. The results are presented in table format in Attachments 5 and 6.

The existing issued EC5046 uses the following derating factors. For cables in tray wrapped with 1-hour rated Thermo-Lag 330 material the derating factor is 28% and 31.15% for cables in tray wrapped with 3-hour rated Thermo-Lag 330 material. The derating factor applied to the ampacities of cables in conduit wrapped with 1-hour rated Thermo-Lag 330 material is 0%, and cables in conduit wrapped with 3-hour rated Thermo-Lag 330 material are derated 9.4%.

Determining Acceptable Ampacity Derating

The Thermal Sciences Inc. derating factors presently used in EC5046 are considered questionable. This is the driving factor in the concern regarding cable ampacity calculations and the possible reduced cable life due to overheating of the cables in Thermo-Lag 330 wrapped raceways. The South Texas Project obtained test data assembled by Texas Utilities and the Tennessee Valley Authority for use as indicators of what constitutes acceptable derating factors under various design configurations. The following is a comparison of the South Texas Project design configuration against the arrangements used by Texas Utilities and the Tennessee Valley Authority.

CONDUIT

Texas Utilities tested the Thermo-Lag 330 wrap system for 1-hour conduit configurations. The Thermo-Lag 330 materials used in the Texas Utilities tests are identical to the materials used at the South Texas Project. Both utilities used pre-formed conduit sections with trowel grade material. Installation of the materials was in accordance with Thermal Sciences Inc. instructions. Trowel grade material was applied to the pre-formed sections and the sections were then banded/wired to the conduit. The trowel grade material was used between the pre-formed sections and the conduit, and was also used to butter the joints between the pre-formed sections.

ONE-HOUR CABLE TRAY FIRE WRAP SYSTEM

The Texas Utilities cable tray wrap system used Thermo-Lag 330 panel material 1/2-inch nominal thickness for the 1-hour fire protection configuration. The system consisted of panel material on top, bottom, and both sides with trowel grade material to butter the joints and seal the panels, per Thermal Sciences Inc. normal instructions. This is the same configuration and material used at the South Texas Project.

THREE-HOUR CABLE TRAY FIRE WRAP SYSTEM

The Tennessee Valley Authority used a 3-hour fire wrap system that is somewhat similar to that used at the South Texas Project. The Tennessee Valley Authority used the 3/4-inch nominal thickness Thermo-Lag 330 material for sides, top and bottom tray covers and used the trowel grade material to butter joints at the top and bottom seams. In addition, the Tennessee Valley Authority used an additional wrap of Thermo-Lag 770 material. The South Texas Project uses the same configuration except the additional wrap of Thermo-Lag 770 material is not used.

CABLE USE IN TESTS

The size and insulation of the cables used in the tests has little effect on the test results. The intent of these tests is to determine the heat transfer through the Thermo-Lag material and the relative change this insulating material has on the cable ampacity.

CONCLUSIONS

Based on the like configurations of the South Texas Project and Texas Utilities installations, the values obtained by the test by Texas Utilities for conduit and 1-hour wrap on cable trays are acceptable for use at the South Texas Project because the same configurations, installations, and materials are used. The Tennessee Valley Authority ampacity derating factors are considered to envelope the South Texas Project installations because the same configurations, installations, and materials are used except for the additional material used by the Tennessee Valley Authority which results in a larger derating factor. Use of the Tennessee Valley Authority 3-hour cable tray ampacity derating factor for South Texas Project configurations is considered conservative.

SELECTION OF DERATING VALUES

For this analysis, a value of 50% derating is used for conduit wrap configurations (both 1-hour and 3-hour). This value is much greater than the values determined by Texas Utilities or the Tennessee Valley Authority and is considered conservative. For the cable tray analysis proposed, a value of 32 % (slightly above the value obtained by Texas Utilities) will be used for derating of cables in cable trays wrapped in 1-hour material and a value of 48% (the value obtained by the Tennessee Valley Authority) will be used for derating cables in cable trays wrapped in 3 hour material. Although final values for ampacity derating for Thermo-Lag 330 materials have not been verified and validated, use of these values to analyze existing Thermo-Lag installations is considered justifiable to determine possible cable life reduction caused by use of Thermo-Lag 330 material used at the South Texas Project.

Analysis of Thermo-Lag Ampacity Derating Using Alternate Derating Factors

LOW VOLTAGE CABLE TRAYS

The computer program used to do the fire wrap ampacity analysis and the current cable data were used to reanalyze the fire wrapped raceway using the derating factors from Texas Utilities and Tennessee Valley Authority tests. The values of 32% for a 1-hour wrap on cable tray, a value of 48% for a 3-hour wrap on a cable tray, and 50% derating on conduits wrapped with either a 1 or 3-hour wrap, were substituted for the old derating values. **All cables passed the analysis. This indicates the cables within the raceways are operating within their design limits.**

CONDUITS AND MEDIUM VOLTAGE TRAYS

A hand-calculated analysis of the conduits and medium voltage trays with Thermo-Lag wrap shows that a derating of 50 % does not cause any cable to fail the analysis. **This indicates the cables within the raceways are operating within their design limits.**
(See Attachment 5 - Table 1 and Attachment 6 - Table 2.)

FIRE-WRAPPED CONDUIT AND TRAY IN FIRE AREA 7

Conduits C1XE2ARX002, C2XE2ARX002 and trays C1XE2ATSAB, C2XE2ATSAB were also analyzed by this analysis. The data sheets which show the cables, load currents, and allowable ampacities of the cables routed in the trays are included in this document as Attachment 4. The two conduits are addressed in Attachment 5. Examination of the tray data shows a large margin exists in the ampacity. Examination of the cables routed in the conduit shows there are no power cables. **This indicates the cables within the raceways are operating within their design limits.**

REGULATORY GUIDE 1.75 USE ANALYSIS

In some cases, where Regulatory Guide 1.75 required a tray cover, Appendix R analysis also required that tray to be wrapped with Thermo-Lag. Where Thermo-Lag was used in place of a tray cover, the ampacity is addressed in the above analysis. The additional Thermo-Lag trowel grade material used to fill gaps between Regulatory Guide 1.75 Sealtemp-wrapped free air cables and tray covers and where it was used to fill tray cover gaps greater than 1/2-inch is enveloped by the above analysis and the ampacity derating assigned to cables in covered trays.

CONCLUSIONS

The above analysis shows the cables in South Texas Project Thermo-Lag 330 wrapped conduit and trays were conservatively derated in the existing initial calculation. The application of the selected derating factors in the analysis indicates these cables are correctly sized for selected values of derating (32% and 48%). **This indicates the cables within the raceway are operating within their design limits and no reduction in cable life has been experienced**. This conclusion is based on the Texas Utilities and Tennessee Valley Authority cable ampacity deratings. Final conclusions cannot be drawn until a valid nuclear industry value for cable derating has been obtained by the ongoing investigations. However, the values used for the ampacity derating are conservative (based upon Texas Utilities and Tennessee Valley Authority information) and are bounding for the South Texas Project. Therefore, the conclusions drawn using these values are considered valid.

ATTACHMENTS

ATTACHMENT 1 - Selected Cable Selection Tables From Electrical Cable Sizing Calculations

ATTACHMENT 2 - Tray Summary Report - Unit 1 Thermo-Lag at 32% And 48%

ATTACHMENT 3 - Tray Summary Report - Unit 2 Thermo-Lag at 32% And 48%

ATTACHMENT 4 - Report of Trays and Cables

ATTACHMENT 5 - Table I - Circuits Routed In Conduit Which Is Wrapped With A 3-Hr Rated Thermo-Lag 330 Fire Barrier

ATTACHMENT 6 - Table II - Medium Voltage Circuits Routed In Tray Which Is Wrapped With Thermo-Lag 330 Fire Barrier

ATTACHMENT 1

Selected Cable Selection Tables From Electrical Cable Sizing Calculations

REV.	ORIGINATOR	DATE	CHECKER	DATE	REV.	ORIGINATOR	DATE	CHECKER	DATE
2	K S CHAN	3/25/85	~~[illegible]~~	4/12/85	3	W.T. Okula	10/28/86	KSC	10/28/86

5.0 SUMMARY

THE MAXIMUM CABLE LENGTH CALCULATIONS FOR THE 125 VDC AND 48 VDC SYSTEMS ARE SUMMARIZED IN THE FOLLOWING TABLE :

TABLE 12

CASE NO.	SYSTEM	DESCRIPTION	TABLE NO.	SHEET NO.
1	125 V & 48 V DC SYSTEMS	BATTERY TERMINAL TO DISTRIBUTION SWITCHBOARD	2	14
2	48 V DC SYSTEM	DISTRIBUTION SWITCHBOARD TO PANEL	3	16
3	125 VDC SYSTEM	DISTRIBUTION SWITCHBOARD TO DISTRIBUTION PANEL	4	18
~~4~~		~~DISTRIBUTION SWITCHBOARD TO INVERTER~~	~~5~~	~~20~~
5		DISTRIBUTION SWITCHBOARD TO 100 VDC LOADS AND SWITCHGEAR & LOAD CENTER BUS	6	22
6		DISTRIBUTION PANEL TO 100 VDC LOADS AND SWITCHGEAR & LOAD CENTER BUS	7	24
7		DISTRIBUTION SWITCHBOARD TO 90 VDC LOADS	8	26
8		DISTRIBUTION PANEL TO 90 VDC LOADS	9	28
9	125 VDC CONTROL CIRCUITS	CONTROL CIRCUITS WITH 10 VOLT DROP	10	30
10		CONTROL CIRCUITS WITH 20 VOLT DROP	11	32

CASE 6

SIMILARLY, LI's ARE CALCULATED FOR ALL DIFFERENT CABLE SIZES.

TABLE 7

CABLE SIZE AWG/MCM	CABLE RESISTANCE PER 1000 FT. AT 90°C (Ω)	CABLE * AMPACITY (A)	PRODUCT OF LI (A-FT)
10	1.35	14	833 ~~500~~
8	0.849	21 ~~22~~	1325 ~~795~~
6	0.534	30	2107 ~~1,264~~
4	0.336	48 ~~43~~	3348 ~~2,009~~
2	0.211	60	5332 ~~3,199~~
2/0	0.1054	82 ~~78~~	10,674 ~~6,404~~
4/0	0.0656	121 ~~115~~	17,149 ~~10,290~~
250	0.0560	152 ~~142~~	20,089 ~~12,054~~
500	0.0278	270 ~~253~~	40,468 ~~24,281~~
750	0.0185	395 ~~369~~	60,811 ~~36,486~~
12	2.15	9	523

OPEN TOP

3

* AMPACITY IS BASED ON CABLES IN ~~TRAY~~ RANDOM FILLED TRAYS TRANSITING FIRESTOPS AT 40°C AMBIENT TEMP AND ~~THROUGH FIRESTOP AT 40°C AMBIENT~~ STANDARD ALLOWABLE FILL FOR POWER CABLE TRAY OF 35% (REF. A, TABLE 6B)

NOTE: FOR REVERSING MOTORS WITH STARTER AT MCC, DIVIDE THE MAXIMUM CABLE LENGTH BY TWO.

REV. 2 BY K S CHAN 3/25/85 CKD [illegible] 4/12/85

REV. 3 BY W. OBERLE 10/14/86 CKD KSC 10/15/86

REV. 1 ORIGINATOR: K S CHAN 6/18/84 CHECKER: [illegible] 6/26/84

SOUTH TEXAS PROJECT
JOB NO. 14926
CALCULATION SHEET

CALC NO. EC5004

SUBJECT CABLE AMPACITIES

SHEET NO. 1

REV.	ORIGINATOR	DATE	CHECKER	DATE	REV.	ORIGINATOR	DATE	CHECKER	DATE
1	KS CHAN	7/29/84	~~[illegible]~~	10/2/84	2	KS CHAN	11/13/84	~~[illegible]~~	11/15/84
3	KS CHAN	1/4/87	[illegible]terrell	2/9/87					

6.0 CALCULATIONS

A AMPACITIES OF POWER CABLE IN CONDUITS

A-1 600 VOLT AND 2KV POWER CABLES (THREE 1/C OR ONE 2/C OR ONE 3/C OR ONE 4/C CABLE IN ONE CONDUIT)

TABLE 1

CABLE SIZE AWG/MCM	CABLE O.D. INCH △2	AMPACITY (AMPS)			
		40°C SEE NOTE 1	50°C SEE NOTE 2	60°C SEE NOTE 2	66°C SEE NOTE 2
3/C #10	~~.704~~ .709	36 *1	32	28	25
3/C #8	~~.917~~ .919	52	46	40	36
3/C #6	~~.997~~ 1.048	69	61	53	48
3/C #4	~~1.096~~ 1.164	94	81	70	63
3/C #2	~~1.224~~ 1.216	123	109	95	85
1/C #2/0	~~.646~~ .668	204	182	157	141
1/C #4/0	~~.753~~ .795	278	247	214	192
1/C-250	~~.860~~ .920	317	282	244	219
1/C-500	~~1.093~~ 1.155	477	425	367	329
1/C-750	~~1.303~~ 1.385	598	532	460	413
2/C #10	.590	36 *1	32	28	25
2/C #8	.700	52	46	40	36
2/C #6	.800	69	61	53	48
2/C #4	1.000	91	81	70	63
4/C #8	1.090	42	37	32	29
4/C #6	~~.975~~ .960	55	49	42	38
4/C #4	~~1.140~~ 1.09	73	65	56	50
4/C #2	~~1.255~~ 1.23	98	87	75	68
3/C #12	.590	27 *1	24	21	19

△5

*1 SEE NOTE 3

SOUTH TEXAS PROJECT
JOB NO. 14926
CALCULATION SHEET

CALC. NO. EC 5004

SUBJECT CABLE AMPACITIES

SHEET NO. 20A

REV.	ORIGINATOR	DATE	CHECKER	DATE	REV.	ORIGINATOR	DATE	CHECKER	DATE
5	FS CHAN	2/6/87	[illegible]	2/9/87					

TABLE 5

COMPARISON OF CABLE AMPACITIES IN DIFFERENT RACEWAYS AT 40°C *

CABLE SIZE AWG/MCM	OPEN TOP RANDOM FILL ICEA P-54-440	THROUGH FIRE STOP 85% OF (2)	SOLID OR VENTILATED BOTTOM WITH SOLID TOP SEC. D.3 ICEA P-46-426	REMARKS
(1)	(2)	(3)	(4)	(5)
3/c #10	16	14	18	
3/c #8	27	23	26	
3/c #6	38	32	35	
3/c #4	54	46	46	
3/c #2	71	60	62	
3-1/c #2/0	97	82	102	
3-1/c #4/0	143	121	139	
3-1/c-250	179	152	159	
3-1/c-500	317	270	286	
3-1/c-750	465	395	359	SEE NOTE 1

* USE CORRECTION FACTORS ON P. 10 TO FIND AMPACITIES AT 50°, 60° & 66°C.

NOTE 1:

WHEN 750 MCM CABLES ARE ROUTED IN A SOLID OR VENTILATED BOTTOM TRAY WITH SOLID TOP, THE AMPACITY OF THE CIRCUITS SHALL BE LIMITED TO THE VALUE IN COLUMN 4 OF THIS TABLE.

REV.	ORIGINATOR	DATE	CHECKER	DATE	REV.	ORIGINATOR	DATE	CHECKER	DATE
4	K S CHAN	6/4/86	[illegible]	6/11/86					

TABLE 6 (CONTINUED)

CABLE AMPACITIES IN OPEN TOP, RANDOMLY FILLED, 5-INCH USABLE DEPTH TRAYS AT 40C AMBIENT TEMPERATURE

CABLE SIZE	O.D.	48%	49%	50%	51%	52%	53%	54%	55%	56%	57%	58%	59%	60%
1/C 250 MCM - 2KV	0.920	141	138	135	132	129	126	123	120	117	114	111	108	105
1/C 500 MCM - 2KV	1.155	251	246	240	235	230	225	219	214	209	203	198	193	187
1/C 750 MCM - 2KV	1.395	368	360	352	344	336	329	321	313	305	297	289	282	274
1/C #2/0 AWG - 2KV	0.680	76	74	73	71	69	68	66	64	63	61	59	58	56
1/C #4/0 AWG - 2KV	0.795	113	111	108	106	103	101	99	96	94	91	89	87	84
2/C # 4 AWG - 2KV	1.000	45	44	43	42	41	40	39	38	37	36	35	34	33
2/C # 6 AWG - 2KV	0.800	29	28	27	27	26	26	25	24	24	23	23	22	21
2/C # 8 AWG - 2KV	0.700	19	19	18	18	17	17	16	16	16	15	15	14	14
2/C # 10 AWG - 2KV	0.590	13	13	13	12	12	12	12	11	11	11	10	10	10
3/C # 2 AWG - 2KV	1.216	56	54	53	52	51	50	49	47	46	45	44	43	41
3/C # 4 AWG - 2KV	1.164	42	42	41	40	39	38	37	36	35	34	33	32	31
3/C # 6 AWG - 2KV	1.048	31	30	29	29	28	27	27	26	26	25	24	24	23
3/C # 8 AWG - 2KV	0.919	20	20	19	19	19	18	18	17	17	16	16	15	15
3/C # 10 AWG - 2KV	0.703	13	13	12	12	12	12	11	11	11	10	10	10	10
4/C # 2 AWG - 2KV	1.270	50	49	48	47	46	45	44	43	42	41	40	39	38
4/C # 4 AWG - 2KV	1.090	34	34	33	32	31	31	30	29	28	28	27	26	25
4/C # 6 AWG - 2KV	0.960	24	24	23	23	22	22	21	21	20	20	19	19	18
4/C # 8 AWG - 2KV	1.090	21	20	20	20	19	19	18	18	17	17	16	16	15
2/C # 10 AWG - 600V	0.530	12	12	12	12	11	11	11	11	11	10	10	10	10
2/C # 12 AWG - 600V	0.470	8	8	8	8	7	7	7	7	7	7	7	6	6
3/C # 10 AWG - 600V	0.630	12	12	12	11	11	11	11	10	10	10	10	10	9
3/C # 12 AWG - 600V	0.590	8	8	8	8	8	8	7	7	7	7	7	7	6
4/C # 4 AWG - 600V	1.110	35	34	33	33	32	31	31	30	29	28	28	27	26
4/C # 6 AWG - 600V	0.930	23	22	22	21	21	20	20	19	19	18	18	17	17
4/C # 10 AWG - 600V	0.670	11	11	11	10	10	10	10	10	9	9	9	9	9

NOTE: STANDARD ALLOWABLE FILL FOR POWER CABLE TRAY IS 35%
STANDARD ALLOWABLE FILL FOR INSTRUMENT & CONTROL CABLE TRAY IS 40%

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ATTACHMENT 2

Tray Summary Report - Unit 1 Thermo-Lag at 32% And 48%

--- TRAY SUMMARY REPORT ---

< FIRE WRAP DERATINGS: 1-HOUR = 32.00% & 3-HOURS = 48.00% >
< # = ANALYSIS FAILURE FLAG >

RACEWAY NUMBER	DRAWING NUMBER	RCWY SIZE	CABLE FILL	AMBIENT TEMP.	RCWY COVERS	FIRE WRAP	TRANSITS FW. PEN.	<- WATTS -> MAX.	TOTAL	<----- ANALYSIS RESULTS ----->
A1XE2ATSAE	9E282400	KE	20.90%	40C	NONE	3-HR	YES	26	0.32	.... PASSES: AMPACITY ANALYSIS
A1XM3BTTVA	9E163702	QE	14.60%	40C	1	1-HR	YES	44	1.00	.... PASSES: AMPACITY ANALYSIS
A1XM4BTTAA	9E164002	KE	32.10%	40C	NONE	1-HR	NO	44	1.00	.... PASSES: AMPACITY ANALYSIS
A1XM4BTTAB	9E164002	KE	32.10%	40C	NONE	1-HR	NO	44	1.00	.... PASSES: AMPACITY ANALYSIS
A1XM4BTTAC	9E164002	KE	31.40%	40C	NONE	1-HR	NO	44	1.00	.... PASSES: AMPACITY ANALYSIS
A1XM4CTTAA	9E164003	KE	31.40%	40C	1	1-HR	NO	44	1.00	.... PASSES: AMPACITY ANALYSIS
A1XM4CTTAB	9E164003	KE	31.20%	40C	NONE	1-HR	NO	44	1.00	.... PASSES: AMPACITY ANALYSIS
A1XM4DTTAS	9E164004	KE	31.20%	40C	NONE	1-HR	NO	44	1.00	.... PASSES: AMPACITY ANALYSIS
A1XM4JTTAA	9E164104	KE	30.40%	40C	NONE	1-HR	YES	44	1.00	.... PASSES: AMPACITY ANALYSIS
A1XM4JTTAB	9E164104	KE	28.00%	40C	NONE	1-HR	NO	44	1.00	.... PASSES: AMPACITY ANALYSIS
A1XM4KTTAA	9E164105	KE	27.40%	40C	NONE	1-HR	NO	44	0.83	.... PASSES: AMPACITY ANALYSIS
A1XM4KTTAB	9E164105	KE	22.90%	40C	NONE	1-HR	NO	44	0.40	.... PASSES: AMPACITY ANALYSIS
A1XM4KTTAC	9E164105	KE	22.90%	40C	NONE	1-HR	YES	44	0.40	.... PASSES: AMPACITY ANALYSIS
B1XC3ATKVA	9E247000	KC	17.10%	50C	1	1-HR	NO	18	8.51	.... PASSES: HEAT ANALYSIS
B1XE2ATSAB	9E282400	KE	19.10%	40C	NONE	3-HR	YES	26	0.22	.... PASSES: AMPACITY ANALYSIS
B1XE3HTWAR	9E282702	KE	5.30%	40C	NONE	1-HR	NO	N/A	N/A	---- NO ANALYSIS: NO PWR CABLE
C1XC3CTHVA	9E247100	KD	17.70%	50C	2	1-HR	NO	30	13.28	.... PASSES: HEAT ANALYSIS
C1XC3CTTVA	9E247100	KD	14.50%	50C	2	1-HR	NO	30	0.05	.... PASSES: AMPACITY ANALYSIS
C1XC5ATSVQ	9E247800	KC	37.60%	50C	NONE	1-HR	NO	20	0.09	.... PASSES: AMPACITY ANALYSIS
C1XC5ATTAR	9E247800	KD	20.70%	50C	NONE	1-HR	NO	30	0.09	.... PASSES: AMPACITY ANALYSIS
C1XC5ATXVJ	9E247800	YD	3.80%	50C	NONE	1-HR	NO	N/A	N/A	---- NO ANALYSIS: INSTM. TRAY
C1XC5ATYAA	9E247800	YC	4.50%	50C	NONE	1-HR	NO	N/A	N/A	---- NO ANALYSIS: INSTM. TRAY
C1XC5ATYAB	9E247800	YC	4.50%	50C	NONE	1-HR	NO	N/A	N/A	---- NO ANALYSIS: INSTM. TRAY
C1XC5ATYAC	9E247800	YC	4.50%	50C	NONE	1-HR	NO	N/A	N/A	---- NO ANALYSIS: INSTM. TRAY
C1XC5ATYAD	9E247800	YC	4.50%	50C	NONE	1-HR	NO	N/A	N/A	---- NO ANALYSIS: INSTM. TRAY
C1XC5ATYAE	9E247800	YC	4.50%	50C	NONE	1-HR	NO	N/A	N/A	---- NO ANALYSIS: INSTM. TRAY
C1XC5ATYAF	9E247800	YC	4.80%	50C	NONE	1-HR	NO	N/A	N/A	---- NO ANALYSIS: INSTM. TRAY
C1XC5CTTAA	9E247900	KD	20.70%	50C	NONE	1-HR	NO	30	0.09	.... PASSES: AMPACITY ANALYSIS
C1XC6ATSAA	9E248100	KC	9.50%	50C	2	1-HR	NO	N/A	N/A	---- NO ANALYSIS: NO PWR CABLE
C1XE2ATSAB	9E282400	KE	21.50%	40C	NONE	3-HR	YES	45	0.34	.... PASSES: AMPACITY ANALYSIS
C1XE5BTSAA	9E284000	KE	19.00%	40C	NONE	1-HR	NO	49	0.01	.... PASSES: AMPACITY ANALYSIS
C1XE5BTSVA	9E284000	KE	24.30%	40C	NONE	1-HR	YES	N/A	N/A	---- NO ANALYSIS: NO PWR CABLE
C1XE5BTSVB	9E284000	KE	25.20%	40C	NONE	1-HR	YES	N/A	N/A	---- NO ANALYSIS: NO PWR CABLE
C1XE5BTSVE	9E284000	YE	19.90%	40C	NONE	1-HR	YES	N/A	N/A	---- NO ANALYSIS: NO PWR CABLE
C1XE5BTSVG	9E284000	KE	5.50%	40C	NONE	1-HR	YES	N/A	N/A	---- NO ANALYSIS: NO PWR CABLE
C1XE5BTTAA	9E284000	KE	29.10%	40C	NONE	1-HR	NO	N/A	N/A	---- NO ANALYSIS: NO PWR CABLE
C1XE5BTTAB	9E284000	KE	4.80%	40C	NONE	1-HR	NO	N/A	N/A	---- NO ANALYSIS: NO PWR CABLE
C1XE5CTSVF	9E283900	YE	24.30%	40C	NONE	1-HR	YES	49	0.20	.... PASSES: AMPACITY ANALYSIS
C1XE5CTXVC	9E283900	YE	2.20%	40C	NONE	1-HR	YES	N/A	N/A	---- NO ANALYSIS: INSTM. TRAY
C1XM1ATHAH	9E163101	KC	8.70%	50C	NONE	1-HR	NO	20	3.91	.... PASSES: AMPACITY ANALYSIS
C1XM1ATHAJ	9E163101	KC	22.60%	50C	NONE	1-HR	YES	20	10.26	.... PASSES: AMPACITY ANALYSIS
C1XM1BTEVA	9E163102	QE	8.52M	50C	2	3-HR	YES	N/A	11.15	---- NO ANALYSIS: MV PWR TRAY
C1XM1BTHAA	9E163102	KC	5.40%	50C	NONE	3-HR	NO	18	4.52	.... PASSES: HEAT ANALYSIS
C1XM1BTHAB	9E163102	KC	3.30%	50C	NONE	3-HR	NO	18	2.34	.... PASSES: AMPACITY ANALYSIS
C1XM1BTSAB	9E163102	KE	13.50%	40C	NONE	3-HR	NO	45	0.71	.... PASSES: AMPACITY ANALYSIS
C1XM1BTSAC	9E163102	KE	13.50%	40C	NONE	3-HR	NO	45	0.71	.... PASSES: AMPACITY ANALYSIS
C1XM1BTSVA	9E163102	QE	6.10%	40C	2	3-HR	YES	45	0.71	.... PASSES: AMPACITY ANALYSIS

--- TRAY SUMMARY REPORT ---

< FIRE WRAP DERATINGS: 1-HOUR = 32.00% & 3-HOURS = 48.00% >
< # = ANALYSIS FAILURE FLAG >

RACEWAY NUMBER	DRAWING NUMBER	RCWY SIZE	CABLE FILL	AMBIENT TEMP.	RCWY COVERS	FIRE WRAP	TRANSITS FW. PEN.	<- WATTS -> MAX.	TOTAL	<----- ANALYSIS RESULTS ----->
C1XM1FTHVA	9E163201	KC	22.60%	40C	NONE	1-HR	NO	25	10.26	.... PASSES: AMPACITY ANALYSIS
C1XM1FTHVB	9E163201	KC	27.70%	40C	NONE	1-HR	NO	25	11.29	.... PASSES: AMPACITY ANALYSIS
C1XM2ATHAA	1E163401	KC	33.00%	40C	NONE	3-HR	YES	23	11.29	.... PASSES: HEAT ANALYSIS
C1XM2ATHAB	1E163401	KC	33.00%	40C	NONE	3-HR	NO	23	11.29	.... PASSES: HEAT ANALYSIS
C1XM2ATHAC	1E163401	KC	33.00%	40C	NONE	3-HR	NO	23	11.29	.... PASSES: HEAT ANALYSIS
C1XM2ATHAD	1E163401	KC	32.30%	40C	NONE	3-HR	NO	23	11.29	.... PASSES: HEAT ANALYSIS
C1XM2ATHAE	1E163401	KC	32.30%	40C	NONE	3-HR	YES	23	11.29	.... PASSES: HEAT ANALYSIS
C1XM2ATHVA	1E163401	QE	7.50%	40C	NONE	3-HR	YES	45	11.29	.... PASSES: AMPACITY ANALYSIS
C1XM2ATSVA	1E163401	QE	2.60%	40C	NONE	1-HR	YES	N/A	N/A	---- NO ANALYSIS: NO PWR CABLE
C1XM2ATXAA	1E163401	YC	2.30%	40C	NONE	1-HR	NO	N/A	N/A	---- NO ANALYSIS: INSTM. TRAY
C1XM2ATXVA	1E163401	VE	0.60%	40C	1	1-HR	YES	N/A	N/A	---- NO ANALYSIS: INSTM. TRAY
C1XM3ATEAD	9E163701	KE	8.52M	40C	NONE	1-HR	NO	N/A	5.57	---- NO ANALYSIS: MV PWR TRAY
C1XM3ATEAE	9E163701	KE	8.52M	40C	NONE	1-HR	NO	N/A	5.57	---- NO ANALYSIS: MV PWR TRAY
C1XM3ATEAF	9E163701	YE	8.52M	40C	NONE	1-HR	NO	N/A	5.57	---- NO ANALYSIS: MV PWR TRAY
C1XM3ATEVA	9E163701	QE	8.52M	40C	1	1-HR	YES	N/A	5.57	---- NO ANALYSIS: MV PWR TRAY
C1XM3ATHVA	9E163701	QE	7.50%	40C	1	1-HR	YES	49	11.29	.... PASSES: AMPACITY ANALYSIS
C1XM3ATSAD	9E163701	KE	13.50%	40C	NONE	1-HR	NO	49	0.36	.... PASSES: AMPACITY ANALYSIS
C1XM3ATSAE	9E163701	KE	13.50%	40C	NONE	1-HR	NO	49	0.36	.... PASSES: AMPACITY ANALYSIS
C1XM3ATSAF	9E163701	YE	11.20%	40C	NONE	1-HR	NO	49	0.36	.... PASSES: AMPACITY ANALYSIS
C1XM3ATSVA	9E163701	QE	2.60%	40C	1	1-HR	YES	N/A	N/A	---- NO ANALYSIS: NO PWR CABLE
C1XM3ATSVB	9E163701	QE	6.10%	40C	1	1-HR	YES	49	0.36	.... PASSES: AMPACITY ANALYSIS
C1XM3ATXVA	9E163701	VE	0.60%	40C	1	1-HR	YES	N/A	N/A	---- NO ANALYSIS: INSTM. TRAY
C1XM3BTEAA	9E163702	KE	8.52M	40C	NONE	1-HR	NO	N/A	5.57	---- NO ANALYSIS: MV PWR TRAY
C1XM3BTEAB	9E163702	KE	8.52M	40C	NONE	1-HR	NO	N/A	5.57	---- NO ANALYSIS: MV PWR TRAY
C1XM3BTSAA	9E163702	KE	13.50%	40C	NONE	1-HR	NO	49	0.36	.... PASSES: AMPACITY ANALYSIS
C1XM3BTSAB	9E163702	KE	13.50%	40C	NONE	1-HR	NO	49	0.36	.... PASSES: AMPACITY ANALYSIS
N1XC4CTAAC	9E247500	KC	8.89M	50C	2	1-HR	NO	N/A	7.03	---- NO ANALYSIS: MV PWR TRAY
N1XE2ATPVX	9E282400	YC	0.40%	40C	NONE	3-HR	NO	N/A	N/A	---- NO ANALYSIS: INSTM. TRAY
N1XE2ATSAA	9E282400	KE	50.10%	40C	NONE	3-HR	NO	45	1.35	.... PASSES: AMPACITY ANALYSIS
N1XE2ATSAB	9E282400	YE	40.50%	40C	NONE	3-HR	YES	45	1.31	.... PASSES: AMPACITY ANALYSIS
N1XE2ATSVB	9E282400	KE	32.50%	40C	NONE	3-HR	NO	45	0.62	.... PASSES: AMPACITY ANALYSIS
N1XE3BTSAM	9E283302	KE	31.80%	40C	NONE	3-HR	NO	45	0.15	.... PASSES: AMPACITY ANALYSIS
N1XE3BTTAD	9E283302	KE	25.80%	40C	NONE	3-HR	NO	45	0.53	.... PASSES: AMPACITY ANALYSIS
N1XE4ATSVA	9E283100	KE	32.80%	40C	NONE	3-HR	NO	45	1.55	.... PASSES: AMPACITY ANALYSIS
N1XE5ATPXX	9E283700	YC	NONE	40C	NONE	3-HR	YES	N/A	N/A	---- NO ANALYSIS: NO CABLES
N1XE5BTVAW	9E284000	KE	18.30%	40C	NONE	1-HR	NO	49	0.06	.... PASSES: AMPACITY ANALYSIS
N1XE5CTSAA	9E283900	KE	33.40%	40C	NONE	1-HR	YES	49	0.13	.... PASSES: AMPACITY ANALYSIS
N1XE5CTSAB	9E283900	KE	20.40%	40C	NONE	1-HR	NO	49	0.03	.... PASSES: AMPACITY ANALYSIS
N1XE5CTSAC	9E283900	KE	20.40%	40C	NONE	1-HR	NO	49	0.03	.... PASSES: AMPACITY ANALYSIS
N1XE5CTSAE	9E283900	KE	20.40%	40C	NONE	1-HR	NO	49	0.03	.... PASSES: AMPACITY ANALYSIS
N1XE5CTSAM	9E283900	KE	26.50%	40C	NONE	1-HR	NO	49	0.03	.... PASSES: AMPACITY ANALYSIS
N1XE5CTVAN	9E283900	KE	32.00%	40C	NONE	1-HR	NO	49	0.07	.... PASSES: AMPACITY ANALYSIS
N1XE5CTVAR	9E283900	KE	19.40%	40C	NONE	1-HR	NO	49	0.02	.... PASSES: AMPACITY ANALYSIS
N1XE5CTVAW	9E283900	YE	21.40%	40C	NONE	1-HR	NO	49	0.06	.... PASSES: AMPACITY ANALYSIS
N1XE5CTVAX	9E283900	YE	21.40%	40C	NONE	1-HR	YES	49	0.06	.... PASSES: AMPACITY ANALYSIS
N1XE5DTHAS	9E283501	KE	13.30%	40C	NONE	1-HR	YES	49	0.24	.... PASSES: AMPACITY ANALYSIS
N1XE5DTWAC	9E283501	KE	43.50%	40C	NONE	1-HR	NO	N/A	N/A	---- NO ANALYSIS: NO PWR CABLE

--- TRAY SUMMARY REPORT ---

< FIRE WRAP DERATINGS: 1-HOUR = 32.00% & 3-HOURS = 48.00% >
< # = ANALYSIS FAILURE FLAG >

RACEWAY NUMBER	DRAWING NUMBER	RCWY SIZE	CABLE FILL	AMBIENT TEMP.	RCWY COVERS	FIRE WRAP	TRANSITS FW. PEN.	<- WATTS -> MAX.	TOTAL	<----- ANALYSIS RESULTS ----->
N1XE5DTWBE	9E283501	YE	27.60%	40C	NONE	1-HR	YES	49	0.13	.... PASSES: AMPACITY ANALYSIS
N1XE6ATSAA	9E284300	KE	48.70%	40C	NONE	1-HR	NO	49	3.00	.... PASSES: HEAT ANALYSIS
N1XE6ATSAB	9E284300	KE	46.60%	40C	NONE	1-HR	YES	49	3.00	.... PASSES: HEAT ANALYSIS
N1XE6ATSVA	9E284300	KE	31.60%	40C	NONE	1-HR	NO	49	1.55	.... PASSES: AMPACITY ANALYSIS
N1XE6BTPXX	9E284500	YE	0.10%	40C	NONE	3-HR	YES	N/A	N/A	---- NO ANALYSIS: INSTM. TRAY
N1XE6BTUAA	9E284500	KE	34.80%	40C	NONE	3-HR	NO	45	1.40	.... PASSES: AMPACITY ANALYSIS
N1XE6BTUAB	9E284500	KE	31.30%	40C	NONE	3-HR	NO	45	1.37	.... PASSES: AMPACITY ANALYSIS
N1XE6BTUAC	9E284500	KE	34.30%	40C	NONE	3-HR	NO	45	1.37	.... PASSES: AMPACITY ANALYSIS
N1XE6BTUAD	9E284500	KE	25.60%	40C	NONE	3-HR	YES	45	0.68	.... PASSES: AMPACITY ANALYSIS
N1XE6CTSVB	9E284400	KE	36.30%	40C	NONE	1-HR	YES	49	0.76	.... PASSES: AMPACITY ANALYSIS
N1XE6CTSVC	9E284400	KC	47.10%	40C	NONE	1-HR	YES	25	0.37	.... PASSES: AMPACITY ANALYSIS
N1XE6CTVAD	9E284400	KE	24.00%	40C	NONE	1-HR	NO	49	0.71	.... PASSES: AMPACITY ANALYSIS
N1XE6CTVAE	9E284400	KE	10.50%	40C	NONE	1-HR	NO	49	0.03	.... PASSES: AMPACITY ANALYSIS
N1XE6CTVAV	9E284400	KE	34.80%	40C	NONE	1-HR	YES	49	1.40	.... PASSES: AMPACITY ANALYSIS
N1XE6CTVAX	9E284400	KE	35.40%	40C	NONE	1-HR	NO	49	1.40	.... PASSES: AMPACITY ANALYSIS
N1XE6GTUAA	9E284600	KE	34.80%	40C	NONE	3-HR	YES	45	1.40	.... PASSES: AMPACITY ANALYSIS
N1XE6GTUAB	9E284600	YE	29.00%	40C	NONE	3-HR	NO	45	1.40	.... PASSES: AMPACITY ANALYSIS
N1XE6GTUAC	9E284600	YE	29.00%	40C	NONE	3-HR	NO	45	1.40	.... PASSES: AMPACITY ANALYSIS
N1XM1ATJAG	9E163101	KE	4.60%	50C	NONE	3-HR	YES	36	3.49	.... PASSES: AMPACITY ANALYSIS
N1XM1ATSAG	9E163101	KE	12.00%	40C	NONE	3-HR	YES	N/A	N/A	---- NO ANALYSIS: NO PWR CABLE
N1XM1BTJAA	9E163102	KE	3.60%	50C	NONE	3-HR	NO	36	3.49	.... PASSES: AMPACITY ANALYSIS
N1XM1BTJVA	9E163102	QE	1.60%	50C	NONE	3-HR	YES	36	3.49	.... PASSES: AMPACITY ANALYSIS
N1XM1BTSAA	9E163102	KE	12.40%	40C	NONE	3-HR	NO	N/A	N/A	---- NO ANALYSIS: NO PWR CABLE
N1XM1BTSVA	9E163102	KE	12.20%	40C	NONE	3-HR	YES	N/A	N/A	---- NO ANALYSIS: NO PWR CABLE
N1XM2BTJVA	1E163402	QE	17.40%	40C	2	1-HR	YES	49	48.36	.... PASSES: HEAT ANALYSIS
N1XM2BTSAA	1E163402	KE	16.10%	40C	NONE	1-HR	YES	49	0.10	.... PASSES: AMPACITY ANALYSIS
N1XM3BTJVA	9E163702	VE	17.50%	40C	2	1-HR	YES	55	54.28	.... PASSES: HEAT ANALYSIS
N1XM4BTHAA	9E164002	KE	29.40%	40C	NONE	1-HR	NO	49	38.91	.... PASSES: HEAT ANALYSIS

--- TRAY SUMMARY REPORT ---

< FIRE WRAP DERATINGS: 1-HOUR = 32.00% & 3-HOURS = 48.00% >
< # = ANALYSIS FAILURE FLAG >

REPORT SUMMARY

....	PASSES: AMPACITY ANALYSIS =	73	(59.84%)
....	PASSES: HEAT ANALYSIS =	3	(10.66%)
----	NO ANALYSIS REQUIRED =	0	(0.00%)
----	NO ANALYSIS: NO CABLES =	1	(0.82%)
----	NO ANALYSIS: NO PWR CABLE =	14	(11.48%)
----	NO ANALYSIS: MV PWR TRAY =	8	(6.56%)
----	NO ANALYSIS: INSTM. TRAY =	13	(10.66%)
****	FAILS : RACEWAY ANALYSIS =	0	(0.00%)
????	ANALYSIS NOT POSSIBLE =	0	(0.00%)
????	MANUAL ANALYSIS REQUIRED =	0	(0.00%)
	TOTAL - RCWY =	122	

********** END OF REPORT **********.

ATTACHMENT 3

Tray Summary Report - Unit 2 Thermo-Lag at 32% And 48%

--- TRAY SUMMARY REPORT ---

< FIRE WRAP DERATINGS: 1-HOUR = 32.00% & 3-HOURS = 48.00% >
< # = ANALYSIS FAILURE FLAG >

RACEWAY NUMBER	DRAWING NUMBER	RCWY SIZE	CABLE FILL	AMBIENT TEMP.	RCWY COVERS	FIRE WRAP	TRANSITS FW. PEN.	<- WATTS -> MAX.	TOTAL	<----- ANALYSIS RESULTS ----->
A2XE2ATJAA	9E282400	KE	8.30%	40C	NONE	1-HR	YES	44	0.92	.... PASSES: AMPACITY ANALYSIS
A2XE2ATSAE	9E282400	KE	19.90%	40C	NONE	3-HR	YES	26	0.24	.... PASSES: AMPACITY ANALYSIS
B2XC3ATKVA	9E247000	KC	17.10%	50C	NONE	1-HR	NO	18	8.51	.... PASSES: HEAT ANALYSIS
B2XE2ATSAB	9E282400	KE	18.30%	40C	NONE	3-HR	YES	26	0.21	.... PASSES: AMPACITY ANALYSIS
B2XE3HTWAR	9E282702	KE	5.20%	40C	NONE	1-HR	NO	N/A	N/A	---- NO ANALYSIS: NO PWR CABLE
B2XE3HTYAL	9E282702	YE	3.60%	40C	NONE	1-HR	NO	N/A	N/A	---- NO ANALYSIS: INSTM. TRAY
C2XC5ATSAR	9E247800	KD	6.30%	50C	NONE	1-HR	NO	26	0.03	.... PASSES: AMPACITY ANALYSIS
C2XC5ATSVQ	9E247800	KC	34.90%	50C	NONE	1-HR	NO	18	0.09	.... PASSES: AMPACITY ANALYSIS
C2XC5ATTAR	9E247800	KD	20.80%	50C	NONE	1-HR	NO	26	0.09	.... PASSES: AMPACITY ANALYSIS
C2XC5ATXVJ	9E247800	YD	3.80%	50C	NONE	1-HR	NO	N/A	N/A	---- NO ANALYSIS: INSTM. TRAY
C2XC5ATYAA	9E247800	YC	4.50%	50C	NONE	1-HR	NO	N/A	N/A	---- NO ANALYSIS: INSTM. TRAY
C2XC5ATYAB	9E247800	YC	4.50%	50C	NONE	1-HR	NO	N/A	N/A	---- NO ANALYSIS: INSTM. TRAY
C2XC5ATYAC	9E247800	YC	4.50%	50C	NONE	1-HR	NO	N/A	N/A	---- NO ANALYSIS: INSTM. TRAY
C2XC5ATYAD	9E247800	YC	4.50%	50C	NONE	1-HR	NO	N/A	N/A	---- NO ANALYSIS: INSTM. TRAY
C2XC5ATYAE	9E247800	YC	4.50%	50C	NONE	1-HR	NO	N/A	N/A	---- NO ANALYSIS: INSTM. TRAY
C2XC5ATYAF	9E247800	YC	4.80%	50C	NONE	1-HR	NO	N/A	N/A	---- NO ANALYSIS: INSTM. TRAY
C2XC5CTTAA	9E247900	KD	20.80%	50C	NONE	1-HR	NO	26	0.09	.... PASSES: AMPACITY ANALYSIS
C2XC6ATSAA	9E248100	KC	9.50%	50C	NONE	1-HR	NO	N/A	N/A	---- NO ANALYSIS: NO PWR CABLE
C2XE2ATSAB	9E282400	KE	20.40%	40C	NONE	3-HR	YES	26	0.32	.... PASSES: AMPACITY ANALYSIS
C2XE5BTSAA	9E284000	KE	19.90%	40C	NONE	1-HR	NO	44	0.01	.... PASSES: AMPACITY ANALYSIS
C2XE5BTSVA	9E284000	KE	24.40%	40C	NONE	1-HR	YES	N/A	N/A	---- NO ANALYSIS: NO PWR CABLE
C2XE5BTSVB	9E284000	KE	26.90%	40C	NONE	1-HR	YES	N/A	N/A	---- NO ANALYSIS: NO PWR CABLE
C2XE5BTSVC	9E284000	KE	10.10%	40C	NONE	1-HR	YES	44	0.02	.... PASSES: AMPACITY ANALYSIS
C2XE5BTSVD	9E284000	KD	9.70%	40C	NONE	1-HR	YES	33	0.01	.... PASSES: AMPACITY ANALYSIS
C2XE5BTSVE	9E284000	YE	19.80%	40C	NONE	1-HR	YES	N/A	N/A	---- NO ANALYSIS: NO PWR CABLE
C2XE5BTSVG	9E284000	KE	5.50%	40C	NONE	1-HR	YES	N/A	N/A	---- NO ANALYSIS: NO PWR CABLE
C2XE5BTTAA	9E284000	KE	28.90%	40C	NONE	1-HR	NO	N/A	N/A	---- NO ANALYSIS: NO PWR CABLE
C2XE5BTTAB	9E284000	KE	4.50%	40C	NONE	1-HR	NO	N/A	N/A	---- NO ANALYSIS: NO PWR CABLE
C2XE5CTSVF	9E283900	YE	24.90%	40C	NONE	1-HR	YES	44	0.20	.... PASSES: AMPACITY ANALYSIS
C2XM1ATHAH	9E163101	KC	8.70%	40C	NONE	1-HR	NO	22	3.38	.... PASSES: AMPACITY ANALYSIS
C2XM1ATHAJ	9E163101	KC	22.60%	40C	NONE	1-HR	YES	22	9.28	.... PASSES: AMPACITY ANALYSIS
C2XM1BTEVA	9E163102	QE	8.52M	40C	NONE	3-HR	YES	N/A	5.57	---- NO ANALYSIS: MV PWR TRAY
C2XM1BTHAA	9E163102	KC	5.40%	40C	NONE	3-HR	NO	13	1.73	.... PASSES: AMPACITY ANALYSIS
C2XM1BTHAB	9E163102	KC	3.30%	40C	NONE	3-HR	NO	13	1.17	.... PASSES: AMPACITY ANALYSIS
C2XM1BTSAB	9E163102	KE	13.30%	40C	NONE	3-HR	NO	26	0.36	.... PASSES: HEAT ANALYSIS
C2XM1BTSAC	9E163102	KE	13.30%	40C	NONE	3-HR	NO	26	0.36	.... PASSES: HEAT ANALYSIS
C2XM1BTSVA	9E163102	QE	6.00%	40C	NONE	3-HR	YES	26	0.36	.... PASSES: HEAT ANALYSIS
C2XM1DTXAA	9E163104	YC	1.00%	40C	NONE	1-HR	NO	N/A	N/A	---- NO ANALYSIS: INSTM. TRAY
C2XM1DTXVA	9E163104	QE	0.30%	40C	NONE	1-HR	YES	N/A	N/A	---- NO ANALYSIS: INSTM. TRAY
C2XM1FTHVA	9E163201	KC	25.10%	40C	NONE	1-HR	NO	22	10.29	.... PASSES: AMPACITY ANALYSIS
C2XM1FTHVB	9E163201	KC	27.70%	40C	NONE	1-HR	NO	22	10.31	.... PASSES: AMPACITY ANALYSIS
C2XM2ATHAA	2E163401	KC	33.00%	40C	NONE	3-HR	YES	13	10.31	.... PASSES: HEAT ANALYSIS
C2XM2ATHAB	2E163401	KC	33.00%	40C	NONE	3-HR	NO	13	10.31	.... PASSES: HEAT ANALYSIS
C2XM2ATHAC	2E163401	KC	33.00%	40C	NONE	3-HR	NO	13	10.31	.... PASSES: HEAT ANALYSIS
C2XM2ATHAD	2E163401	KC	32.30%	40C	NONE	3-HR	NO	13	10.31	.... PASSES: HEAT ANALYSIS
C2XM2ATHAE	2E163401	KC	32.30%	40C	NONE	3-HR	YES	13	10.31	.... PASSES: HEAT ANALYSIS
C2XM2ATHVA	2E163401	VE	6.90%	40C	NONE	3-HR	YES	26	10.31	.... PASSES: AMPACITY ANALYSIS

--- TRAY SUMMARY REPORT ---

< FIRE WRAP DERATINGS: 1-HOUR = 32.00% & 3-HOURS = 48.00% >
< # = ANALYSIS FAILURE FLAG >

RACEWAY NUMBER	DRAWING NUMBER	RCWY SIZE	CABLE FILL	AMBIENT TEMP.	RCWY COVERS	FIRE WRAP	TRANSITS FW. PEN.	<- WATTS -> MAX.	TOTAL	<----- ANALYSIS RESULTS ----->
C2XM2ATSVA	2E163401	QE	2.60%	40C	NONE	1-HR	YES	N/A	N/A	---- NO ANALYSIS: NO PWR CABLE
C2XM2ATXAA	2E163401	YC	2.30%	40C	NONE	1-HR	NO	N/A	N/A	---- NO ANALYSIS: INSTM. TRAY
C2XM2ATXVA	2E163401	VE	0.60%	40C	NONE	1-HR	YES	N/A	N/A	---- NO ANALYSIS: INSTM. TRAY
C2XM3ATEAD	9E163701	KE	8.52M	40C	NONE	1-HR	NO	N/A	5.57	---- NO ANALYSIS: MV PWR TRAY
C2XM3ATEAE	9E163701	KE	8.52M	40C	NONE	1-HR	NO	N/A	5.57	---- NO ANALYSIS: MV PWR TRAY
C2XM3ATEAF	9E163701	KE	8.52M	40C	NONE	1-HR	NO	N/A	5.57	---- NO ANALYSIS: MV PWR TRAY
C2XM3ATEVA	9E163701	VE	8.52M	40C	NONE	1-HR	YES	N/A	5.57	---- NO ANALYSIS: MV PWR TRAY
C2XM3ATHVA	9E163701	VE	6.90%	40C	NONE	1-HR	YES	44	10.31	.... PASSES: AMPACITY ANALYSIS
C2XM3ATSAD	9E163701	KE	13.30%	40C	NONE	1-HR	NO	44	0.36	.... PASSES: AMPACITY ANALYSIS
C2XM3ATSAE	9E163701	KE	13.30%	40C	NONE	1-HR	NO	44	0.36	.... PASSES: AMPACITY ANALYSIS
C2XM3ATSAF	9E163701	KE	13.30%	40C	NONE	1-HR	NO	44	0.36	.... PASSES: AMPACITY ANALYSIS
C2XM3ATSVA	9E163701	VE	2.30%	40C	NONE	1-HR	YES	N/A	N/A	---- NO ANALYSIS: NO PWR CABLE
C2XM3ATSVB	9E163701	VE	5.50%	40C	NONE	1-HR	YES	44	0.36	.... PASSES: AMPACITY ANALYSIS
C2XM3ATXVA	9E163701	VE	0.60%	40C	NONE	1-HR	YES	N/A	N/A	---- NO ANALYSIS: INSTM. TRAY
C2XM3BTEAA	9E163702	KE	8.52M	40C	NONE	1-HR	NO	N/A	5.57	---- NO ANALYSIS: MV PWR TRAY
C2XM3BTEAB	9E163702	KE	8.52M	40C	NONE	1-HR	NO	N/A	5.57	---- NO ANALYSIS: MV PWR TRAY
C2XM3BTSAA	9E163702	KE	13.30%	40C	NONE	1-HR	NO	44	0.36	.... PASSES: AMPACITY ANALYSIS
C2XM3BTSAB	9E163702	KE	13.30%	40C	NONE	1-HR	NO	44	0.36	.... PASSES: AMPACITY ANALYSIS
N2XC3BTAAC	9E246900	KC	8.89M	50C	NONE	1-HR	NO	N/A	4.95	---- NO ANALYSIS: MV PWR TRAY
N2XE1BTHAJ	9E282100	KE	24.00%	40C	NONE	1-HR	YES	44	11.19	.... PASSES: AMPACITY ANALYSIS
N2XE3HTJAJ	9E282702	YE	22.00%	40C	NONE	1-HR	YES	44	40.69	.... PASSES: AMPACITY ANALYSIS
N2XM1ATJAG	9E163101	KE	4.60%	40C	NONE	3-HR	YES	26	3.08	.... PASSES: AMPACITY ANALYSIS
N2XM1BTJAA	9E163102	KE	3.60%	40C	NONE	3-HR	NO	26	3.08	.... PASSES: AMPACITY ANALYSIS
N2XM1BTJVA	9E163102	QE	1.60%	40C	NONE	3-HR	YES	26	3.08	.... PASSES: AMPACITY ANALYSIS
N2XM2BTJVA	2E163402	VE	16.00%	40C	NONE	1-HR	YES	44	39.80	.... PASSES: HEAT ANALYSIS
N2XM3BTJVA	9E163702	VE	17.50%	40C	NONE	1-HR	YES	49	44.54	.... PASSES: HEAT ANALYSIS
N2XM4BTHAA	9E164002	KE	31.70%	40C	NONE	1-HR	NO	44	36.28	.... PASSES: AMPACITY ANALYSIS

--- TRAY SUMMARY REPORT ---

< FIRE WRAP DERATINGS: 1-HOUR = 32.00% & 3-HOURS = 48.00% >
< # = ANALYSIS FAILURE FLAG >

REPORT SUMMARY

....	PASSES: AMPACITY ANALYSIS =	32	(43.24%)
....	PASSES: HEAT ANALYSIS =	11	(14.86%)
----	NO ANALYSIS REQUIRED =	0	(0.00%)
----	NO ANALYSIS: NO CABLES =	0	(0.00%)
----	NO ANALYSIS: NO PWR CABLE =	10	(13.51%)
----	NO ANALYSIS: MV PWR TRAY =	8	(10.81%)
----	NO ANALYSIS: INSTM. TRAY =	13	(17.57%)
****	FAILS : RACEWAY ANALYSIS =	0	(0.00%)
????	ANALYSIS NOT POSSIBLE =	0	(0.00%)
????	MANUAL ANALYSIS REQUIRED =	0	(0.00%)
	TOTAL - RCWY =	74	

********** END OF REPORT **********.

ATTACHMENT 4

Report of Trays and Cables

--- REPORT OF TRAYS AND CABLES ---

< FIRE WRAP DERATINGS: 1-HOUR = 32.00% & 3-HOURS = 48.00% >
< # = ANALYSIS FAILURE FLAG >

RACEWAY NUMBER	DRAWING NUMBER	RCWY SIZE	CABLE FILL	AMBIENT TEMP.	RCWY COVERS	FIRE WRAP	TRANSITS FW.	TRANSITS PEN.	<- WATTS -> MAX.	<- WATTS -> TOTAL	<----- ANALYSIS RESULTS ----->
C1XE2ATSAB	9E282400	KE	21.50%	40C	NONE	3-HR	YES		45	0.34	.... PASSES: AMPACITY ANALYSIS

CABLE NUMBER	DRAWING NUMBER	-- CABLE -- QTY	-- CABLE -- SIZE	FL AMPS	MULT. FACTOR	TOTAL AMPS	MAX. AMPS	TOTAL WATTS	
C1AMACC1SA	9EVAAC01	1	- RC304	7.00	1.25	9	46	0.05	.... PASSES AMPACITY ANALYSIS
C1AMACC1SB	9EVAAC01	1	- RC306	7.00	1.25	9	33	0.08	.... PASSES AMPACITY ANALYSIS
C1AMACC1SC	9EVAAC01	1	- RC310	2.00	1.25	3	14	0.02	.... PASSES AMPACITY ANALYSIS
C1AMACC1SJ	9EVAAC01	1	- RC304	10.00	1.25	13	46	0.11	.... PASSES AMPACITY ANALYSIS
C1NIACC1SA	9EVAAC01	1	- RC310	2.00	1.25	3	14	0.02	.... PASSES AMPACITY ANALYSIS
C1SPADC1SA	9EDJAD01	1	- RC302	10.00	1.25	13	61	0.07	.... PASSES AMPACITY ANALYSIS

--- REPORT OF TRAYS AND CABLES ---

< FIRE WRAP DERATINGS: 1-HOUR = 32.00% & 3-HOURS = 48.00% >
< # = ANALYSIS FAILURE FLAG >

RACEWAY NUMBER	DRAWING NUMBER	RCWY SIZE	CABLE FILL	AMBIENT TEMP.	RCWY COVERS	FIRE WRAP	TRANSITS FW.	TRANSITS PEN.	<- WATTS -> MAX.	<- WATTS -> TOTAL	<----- ANALYSIS RESULTS ----->
C2XE2ATSAB	9E282400	KE	20.40%	40C	NONE	3-HR	YES		26	0.32	.... PASSES: AMPACITY ANALYSIS

CABLE NUMBER	DRAWING NUMBER	-- CABLE -- QTY	SIZE	FL AMPS	MULT. FACTOR	TOTAL AMPS	MAX. AMPS	TOTAL WATTS	
C2AF01C3WF	9EAF0102	1 -	CC712	N/A	N/A	N/A	N/A	N/A	
C2AF01C3WG	9EAF0102	1 -	CC512	N/A	N/A	N/A	N/A	N/A	
C2AF15C1WA	9EAF1501	1 -	CC312	N/A	N/A	N/A	N/A	N/A	
C2AMACC1SA	9EVAAC01	1 -	RC304	7.00	1.25	9	35	0.05	.... PASSES AMPACITY ANALYSIS
C2AMACC1SB	9EVAAC01	1 -	RC306	7.00	1.25	9	25	0.08	.... PASSES AMPACITY ANALYSIS
C2AMACC1SJ	9EVAAC01	1 -	RC304	10.00	1.25	13	35	0.11	.... PASSES AMPACITY ANALYSIS
C2CC01C3WB	9ECC0102	1 -	CC512	N/A	N/A	N/A	N/A	N/A	
C2CC01C3WT	9ECC0102	1 -	CC712	N/A	N/A	N/A	N/A	N/A	
C2CC15C1WC	9ECC1501	1 -	CC312	N/A	N/A	N/A	N/A	N/A	
C2CC41C1WG	9ECC4101	1 -	CC512	N/A	N/A	N/A	N/A	N/A	
C2CC42C1WG	9ECC4201	1 -	CC512	N/A	N/A	N/A	N/A	N/A	
C2CC51C3WG	2ECC5101	1 -	CC212	N/A	N/A	N/A	N/A	N/A	
C2CH07C3WC	9ECH0701	1 -	CC312	N/A	N/A	N/A	N/A	N/A	
C2CH11C3WD	9ECH1103	1 -	CC512	N/A	N/A	N/A	N/A	N/A	
C2CH12C3WJ	9ECH1201	1 -	CC512	N/A	N/A	N/A	N/A	N/A	
C2CS01C3SB	9ECS0102	1 -	CCB12	N/A	N/A	N/A	N/A	N/A	
C2CV26C1WC	9ECV2601	1 -	CC512	N/A	N/A	N/A	N/A	N/A	
C2CV26C1WE	9ECV2601	1 -	CC512	N/A	N/A	N/A	N/A	N/A	
C2DG01C3SA	9EDG0102	1 -	IC3P6	N/A	N/A	N/A	N/A	N/A	
C2DG01C3SB	9EDG0102	1 -	IC3P6	N/A	N/A	N/A	N/A	N/A	
C2DG01C3WK	9EDG0102	1 -	CC312	N/A	N/A	N/A	N/A	N/A	
C2DG04C3SK	9EDG0402	1 -	IC3P6	N/A	N/A	N/A	N/A	N/A	
C2DG04C3SN	9EDG0402	1 -	IC3P6	N/A	N/A	N/A	N/A	N/A	
C2DG04C3WH	9EDG0402	1 -	CC312	N/A	N/A	N/A	N/A	N/A	
C2DG04C3WR	9EDG0402	1 -	CC312	N/A	N/A	N/A	N/A	N/A	
C2ED25C6JB	9EED2501	1 -	CC312	N/A	N/A	N/A	N/A	N/A	
C2ED25C7SB	9EED2501	1 -	CC312	N/A	N/A	N/A	N/A	N/A	
C2EW01C3WE	9EEW0102	1 -	CC712	N/A	N/A	N/A	N/A	N/A	
C2EW01C3WN	9EEW0102	1 -	CC512	N/A	N/A	N/A	N/A	N/A	
C2EW11CBWA	2EEW1103	1 -	IC3P6	N/A	N/A	N/A	N/A	N/A	
C2EW11CCWA	2EEW1103	1 -	IC3P6	N/A	N/A	N/A	N/A	N/A	
C2EW11CNWA	2EEW1103	1 -	IC3P6	N/A	N/A	N/A	N/A	N/A	
C2EW11CPWA	2EEW1103	1 -	IC3P6	N/A	N/A	N/A	N/A	N/A	
C2FC01C2SC	9EFC0101	1 -	CC512	N/A	N/A	N/A	N/A	N/A	
C2HC13C1WB	9EHC1301	1 -	CC312	N/A	N/A	N/A	N/A	N/A	
C2HC13C1WH	9EHC1301	1 -	CC312	N/A	N/A	N/A	N/A	N/A	
C2HC13C2WB	9EHC1301	1 -	CC312	N/A	N/A	N/A	N/A	N/A	
C2HC13C2WH	9EHC1301	1 -	CC312	N/A	N/A	N/A	N/A	N/A	
C2HE09C3WD	9EHE0901	1 -	CC312	N/A	N/A	N/A	N/A	N/A	
C2HE13C3WB	9EHE1301	1 -	CC312	N/A	N/A	N/A	N/A	N/A	
C2MS11C5WA	9EMS1106	1 -	IC3P6	N/A	N/A	N/A	N/A	N/A	
C2NIACC1SA	9EVAAC01	1 -	RC310	2.00	1.25	3	10	0.02	.... PASSES AMPACITY ANALYSIS

ATTACHMENT 5

Table I - Circuits Routed In Conduit Which Is Wrapped With A 3-Hr Rated Thermo-Lag 330 Fire Barrier

TABLE I

CIRCUITS ROUTED IN CONDUIT WHICH IS WRAPPED WITH A 3-HR RATED THERMO-LAG 330 FIRE BARRIER

Conduit		Circuit		Total Load Current	EC5004			Max. Allowable Amps after 50% Derating	Wire Size Adequate
No.	Size	No.	Size		Table 1 Amps	Table 4 Factor	Max. Amps		
B1XE2ARY007	4"	B1EW11CAPA	IB3P6	0	N/A	N/A	N/A	N/A	N/A
		B1EW11CFPA	IB3P6	0	N/A	N/A	N/A	N/A	N/A
		B1EW11CGPA	IB5Q6	0	N/A	N/A	N/A	N/A	N/A
		B1EW11CMPA	IB3P6	0	N/A	N/A	N/A	N/A	N/A
		B1EW11CTPA	IB3P6	0	N/A	N/A	N/A	N/A	N/A
		B1EW11CVPA	IB5Q6	0	N/A	N/A	N/A	N/A	N/A
		B1EW11CDPA	XBTTN	0	N/A	N/A	N/A	N/A	N/A
		B1EW11CRPA	IB3P6	0	N/A	N/A	N/A	N/A	N/A
		B1RC10C7PC	IB3P6	0	N/A	N/A	N/A	N/A	N/A
C1XE2ARX002	4"	C1EW11CAPA	IC3P6	0	N/A	N/A	N/A	N/A	N/A
		C1EW11CFPA	IC3P6	0	N/A	N/A	N/A	N/A	N/A
		C1EW11CGPA	IC5Q6	0	N/A	N/A	N/A	N/A	N/A
		C1EW11CMPA	IC3P6	0	N/A	N/A	N/A	N/A	N/A
		C1EW11CTPA	IC3P6	0	N/A	N/A	N/A	N/A	N/A
		C1EW11CVPA	IC5Q6	0	N/A	N/A	N/A	N/A	N/A
		C1EW11CDPA	XCTTN	0	N/A	N/A	N/A	N/A	N/A
		C1EW11CRPA	XCTTN	0	N/A	N/A	N/A	N/A	N/A
A1XM1GRK009	2"	A1HMABC1LD	RA310	9.5	36	0.8	28.8	14.4	YES
		A1HMABC1LE	RA310	9.5	36	0.8	28.8	14.4	YES
A1XM1GRU035	2"	A1VF01C1SM	CA312	2	27	1.0	27	13.5	YES
		A1HM12C1WB	CA312	0	N/A	N/A	N/A	N/A	N/A
C1XM1GRE079	6"	C1CVACC1GA	3PC125	94	314	1.0	314	157	YES
C1XM1GRH093	2"	C1HMAGC1LA	RC310	9.5	36	0.8	28.8	14.4	YES
		C1HMAGC1LB	RC310	9.5	36	0.8	28.8	14.4	YES
C1XM1GRS127	2"	C1VF01C3SB	CC312	2	27	1.0	27	13.5	YES
		C1HM12C2WB	CC312	0	N/A	N/A	N/A	N/A	N/A
A1XM2ARJ001	12"	A1CCABC1LM	RA310	4	36	1.0	36	18	YES
A1XM2ARJ002	1"	A1CCABC1LL	RA310	2	36	1.0	36	18	YES
A1XM2ARJ003	2"	A1CCABC1LL	RA310	2	36	0.8	28.8	14.4	YES
		A1CCABC1LM	RA310	4	36	0.8	28.8	14.4	YES
A1XM2ART010	12	A1CC22C1WA	CA912	0	N/A	N/A	N/A	N/A	N/A
A1XM2ART012	1"	A1CC21C1WA	CA114	0	N/A	N/A	N/A	N/A	N/A
A1XM2ART014	3"	A1CC21C1WB	CA912	0	N/A	N/A	N/A	N/A	N/A
A1XM2ARV015	3"	A1CC21C1WB	CA912	0	N/A	N/A	N/A	N/A	N/A
		A1CC22C1WA	CA912	0	N/A	N/A	N/A	N/A	N/A
B1XM2ARH040	12"	B1CCAEC1LM	RB310	3	36	1.0	36	18	YES
B1XM2ARH041	2"	B1CCAEC1LM	RB310	3	36	1.0	36	18	YES
B1XM2ARH042	1"	B1CCAEC1LL	RB310	2	36	1.0	36	18	YES
B1XM2ARH043	2"	B1CCAEC1LL	RB310	2	36	1.0	36	18	YES

TABLE I (Cont'd)

CIRCUITS ROUTED IN CONDUIT WHICH IS WRAPPED WITH A 3-HR RATED THERMO-LAG 330 FIRE BARRIER

Conduit		Circuit		Total Load Current	EC5004			Max. Allowable Amps after 50% Derating	Wire Size Adequate
No.	Size	No.	Size		Table 1 Amps	Table 4 Factor	Max. Amps		
B1XE2ARS050	12"	B1CC22C2WA	CB912	0	N/A	N/A	N/A	N/A	N/A
B1XM2ARS052	3"	B1CC22C2WA	CB912	0	N/A	N/A	N/A	N/A	N/A
B1XM2ARS053	1"	B1CC21C2WA	CB114	0	N/A	N/A	N/A	N/A	N/A
B1XM2ARS055	3"	B1CC21C2WB	CB912	0	N/A	N/A	N/A	N/A	N/A
B1XM2ARS056	3"	B1CC21C2WB	CB912	0	N/A	N/A	N/A	N/A	N/A
		B1CV32C1SJ	CB212	0	N/A	N/A	N/A	N/A	N/A
N1XE6BRS030	4"	N1CV30C1SA	CN712	0	N/A	N/A	N/A	N/A	N/A
		N1DB02C1SB	CN312	0	N/A	N/A	N/A	N/A	N/A
		N1DB04C1SAE	CNB12	0	N/A	N/A	N/A	N/A	N/A
		N1DB04C1SCB	CN512	0	N/A	N/A	N/A	N/A	N/A
		N1DB04C1SKB	CN712	0	N/A	N/A	N/A	N/A	N/A
		N1DBATC3SA	RN204	7	91	1.0	91	45.5	YES
		N1HM09C1SA	CN712	0	N/A	N/A	N/A	N/A	N/A
N1XE1FRS018	3"	N1CV30C1SBA	CN708	0	N/A	N/A	N/A	N/A	N/A
N1XE1FRS019	3"	N1HM09C1SCA	CN708	0	N/A	N/A	N/A	N/A	N/A
A2XM1GRK009	2"	A2HMABC1LD	RA310	9.5	36	0.8	28.8	14.4	YES
		A2HMABC1LE	RA310	9.5	36	0.8	28.8	14.4	YES
A2XM1GRU035	2"	A2HM12C1WB	CA312	2	27	1.0	27	13.5	YES
		A2VF01C1SM	CA312	0	N/A	N/A	N/A	N/A	N/A
A2XM2ARJ001	3"	A2CCABC1LM	RA310	4	36	1.0	36	18	YES
		A2CC22C1SM	CA312	0	N/A	N/A	N/A	N/A	N/A
A2XM2ARJ002	1"	A2CCABC1LL	RA310	2	36	1.0	36	18	YES
A2XM2ARJ003	3"	A2CCABC1LL	RA310	2	36	0.8	28.8	14.4	YES
		A2CCABC1LM	RA310	4	36	0.8	28.8	14.4	YES
		A2CC22C1WA	CA912	0	N/A	N/A	N/A	N/A	N/A
		A2CC21C1WB	CA912	0	N/A	N/A	N/A	N/A	N/A
A2XM2ART014	12"	A2CC21C1WB	CA912	0	N/A	N/A	N/A	N/A	N/A
B2XE2ARY007	4"	B2EW11CAPA	IB3P6	0	N/A	N/A	N/A	N/A	N/A
		B2EW11CDPA	XBTTN	0	N/A	N/A	N/A	N/A	N/A
		B2EW11CFPA	IB3P6	0	N/A	N/A	N/A	N/A	N/A
		B2EW11CGPA	IB5Q6	0	N/A	N/A	N/A	N/A	N/A
		B2EW11CMPA	IB3P6	0	N/A	N/A	N/A	N/A	N/A
		B2EW11CRPA	XBTTN	0	N/A	N/A	N/A	N/A	N/A
		B2EW11CTPA	IB3P6	0	N/A	N/A	N/A	N/A	N/A
		B2EW11CVPA	IB5Q6	0	N/A	N/A	N/A	N/A	N/A
B2XM2ARH040	3"	B2CCAEC1LM	RB310	3	36	1.0	36	18	YES
		B2CC22C2WA	CB912	0	N/A	N/A	N/A	N/A	N/A
B2XM2ARH042	1"	B2CCAEC1LL	RB310	2	36	1.0	36	18	YES

TABLE I (Cont'd)

CIRCUITS ROUTED IN CONDUIT WHICH IS WRAPPED WITH A 3-HR RATED THERMO-LAG 330 FIRE BARRIER

Conduit		Circuit		Total Load Current	EC5004			Max. Allowable Amps after 50% Derating	Wire Size Adequate
No.	Size	No.	Size		Table 1 Amps	Table 4 Factor	Max. Amps		
B2XM2ARH043	3"	B2CCAEC1LL	RB310	2	36	1.0	36	18	YES
		B2CCAEC1LM	RB310	3	36	1.0	36	18	YES
		B2CC21C2WB	CB912	0	N/A	N/A	N/A	N/A	N/A
		B2CC22C2WA	CB912	0	N/A	N/A	N/A	N/A	N/A
		B2CV32C1SJ	CB212	0	N/A	N/A	N/A	N/A	N/A
B2XM2ARS055	12"	B2CC21C2WB	CB912	0	N/A	N/A	N/A	N/A	N/A
C2XM2ARX002	4"	C2EW11CAPA	IC3P6	0	N/A	N/A	N/A	N/A	N/A
		C2EW11CDPA	XCTTN	0	N/A	N/A	N/A	N/A	N/A
		C2EW11CFPA	IC3P6	0	N/A	N/A	N/A	N/A	N/A
		C2EW11CGPA	IC5Q6	0	N/A	N/A	N/A	N/A	N/A
		C2EW11CMPA	IC3P6	0	N/A	N/A	N/A	N/A	N/A
		C2EW11CRPA	XCTTN	0	N/A	N/A	N/A	N/A	N/A
		C2EW11CTPA	IC3P6	0	N/A	N/A	N/A	N/A	N/A
		C2EW11CVPA	IC5Q6	0	N/A	N/A	N/A	N/A	N/A
C2XE3BRX079	3"	C2EW11CDPA	XCTTN	0	N/A	N/A	N/A	N/A	N/A
		C2EW11CRPA	XCTTN	0	N/A	N/A	N/A	N/A	N/A
C2XM1GRE079	6"	C2CVACC1GA	3PC125	94	314	1.0	314	157	YES
C2XM1GRH093	2"	C2HMAGC1LA	RC310	9.5	36	0.8	28.8	14.4	YES
		C2HMAGCL1B	RC310	9.5	36	0.8	28.8	14.4	YES
C2XM1GRS127	2"	C2HM i2C2WB	CC312	0	N/A	N/A	N/A	N/A	N/A
		C2VF01C3SB	CC312	0	N/A	N/A	N/A	N/A	N/A

ATTACHMENT 6

Table II - Medium Voltage Circuits Routed In Tray Which Is Wrapped With Thermo-Lag 330 Fire Barrier

TABLE II

MEDIUM VOLTAGE CIRCUITS ROUTED IN TRAY WHICH IS WRAPPED WITH THERMO-LAG 330 FIRE BARRIER

Tray		Circuit		Total Load Current	EC5004 Table II Amps	Fire Barrier		Max. Allow. Amps after Derating	Wire Size Adequate
No.	Size	No.	Size			Rating	Derating Factor		
C1XM1BTEVA	11" X 24"	C1CHACC1GA C1CCACC1GA C1CVACC1GA	3PC125 3PC125 3PC125	125A 83A 94A	303 303 303	3HR 3HR 3HR	48% 48% 48%	157.56A 157.56A 157.56A	YES YES YES
C1XM3ATEAD	5" X 24"	C1CHACC1GA C1CCACC1GA C1CVACC1GA	3PC125 3PC125 3PC125	125A 83A 94A	303 303 303	1HR 1HR 1HR	32% 32% 32%	206.04A 206.04A 206.04A	YES YES YES
C1XM3ATEAE	5" X 24"	C1CHACC1GA C1CCACC1GA C1CVACC1GA	3PC125 3PC125 3PC125	125A 83A 94A	303 303 303	1HR 1HR 1HR	32% 32% 32%	206.04A 206.04A 206.04A	YES YES YES
C1XM3ATEAF	6" X 24"	C1CHAAC1GA C1CCACC1GA C1CVACC1GA	3PC125 3PC125 3PC125	125A 83A 94A	303 303 303	1HR 1HR 1HR	32% 32% 32%	206.04A 206.04A 206.04A	YES YES YES
C1XM3ATEVA	11" X 24"	C1CHACC1GA C1CCACC1GA C1CVACC1GA	3PC125 3PC125 3PC125	125A 83A 94A	303 303 303	1HR 1HR 1HR	32% 32% 32%	206.04A 206.04A 206.04A	YES YES YES
C1XM3BTEAA C1XM3BTEAB	5" X 24"	C1CHACC1GA C1CCACC1GA C1CVACC1GA	3PC125 3PC125 3PC125	125A 83A 94A	303 303 303	1HR 1HR 1HR	32% 32% 32%	206.04A 206.04A 206.04A	YES YES YES
N1XC4CTAAC	5' X 12"	N1RCADC1AC N1RCADC1AD	3QN175 3QN175	229 229	542 542	1HR 1HR	32% 32%	368.56A 368.56A	YES YES

TABLE II (Cont'd)

MEDIUM VOLTAGE CIRCUITS ROUTED IN TRAY WHICH IS WRAPPED WITH THERMO-LAG 330 FIRE BARRIER

Tray		Circuit		Total Load Current	EC5004 Table il Amps	Fire Barrier		Max. Allow. Amps after Derating	Wire Size Adequate
No.	Size	No.	Size			Rating	Derating Factor		
C2XM1BTEVA	11" X 24"	C2CCACC1GA C2CHACC1GA C2CVACC1GA	3PC125 3PC125 3PC125	125A 83A 94A	303 303 303	3HR 3HR 3HR	48% 48% 48%	157.56A 157.56A 157.56A	YES YES YES
C2XM3ATEAD	5" X 24"	C2CCACC1GA C2CHACC1GA C2CVACC1GA	3PC125 3PC125 3PC125	125A 83A 94A	303 303 303	1HR 1HR 1HR	32% 32% 32%	206.04A 206.04A 206.04A	YES YES YES
C2XM3ATEAE	5" X 24"	C2CCACC1GA C2CHACC1GA C2CVACC1GA	3PC125 3PC125 3PC125	125A 83A 94A	303 303 303	1HR 1HR 1HR	32% 32% 32%	206.04A 206.04A 206.04A	YES YES YES
C2XM3ATEAF	5" X 24"	C2CCAAC1GA C2CHACC1GA C2CVACC1GA	3PC125 3PC125 3PC125	125A 83A 94A	303 303 303	1HR 1HR 1HR	32% 32% 32%	206.04A 206.04A 206.04A	YES YES YES
C2XM3ATEVA	12" X 24"	C2CCACC1GA C2CHACC1GA C2CVACC1GA	3PC125 3PC125 3PC125	125A 83A 94A	303 303 303	1HR 1HR 1HR	32% 32% 32%	206.04A 206.04A 206.04A	YES YES YES
C2XM3BTEAA	5" X 24"	C2CCACC1GA C2CHACC1GA C2CVACC1GA	3PC125 3PC125 3PC125	125A 83A 94A	303 303 303	1HR 1HR 1HR	32% 32% 32%	206.04A 206.04A 206.04A	YES YES YES
C2XM3BTEAB	5" X 24"	C2CCACC1GA C1CHACC1GA C2CVAGC1GA	3PC125 3PC125 3PC125	125A 83A 94A	303 303 303	1HR 1HR 1HR	32% 32% 32%	206.04A 206.04A 206.04A	YES YES YES
N2XC3BTAAC	5' X 12"	N2RCAAC1AC N2RCAAC1AD	3QN175 3QN175	192 192	542 542	1HR 1HR	32% 32%	368.56A 368.56A	YES YES