

CRWMS/M&O

Design Analysis Cover Sheet

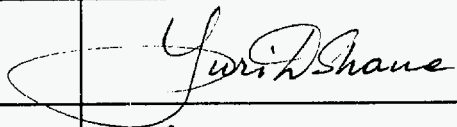
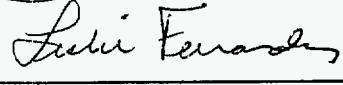
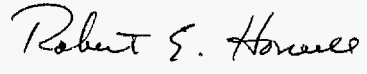
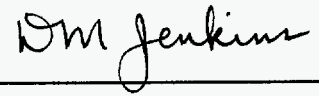

Complete only applicable items.

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QA: N/A

Page: 1 Of: 5

(SCPB: N/A)

2. DESIGN ANALYSIS TITLE CABLE AMPACITY DERATING			
3. DOCUMENT IDENTIFIER (Including Rev. No.) BABBD A000-01717-0200-00088 REV 01		4. REV. NO. 01	5. TOTAL PAGES 5
6. TOTAL ATTACHMENTS 5	7. ATTACHMENT NUMBERS - NO. OF PAGES IN EACH I-2, II-2, III-2, IV-2, V-37		8. SYSTEM ELEMENT ESF
	Print Name	Signature	Date
9. Originator	YURI SHANE		7/21/95
10. Checker	LESLIE FERNANDEZ		7/24/95
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12. QA Manager	Daniel M. Jenkins		07.24.95
13. Department Manager	Gene N. Kimura		7/24/95

14. REMARKS

Design Analysis Revision Record

CRWMS/M&O

Complete only applicable items.

1.

QA: N/A

Page: 2 Of: 5

2. DESIGN ANALYSIS TITLE		
CABLE AMPACITY DERATING		
3. DOCUMENT IDENTIFIER (Including Rev. No.)		4. REVISION NO.
BABBDA000-01717-0200-00088 REV 01		01
5. Revision No.	6. Total Pages	7. Description of Revision
00	5	Initial issue
01	5	Removed TBV-127 Reformatted entire Design Analysis to conform with Procedure QAP-3-9 Rev. 5

1. PURPOSE

The purpose and objective of this calculation is to determine the maximum ampacity of the cables in the underground duct bank for ensuring compliance with cable limits.

2. QUALITY ASSURANCE

- 2.1 No quality assurance (QA) controls apply to the items and activities as they are discussed within this analysis and it is therefore QA classified as "NONE" per [Quality Administrative Procedure] QAP-2-0 Rev. 2, QAP-2-3 Rev. 7, and [Implementing Line Procedure] NLP-3-18 Rev. 2.
- 2.2 No applicable Determination of Importance Evaluations (DIEs) (Reference 5.1) have resulted in controls that would affect the structures, systems, or components/configuration items described within this analysis. If a subsequent DIE indicates that the information provided in this analysis is required for use as a design input, this design analysis will require revision.
- 2.3 This study was revised in accordance with QAP-3-9 Rev. 5.

3. METHOD

The computer program developed by Operation Technology Inc. was used for this design. This program uses the following factors to determine the cable ampacity and temperature:

- A. Ambient temperature
- B. Soil thermal resistivity
- C. Cable position in the duct-bank

4. DESIGN INPUTS

4.1 DESIGN PARAMETERS

- Earth Thermal Resistivity - 120 RHO (NEC 93, Appendix B)
- Fill (concrete) - 85 RHO (ETAP)
- Ambient Temperature - 40°C
- Cable temperature not to exceed 90°C

4.2 CRITERIA

Exploratory Studies Facility Basis For Design 7.2 IV.1

4.3 ASSUMPTIONS

4.3.1 Typical values for DC resistance, insulation thermal resistance, and dielectric losses are assumed for each cable size.

4.3.2 Following loads are assumed for the feeders:

1. Subsurface feeder no. 1 - 25 MVA
2. Subsurface feeder no. 2 - 25 MVA
3. Tunnel Boring Machine - 4.5 MVA
4. 480 V transformer loads at full capacity.

4.4 CODES AND STANDARDS

4.4.1 NFPA 70-1993 National Electrical Code (NEC)

4.4.2 ANSI/IEEE 442-1981 A Guide for Soil Thermal Resistivity Measurements

5. REFERENCES

5.1 BABB00000-01717-2200-00001 REV. 05, DIE For ESF North Portal Pad

6. USE OF COMPUTER SOFTWARE

The Electrical Transient Analysis Program (ETAP) by Operation Technology, Inc. (OTI) Version 6.52 was used for cable ampacity derating calculations. The software used was appropriate for the nonquality affecting application.

7. DESIGN ANALYSIS

Cable derating program was run to determine the maximum load current capacity and cable temperature for different duct bank configuration. Earth and fill resistivity and ambient temperature were assumed as close as possible to actual environmental conditions. Each duct will contain three-single conductor copper cables. Cable sizes are shown on the computer printout.

8. CONCLUSION |

Cable ampacity and cable temperature were calculated for the following duct bank configuration:

1. 3 x 8 main duct bank (permanent power)
2. 3 x 8 main duct bank (temporary power)
3. 1 x 3 duct bank (480V cables to pad mount transformer)
4. 2 x 5 duct bank (from pole to 15 kV switchgear).

In each case above, it was determined that cable temperature and ampacities were within the cable limits.

9. ATTACHMENTS |

ATTACHMENT

TITLE

I	Computer Printout Study Case: 1	
II	Computer Printout Study Case: 2	
III	Computer Printout Study Case: 3	
IV	Computer Printout Study Case: 4	
V	Support Documents	

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COMPUTER PRINTOUT STUDY CASE: 1

Project: ESF DESIGN-YUCCA MOUNTAIN
 Location: LAS VEGAS, NV.
 Contract: 4580823
 Engineer: B.HAJMUDAR *BAA*

ETAP 6.52

Page: 1/2
 Date: 09-24-1993
 SH: 88FD130132
 File: MAINDUC8

Study Case: 1

2 X 5 DUCT BANK (FROM POLE TO 15KV SWITCHGEAR)

Cable Size	No of Cond.	Volt kV	Type	DC Res. μ ohm/ft	O. D. (in)	Insul. Ther.R ohm-ft	Dielec Losses (W/ft)	Yc	Ys
750	1	15	CU	14.40	1.811	1.549	0.161	0.038	0.000
SPR	0	0		0.00	1.000	0.000	0.000	0.000	0.000

Instal- lation	Conduit Type	# of Rows	# of Cols	Ref. Depth (in)	Height (in)	Width (in)	RHO		Ambient Temp. °C
							Earth	Fill	
Duct Bank	PVC	2	5	24.0	28.5	57.0	120.0	85.0	40.0

Col	Row	Horiz. Dist. (in)	Verti. Dist. (in)	Circuit Name	Load Current (Amp)	Cable Temp. (°C)	CABLE					CONDUIT (in)		
							No.	C/C	Size	kV	Type	Status	Size	Thick.
1	1	9.50	9.50	MAIN INCOM.	282.5	83.7	3	1	750	15	CU		6.060	0.280
1	2	9.50	19.00	MAIN INCOM.	282.5	84.8	3	1	750	15	CU		6.060	0.280
2	1	19.00	9.50	MAIN INCOM.	282.5	87.0	3	1	750	15	CU		6.060	0.280
2	2	19.00	19.00	SPARE	0.0	77.1	0	0	SPR	0			6.060	0.280
3	1	28.50	9.50	MAIN INCOM.	282.5	88.6	3	1	750	15	CU		6.060	0.280
3	2	28.50	19.00	SPARE	0.0	78.7	0	0	SPR	0			6.060	0.280
4	1	38.00	9.50	MAIN INCOM.	282.5	88.8	3	1	750	15	CU		6.060	0.280
4	2	38.00	19.00	MAIN INCOM.	282.5	89.9	3	1	750	15	CU		6.060	0.280
5	1	47.50	9.50	MAIN INCOM.	282.5	85.5	3	1	750	15	CU		6.060	0.280
5	2	47.50	19.00	MAIN INCOM.	282.5	87.2	3	1	750	15	CU		6.060	0.280

COMPUTER PRINTOUT STUDY CASE: 1 (CONTINUED)

Project: ESF DESIGN-YUCCA MOUNTAIN

ETAP 6.52

Page: 2/2

Location: LAS VEGAS, NV.

Date: 09-24-1993

Contract: 4580823

SN: 88FDI30132

Engineer: B.MAJMUDAR *BA*

Study Case: 1

File: MAINDUC8

2 X 5 DUCT BANK (FROM POLE TO 15KV SWITCHGEAR)

	COLUMNS:	1	2	3	4	5
ROW 1	Cable:	750	750	750	750	750
	Amp.:	282.5	282.5	282.5	282.5	282.5
	Temp.:	83.7	87.0	88.6	88.8	85.5
ROW 2	Cable:	750	SPR	SPR	750	750
	Amp.:	282.5	0.0	0.0	282.5	282.5
	Temp.:	84.8	77.1	78.7	89.9	87.2

* Indicates locations where the calculated temperature exceeds the rated conductor temperature as specified in the cable libraries.

COMPUTER PRINTOUT STUDY CASE: 2

Project: ESF DESIGN-YUCCA MOUNTAIN
 Location: LAS VEGAS, NV.
 Contract: 4580823
 Engineer: B.MAJMUDAR

ETAP 6.52
 Study Case: 2

Page: 1/2
 Date: 09-24-1993
 SN: 88FD130132
 File: MAINDUC6

3 X 8 MAIN DUCT BANK (TEMPORARY POWER)

Cable Size	No of Cond.	Volt kV	Type	DC Res. μ ohm/ft	O. D. (in)	Insul. Ther.R ohm-ft	Dielec Losses (W/ft)	Yc	Ys
SPR	0	0		0.00	1.000	0.000	0.000	0.000	0.000
750	1	15	CU	14.40	1.811	1.549	0.161	0.038	0.000

Instal- lation	Conduit Type	# of Rows	# of Cols	Ref. Depth (in)	Height (in)	Width (in)	RHO		Ambient Temp. °C
							Earth	Fill	
Duct Bank	PVC	3	8	24.0	38.0	85.5	120.0	85.0	40.0

Col	Row	Horiz. Dist. (in)	Verti. Dist. (in)	Circuit Name	Load Current (Amp)	Cable Temp. (°C)	CABLE					CONDUIT (in)	
							No.	C/C	Size	kV	Type	Status	Size
1	1	9.50	9.50	SPARE	0.0	58.7	0	0	SPR	0		6.060	0.280
1	2	9.50	19.00	SPARE	0.0	63.6	0	0	SPR	0		6.060	0.280
1	3	9.50	28.50	SUB.SURF.#1	407.0	87.2	3	1	750	15	CU	6.060	0.280
2	1	19.00	9.50	SPARE	0.0	59.6	0	0	SPR	0		6.060	0.280
2	2	19.00	19.00	SPARE	0.0	64.1	0	0	SPR	0		6.060	0.280
2	3	19.00	28.50	SPARE	0.0	67.3	0	0	SPR	0		6.060	0.280
3	1	28.50	9.50	SPARE	0.0	60.3	0	0	SPR	0		6.060	0.280
3	2	28.50	19.00	SPARE	0.0	64.9	0	0	SPR	0		6.060	0.280
3	3	28.50	28.50	SPARE	0.0	68.1	0	0	SPR	0		6.060	0.280
4	1	38.00	9.50	SPARE	0.0	60.6	0	0	SPR	0		6.060	0.280
4	2	38.00	19.00	SPARE	0.0	66.0	0	0	SPR	0		6.060	0.280
4	3	38.00	28.50	SUB.SURF.#2	407.0	90.0	3	1	750	15	CU	6.060	0.280
5	1	47.50	9.50	SPARE	0.0	60.3	0	0	SPR	0		6.060	0.280
5	2	47.50	19.00	SPARE	0.0	64.9	0	0	SPR	0		6.060	0.280
5	3	47.50	28.50	SPARE	0.0	68.1	0	0	SPR	0		6.060	0.280
6	1	57.00	9.50	SPARE	0.0	59.6	0	0	SPR	0		6.060	0.280

COMPUTER PRINTOUT STUDY CASE: 2 (CONTINUED)

Project: ESF DESIGN-YUCCA MOUNTAIN
 Location: LAS VEGAS, NV.
 Contract: 4580823
 Engineer: B.MAJMUDAR

ETAP 6.52
 Study Case: 2

Page: 2/2
 Date: 09-24-1993
 SN: 88FD130132
 File: MAINDUC6

3 X 8 MAIN DUCT BANK (TEMPORARY POWER)

Col	Row	Horiz. Dist. (in)	Verti. Dist. (in)	Circuit Name	Load Current (Amp)	Cable Temp. (°C)	CABLE						CONDUIT (in)	
							No.	C/C	Size	kV	Type	Status	Size	Thick.
7	1	66.50	9.50	SPARE	0.0	58.7	0	0	SPR	0			6.060	0.280
7	2	66.50	19.00	SPARE	0.0	63.6	0	0	SPR	0			6.060	0.280
7	3	66.50	28.50	TBM LOAD	407.0	87.2	3	1	750	15	CU		6.060	0.280
8	1	76.00	9.50	SPARE	0.0	57.1	0	0	SPR	0			6.060	0.280
8	2	76.00	19.00	SPARE	0.0	60.6	0	0	SPR	0			6.060	0.280
8	3	76.00	28.50	SPARE	0.0	63.3	0	0	SPR	0			6.060	0.280

COLUMNS:		1	2	3	4	5	6	7	8
ROW 1	Cable:	SPR	SPR	SPR	SPR	SPR	SPR	SPR	SPR
	Amp.:	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Temp.:	58.7	59.6	60.3	60.6	60.3	59.6	58.7	57.1
ROW 2	Cable:	SPR	SPR	SPR	SPR	SPR	SPR	SPR	SPR
	Amp.:	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Temp.:	63.6	64.1	64.9	66.0	64.9	64.1	63.6	60.6
ROW 3	Cable:	750	SPR	SPR	750	SPR	SPR	750	SPR
	Amp.:	407.0	0.0	0.0	407.0	0.0	0.0	407.0	0.0
	Temp.:	87.2	67.3	68.1	90.0	68.1	67.3	87.2	63.3

* Indicates locations where the calculated temperature exceeds the rated conductor temperature as specified in the cable libraries.

COMPUTER PRINTOUT STUDY CASE: 3

Project: ESF DESIGN-YUCCA MOUNTAIN
 Location: LAS VEGAS, NV.
 Contract: 4580823
 Engineer: B.MAJMUDAR

ETAP 6.52

Page: 1/2
 Date: 09-24-1993
 SN: 88FD130132
 File: MAINDUCT7

Study Case: 3

3 X 8 MAIN DUCT BANK (PERMANENT POWER)

Cable Size	No of Cond.	Volt kV	Type	DC Res. μ ohm/ft	O. D. (in)	Insul. Ther.R ohm-ft	Dielec Losses (W/ft)	Yc	Ys
750	1	15	CU	14.40	1.811	1.549	0.161	0.038	0.000
4/0	1	15	CU	50.90	1.315	2.353	0.100	0.004	0.000
SPR	0	0		0.00	1.000	0.000	0.000	0.000	0.000
500	1	15	CU	21.60	1.597	1.752	0.137	0.016	0.000

Installation	Conduit Type	# of Rows	# of Cols	Ref. Depth (in)	Height (in)	Width (in)	RHO		Ambient Temp. $^{\circ}$ C
							Earth	Fill	
Duct Bank	PVC	3	8	24.0	38.0	85.5	120.0	85.0	40.0

Col	Row	Horiz. Dist. (in)	Verti. Dist. (in)	Circuit Name	Load Current (Amp)	Cable Temp. ($^{\circ}$ C)	CABLE					CONDUIT (in)		
							No.	C/C	Size	kV	Type	Status	Size	Thick.
1	1	9.50	9.50	SUB.SURF.#1	208.7	79.7	3	1	750	15	CU		6.060	0.280
1	2	9.50	19.00	CONVEYOR	115.4	85.2	3	1	4/0	15	CU		6.060	0.280
1	3	9.50	28.50	SUB.SURF.#1	208.7	84.1	3	1	750	15	CU		6.060	0.280
2	1	19.00	9.50	SUB.SURF.#1	208.7	82.7	3	1	750	15	CU		6.060	0.280
2	2	19.00	19.00	SPARE	0.0	80.6	0	0	SPR	0			6.060	0.280
2	3	19.00	28.50	SUB.SURF.#1	208.7	87.4	3	1	750	15	CU		6.060	0.280
3	1	28.50	9.50	SUB.SURF.#1	208.7	84.3	3	1	750	15	CU		6.060	0.280
3	2	28.50	19.00	SPARE	0.0	82.1	0	0	SPR	0			6.060	0.280
3	3	28.50	28.50	SUB.SURF.#1	208.7	89.1	3	1	750	15	CU		6.060	0.280
4	1	38.00	9.50	SUB.SURF.#2	208.7	85.0	3	1	750	15	CU		6.060	0.280
4	2	38.00	19.00	SPARE	0.0	82.9	0	0	SPR	0			6.060	0.280
4	3	38.00	28.50	SUB.SURF.#2	208.7	90.0	3	1	750	15	CU		6.060	0.280
5	1	47.50	9.50	SUB.SURF.#2	208.7	85.0	3	1	750	15	CU		6.060	0.280
5	2	47.50	19.00	SPARE	0.0	82.9	0	0	SPR	0			6.060	0.280

COMPUTER PRINTOUT STUDY CASE: 3 (CONTINUED)

Project: ESF DESIGN-YUCCA MOUNTAIN
 Location: LAS VEGAS, NV.
 Contract: 4580823
 Engineer: B.MAJMUDAR *BMA*

ETAP 6.52

Study Case: 3

Page: 2/2
 Date: 09-24-1993
 SN: 88FD130132
 File: MAINDUC7

3 X 8 MAIN DUCT BANK (PERMANENT POWER)

Col	Row	Horiz. Dist. (in)	Verti. Dist. (in)	Circuit Name	Load Current (Amp)	Cable Temp. (°C)	CABLE					CONDUIT (in)	
							No.	C/C	Size	kV	Type	Status	Size
6	1	57.00	9.50	SUB.SURF.#2	208.7	84.3	3	1	750	15	CU	6.060	0.280
6	2	57.00	19.00	SAPRE	0.0	82.1	0	0	SPR	0		6.060	0.280
6	3	57.00	28.50	SUB.SURF.#2	208.7	89.1	3	1	750	15	CU	6.060	0.280
7	1	66.50	9.50	TBM LOAD	208.7	82.7	3	1	750	15	CU	6.060	0.280
7	2	66.50	19.00	SPARE	0.0	80.6	0	0	SPR	0		6.060	0.280
7	3	66.50	28.50	TBM LOAD	208.7	87.3	3	1	750	15	CU	6.060	0.280
8	1	76.00	9.50	FUT.TBM	208.7	79.6	3	1	750	15	CU	6.060	0.280
8	2	76.00	19.00	SURF.FAC.	169.5	83.6	3	1	500	15	CU	6.060	0.280
8	3	76.00	28.50	FUT.TBM	208.7	84.0	3	1	750	15	CU	6.060	0.280

COLUMNS:		1	2	3	4	5	6	7	8
ROW 1	Cable:	750	750	750	750	750	750	750	750
	Amp.:	208.7	208.7	208.7	208.7	208.7	208.7	208.7	208.7
	Temp.:	79.7	82.7	84.3	85.0	85.0	84.3	82.7	79.6
ROW 2	Cable:	4/0	SPR	SPR	SPR	SPR	SPR	SPR	500
	Amp.:	115.4	0.0	0.0	0.0	0.0	0.0	0.0	169.5
	Temp.:	85.2	80.6	82.1	82.9	82.9	82.1	80.6	83.6
ROW 3	Cable:	750	750	750	750	750	750	750	750
	Amp.:	208.7	208.7	208.7	208.7	208.7	208.7	208.7	208.7
	Temp.:	84.1	87.4	89.1	90.0	89.9	89.1	87.3	84.0

* Indicates locations where the calculated temperature exceeds the rated conductor temperature as specified in the cable libraries.

COMPUTER PRINTOUT STUDY CASE: 4

Project: ESF DESIGN-YUCCA MOUNTAIN
 Location: LAS VEGAS, NV.
 Contract: 4580823
 Engineer: B.MAJMUDAR *BMA*

ETAP 6.52
 Study Case: 4

Page: 1/2
 Date: 09-24-1993
 SN: 88FD130132
 File: 480VCUC3

1 X 3 DUCT BANK (480V CABLES TO PAD MOUNT TRANSFORMER)

Cable Size	No of Cond.	Volt kV	Type	DC Res. μ ohm/ft	O. D. (in)	Insul. Ther.R ohm-ft	Dielec Losses (W/ft)	Yc	Ys
500	1	1	CU	21.60	1.189	0.983	0.000	0.016	0.000

Instal- lation	Conduit Type	# of Rows	# of Cols	Ref. Depth (in)	Height (in)	Width (in)	RHO		Ambient Temp. °C
							Earth	Fill	
Duct Bank	PVC	1	3	24.0	17.0	34.0	120.0	85.0	40.0

Col	Row	Horiz. Dist. (in)	Verti. Dist. (in)	Circuit Name	Load Current (Amp)	Cable Temp. (°C)	CABLE					CONDUIT (in)		
							No.	C/C	Size	kV	Type	Status	Size	Thick.
1	1	8.50	8.50	A1	310.2	87.5	3	1	500	1	CU		5.040	0.260
2	1	17.00	8.50	B1	310.2	90.0	3	1	500	1	CU		5.040	0.260
3	1	25.50	8.50	C1	310.2	87.5	3	1	500	1	CU		5.040	0.260

COMPUTER PRINTOUT STUDY CASE: 4 (CONTINUED)

Project: ESF DESIGN-YUCCA MOUNTAIN

ETAP 6.52

Page: 2/2

Location: LAS VEGAS, NV.

Date: 09-24-1993

Contract: 4580823

SN: 88FD130132

Engineer: B.MAJMUDAR *BMA*

Study Case: 4

File: 480VCUC3

1 X 3 DUCT BANK (480V CABLES TO PAD MOUNT TRANSFORMER)

COLUMNS:	1	2	3
Cable:	500	500	500
ROW 1 Amp.:	310.2	310.2	310.2
Temp.:	87.5	90.0	87.5

* Indicates locations where the calculated temperature exceeds the rated conductor temperature as specified in the cable libraries.

SUPPORT DOCUMENTS

15KV 1/2 SHLD EPR/PVC 133% INSUL. 750MCM DIA= 1.89 2.8
 500MCM 1.55 1.89

5" CONDUIT 5.047 = 20.0" AREA 53% = 10.6" 40% = 8" 31% = 6.2

6" CONDUIT 6.065 = 28.83 AREA 53% = 15.31 40% = 11.56" 31% = 8.96

MAX 6-500MCM WILL FIT IN A 6" CONDUIT (40% FILL)
 " 4 " " " " " 5" " (↓)

MAX 4 750MCM " " " " 6" CONDUIT (40% FILL)

MAX 2 " " " " " " 5" " (31% FILL)

Title: Cable Ampacity Derating

SUPPORT DOCUMENTS (CONTINUED)

CABLE DERATING AND DUCT BANK LAYOUT

STUDY CASE #1	3/C # 750 kcmil (For tunnel load)

	1160A / 205.7 = 6 Cables Per Phase (1-3/C #750 kcmil in a duct)
STUDY CASE #2	1/C # 500 kcmil (For tunnel load)

	1160A / 175.9 = 7 Cable Per Phase (3-1/C #500 kcmil in a duct)
STUDY CASE #3	1/C # 750 kcmil (For tunnel load)

	1160A / 211.7 = 6 Cable Per Phase (3-1/C #750 kcmil in a duct)

DUCT CONFIGURATION

DESCRIPTION	STUDY CASE #1	STUDY CASE #2	STUDY CASE # 3
TUNN.1A LOAD	6 Ducts	7 Ducts	6 Ducts
TUNN.1B LOAD	6 Ducts	7 Ducts	6 Ducts
TBM FDR.	2 Ducts	2 Ducts	2 Ducts
FUTURE TBM	2 Ducts	2 Ducts	2 Ducts
CONVEYOR	1 Duct	1 Duct	1 Duct
SURF.FAC.	1 Duct	1 Duct	1 Duct
SPARE	6 Ducts	7 Ducts	6 Ducts
TOTAL	24 Ducts	27 Ducts	24 Ducts

2.5MVA

2.5MVA

4.5MVA

Title: Cable Ampacity Derating

SUPPORT DOCUMENTS (CONTINUED)

CABLE AMPACITY DERATING

Project: ESF DESIGN-YUCCA MOUNTAIN
 Location: LAS VEGAS, NV.
 Contract: 4580823
 Engineer: B.MAJMUDAR

ETAP 6.52

Page: 1
 Date: 06-17-1993
 SN: 88FD130132
 File: MAINDUC5

3 X 11 MAIN DUCT BANK (750 kcmil, 3/c, 9.5" SPACING, 40°C AMB.)

Cable Size	No of Cond.	Volt kV	Type	DC Res. 1ohm/ft	O. D. (in)	Insul. Ther.R ohm-ft	Dielec Losses (W/ft)	Yc	Ys
750	3	15	CU	14.40	3.790	1.795	0.160	0.093	0.000
SPR	0	0		0.00	1.000	0.000	0.000	0.000	0.000

Installation	Conduit Type	# of Rows	# of Cols	Ref. Depth (in)	Height (in)	Width (in)	RHO		Ambient Temp. °C
							Earth	Fill	
Duct Bank	PVC	3	11	24.0	38.0	114.0	120.0	85.0	40.0

Col	Row	Horiz. Dist. (in)	Verti. Dist. (in)	Circuit Name	Load Current (Amp)	Cable Temp. (°C)	CABLE						CONDUIT (in)	
							No.	C/C	Size	kV	Type	Status	Size	Thick.
1	1	9.50	9.50	A1	205.7	82.7	1	3	750	15	CU		6.060	0.280
1	2	9.50	19.00	B1	205.7	86.6	1	3	750	15	CU		6.060	0.280
1	3	9.50	28.50	C1	205.7	86.4	1	3	750	15	CU		6.060	0.280
2	1	19.00	9.50	A2	205.7	86.0	1	3	750	15	CU		6.060	0.280
2	2	19.00	19.00	B2	205.7	89.9	1	3	750	15	CU		6.060	0.280
2	3	19.00	28.50	C2	205.7	88.9	1	3	750	15	CU		6.060	0.280
3	1	28.50	9.50	A3	205.7	86.9	1	3	750	15	CU		6.060	0.280
3	2	28.50	19.00	B3	205.7	89.9	1	3	750	15	CU		6.060	0.280
3	3	28.50	28.50	C3	0.0	82.1	0	0	SPR	0			6.060	0.280
4	1	38.00	9.50	A4	205.7	86.3	1	3	750	15	CU		6.060	0.280
4	2	38.00	19.00	B4	0.0	82.0	0	0	SPR	0			6.060	0.280
4	3	38.00	28.50	C4	0.0	80.7	0	0	SPR	0			6.060	0.280
5	1	47.50	9.50	A5	205.7	85.7	1	3	750	15	CU		6.060	0.280
5	2	47.50	19.00	B5	0.0	80.9	0	0	SPR	0			6.060	0.280
5	3	47.50	28.50	C5	0.0	79.9	0	0	SPR	0			6.060	0.280
6	1	57.00	9.50	A6	205.7	85.5	1	3	750	15	CU		6.060	0.280

SUPPORT DOCUMENTS (CONTINUED)

CABLE AMPACITY DERATING

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Project: ESF DESIGN-YUCCA MOUNTAIN

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Page: 2

Location: LAS VEGAS, NV.

Date: 06-17-1993

Contract: 4580823

SN: 88FD130132

Engineer: B.MAJMUDAR

Study Case: 1

File: MAINDUC5

3 X 11 MAIN DUCT BANK
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Col	Row	Horiz. Dist. (in)	Verti. Dist. (in)	Circuit Name	Load Current (Amp)	Cable Temp. (%C)	CABLE						CONDUIT (in)	
							No.	C/C	Size	kV	Type	Status	Size	Thick.
7	1	66.50	9.50	A7	205.7	85.7	1	3	750	15	CU	6.060	0.280	
7	2	66.50	19.00	B7	0.0	80.9	0	0	SPR	0		6.060	0.280	
7	3	66.50	28.50	C7	0.0	79.9	0	0	SPR	0		6.060	0.280	
8	1	76.00	9.50	A8	205.7	86.3	1	3	750	15	CU	6.060	0.280	
8	2	76.00	19.00	B8	0.0	82.0	0	0	SPR	0		6.060	0.280	
8	3	76.00	28.50	C8	0.0	80.7	0	0	SPR	0		6.060	0.280	
9	1	85.50	9.50	A9	205.7	86.9	1	3	750	15	CU	6.060	0.280	
9	2	85.50	19.00	B9	205.7	89.9	1	3	750	15	CU	6.060	0.280	
9	3	85.50	28.50	C9	0.0	82.1	0	0	SPR	0		6.060	0.280	
10	1	95.00	9.50	A10	205.7	86.0	1	3	750	15	CU	6.060	0.280	
10	2	95.00	19.00	B10	205.7	89.9	1	3	750	15	CU	6.060	0.280	
10	3	95.00	28.50	C10	205.7	88.9	1	3	750	15	CU	6.060	0.280	
11	1	104.50	9.50	A11	205.7	82.7	1	3	750	15	CU	6.060	0.280	
11	2	104.50	19.00	B11	205.7	86.6	1	3	750	15	CU	6.060	0.280	
11	3	104.50	28.50	C11	205.7	86.4	1	3	750	15	CU	6.060	0.280	

SUPPORT DOCUMENTS (CONTINUED)

CABLE AMPACITY DERATING

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Project: ESF DESIGN-YUCCA MOUNTAIN
 Location: LAS VEGAS, NV.
 Contract: 4580823
 Engineer: B.MAJMUDAR

ETAP 6.52

Page: 3
 Date: 06-17-1993
 SN: 88FDI30132
 File: MAINDUC5

Study Case: 1

 3 X 11 MAIN DUCT BANK

COLUMNS:	1	2	3	4	5	6	7	8	9	10
ROW 1	Cable: 750	750	750	750	750	750	750	750	750	750
	Amp.: 205.7	205.7	205.7	205.7	205.7	205.7	205.7	205.7	205.7	205.7
	Temp.: 82.7	86.0	86.9	86.3	85.7	85.5	85.7	86.3	86.9	86.0
ROW 2	Cable: 750	750	750	SPR	SPR	SPR	SPR	SPR	750	750
	Amp.: 205.7	205.7	205.7	0.0	0.0	0.0	0.0	0.0	205.7	205.7
	Temp.: 86.6	89.9	89.9	82.0	80.9	80.6	80.9	82.0	89.9	89.9
ROW 3	Cable: 750	750	SPR	SPR	SPR	SPR	SPR	SPR	SPR	750
	Amp.: 205.7	205.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	205.7
	Temp.: 86.4	88.9	82.1	80.7	79.9	79.6	79.9	80.7	82.1	88.9

COLUMNS:	11
ROW 1	Cable: 750
	Amp.: 205.7
	Temp.: 82.7
ROW 2	Cable: 750
	Amp.: 205.7
	Temp.: 86.6
ROW 3	Cable: 750
	Amp.: 205.7
	Temp.: 86.4

* Indicates locations where the calculated temperature exceeds the rated conductor temperature as specified in the cable libraries.

SUPPORT DOCUMENTS (CONTINUED)

CABLE AMPACITY DERATING

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Project: ESF DESIGN-YUCCA MOUNTAIN
 Location: LAS VEGAS, NV.
 Contract: 4580823
 Engineer: B.MAJMUDAR

ETAP 6.52

Page: 1
 Date: 06-17-1993
 SN: 88FDI30132
 File: MAINDUC1

Study Case: 2

 3 X 11 MAIN DUCT BANK (500kcmil, 1/2", 9.5" SPACING, 40°C AMP.)

Cable Size	No of Cond.	Volt kV	Type	DC Res. lohm/ft	O. D. (in)	Insul. Ther. R ohm-ft	Dielec Losses (W/ft)	Yc	Ys
500	1	15	CU	21.60	1.597	1.752	0.137	0.016	0.000
SPR	1	0		0.00	1.000	0.000	0.000	0.000	0.000

Installation	Conduit Type	# of Rows	# of Cols	Ref. Depth (in)	Height (in)	Width (in)	RHO		Ambient Temp. %C
							Earth	Fill	
Duct Bank	PVC	3	11	24.0	38.0	114.0	120.0	85.0	40.0

Col	Row	Horiz. Dist. (in)	Verti. Dist. (in)	Circuit Name	Load Current (Amp)	Cable Temp. (%C)	CABLE					CONDUIT (in)		
							No.	C/C	Size	kV	Type	Status	Size	Thick.
1	1	9.50	9.50	A1	175.9	82.7	3	1	500	15	CU		6.060	0.280
1	2	9.50	19.00	B1	175.9	86.6	3	1	500	15	CU		6.060	0.280
1	3	9.50	28.50	C1	175.9	86.3	3	1	500	15	CU		6.060	0.280
2	1	19.00	9.50	A2	175.9	86.0	3	1	500	15	CU		6.060	0.280
2	2	19.00	19.00	B2	175.9	89.9	3	1	500	15	CU		6.060	0.280
2	3	19.00	28.50	C2	175.9	88.9	3	1	500	15	CU		6.060	0.280
3	1	28.50	9.50	A3	175.9	86.9	3	1	500	15	CU		6.060	0.280
3	2	28.50	19.00	B3	175.9	89.8	3	1	500	15	CU		6.060	0.280
3	3	28.50	28.50	C3	0.0	81.8	3	1	SPR	0			6.060	0.280
4	1	38.00	9.50	A4	175.9	86.3	3	1	500	15	CU		6.060	0.280
4	2	38.00	19.00	B4	0.0	81.7	3	1	SPR	0			6.060	0.280
4	3	38.00	28.50	C4	0.0	80.4	3	1	SPR	0			6.060	0.280
5	1	47.50	9.50	A5	175.9	85.7	3	1	500	15	CU		6.060	0.280
5	2	47.50	19.00	B5	0.0	80.6	3	1	SPR	0			6.060	0.280
5	3	47.50	28.50	C5	0.0	79.6	3	1	SPR	0			6.060	0.280
6	1	57.00	9.50	A6	175.9	85.5	3	1	500	15	CU		6.060	0.280

SUPPORT DOCUMENTS (CONTINUED)

CABLE AMPACITY DERATING

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Project: ESF DESIGN-YUCCA MOUNTAIN

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Page: 2

Location: LAS VEGAS, NV.

Date: 06-17-1993

Contract: 4580823

SN: 88FDI30132

Engineer: B.MAJMUDAR

Study Case: 2

File: MAINDUC1

3 X 11 MAIN DUCT BANK

Col	Row	Horiz. Dist. (in)	Verti. Dist. (in)	Circuit Name	Load Current (Amp)	Cable Temp. (%C)	CABLE						CONDUIT (in)	
							No.	C/C	Size	kV	Type	Status	Size	Thick.
7	1	66.50	9.50	A7	175.9	85.7	3	1	500	15	CU		6.060	0.280
7	2	66.50	19.00	B7	0.0	80.6	3	1	SPR	0			6.060	0.280
7	3	66.50	28.50	C7	0.0	79.6	3	1	SPR	0			6.060	0.280
8	1	76.00	9.50	A8	175.9	86.3	3	1	500	15	CU		6.060	0.280
8	2	76.00	19.00	B8	0.0	81.7	3	1	SPR	0			6.060	0.280
8	3	76.00	28.50	C8	0.0	80.4	3	1	SPR	0			6.060	0.280
9	1	85.50	9.50	A9	175.9	86.9	3	1	500	15	CU		6.060	0.280
9	2	85.50	19.00	B9	175.9	89.8	3	1	500	15	CU		6.060	0.280
9	3	85.50	28.50	C9	0.0	81.8	3	1	SPR	0			6.060	0.280
10	1	95.00	9.50	A10	175.9	86.0	3	1	500	15	CU		6.060	0.280
10	2	95.00	19.00	B10	175.9	89.9	3	1	500	15	CU		6.060	0.280
10	3	95.00	28.50	C10	175.9	88.9	3	1	500	15	CU		6.060	0.280
11	1	104.50	9.50	A11	175.9	82.7	3	1	500	15	CU		6.060	0.280
11	2	104.50	19.00	B11	175.9	86.6	3	1	500	15	CU		6.060	0.280
11	3	104.50	28.50	C11	175.9	86.3	3	1	500	15	CU		6.060	0.280

SUPPORT DOCUMENTS (CONTINUED)

CABLE AMPACITY DERATING

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Project: ESF DESIGN-YUCCA MOUNTAIN

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Page: 3

Location: LAS VEGAS, NV.

Date: 06-17-1993

Contract: 4580823

SN: 88FD130132

Engineer: B.MAJMUDAR

Study Case: 2

File: MAINDUC1

3 X 11 MAIN DUCT BANK
=====

	COLUMNS:	1	2	3	4	5	6	7	8	9	10
ROW 1	Cable:	500	500	500	500	500	500	500	500	500	500
	Amp.:	175.9	175.9	175.9	175.9	175.9	175.9	175.9	175.9	175.9	175.9
	Temp.:	82.7	86.0	86.9	86.3	85.7	85.5	85.7	86.3	86.9	86.0
ROW 2	Cable:	500	500	500	SPR	SPR	SPR	SPR	SPR	500	500
	Amp.:	175.9	175.9	175.9	0.0	0.0	0.0	0.0	0.0	175.9	175.9
	Temp.:	86.6	89.9	89.8	81.7	80.6	80.3	80.6	81.7	89.8	89.9
ROW 3	Cable:	500	500	SPR	SPR	SPR	SPR	SPR	SPR	SPR	500
	Amp.:	175.9	175.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	175.9
	Temp.:	86.3	88.9	81.8	80.4	79.6	79.4	79.6	80.4	81.8	88.9

	COLUMNS:	11
ROW 1	Cable:	500
	Amp.:	175.9
	Temp.:	82.7
ROW 2	Cable:	500
	Amp.:	175.9
	Temp.:	86.6
ROW 3	Cable:	500
	Amp.:	175.9
	Temp.:	86.3

* Indicates locations where the calculated temperature exceeds the rated conductor temperature as specified in the cable libraries.

Title: Cable Ampacity Derating

SUPPORT DOCUMENTS (CONTINUED)

CABLE AMPACITY DERATING

Project: ESF DESIGN-YUCCA MOUNTAIN
 Location: LAS VEGAS, NV.
 Contract: 4580823
 Engineer: B.MAJMUDAR

ETAP 6.52

Page: 1
 Date: 06-17-1993
 SN: 88FDI30132
 File: MAINDUC5

3 X 11 MAIN DUCT BANK (750 kcmil, 1/2", 9.5" SPACING, 40°CAMB.)

Cable Size	No of Cond.	Volt kV	Type	DC Res. 1ohm/ft	O. D. (in)	Insul. Ther.R ohm-ft	Dielec Losses (W/ft)	Yc	Ys
750	1	15	CU	14.40	1.811	1.549	0.161	0.038	0.000
SPR	0	0		0.00	1.000	0.000	0.000	0.000	0.000

Installation	Conduit Type	# of Rows	# of Cols	Ref. Depth (in)	Height (in)	Width (in)	RHO		Ambient Temp. %C
							Earth	Fill	%C
Duct Bank	PVC	3	11	24.0	38.0	114.0	120.0	85.0	40.0

Col	Row	Horiz. Dist. (in)	Verti. Dist. (in)	Circuit Name	Load Current (Amp)	Cable Temp. (%C)	CABLE						CONDUIT (in)	
							No.	C/C	Size	kV	Type	Status	Size	Thick.
1	1	9.50	9.50	A1	211.7	82.6	3	1	750	15	CU		6.060	0.280
1	2	9.50	19.00	B1	211.7	86.5	3	1	750	15	CU		6.060	0.280
1	3	9.50	28.50	C1	211.7	86.3	3	1	750	15	CU		6.060	0.280
2	1	19.00	9.50	A2	211.7	86.0	3	1	750	15	CU		6.060	0.280
2	2	19.00	19.00	B2	211.7	89.9	3	1	750	15	CU		6.060	0.280
2	3	19.00	28.50	C2	211.7	88.9	3	1	750	15	CU		6.060	0.280
3	1	28.50	9.50	A3	211.7	86.8	3	1	750	15	CU		6.060	0.280
3	2	28.50	19.00	B3	211.7	89.8	3	1	750	15	CU		6.060	0.280
3	3	28.50	28.50	C3	0.0	82.3	0	0	SPR	0			6.060	0.280
4	1	38.00	9.50	A4	211.7	86.2	3	1	750	15	CU		6.060	0.280
4	2	38.00	19.00	B4	0.0	82.2	0	0	SPR	0			6.060	0.280
4	3	38.00	28.50	C4	0.0	80.9	0	0	SPR	0			6.060	0.280
5	1	47.50	9.50	A5	211.7	85.6	3	1	750	15	CU		6.060	0.280
5	2	47.50	19.00	B5	0.0	81.1	0	0	SPR	0			6.060	0.280
5	3	47.50	28.50	C5	0.0	80.1	0	0	SPR	0			6.060	0.280
6	1	57.00	9.50	A6	211.7	85.4	3	1	750	15	CU		6.060	0.280

SUPPORT DOCUMENTS (CONTINUED)

CABLE AMPACITY DERATING

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Project: ESF DESIGN-YUCCA MOUNTAIN

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Location: LAS VEGAS, NV.

Date: 06-17-1993

Contract: 4580823

SN: 88FD130132

Engineer: B.MAJMUDAR

Study Case: 3

File: MAINDOUC5

3 X 11 MAIN DUCT BANK
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Col	Row	Horiz. Dist. (in)	Verti. Dist. (in)	Circuit Name	Load Current (Amp)	Cable Temp. (%C)	CABLE						CONDUIT (in)	
							No.	C/C	Size	kV	Type	Status	Size	Thick.
7	1	66.50	9.50	A7	211.7	85.6	3	1	750	15	CU		6.060	0.280
7	2	66.50	19.00	B7	0.0	81.1	0	0	SPR	0			6.060	0.280
7	3	66.50	28.50	C7	0.0	80.1	0	0	SPR	0			6.060	0.280
8	1	76.00	9.50	A8	211.7	86.2	3	1	750	15	CU		6.060	0.280
8	2	76.00	19.00	B8	0.0	82.2	0	0	SPR	0			6.060	0.280
8	3	76.00	28.50	C8	0.0	80.9	0	0	SPR	0			6.060	0.280
9	1	85.50	9.50	A9	211.7	86.8	3	1	750	15	CU		6.060	0.280
9	2	85.50	19.00	B9	211.7	89.8	3	1	750	15	CU		6.060	0.280
9	3	85.50	28.50	C9	0.0	82.3	0	0	SPR	0			6.060	0.280
10	1	95.00	9.50	A10	211.7	86.0	3	1	750	15	CU		6.060	0.280
10	2	95.00	19.00	B10	211.7	89.9	3	1	750	15	CU		6.060	0.280
10	3	95.00	28.50	C10	211.7	88.9	3	1	750	15	CU		6.060	0.280
11	1	104.50	9.50	A11	211.7	82.6	3	1	750	15	CU		6.060	0.280
11	2	104.50	19.00	B11	211.7	86.5	3	1	750	15	CU		6.060	0.280
11	3	104.50	28.50	C11	211.7	86.3	3	1	750	15	CU		6.060	0.280

SUPPORT DOCUMENTS (CONTINUED)

CABLE AMPACITY DERATING

Project: ESF DESIGN-YUCCA MOUNTAIN
 Location: LAS VEGAS, NV.
 Contract: 4580823
 Engineer: B.MAJMUDAR

ETAP 6.52

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 Date: 06-17-1993
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 File: MAINDUC5

Study Case: 3

3 X 11 MAIN DUCT BANK

COLUMNS:	1	2	3	4	5	6	7	8	9	10
ROW 1	Cable: 750	750	750	750	750	750	750	750	750	750
	Amp.: 211.7	211.7	211.7	211.7	211.7	211.7	211.7	211.7	211.7	211.7
	Temp.: 82.6	86.0	86.8	86.2	85.6	85.4	85.6	86.2	86.8	86.0
ROW 2	Cable: 750	750	750	SPR	SPR	SPR	SPR	SPR	750	750
	Amp.: 211.7	211.7	211.7	0.0	0.0	0.0	0.0	0.0	211.7	211.7
	Temp.: 86.5	89.9	89.8	82.2	81.1	80.8	81.1	82.2	89.8	89.9
ROW 3	Cable: 750	750	SPR	SPR	SPR	SPR	SPR	SPR	SPR	750
	Amp.: 211.7	211.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	211.7
	Temp.: 86.3	88.9	82.3	80.9	80.1	79.8	80.1	80.9	82.3	88.9

COLUMNS:	11
ROW 1	Cable: 750
	Amp.: 211.7
	Temp.: 82.6
ROW 2	Cable: 750
	Amp.: 211.7
	Temp.: 86.5
ROW 3	Cable: 750
	Amp.: 211.7
	Temp.: 86.3

* Indicates locations where the calculated temperature exceeds the rated conductor temperature as specified in the cable libraries.

SUPPORT DOCUMENTS (CONTINUED)

Interoffice Correspondence

Civilian Radioactive Waste Management System
Management & Operating Contractor



TRW Environmental
Safety Systems Inc.

Subject
ESF Subsurface Electrical
Power Requirements

Date
June 1, 1993
LV.ESSD.JG.6/93-126

WBS: 1.2.6

QA: N/A

From

James Giff

To
Larry Engwall

cc
P. Pimentel
B. Majmudar
A. Tuma
J. Naaf
W. Reed
E. Eberhardt
W. French
R. Howell

Location/Phone

TES3/4-7999

Information requested by the surface design team for properly sizing the feeder cabling to the subsurface facilities has produced the following results:

Two (2) Circuits will be required to power all subsurface equipment and systems excluding the Tunnel Boring Machine (TBM). Each of these circuits will be sized for 25 MVA (1160 A @ 12.47 kV). The two circuits will be connected to provide redundant capacity, total required capacity is estimated at less than 25 MVA.

To provide capacity for 25 MVA, nine (9) 3/C 500 kcmil cables will be required. This is based on a derated ampacity of 143.3 A ($1160 / 8.094 = 143.3$) to meet NEC requirements 9 cables are required. To provide the redundancy as stated previously two circuits each with nine cables will be provided.

The increased capacity requirement will directly affect the Duct Bank design from the Switchgear Building to the tunnel entrance. The present design has 24 -5" conduits leaving the Switchgear Building. To accommodate the increased capacity requirement 32 conduits will be planned as follows:

- ✓ 9--5"C each with 1-3/C 500 kcmil for tunnel 1A load
- ✓ 9--5"C each with 1-3/C 500 kcmil for tunnel 1B load
- ✓ 2--5"C each with 1-3/C 500 kcmil for TBM
- 2--5"C empty, reserved for future TBM
- 1--5"C with 3/C (later) for conveyor
- 1--5"C with 3/C 2/0 for surface facility power distribution
- 8--5"C empty, spare as required by DOE Order 6430.1A (25% spares)

SUPPORT DOCUMENTS (CONTINUED)

Interoffice Correspondence

Civilian Radioactive Waste Management System
Management & Operating Contractor



TRW Environmental
Safety Systems Inc.

LV.ESSD.JG.6/93-126

June 1, 1993

Page 2

The increased capacity requirement will necessitate a revision to drawing YMP-025-1-7007-EL109 Rev. 2 and to drawing YMP-025-1-7007-EL128, EL129, & EL130 all Rev 0. At two locations larger manholes will be required which may require a poured in place design (vs precast). The connections to disconnect switches at the tunnel entrance will require an additional bus bar termination arrangement to accommodate the 9 conductors per phase. This will also enlarge the equipment footprint and cabinet space.

The requirement for the 25 MVA capacity with redundancy should be carefully reviewed with consideration to the following items:

1. The total estimated loading is \leq 21 MVA.
2. Only one 138 kV transmission line feeding the system.
3. Only one 138-12.47 kV transformer at the substation.
4. Only one 12.47 kV line to the main switchgear.
5. The switchgear will operate as a single bus with the tie breaker closed.

The justification for the 25 MVA redundant capacity can only be based on known loading and expected redundant dual primary transmission lines, transformers and incoming service.

When the 25 MVA loading requirement is validated a viable alternative will be to route the cabling above ground in cable tray. A cable tray support structure is required between the switchgear building and the conveyor structure. The cable tray can be supported by the conveyor structure to the tunnel entrance. This design will increase the cable ampacity by approximately 60%.

JG:mct

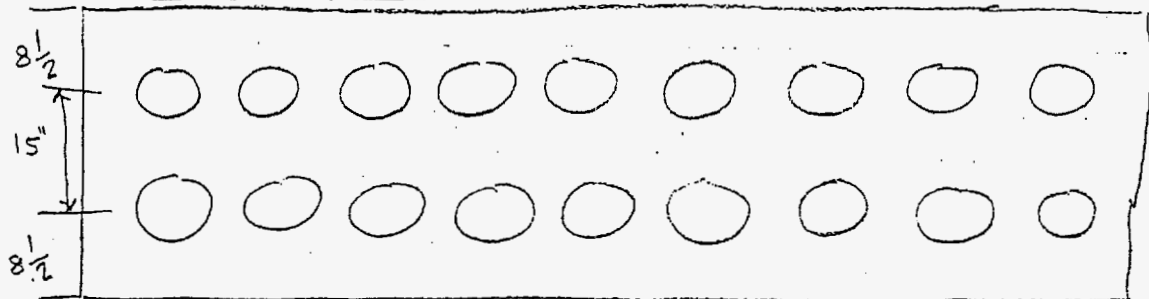
SUPPORT DOCUMENTS (CONTINUED)

3/27/93

DUCT BANK CALC:

FLA @ 12.47 kV, 25 MVA = 1158 A

35 MVA = 1620 A.

2X9 DUCT BANK

①

°C
1 CABLE/DUCT.

1158A — 7 - 3/C # 750 MCM
(168.6A/cond.)

1620A — 10 - 3/C # 750 MCM
(168.6A/cond.)

②

✓ 1158A — 9 - 3/C # 500 MCM
(143.3A/cond.)

1620A — 12 - 3/C # 500 MCM
(143.3A/cond.)

SUPPORT DOCUMENTS (CONTINUED)6 CONDUCTOR PER DUCT.

$$\begin{aligned} \textcircled{3} \quad 1158 \text{ A} &- 12 - \frac{1}{2} \text{C} - 750 \text{ MCM} / \text{PHASE} = \text{TOTAL } 36 - \frac{1}{2} \text{C} - 750 \text{ MCM} \\ & \left(\begin{array}{l} 104.2 \text{ A/CABLE} \\ 208.4 \text{ A/DUCT} \end{array} \right) & \text{YS } 7/27/95 \end{aligned}$$

$$1620 \text{ A} - 16 - \frac{1}{2} \text{C} - 750 \text{ MCM} / \text{PHASE} = 48 - \frac{1}{2} \text{C} - 750 \text{ MCM} \text{ YS } 7/27/95$$

$$\begin{aligned} \textcircled{4} \quad 1158 \text{ A} & 13 - \frac{1}{2} \text{C} - 500 \text{ MCM} / \text{PHASE} = 39 - \frac{1}{2} \text{C} - 500 \text{ MCM} \\ & \left(\begin{array}{l} 91.7 \text{ A/CABLE} \\ 183.4 \text{ A/DUCT} \end{array} \right) & \text{(7 ducts.) YS } 7/27/95 \end{aligned}$$

$$1620 \text{ A} - 18 - \frac{1}{2} \text{C} - 500 \text{ MCM} / \text{PHASE} = 54 - \frac{1}{2} \text{C} - 500 \text{ MCM} \text{ YS } 7/27/95$$

⑤ FREE AIR RATING:

NEC TABLE 310-75, AMB. AIR TEMP. = 40°C (104°F)

$$\begin{aligned} \text{A. } 750 \text{ MCM} & \longrightarrow 570 \text{ AMPS} \times \text{K CORR. FACTOR FOR } 50^\circ\text{C} \\ & 570 \times 0.93 = 530 \end{aligned}$$

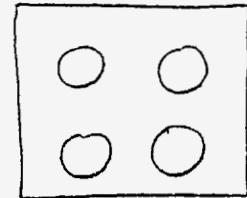
$$\therefore 1158 \text{ A} / 530 \text{ A} = 3 - \frac{3}{4} \text{C} - 750 \text{ MCM}$$

$$\text{B. } 500 \text{ MCM} \longrightarrow 470 \times 0.93 = 437 \text{ A}$$

$$\therefore 1158 \text{ A} / 437 \text{ A} = 3 - \frac{3}{4} \text{C} - 500 \text{ MCM}$$

SUPPORT DOCUMENTS (CONTINUED)

			<u>55°C</u>	<u>65°C</u>
XFRM -	500 KVA	@ 480V	→ 601 A	674A
	750 KVA	"	902 A	1010 A
	1000 KVA	"	1203A	1347A



1. 674 A — 3 - 3/C 500 MCM
(234A/COND).
2. 1010 A — 5 - 3/C 500 MCM
(234A/COND)
3. 1203 A — 6 - 3/C 500 MCM.
(234A/COND)

6 CONDUCTOR / DUCT.

4. 674 A (177.6A/CABLE) 4 - 1/2 500 MCM / PHASE = TOTAL 12 - 1/2 500 MCM
MCM
7/27/95
5. 1010 A (177.6A/CABLE) 6 - 1/2 500 MCM / PHASE = 18 - 1/2 500 MCM
6. 1347 A (177.6A/CABLE) 8 - 1/2 500 MCM / PHASE = 24 - 1/2 500 MCM.
7. 1347 A (213.3A/CABLE) 7 - 1/2 750 MCM / PHASE = 21 - 1/2 750 MCM

SUPPORT DOCUMENTS (CONTINUED)

PAGE NO. ____ OF ____

YUCCA MOUNTAIN SITE CHARACTERIZATION PROJECT

Civilian Radioactive Waste Management System
Management & Operating Contractor

CONTRACT NO. DE-AC01-91RW00134

SUBJECT: CABLE DERATING - UNDERGROUND
DUCT BANK.

WBS NO: 1.2.6. _____

DATE: _____ - _____ - _____ REV NO: _____

CALC NO: _____

ORIGINATOR: _____

CHECKED BY: _____

CHECKED DATE: _____ - _____ - _____

1
2 THE CABLE AMPACITY ADJUSTMENT FACTOR IS
3 COMPOSED OF FOLLOWING COMPONENTS:

$$4 \quad F = F_T \times F_{Th} \times F_g$$

5
6
7 WHERE F_T = AMBIENT TEMPERATURE ADJUSTMENT FACTOR

8
9 F_{Th} = SOIL THERMAL RESISTIVITY DIFFERENCE
10 FROM RHO OF 90.

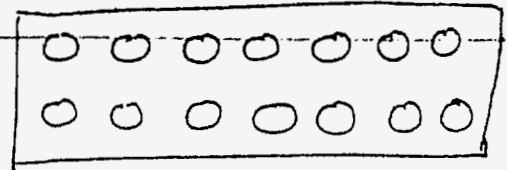
11
12 F_g = CABLE GROUPING FACTOR. (DEPEND ON
13 DUCT BANK CONFIGURATION.)

14
15
16 USE $F_T = 0.82$ (NEC 70-174, FOR AMBIENT TEMP OF
17 $46^\circ - 50^\circ C$)

18 $F_{Th} = 0.90$ (FROM TABLE 3, IEEE PAPER BY
19 SHOKOAH & KNUTSON)

20
21 F_g = USE ATTACHED TABLES FOR CABLE SIZE &
22 DUCT BANK CONFIGURATION.
23
24
25
26
27
28
29
30
31

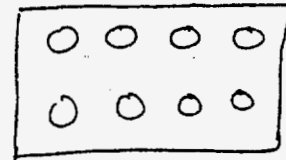
SUPPORT DOCUMENTS (CONTINUED)

① $3/c$ #500 MCM, 5" c

$$0.82 \times 0.69 \times 0.516$$

$$= 0.29$$

$$430 \text{ A} \times 0.29 = 125.57 \text{ AMPS}$$

② $1/c$ #500 MCM 5" c

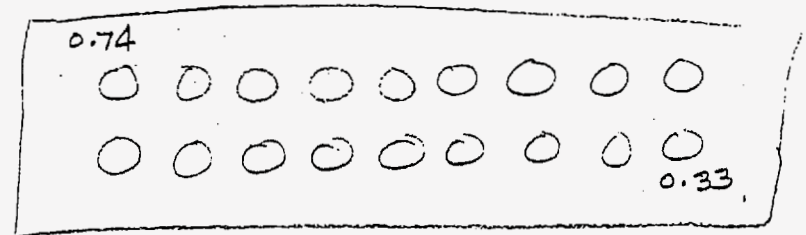
$$0.82 \times 0.69 \times 0.608$$

$$= 0.34$$

$$430 \times 0.34 = 148 \text{ AMPS.}$$

2 x 9

3 x 8



$$0.82 \times 0.9 \times 1 = 0.74$$

$$0.82 \times 0.9 \times 0.447 = 0.33$$

Title: Cable Ampacity Derating

Page: V-19

SUPPORT DOCUMENTS (CONTINUED)

MRS Design

230 South Tryon Street
P. O. Box 1004
Charlotte, NC 28201-1004

FACSIMILE COVER SHEET

FAX No. (704) 382-3105

Date: May 19, 1993
To: Bharat Majumdar
Company: MEO
FAX No.: (702) 794-1843
From: Bob Howell
Telephone No.: (704) 382-3086

Message:

Dapper documentation for 750 MCM cable
application on standby generators

This Transmittal Contains 7 Pages Including Cover Sheet

SUPPORT DOCUMENTS (CONTINUED)

yucca cable size
size
DUKE POWER COMPANY - CHARLOTTE, NORTH CAROLINA

DATE: 19 MAR 93
TIME: 4 37 PM

ALL INFORMATION PRESENTED IS FOR REVIEW, APPROVAL, INTERPRETATION
AND APPLICATION BY A REGISTERED ENGINEER ONLY

DAPPER (SIZE FEEDERS AND TRANSFORMERS MINI/MICRO VERSION 3.5 LEVEL 2.1)
COPYRIGHT SKM SYSTEMS ANALYSIS, INC. 1983

SUPPORT DOCUMENTS (CONTINUED)

DATE: 19 MAR 93 TIME: 4 37 PM

yucca cable size
size

DUKE POWER COMPANY - CHARLOTTE, NORTH CAROLINA

FEEDER AND TRANSFORMER STUDY CRITERIA
-----FEEDERS AND TRANSFORMERS TO BE SIZED
MASTER FILE WILL NOT BE UPDATED

BRANCH VOLTAGE DROP CRITERIA 2.50

VOLTAGE DROP CALCULATIONS PRESENTED HERE IN ARE PRELIMINARY
EXECUTE VOLTAGE DROP AND LOAD FLOW STUDY FOR MORE COMPLETE RESULTS

PRIMARY/SECONDARY TRANSFORMER FDRS SIZED AT 125. % OF TX FULL LOAD RATING

*** WARNING *** FROM 1 GEN TO 2 T1 PRIM 7 PARALLEL
CONDUCTORS REQD*** WARNING *** FROM 1 GEN TO 2 T1 PRIM 10 PARALLELED CONDUCTO
*** NOTICE *** FEEDER SIZED TO 125. PERCENT OF TRANSFORMER SIZE
BRANCH FROM 1 GEN TO 2 T1 PRIM
TR KVA: 2300.0 TR FLA: 2766.5
MINIMUM FEEDER AMPACITY: 3458.1

SUPPORT DOCUMENTS (CONTINUED)

DATE: 19 MAR 93 TIME: 4 37 PM

yucca cable size
size

DUKE POWER COMPANY - CHARLOTTE, NORTH CAROLINA

FOR MISSING DATA, DAPPER DEFAULTS TO THE FOLLOWING VALUES

FEDER INSULATION:	THWN	0-600	VOLTS
FEDER INSULATION:	XLP	601-15000	VOLTS
CIRCUIT DATA:		4 WIRE,	NO GROUND
CIRCUIT DATA:		3 WIRE,	NO GROUND FOR
		DELTA AND WYE	XFORMERS
FEDER TYPE:		COPPER	
DUCT TYPE:		METALLIC RACEWAY	
TRANSFORMER TYPES:	DT	DRY TYPE	
PERCENT TAP:	0.0	NO TAP SET	
PRIMARY CONNECTIONS:		DELTA	
SECONDARY CONNECTIONS:		WYE-GROUNDED	

0 DEFAULT VALUES USED IN THIS REPORT

SUPPORT DOCUMENTS (CONTINUED)

DATE: 19 MAR 93 TIME: 4 37 PM

yucca cable size
size

DUKE POWER COMPANY - CHARLOTTE, NORTH CAROLINA

FEEDER SIZE REPORT

FEEDER SCHEDULE

FEEDER NO	ROUTING NAME	FEEDER VOLTAGE	NO /PH	WIRE QTY	SIZE FDR	TYPE MAT	INSUL TYPE	GROUND WIRE	RACEWAY SIZE	TYPE
FROM 1	GEN	480.								
TO 2	T1 PRIM		(10)	3	750	CU	THWN			N

SUPPORT DOCUMENTS (CONTINUED)

DATE: 19 MAR 93 TIME: 4 37 PM

yucca cable size
size

DUKE POWER COMPANY - CHARLOTTE, NORTH CAROLINA

FEEDER EVALUATION

F E E D E R D E S I G N L O A D A N A L Y S I S

FEEDER NO	ROUTING NAME	EXTG VD	% /PH	QTY FDR	SIZE	FEEDER DESCRIPTION MAT	INSUL AMBIENT	DESIGN LOAD	FEEDER CAPACITY
FROM	1 GEN				480.				
TO	2 T1 PRIM	.21	10	750		CU THWN	47.	2388. A	3563. A

SUPPORT DOCUMENTS (CONTINUED)

DATE: 19 MAR 93 TIME: 4 37 PM

yucca cable size
size

DUKE POWER COMPANY - CHARLOTTE, NORTH CAROLINA

TRANSFORMER SIZE REPORT

T R A N S F O R M E R S C H E D U L E

```

=====
LOCATION DESCRIPTION VOLTAGE  CONN  PCT.  TRANSFORMER DESCRIPTION
BUS NO. NAME      LEVELS CODE  TAP
=====

```

```

FROM 2 T1 PRIM      480.   D      .0  TYPE: OA      SIZE: 2300.0 KVA
TO   3 T1 SEC      12470. YC
DESIGN LOAD: 1985.6 KVA  DESCRIPTION: OIL TO AIR
5.75 %Z NOMINAL RATING 2000.0 KVA

```

SUPPORT DOCUMENTS (CONTINUED)

MRS Design

230 South Tryon Street
P. O. Box 1004
Charlotte, NC 28201-1004

FACSIMILE COVER SHEET

FAX No. (704) 382-3105

Date: 5/18/93

To: RS Howell

Company: DE&S

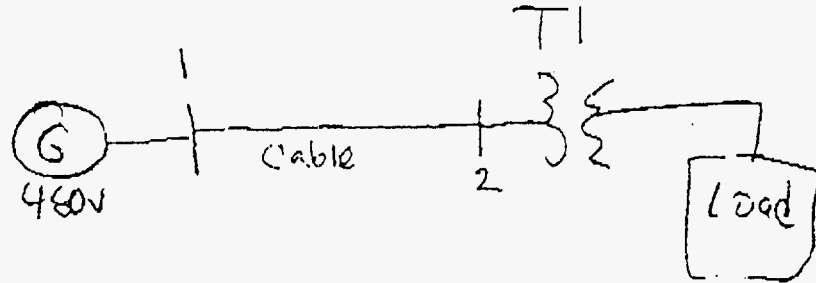
FAX No.: _____

From: R. Wright

Telephone No.: 704-382-3086

Message:

SUPPORT DOCUMENTS (CONTINUED)



yucca demand load analysis
size

DUKE POWER COMPANY - CHARLOTTE, NORTH CAROLINA

DATE: 18 MAR 93
TIME: 9 45 AM

ALL INFORMATION PRESENTED IS FOR REVIEW, APPROVAL, INTERPRETATION
(ID APPLICATION BY A REGISTERED ENGINEER ONLY

DAPPER (DEMAND LOAD ANALYSIS MINI/MICRO VERSION 3.5 LEVEL 2.1)
COPYRIGHT SKM SYSTEMS ANALYSIS, INC. 1983

SUPPORT DOCUMENTS (CONTINUED)

DATE: 16 MAR 93 TIME: 9 45 AM
yucca demand load analysis
size

CE POWER COMPANY - CHARLOTTE, NORTH CAROLINA

LOAD SUMMARY

LOAD SCHEDULE FOR 1 GEN 480. VOLTS LINE TO LINE
SOURCE OF PWR **** SOURCE BUS

=====

ITEM DESCRIPTION *	CONNECTED KVA	LOAD AMPS	* DEMAND KVA	LOAD AMPS	* DESIGN KVA	LOAD AMPS	* % P F
BRANCH LOADS							
2 T1 PRIM	2136.5	2569.8	1866.0	2244.4	1988.8	2392.2	-85.7
TOTALS	2136.5	2569.8	1866.0	2244.4	1988.8	2392.2	-85.7

=====

LOAD SCHEDULE FOR 2 T1 PRIM 480. VOLTS LINE TO LINE
SOURCE OF PWR 1 GEN

=====

ITEM DESCRIPTION *	CONNECTED KVA	LOAD AMPS	* DEMAND KVA	LOAD AMPS	* DESIGN KVA	LOAD AMPS	* % P F
BRANCH LOADS							
3 T1 SEC	2136.5	2569.8	1866.0	2244.4	1988.8	2392.2	-85.7
TOTALS	2136.5	2569.8	1866.0	2244.4	1988.8	2392.2	-85.7

=====

LOAD SCHEDULE FOR 3 T1 SEC 12470. VOLTS LINE TO LINE
SOURCE OF PWR 2 T1 PRIM

=====

ITEM DESCRIPTION *	CONNECTED KVA	LOAD AMPS	* DEMAND KVA	LOAD AMPS	* DESIGN KVA	LOAD AMPS	* % P F
END USE LOADS							
GENERAL LOADS	500.0	23.1	300.0	13.9	300.0	13.9	-90.0
LIGHTING	300.0	13.9	300.0	13.9	375.0	17.4	-95.0
RECEPTACLES	156.0	7.2	83.0	3.8	83.0	3.8	-95.0
MOTOR LOADS	1000.0	46.3	1000.0	46.3	1000.0	46.3	-80.0
LARGEST MOTOR	200.0	9.3	200.0	9.3	250.0	11.6	-80.0
TOTALS	2136.5	98.9	1866.0	86.4	1988.8	92.1	-85.7

=====

SUPPORT DOCUMENTS (CONTINUED)

DATE: 18 MAR 93 TIME: 9 45 AM
 yucca demand load analysis
 size
 KE POWER COMPANY - CHARLOTTE, NORTH CAROLINA

SOURCE LOAD SUMMARY

LOAD BUS	1 GEN	480. VOLTS LINE TO LINE			
LOAD DESCRIPTION TYPE	UNITS	CONNECTED LOAD	DEMAND LOAD	DESIGN LOAD	POWER FACTOR %
GENERAL LOADS	KW	450.0	270.0	270.0	
	KVAR	-217.9	-130.8	-130.8	
	KVA	500.0	300.0	300.0	90.0 LAGGING
LIGHTING	KW	285.0	285.0	356.3	
	KVAR	-93.7	-93.7	-117.1	
	KVA	300.0	300.0	375.0	95.0 LAGGING
RECEPTACLES	KW	148.2	78.8	78.8	
	KVAR	-48.7	-25.9	-25.9	
	KVA	156.0	83.0	83.0	95.0 LAGGING
MOTOR LOADS	KW	800.0	800.0	800.0	
	KVAR	-600.0	-600.0	-600.0	
	KVA	1000.0	1000.0	1000.0	80.0 LAGGING
LARGEST MOTOR	KW	160.0	160.0	200.0	
	KVAR	-120.0	-120.0	-150.0	
	KVA	200.0	200.0	250.0	80.0 LAGGING

TOTAL LOADS	KW	1843.2	1593.8	1705.1	
	KVAR	-1080.3	-970.4	-1023.8	
	KVA	2136.5	1866.0	1988.8	
	* PF	86.3	85.4	85.7	
		LAGGING	LAGGING	LAGGING	

SUPPORT DOCUMENTS (CONTINUED)

DATE: 18 MAR 93 TIME: 9 45 AM
yucca demand load analysis
size
DUKE POWER COMPANY - CHARLOTTE, NORTH CAROLINA

LOAD DEMAND TABLE

LOAD DESCRIPTION	LOAD TYPE	FIRST DEMAND KVA	FIRST DEMAND %	SECOND DEMAND KVA	SECOND DEMAND %	THIRD DEMAND KVA	THIRD DEMAND %	PF	DESIGN FACT
GENERAL LOADS	K	100.	100.	ALL	50.	ALL	50.	-90.0	1.00
LIGHTING	K	ALL	100.	ALL	100.	ALL	100.	-95.0	1.25
RECEPTACLES	Z	10.	100.	ALL	50.	ALL	50.	-95.0	1.00
OFFICE EQUIPMENT	Z	ALL	100.	ALL	100.	ALL	100.	-85.0	1.00
HEATING	Z	ALL	100.	ALL	100.	ALL	100.	100.0	1.25
STANDBY LOADS	K	ALL	100.	ALL	100.	ALL	100.	-85.0	1.25
CAPACITOR BANK	Z	ALL	100.	ALL	100.	ALL	100.	.0	1.35
SYNC. MOTOR	K	ALL	100.	ALL	100.	ALL	100.	100.0	1.25
MOTOR LOADS	K	ALL	100.	ALL	100.	ALL	100.	-80.0	1.00
LARGEST MOTOR	K	ALL	100.	ALL	100.	ALL	100.	-80.0	1.25
CRANE	K	ALL	20.	ALL	20.	ALL	20.	-80.0	1.00
MOTOR	K	ALL	50.	ALL	50.	ALL	50.	-80.0	1.00
MOTOR	K	ALL	70.	ALL	70.	ALL	70.	-80.0	1.00
SPARE	K	ALL	100.	ALL	100.	ALL	100.	100.0	1.00
SPARE	K	ALL	100.	ALL	100.	ALL	100.	100.0	1.00
SPARE	K	ALL	100.	ALL	100.	ALL	100.	100.0	1.00
SPARE	K	ALL	100.	ALL	100.	ALL	100.	100.0	1.00
SPARE	K	ALL	100.	ALL	100.	ALL	100.	100.0	1.00
SPARE	K	ALL	100.	ALL	100.	ALL	100.	100.0	1.00
SPARE	K	ALL	100.	ALL	100.	ALL	100.	100.0	1.00

NOTES: LOAD TYPE 10 PROVIDES TRANSFER FUNCTION TO LOAD TYPE 9
DEMAND AND DESIGN FACTORS APPLIED AT EACH LOAD BUS
AND ALL LOAD TOTALS ARE POWER FACTOR CORRECTED

SUPPORT DOCUMENTS (CONTINUED)

yucca transformer and feeder size
size
DUKE POWER COMPANY - CHARLOTTE, NORTH CAROLINA

DATE: 18 MAR 93
TIME: 9 47 AM

ALL INFORMATION PRESENTED IS FOR REVIEW, APPROVAL, INTERPRETATION
AND APPLICATION BY A REGISTERED ENGINEER ONLY

PPER (SIZE FEEDERS AND TRANSFORMERS MINI/MICRO VERSION 3.5 LEVEL 2.1)
COPYRIGHT SKM SYSTEMS ANALYSIS, INC. 1983

SUPPORT DOCUMENTS (CONTINUED)

DATE: 18 MAR 93 TIME: 9 47 AM
yucca transformer and feeder size
size
PTE POWER COMPANY - CHARLOTTE, NORTH CAROLINA

FEEDER AND TRANSFORMER STUDY CRITERIA

FEEDERS AND TRANSFORMERS TO BE SIZED
MASTER FILE WILL NOT BE UPDATED

BRANCH VOLTAGE DROP CRITERIA 2.50

VOLTAGE DROP CALCULATIONS PRESENTED HERE IN ARE PRELIMINARY
EXECUTE VOLTAGE DROP AND LOAD FLOW STUDY FOR MORE COMPLETE RESULTS

PRIMARY/SECONDARY TRANSFORMER FDRS SIZED AT 125. % OF TX FULL LOAD RATING

*** WARNING *** FROM 1 GEN TO 2 T1 PRIM 9 PARALLEL
CONDUCTORS REQD

*** WARNING *** FROM 1 GEN TO 2 T1 PRIM 13 PARALLEL CONDUCTO
*** NOTICE *** FEEDER SIZED TO 125. PERCENT OF TRANSFORMER SIZE
BRANCH FROM 1 GEN TO 2 T1 PRIM
TR KVA: 2300.0 TR FLA: 2766.5
MINIMUM FEEDER AMPACITY: 3458.1

SUPPORT DOCUMENTS (CONTINUED)

DATE: 18 MAR 93 TIME: 9 47 AM
yucca transformer and feeder size
size
DUKE POWER COMPANY - CHARLOTTE, NORTH CAROLINA

FOR MISSING DATA, DAPPER DEFAULTS TO THE FOLLOWING VALUES

FEEDER INSULATION:	THWN	0-600	VOLTS
FEEDER INSULATION:	XLP	601-15000	VOLTS
CIRCUIT DATA:		4 WIRE,	NO GROUND
CIRCUIT DATA:		3 WIRE,	NO GROUND FOR DELTA AND WYE XFORMERS
FEEDER TYPE:		COPPER	
DUCT TYPE:		METALLIC RACEWAY	
TRANSFORMER TYPES:	DT	DRY TYPE	
PERCENT TAP:	0.0	NO TAP SET	
PRIMARY CONNECTIONS:		DELTA	
SECONDARY CONNECTIONS:		WYE-GROUNDED	

0 DEFAULT VALUES USED IN THIS REPORT

SUPPORT DOCUMENTS (CONTINUED)

DATE: 18 MAR 93 TIME: 9 47 AM
yucca transformer and feeder size
size
Duke POWER COMPANY - CHARLOTTE, NORTH CAROLINA

FEEDER SIZE REPORT

F E E D E R S C H E D U L E

FEEDER NO	ROUTING NAME	FEEDER VOLTAGE	NO /PH	WIRE QTY	SIZE FDR	TYPE MAT	INSUL TYPE	GROUND WIRE	RACEWAY SIZE	TYPE
FROM 1	GEN	480.								
TO 2	T1 PRIM		(13)	3	500	CU	THWN			N

3458 AMPS
 13
 = 266 A / cable

SUPPORT DOCUMENTS (CONTINUED)

DATE: 18 MAR 93 TIME: 9 47 AM
 yucca transformer and feeder size
 size
 DUNE POWER COMPANY - CHARLOTTE, NORTH CAROLINA

FEEDER EVALUATION

FEEDER DESIGN LOAD ANALYSIS

FEEDER NO	ROUTING NAME	EXTG	* QTY	SIZE	FEEDER DESCRIPTION	DESIGN LOAD	FEEDER CAPACITY
		VD	/PH	FDR	MAT	TNSUT. AMBIENT	
FROM 1	GEN			480.			
TO 2	T1 PRIM	.20	13	500	CU	THWN 47.	2392. A 3705. A

Title: Cable Ampacity Derating

SUPPORT DOCUMENTS (CONTINUED)

DATE: 18 MAR 93 TIME: 9 47 AM
yucca transformer and feeder size
size
PINE POWER COMPANY - CHARLOTTE, NORTH CAROLINA

TRANSFORMER SIZE REPORT

TRANSFORMER SCHEDULE

LOCATION	DESCRIPTION	VOLTAGE	CONN	PCT.	TRANSFORMER	DESCRIPTION
BUS NO.	NAME	LEVELS	CODE	TAP		
FROM:	2 T1 PRIM	480.	D	.0	TYPE: OA	SIZE: 2300.0 KVA
TO	3 T1 SEC	12470.	YG		DESCRIPTION: OIL TO AIR	
DESIGN	LOAD: 1988.8 KVA				5.75 %Z NOMINAL RATING	2000.0 KVA

SUPPORT DOCUMENTS (CONTINUED)

ACTIVITY REPORT <SEND>

NO.	REMOTE STATION	MODE	START	DURATION	PAGES	RESULT	NOTE
006	714 9755271	STD	17,11:43	11'40	24	* OK	SEND
007	702 7941843	STD	17,12:00	01'35	04	* OK	SEND
008	45378	STD	17,13:49	02'14	04	* OK	SEND
009	7026424560	STD	17,14:56	00'58	02	OK	SEND
010	714 975 5949	STD	17,15:16	03'11	05	* OK	SEND
011	89093822367	STD	17,15:58	00'00	00	* D.O.O	SEND
012	714 382 2868	STD	17,15:59	03'17	05	* OK	SEND
001	702 7941843	STD	18,08:10	02'46	07	* OK	SEND
002	714 9755816	STD	18,08:24	01'15	02	* OK	SEND

ACTIVITY REPORT <RECEIVE>

NO.	REMOTE STATION	MODE	START	DURATION	PAGES	RESULT	NOTE
008	702 246 7300	STD	17,11:38	02'14	02	OK	
009	63	STD	17,12:38	02'31	02	OK	
010	702 295 5516	STD	17,13:38	02'11	04	* OK	
011	818 334 7499	STD	17,13:47	01'51	03	OK	
012	63	FINE	17,14:14	03'02	01	* OK	
013	63	STD	17,14:21	03'08	05	* OK	
014	IFPC FLIGHTLINK	FINE	17,14:59	01'13	01	OK	
015	301 353 4690	STD	17,15:01	03'04	05	OK	
016	63	STD	17,15:28	05'40	09	* OK	
017	510 246 6542	STD	17,15:35	01'37	03	* OK	
018	1-602-964-9717	FINE	17,16:11	04'33	01	R.1.4	STOP
019	206 872 0199	FINE	17,17:23	01'34	02	* OK	
020	OLSEN - 702-431-8036	FINE	17,22:00	02'11	01	R.3.3	
021	OLSEN - 702-431-8036	FINE	17,22:08	01'02	01	OK	
001	63	STD	18,08:03	03'09	05	* OK	
002	704 382 3105	STD	18,08:34	05'45	11	* OK	