

Subject: SCE ductbank testcase

Date: Wednesday, January 25, 2023 at 5:22:03 PM Pacific Standard Time

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Attachments: image003.png, image004.png, image007.png, image008.png, image024.jpg, image025.png, image026.jpg, image027.jpg, image028.jpg, image029.jpg, image030.jpg, image031.jpg

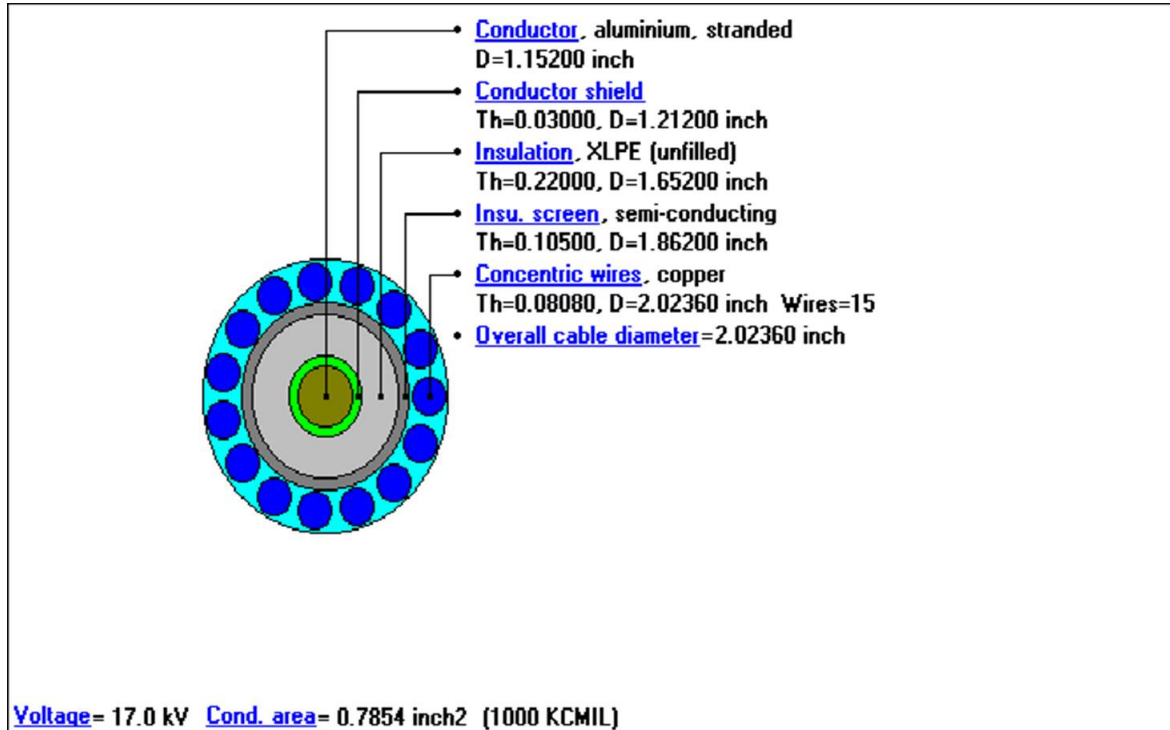


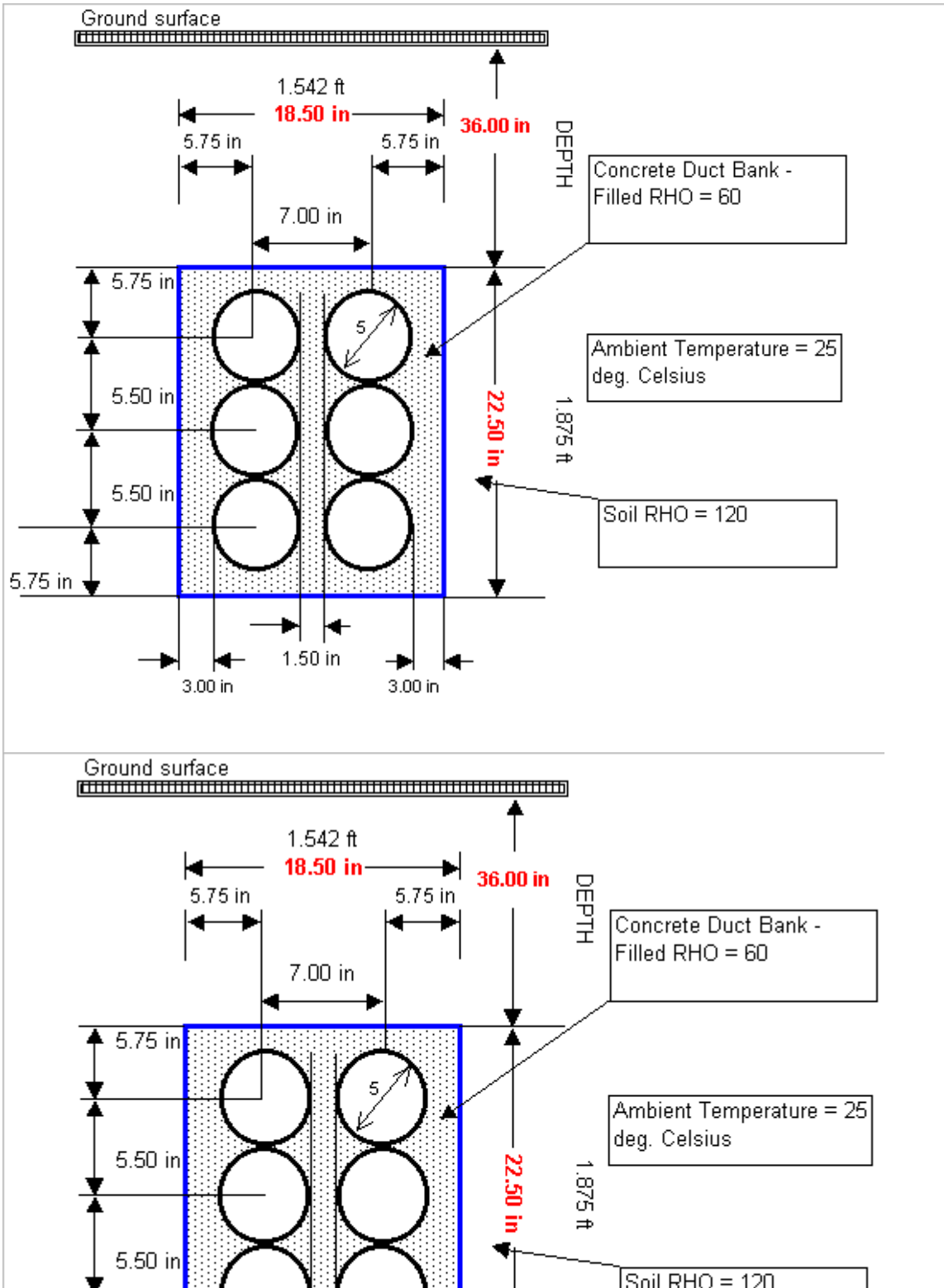
Figure 1: (M/C: 592-87722) 12/17 KV-1,000 Kcmil-AL-TRXLPE- UG - UNJACKETED - (ZUGC 130)

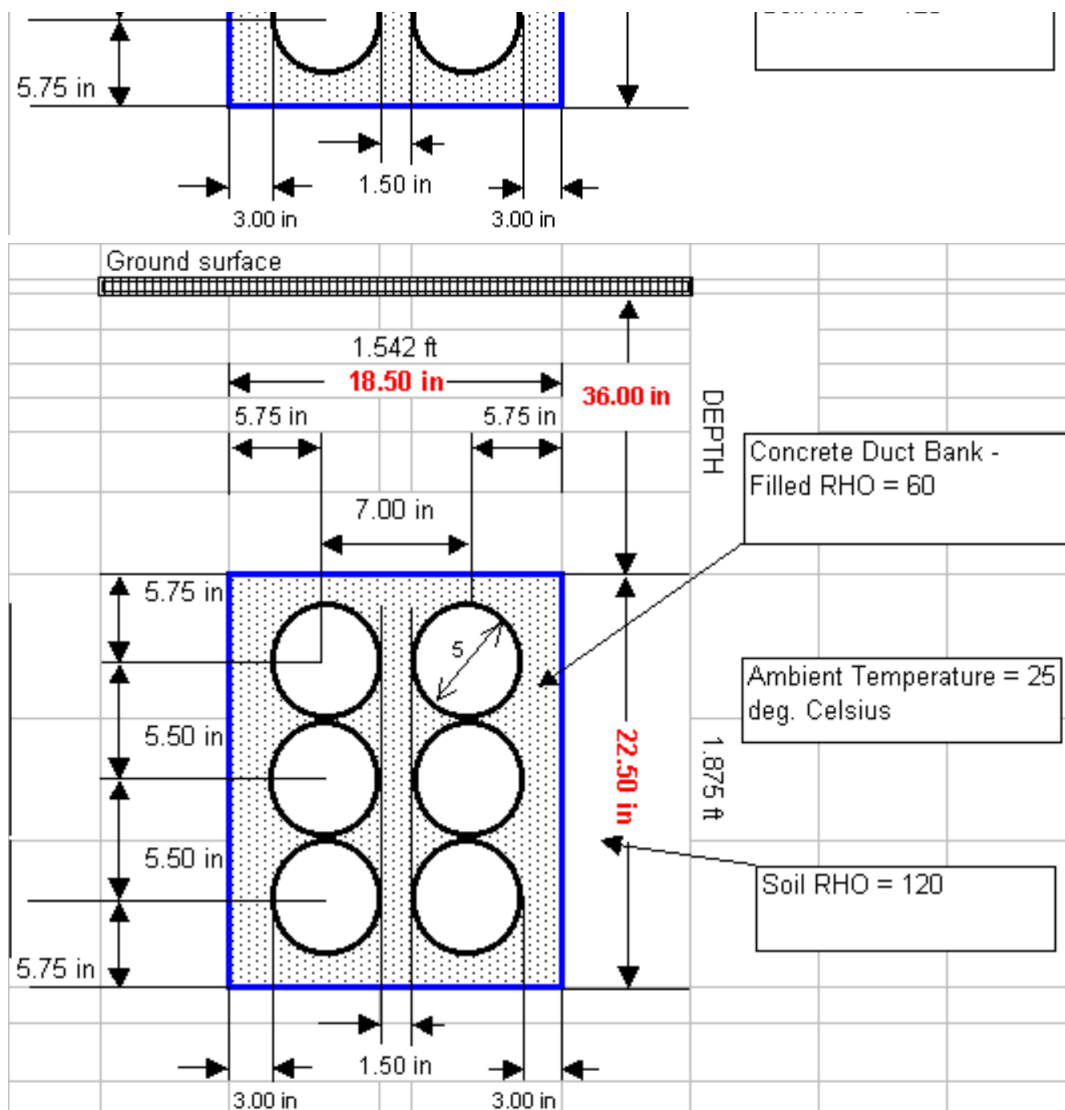
Parameters used on duct bank loading

Conductor Temperature	90 deg. Celsius
Load Factor	60 %
Soil Thermal Resistivity	120 RHO
Filled Thermal Resistivity	60 RHO
Earth Temperature	25 deg. Celsius
Sheath/Shield Bonding	1-conductor, Sheaths bonded ends, triangular configuration (multi-grounded system)
Duct Inside Diameter	5.0"
Duct Outside Diameter	5.25 "
Duct Bank Dimension	See drawings of typical SCE duct banks
Cable Position Arrangement	Each case depicts the best cable position arrangement that optimize cable ampacity. Normally, by positioning cables on the top of the duct bank, more heat dissipation is allowed. Thus, more ampacity is gained. Also, allowing empty ducts between two rows, more

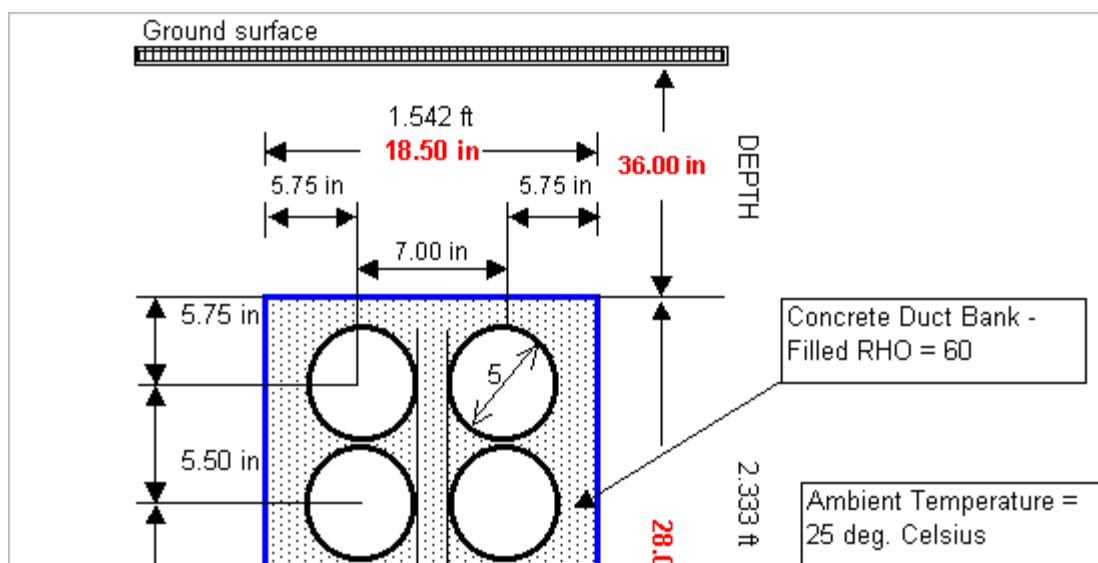
ampacity is gained. 4x2 Duct bank is used for 5 and 6 circuits.

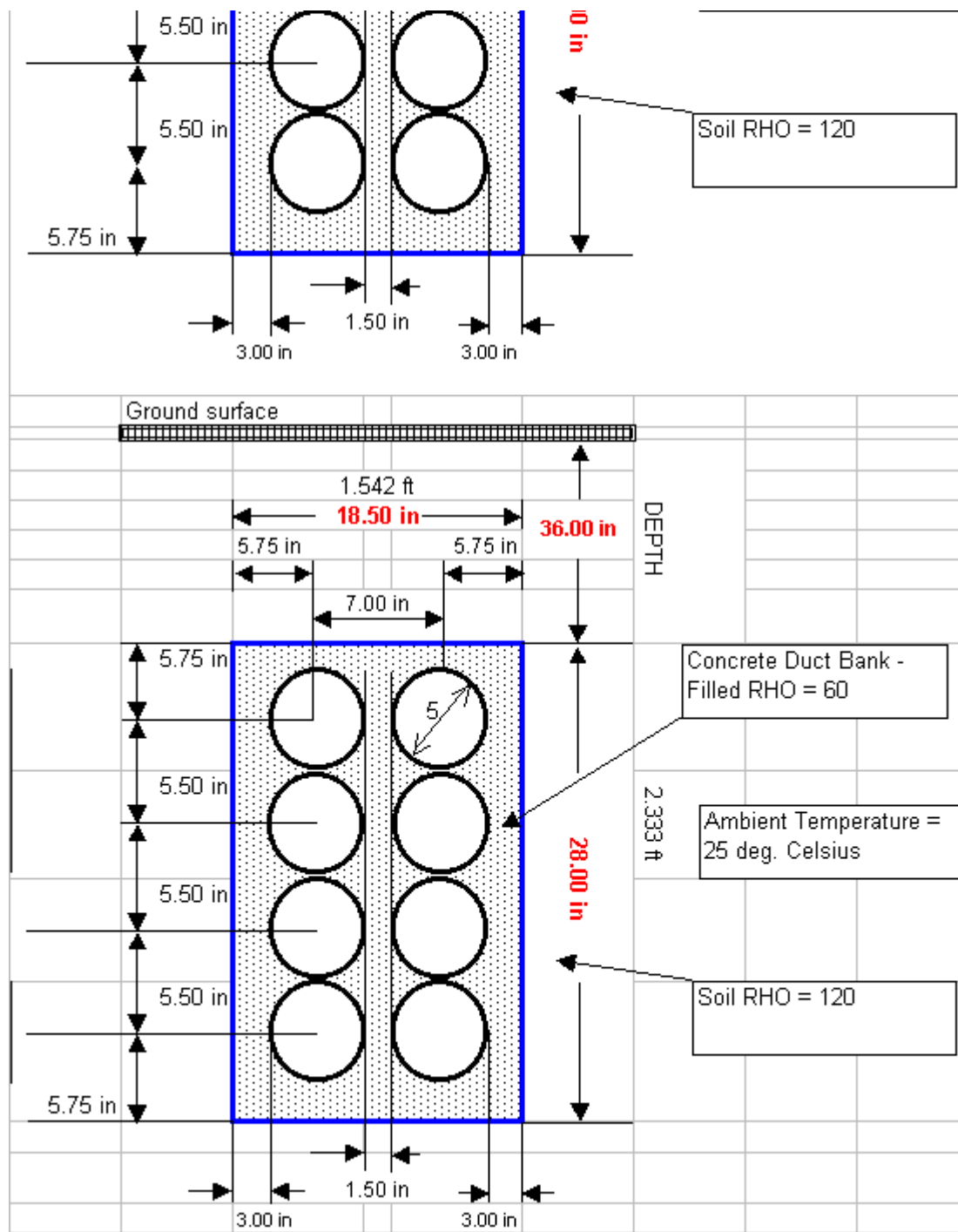
Typical SCE 3x2 Duct Bank



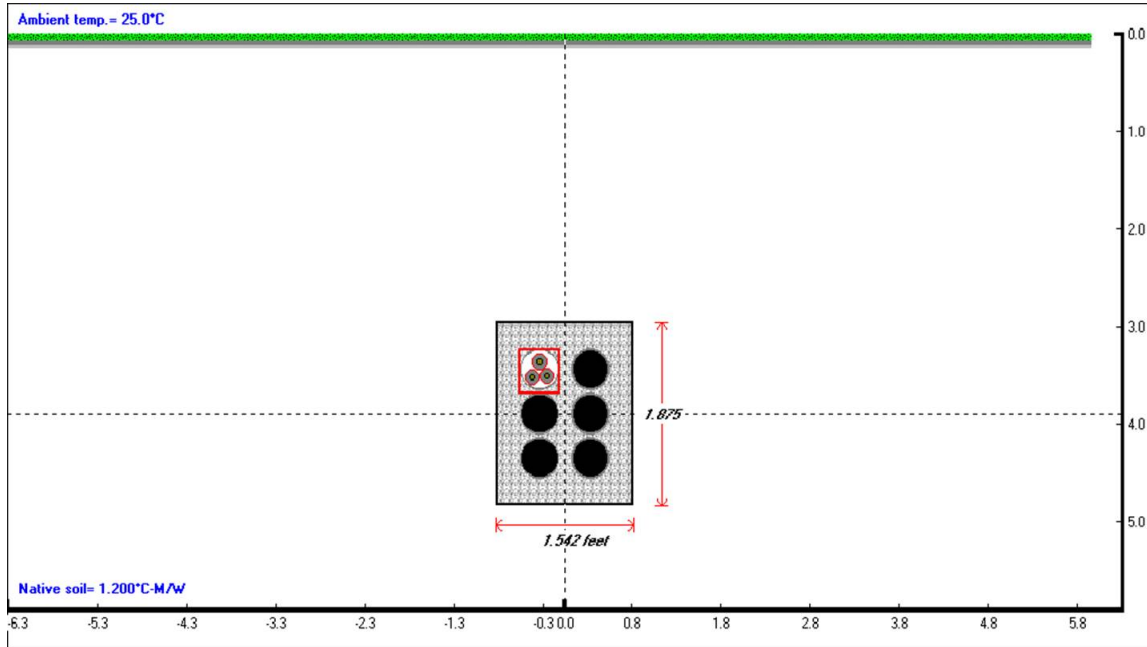


Typical SCE 4x2 Duct Bank



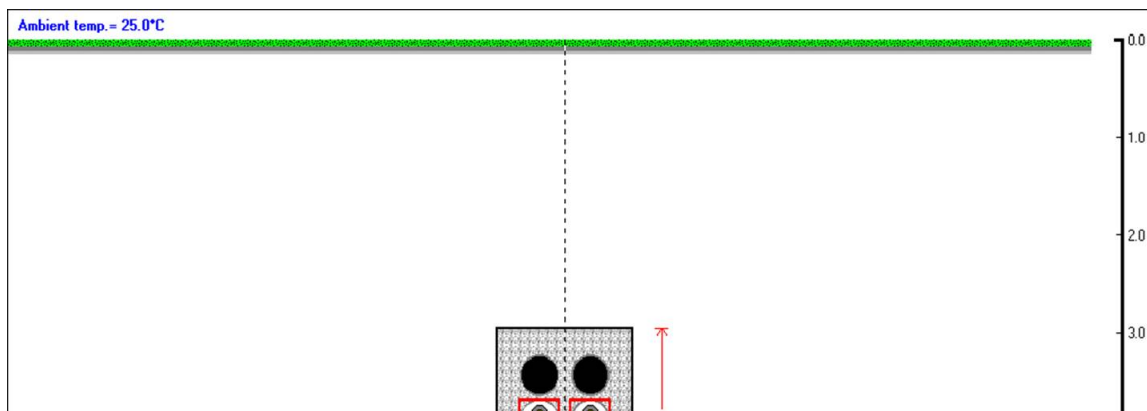


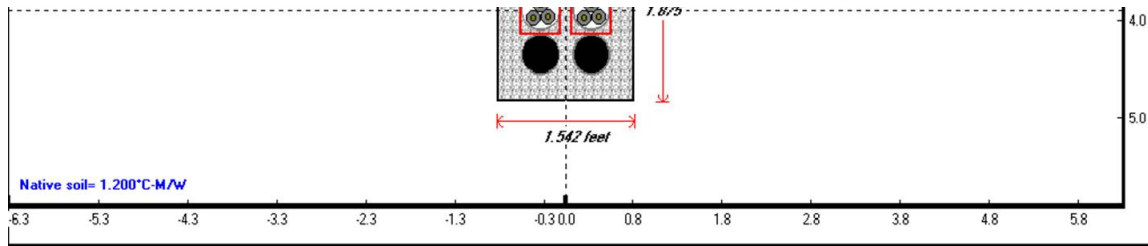
1 – 1,000 Kcmil AL in 3x2 Duct Bank



Position (Row – Column)	Temperature (deg. Celsius)	Ampacity CYMCAP	Ampacity USAMP+	Temperature* USAMP+	Temperature** Difference	% Difference
1 – 1	90.0	650	600	101.4	11.4	12.7%
1 – 2	empty					
2 – 1	empty					
2 – 2	empty					
3 – 1	empty					
3 – 2	empty					
AVERAGE	90.0	650	600	101.4	11.4	12.7%

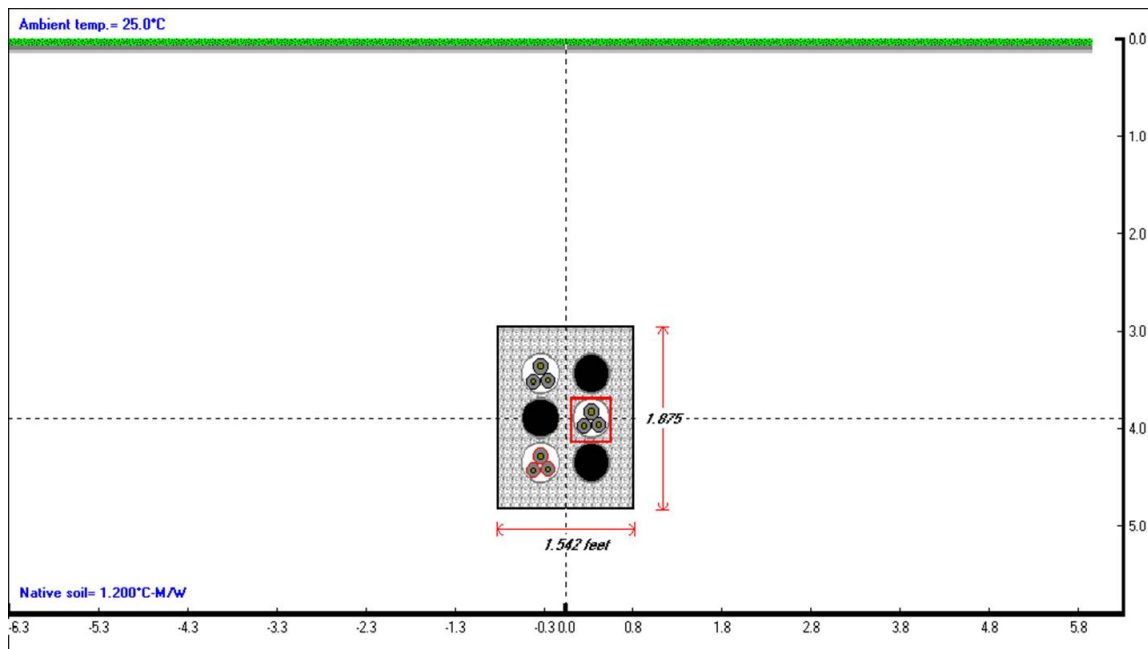
2 – 1,000 Kcmil AL in 3x2 Duct Bank





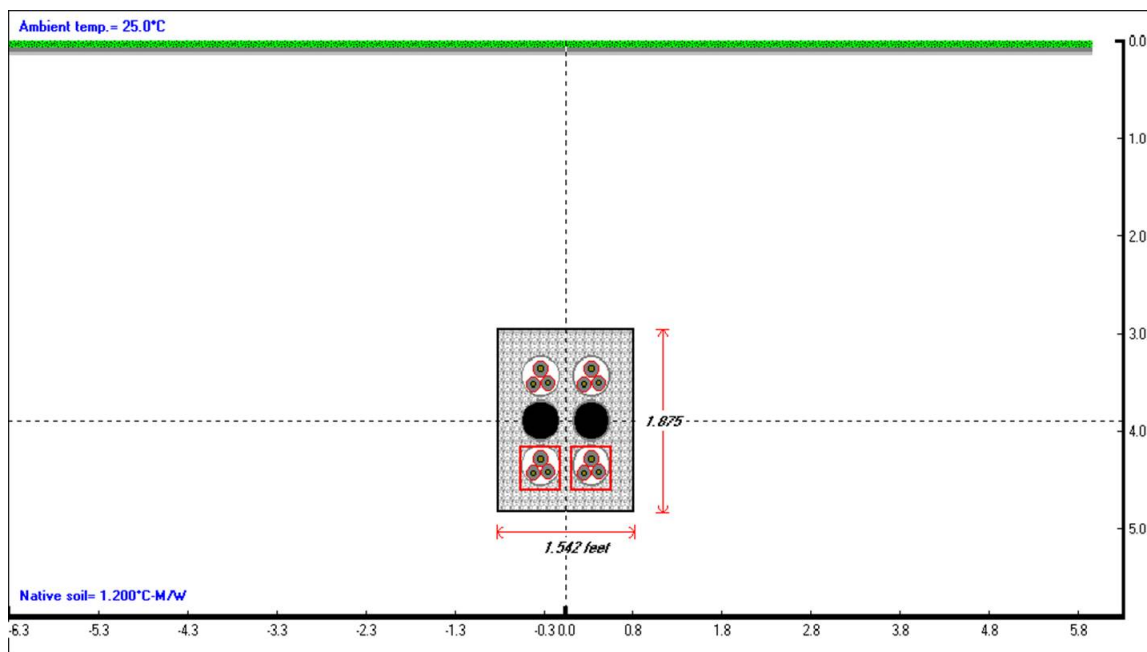
Position (Row – Column)	Temperature (deg. Celsius)	Ampacity CYMCAP	Ampacity USAMP+	Temperature* USAMP+	Temperature** Difference	% Difference
1 – 1	empty					
1 – 2	empty					
2 – 1	90.0	569	531	100.3	10.3	11.4%
2 – 2	90.0	569	531	100.2	10.2	11.3%
3 – 1	empty					
3 – 2	empty					
AVERAGE	90.0	569	531	100.3	10.3	11.4%

3 – 1,000 Kcmil AL in 3x2 Duct Bank



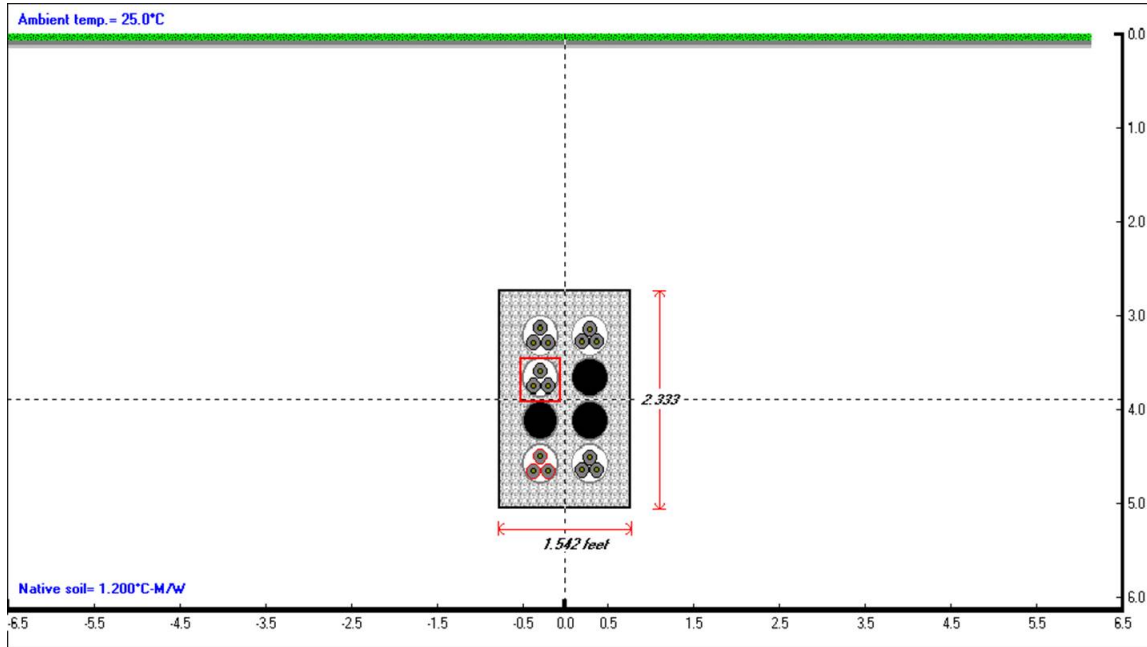
Position (Row – Column)	Temperature (deg. Celsius)	Ampacity CYMCAP	Ampacity USAMP+	Temperature* USAMP+	Temperature** Difference	% Difference
1 – 1	89.0	517	492	97.9	8.9	10.0%
1 – 2	empty					
2 – 1	empty					
2 – 2	90.0	517	485	99.1	9.1	10.1%
3 – 1	89.9	517	486	99.0	9.1	10.1%
3 – 2	empty					
AVERAGE	89.6	517	488	98.6	9.0	10.1%

4 – 1,000 Kcmil AL in 3x2 Duct Bank



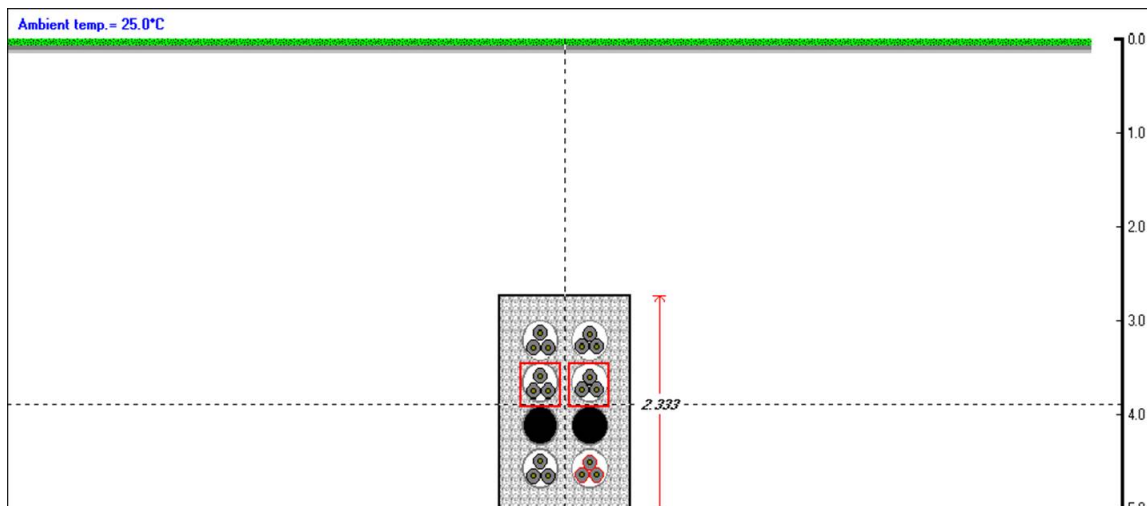
Position (Row – Column)	Temperature (deg. Celsius)	Ampacity CYMCAP	Ampacity USAMP+	Temperature* USAMP+	Temperature** Difference	% Difference
1 – 1	89.0	477	450	97.6	8.6	9.7%
1 – 2	89.0	477	451	97.5	8.5	9.6%
2 – 1	empty					
2 – 2	empty					
3 – 1	90.0	477	451	98.6	8.6	9.6%
3 – 2	90.0	477	450	98.5	8.5	9.4%
AVERAGE	89.5	477	451	98.1	8.6	9.6%

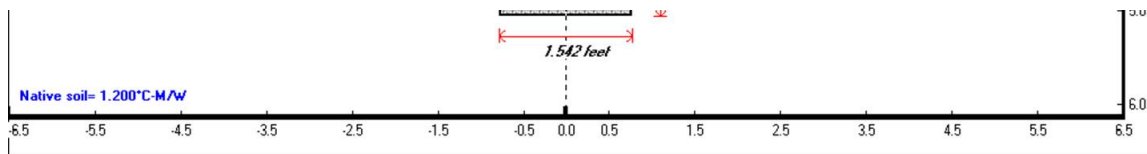
5 – 1,000 Kcmil AL in 4x2 Duct Bank



Position (Row – Column)	Temperature (deg. Celsius)	Ampacity CYMCAP	Ampacity USAMP+	Temperature* USAMP+	Temperature** Difference	% Difference
1 – 1	88.5	447	417	97.8	9.3	10.5%
1 – 2	88.6	447	417	96.6	8.0	9.0%
2 – 1	90.0	447	425	99.1	9.1	10.1%
2 – 2	empty					
3 – 1	empty					
3 – 2	empty					
4 – 1	88.9	447	427	97.8	8.9	10.0%
4 – 2	88.6	447	409	97.7	9.1	10.3%
AVERAGE	88.9	447	419	97.8	8.9	10.0%

6 – 1,000 Kcmil AL in 4x2 Duct Bank





Position (Row – Column)	Temperature (deg. Celsius)	Ampacity CYMCAP	Ampacity USAMP+	Temperature* USAMP+	Temperature** Difference	% Difference
1 –1	88.2	419	391	97.6	9.4	10.7%
1 –2	88.2	419	391	97.6	9.4	10.7%
2 – 1	90.0	419	395	99.4	9.4	10.4%
2 – 2	90.0	419	397	99.2	9.2	10.2%
3 –1	empty					
3 - 2	empty					
4 – 1	88.2	419	395	97.1	8.9	10.1%
4 - 2	88.2	419	393	97.3	9.1	10.3%
<i>AVERAGE</i>	<i>88.8</i>	<i>419</i>	<i>394</i>	<i>98.0</i>	<i>9.2</i>	<i>10.4%</i>

SUMMARY

# Of Conductors in 4x2 Duct Bank	Temperature (deg. Celsius)	Ampacity CYMCAP	Ampacity USAMP+	Temperature* USAMP+	Temperature** Difference	% Difference
1	90.0	650	600	101.4	11.4	12.7%
2	90.0	569	531	100.3	10.3	11.4%
3	89.6	517	488	98.6	9.0	10.1%
4	89.5	477	451	98.1	8.6	9.6%
5	88.9	447	419	97.8	8.9	10.0%
6	88.8	419	394	98.0	9.2	10.4%
<i>AVERAGE</i>	<i>89.5</i>			<i>99.0</i>	<i>9.6</i>	<i>10.7%</i>

* Calculated temperature utilizing the ampacity used for CYMCAP program.

** Difference between temperatures calculated with CYMCAP and USAMP+ program utilizing the CYMCAP ampacity data.