Document Title: Description, AN, THERM, TR.com The Effect of Soil Thermal Resistivity RHO on Underground Power Cable Installation		Part # and Rev. 13943-01	
		Release Date:	
Rev.	Description	Revision By	Date

Production Filename: 13943 (In Product Library)

Path to Working Files: DecaDoc\Application Notes\Master

Dimensions: 8.5 inch wide, 11 inch tall

Material: Paper, 92 Bright White or better, 75g/m² or heavier

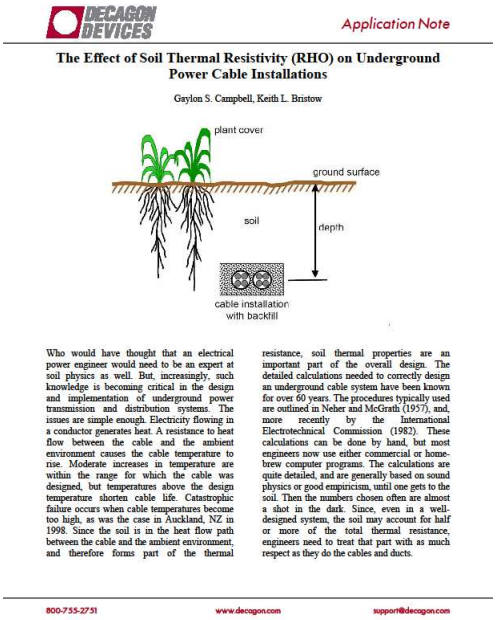
Colors: Color Print on White

Printer: HP Color LaserJet 8550-PS

Finish: None

Adhesive: None

Special Notes: Illustrations are Ref Only ** Not to Scale ** (Shown page 1 of 4)



DECAGON DEVICES Application Note

The Effect of Soil Thermal Resistivity (RHO) on Underground Power Cable Installations

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Who would have thought that an electrical power engineer would need to be an expert at soil physics as well. But, increasingly, such knowledge is becoming critical in the design and implementation of underground power transmission and distribution systems. The issues are simple enough. Electricity flowing in a conductor generates heat. A resistance to heat flow between the cable and the ambient environment causes the cable temperature to rise. Moderate increases in temperature are within the range for which the cable was designed, but temperatures above the design temperature shorten cable life. Catastrophic failure occurs when cable temperatures become too high, as was the case in Auckland, NZ in 1998. Since the soil is in the heat flow path between the cable and the ambient environment, and therefore forms part of the thermal resistance, soil thermal properties are an important part of the overall design. The detailed calculations needed to correctly design an underground cable system have been known for over 60 years. The procedures typically used are outlined in Neher and McGrath (1957), and, more recently by the International Electrotechnical Commission (1982). These calculations can be done by hand, but most engineers now use either commercial or home-brew computer programs. The calculations are quite detailed, and are generally based on sound physics or good empiricism, until one gets to the soil. Then the numbers chosen often are almost a shot in the dark. Since, even in a well-designed system, the soil may account for half or more of the total thermal resistance, engineers need to treat that part with as much respect as they do the cables and ducts.