

Document Title: 14529-01 LIT, Heat and Water Transport in Soil		Part # 14529-01	
		Release Date: 6-6-12	
Rev.	Description	Revision By	Date

Production Filename: 14529-01 LIT, Heat and Water Transport in Soil

Path to Working Files: Decadoc\Video Transcriptions\Master\Thermal Properties\14529-01 LIT, Heat and Water Transport in Soil

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 ** Page 1 of 10

 DECA GON THERMAL BY DECA GON DEVICES, INC.		Video Transcript 2012 International Thermal Resistivity Workshop	
Heat and Water Transport in Soil Gaylon S. Campbell			
Introduction Heat and water transport in soil, the fundamental principles of science behind it probably is 150 to 200 years old. It's been known for a long time, and yet when Decagon built their first thermal properties instrument about 20 years ago, it was hard to find anybody who even would admit to needing a thing like that. They couldn't imagine what they would do with a thermal properties measurement. I think everybody thought that we just have a natural feeling for how heat flows in things. We should be able to look at something, and know whether it will be thermally resistive or thermally conductive. The actual application in geotechnical engineering of this kind of science, science that has been around for many many years, is pretty new. It has been interesting to talk to some of you this morning, to hear about how that interest in those kinds of things, is increasing pretty rapidly. While one of the things that caused a lot of that interest recently is the one that Mike Beanland has talked about, the fact they put in some cables that burned up. So some people started thinking, well maybe we do need to engineer that a little bit better than we'd have been in the past.		and that requires that we understand some things about heat flow and soil. Another thing that has been mentioned, as we went around the room, is ground source heat pumps. The soil is increasingly being used as a reservoir for the heat. And we need to know how much heat can be stored and we need to know how rapidly the heat can be transferred to and from that reservoir. The last one, I kind of hesitated to even put that down. I wondered how many engineers in a room like this might actually be involved in storage of nuclear waste. I gave a talk a month or so ago in Iowa and at a group of geotechnical engineers and I was having some of the same thoughts there and wondering if that should even be mentioned but it turned out that the speaker just before me had worked on the Yucca Mountain project and spent a little bit of time in his talk talking about the storage of the high level waste. Have any of you been involved in any of that? Probably not storing it, but in the calculations and engineering of storage? Nobody here got involved?	
Some Geotechnical Applications of Soil Thermal Properties The kinds of things that the information that we will talk about here are applied in, are things like buried transmission lines for power transmission, a lot of interest now in data centers and other places where heat needs to be dissipated into the environment from things that are buried in the soil. When we run a current through a conductor we generate heat. The heat that is generated has to be dissipated to the environment with conductor temperatures that are low enough that we don't cause damage to the conductor. So, we need to know how fast the heat will be conducted away		Workshop Attendee: "Dr. Craig Benson and I worked for a consortium for the Department of Energy and we're working in long-term storage of low level nuclear waste but that near the transfer still have to be considered long-term drying and desiccation of the cover systems." Dr. Campbell: "So even in a low level waste you get enough keep reduction to that you need to do the calculations. Okay, I was not wrong again."	
Thermal Properties of Soil Impact Wind Power Generation This is a thing that is becoming more and more common in our surroundings one that Mike will talk about later today. About 10 years ago I was on a soils field trip, down along the Columbia River,			
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