

|  |             |                                  |      |
|--|-------------|----------------------------------|------|
| Document Title:<br><b>14545-01 LIT, Sensitivity Analysis</b> |             | Part #<br><b>14544-01</b>        |      |
|  |             | Release Date:<br><b>10-31-12</b> |      |
| Rev.   | Description | Revision By                      | Date |
|  |             |                                  |      |

**Production Filename:** 14545-01 LIT, Sensitivity Analysis

**Path to Working Files:** Decadoc\Video Transcriptions\Master\Thermal Properties \14545-01 LIT, Sensitivity Analysis

**Dimensions:** 8.5 inch wide, 11 inch tall

**Material:** Paper, 92 Bright White or better, 75g/m<sup>2</sup> or heavier


**Colors:** Color Print on White

**Printer:** HP Color LaserJet 5550

**Finish:** None

**Adhesive:** None

**Special Notes:** Illustrations are Ref Only \*\* Not to Scale \*\*

|  |  |  |  |
|--|--|--|--|
|   |  | <b>Video Transcript</b><br><small>2012 International Thermal Resistivity Workshop</small>  |  |
| <b>Underground Cable Ampacity</b><br><b>Michael Beanland</b>   |  |  |  |
| <p><b>Biography</b></p> <p>Well thank you, everybody, for showing up and being here. I have several presentations, we're going to walk through several different aspects of the thermal aspects of underground cables and this'll be the first presentation. Michael Beanland, I've been an electrical engineer for 30 some odd years and am licensed in New Mexico now, I actually started work in the electric utility industry while I was in college doing summer work. In fact, some of my first work was with the Pacific Gas &amp; Electric Department of Engineering Research in San Ramon when we were actually doing all kinds of interesting esoteric studies back in the 1970's. I'm based out of Vancouver, Washington and Triaxis Engineering is predominately a company providing services to electric utilities. We also do a lot of work for developers on everything from data centers, photo able lake projects, wind projects, gas-fired generation and a lot of different things. My forte in the company as business studies is the analytic side. We also have a group that does design overhead underground transmission line designs all over the United States and then we have a group that does substation design, and in fact I'm involved in all those. I was just up in Fort Angeles across the sound here getting ready to do a substation redesign last week, one of the many different projects I work on.</p> <p>In fact, one of the nice things is I've lucked out being able to do a lot of things. I do everything from commercial building design, underground cable thermal analysis, airport lighting design, substation design, transmission design, interconnection studies and protective relay. I'm basically a controls guy with a lot of analysis capability. My graduate degree's is controls and in fact, I think it's humorous, as I like Jim's comment about nuclear issues. My professors in college tried to encourage us all to get into</p> |  | <p>nuclear engineering and all of us in the graduate program looked at him and went, "No," and we all went different directions; like controls or microelectronics because we kind of read the writing on the wall where trying to get a job in that industry was ahead.</p> <p><b>Neher McGrath</b></p> <p>My focus is starting off really giving some background about the history behind the way underground cables and ampacity calculation have been done and I thought I would bring a little show and tell. This is a nice brand new piece of 35 KV underground electrical cable, this is a piece of almost new 35 KV underground cable that overheated. The comment that Gaylon was making about some of the wind projects buried in the soil, this is an exact example of that and a combination of having very poor thermal properties of loose soils, which are a windblown particulate matter, very poor thermal conductor, with the added negative side of the fact that it was all excavated soil, stacked by the side, wonderful chance to dry out, dumped back in the ground as backfill, not very well compacted because it was on the side of a very steep hill so they just basically threw it in. Then they added to that is in an area where the rainfall in Eastern Washington is maybe 10 inches a year. They actually have to wait two years to be able to get enough moisture in the soil to grow a crop, so it's in action every other year crop and then we also than had an extraordinary wind event surely after all of this came together where we had nonstop full tilt wind production for about a week and of all strange things we actually had a cable failure and it was for a totally unrelated reason but as they were troubleshooting that cable failure, they excavated and exposed some of the underground cable that we have installed and then we looked at it and said, "Ih, something isn't right." We went back and started debugging what</p> |  |
| <small>www.decagonthermal.com</small>  |  | <small>509-332-5600</small>  |  |
|  |  | <small>support@decagonthermal.com</small>  |  |