

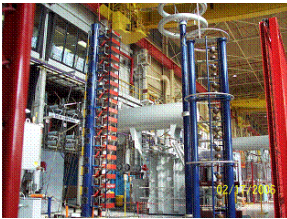


Apparatus Maintenance and Power
Management For Energy Delivery

September Client Conference Tutorials

This year's September Doble Client Conference in Philadelphia will feature two informative tutorials, Transformer Factory Testing on Sunday and Personal Protective Grounding on Friday. **The Transformer Factory Testing Tutorial** is intended for individuals who witness and approve the result of these tests. The tutorial will concentrate on two of the more significant groups of tests commonly performed – dielectric tests and temperature tests. The **Personal Protective Ground Tutorial** is for those individuals performing hands-on maintenance of de-energized high voltage lines or equipment requiring the application of personal protective grounding. Find out more information about each tutorial below.

FACTORY TESTING TUTORIAL ABSTRACT Sunday, September 23, 2007 12:30 – 5:30 PM



There are many tests performed on a transformer in the factory. Each test is designed to test a different performance characteristic of the unit under test. This tutorial will concentrate on two of the more significant groups of tests commonly performed which are the dielectric tests and the temperature test.

The purpose of dielectric tests in the factory is to demonstrate that the transformer has been designed and constructed to withstand the specified insulation levels. Tests included in the dielectric category include the lightning impulse, switching surge, applied potential and the induced potential tests. This tutorial will discuss the test levels and other test parameters as outlined in IEEE Standard C57.12.00. In addition, the discussion will include the test methods, the equipment used to perform the test and the analysis of the results.

The temperature test verifies a transformer's guaranteed temperature rise and consequently its ultimate capacity. This tutorial will discuss the temperature test parameters as outlined in IEEE Standard C57.12.90. The temperature test tutorial will focus on the test methods, the equipment used to perform the test and the analysis of the results. The session will also discuss how the transformer oil rises and winding gradients are calculated to establish the average winding and hottest spot rises for the unit under test.



This tutorial is intended for those individuals who are required to witness and approve the results of the factory acceptance testing. Engineering and supervisory personnel that are



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required to interpret and analyze the results of the factory tests for field commissioning, loading studies, or failure investigations can also gain insight about the information supplied in the Certified Test Report.

Persons attending this tutorial will leave with the basic knowledge required to witness these types of factory tests and make rudimentary decisions on the suitability of the test methods and procedures utilized during the factory testing. This tutorial is meant to be interactive, and the instructor encourages student participation in sharing questions and experiences.

PERSONAL PROTECTIVE GROUNDING TUTORIAL

Friday, September 28, 2007

8:00 AM – 5:00 PM

This tutorial is intended for those who perform hands-on maintenance of de-energized high-voltage lines or equipment requiring the application of personal protective grounds. Engineering and supervisory personnel that provide technical and policy support for your protective grounding program can also gain insight about safe grounding practice and procedures necessary to work on de-energized equipment. Topics covered in this tutorial include:

- Human electric shock hazard and the power system environment – recognizing the hazards
- Purpose of personal protective grounding – what it will and will not do
- Application of temporary protective grounds and safe grounding practice – the equipotential safe work zone
- How to choose the right size protective ground for the job and why it's called a ground cable assembly
- Predicting worker exposure voltage at the grounded worksite, including life-size classroom grounding demonstrator – how effective are your grounds?
- Staged fault test results of protective grounding effectiveness at grounded worksites on transmission lines and electric power stations
- Care and maintenance testing protective grounds, including hands-on electrical test demonstration
- Industry and Reclamation guides for protective grounding practice

Persons attending this tutorial will leave with the basic knowledge required to access the electrical hazards at a particular worksite and understand the principles involved in applying personal protective grounds in a safe and effective manner. This tutorial is meant to be interactive, and the instructor encourages student participation in sharing questions and experiences.



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PERSONAL PROTECTIVE GROUNDING TUTORIAL INSTRUCTOR BIOGRAPHY

Philip L. Atwater received a B.S. degree in electrical engineering from Michigan State University in 1975, moved to Colorado, and began working for the Bureau of Reclamation, Department of Interior. Phil has 32 years Reclamation experience performing design, research, and field testing in areas of power and pumping plant control and protective relaying, large rotating machine diagnostics, station grounding, power system staged fault testing, and special instrumentation development. He is a registered Professional Engineer in the State of Colorado. Throughout his career he took interest in and focused on high-voltage equipment maintenance safety grounding procedure. Phil has performed several research related staged fault protective grounding tests on high-voltage transmission lines and in power generation facilities and has published several technical grounding papers, including at the 2005 International Conference of Doble Clients. He presently coordinates Reclamation's high-voltage equipment maintenance protective grounding program and provides grounding clinics and consultation.