Underground Cable Systems

Training Course
Presented by Power Delivery Consultants, Inc.

Industry Need
Underground transmission and distribution cable systems have seen renewed interest by both utilities and industrials in recent years. Areas of evaluation include: review of new designs that will provide lowest cost and highest reliability systems, uprating of existing cable systems, and identifying and correcting problems that lead to unacceptable failure rates.

Objectives
The Underground Cable Systems course provides an understanding of the principles of cable and accessory, design, and gives guidance on planning, design, and siting of underground cable circuits. Cable utilization practices are changing rapidly, as regards system types, design tools, suppliers, installers, installation methods, accessories, configurations, etc. This course is intended to provide the engineer with up-to-date information on all aspects of underground transmission systems, from initial planning through design optimization, to final operation and maintenance.

Prerequisites
The course will provide value to engineers involved in the planning, design, and specification of cable systems as well as those concerned with cable installation and operation. No specialized background in underground cables is required, but a general familiarity with electric power engineering is desirable.

Course Structure
The course is given to small groups, permitting adjustment of technical level and emphasis to the interests and backgrounds of participants. Course duration is four and one-half days, with 3 hour sessions morning and afternoon. The last day concludes at noon. Note: A calculator with engineering functions may be useful for the illustrative problems which will be demonstrated.

Documentation
Extensive course notes complement the lectures. No additional texts are required.

Instructors
The course is taught by Power Delivery Consultants, Inc. staff members with extensive experience in all aspects of underground applications and manufacturing.

Location
The course is conducted on a regular basis at Siemens PTI offices in Schenectady, NY and at other major cities throughout the United States. It is also available for presentation at a client's location by special arrangement.

Continuing Education Units
2.7 Continuing Education Units (CEU's) will be awarded for successful completion of this short course. The CEU is the nationally recognized unit for recording participation in noncredit educational programs. One CEU is equal to ten classroom hours.

PTI – Power Academy TD

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Course Outline

Day 1

- Introductions / Course Overview
- Cable Types, Components and Principles
- Typical Applications
- System Grounding / Bonding
- Cable Installation Mechanical Problems
- Reactance / Sequence Impedances / Fault Current / Over-Voltage Protection
- Magnetic Fields
- Conductor Related Losses

Day 2

- Soil and Thermal Design of Underground Systems
- Equipment for Measuring Soil Thermal Properties
- Thermal Surveys
- Corrective Thermal Backfills
- Other Soils Topics
- Ampacity Calculations

Day 3

- Short Circuit Characteristics
- Cable Manufacturing (extruded / paper)
- Accessories
- SCFF Cable Hydraulics
- Cable Manufacturing
- Testing / Fault Location / Industry Specifications / Factory Inspections
- Grounding

Day 4

- Cable Installation & Commissioning (directional drilling, slides, video)
- Corrosion Mitigation / Cathodic Protection
- Failure Analysis
- Worked Examples – 230kV XLPE Cable Design / Analysis

Day 5

- Operation & Maintenance
- Uprating & Monitoring

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Siemens PTI has local offices in many countries throughout the world. For further information and contact to our worldwide business locations and local experts, please visit the Siemens PTI website and complete a contact form.

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