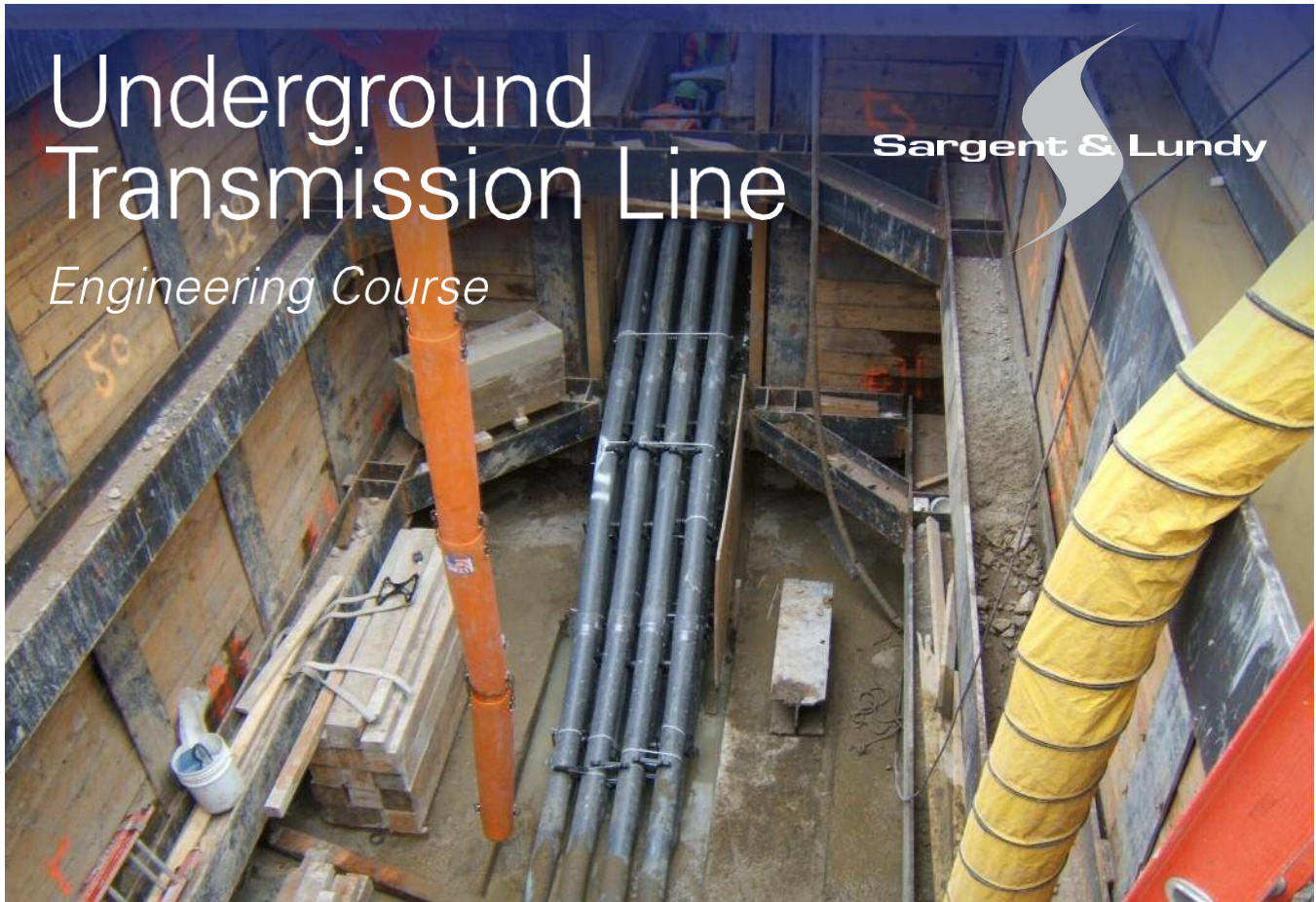


# Underground Transmission Line

## Engineering Course

Sargent & Lundy



Sargent & Lundy is now offering two days of training in underground transmission line design for our clients in the utility industry. Training is conducted at our Chicago headquarters by engineers experienced in underground transmission design.

### What You'll Learn

This two-day course provides a comprehensive treatment of underground transmission line engineering. Specific tasks and activities pertaining to line design will be presented, as well as the fundamentals of system needs, design requirements, route selection, cable selection, detailed design, and installation. In-class exercises include evaluation of alternate routes and cable types. Each attendee receives a copy of all classroom exhibits for future reference.

Course instructors include Dennis O'Reilly, PE; Mark Rankin, PMP; and Tom Thorsell, PE.

### Who Should Attend?

Utility engineers, project managers, and other professionals involved with transmission line projects, as well as entry level engineers or experienced professionals who are new to this area of the electric utility business.

### Course Fees

The two-day course at Sargent & Lundy's Chicago office is offered at a price of \$950. The price is reduced to \$850 if payment is received by Sargent & Lundy one week prior to the course start date. Credit card payment is accepted through our website. The fee covers supporting text, course materials, and breakfast and lunch each day. Utility on-site sessions for 15 or more students are also available. Please call for information.

### 16 Professional Development Hours

Participants receive a certificate of completion and one continuing education unit for every 10 hours of classroom instruction. Refer to specific state requirements for applicable professional development hour (PDH) credits.

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# Underground Transmission Line Course Details

## Day 1

Session 1 provides an overview of underground transmission. Session 2 is an introduction to power system analysis and factors influencing transmission line design. Sessions 3, 4, and 5 cover the engineering aspects of underground line design, including route selection, preliminary design, and factors affecting ampacity. Attendees will gain an understanding of applications and limitations of underground transmission and parameters affecting design, as well as relative costs of underground transmission.

### Session 1 – Overview

- Why go underground
- Relative cost of going underground
- Underground cable types
- Options

### Session 2 – System Needs

- Power system analysis
- Continuous steady-state, short-circuit, and emergency ratings
- Cable capacitance
- Electromagnetic fields
- Communications cable
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### Session 3 – Design Requirements

- Factors affecting cable ampacity
- XLPE cable

### Session 4 – Route Selection

- Routing objectives
- Identifying information sources
- Compiling/interpreting information
- Evaluating alternatives

### Session 5 – Preliminary Design

- Preliminary cable sizing
- Manhole locations
- Duct bank routing
- Cable expansion allowance

## Day 2

- Sessions 6 and 7 present detailed design and explore obstructions encountered in the design process. The detailed design section includes duct banks, manholes, cable bonding, cable support, grounding, and terminations. Sessions 8 and 9 address installation and cable system testing. While the course is focused on solid dielectric cable, session 10 covers pipe type cable as well.

### Session 6 – Obstructions

- Typical existing underground installations
- Typical clearance required from obstructions
- Relocation of obstructions

### Session 7 – Detailed Design

- Duct banks
- Manholes
- Cable, cable bonding, cable supports
- Grounding
- Cathodic protection
- Termination structures

### Session 8 – Installation

- Duct bank and manhole installation
- Clean and mandrel conduit
- Cable pulling lubricants, calcs, operation, splicing/terminations

### Session 9 – Cable System Testing

- Cable manufacturing tests
- Post installation testing
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### Session 10 – Pipe-Type Cable

- Cable types
- Cathodic protection
- Replacing pipe-type cables

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