

# SUBSTATION

## Engineering Design Course

Sargent & Lundy conducts 3.5-day substation design training for utility clients. Engineers specializing in utility substation design and engineering lead the training onsite at our Chicago headquarters.

### WHAT YOU'LL LEARN

This 3.5-day course covers substation physical design, protection and control systems, civil/structural design, and telecommunications fundamentals. It's tailored to specific substation design tasks and applications. Participants will complete calculation and design exercises to apply the principles learned.

Each session draws on recent experience from a range of projects, including enclosed GIS substations in urban areas and extensive upgrades to existing facilities.

### WHO SHOULD ATTEND?

Utility engineers, project managers, and professionals active in various substation project aspects, as well as entry-level engineers or experienced professionals new to this area of the electric utility industry.

### 28 PROFESSIONAL DEVELOPMENT HOURS

Participants receive a certificate of completion and one professional development hour for every hour of classroom instruction. Refer to specific state requirements for applicable PDH credits.

### COURSE FEES

**The course fee is \$2,200 per person.**

The fee is reduced to \$2,100 if payment is received one week before the course start date. Credit card payments are accepted via PayPal on our website.

*The course is also available for utilities seeking an onsite presentation for their employees. A minimum of 18 students is required for exclusive onsite sessions.*

*Please call for more information and pricing.*

### FOR INFORMATION CONTACT:

MELINDA BURNS

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# SUBSTATION ENGINEERING DESIGN COURSE DETAILS

## Day 1: Power System Analysis and Electrical Design

Session 1 introduces students to electric power systems and factors influencing substation design. Session 2 addresses various substation component functions and design.

### Session 1: Electric Power Systems

- Electricity basics
- Power grid operation
- Types of studies
- Power grid configuration

### Session 2: Substation Components

- Substation types
- Substation equipment
- Equipment standards and ratings
- Substation material

## Day 2: Substation Electrical Design

Session 3 reviews the single line development process and allows participants to develop a single line in class. Session 4 presents design inputs, layout options and selection, and air- and gas-insulated substation design. Session 5 covers grounding principles and substation grounding design.

### Session 3: Single Line Development

- Bus arrangements
- One-line diagrams
- Protection zones

### Session 4: Substation Layout

- Design inputs
- Substation layout options
- Air-insulated substations
- Gas-insulated substations

### Session 5: Substation Grounding

- Purpose of the grounding system
- Touch and step potentials
- Grounding system design

## Day 3: Substation Design and Communications

Session 6 presents relay protection fundamentals and protection scheme principles for major substation equipment. Sessions 7 and 8 cover SCADA concepts and telecom methods.

### Session 6: Protective Relaying Principles

- PLC components
- Transformers
- Buses
- Lines
- Breaker failure

### Session 7: SCADA Concepts

- Typical network
- Equipment
- Communication protocols

### Session 8: Telecom

- Telecommunications network functions
- Main types of communication
- Substation telecom networks and components

## Day 4: Civil/Structural Design

Sessions 9-13 explain key tasks performed by civil and structural engineers in substation design.

### Session 9: Site Development

- Grading and drainage

### Session 10: Foundations

- Soil types
- Foundation types

### Session 11: Bus Structural Design

- Strain bus
- Rigid bus

### Session 12: Structures

- Types
- Loadings

### Session 13: Substation Buildings

- Construction alternatives
- Cost factors

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