A practical course in substation design fundamentals...

Principles of Substation Design and Construction

February 1–3, 2012
Orlando, Florida

October 15–17, 2012
Madison, Wisconsin

Gain valuable knowledge to help you

- Develop reliable designs
- Control project costs
- Keep your project on schedule

Principles of Substation Design and Construction

- Designing foundations and structures
- Writing equipment specifications
- Grounding and ground grid design
- Protective relaying basics
- Managing environmental issues
- Control and wiring diagrams
- Designing foundations and utility substations
- Managing and ground grid design
- Writing equipment specifications
- Protective relaying basics
- Grounding and grid design
- Designing foundations and utility substations

Save time and money!
Inquire about on-site & online courses.
Call 800-462-0876 today!

Please route this brochure to colleagues who would also benefit by attending.

Department of Engineering Professional Development
432 North Lake Street
Madison, Wisconsin 53706

College of Engineering
Department of Engineering Professional Development
Principles of Substation Design and Construction

February 1–3, 2012 in Orlando, Florida  ▪ October 15–17, 2012 in Madison, Wisconsin

A Comprehensive Introduction to Substation Design

This introductory course in design fundamentals will guide you through a step-by-step study of the substation design and construction process. You will consider all phases, from initial site review and selection, all the way to substation start-up and commissioning.

What You Will Study

Starting from the initial project scope document, you will learn about:

• The project scope document and what it should contain
• Foundation, structure, and ground grid design
• Writing equipment specifications
• Substation layout and bus design
• Protective relaying and control basics
• Trip schematics and wiring diagrams
• Site and structure drawings
• Function and ratings of major substation equipment
• Auxiliary equipment and systems
• Substation automation and integration
• Working with the project manager
• Managing environmental and permitting issues
• Dealing effectively with the public

Who Should Attend

• Substation design engineers
• Consulting engineers
• Industrial, utility, or plant engineers
• Transmission and distribution line design engineers and technicians
• Project managers
• Construction supervisors
• Engineering technicians
• Managers of design engineering departments
• Electric utility engineers involved in distribution engineering, operations, or planning

If you are involved in the design, construction, or operation of medium- or high-voltage substation and distribution facilities, you will benefit from this course. Individuals recently assigned to a position in substation design will find this course especially valuable.

Learn Important Project Management Issues

You may either work with a project manager on your substation design projects or be asked to manage a substation design and construction project yourself. Attend this course and learn how to keep a substation project on time and on budget.

Course Instructors

Kevin Borgmeyer, PE is Manager of Substation Engineering at Alliant Energy, Madison, Wisconsin. His department is responsible for substation design and system protection engineering, providing design services for WP&L utility and other clients. Mr. Borgmeyer has been with Alliant Energy (WP&L) more than 25 years. During that time he has worked as a transmission and substation engineer and also as a senior system protection engineer, encompassing a wide engineering experience from substation siting and design to system protection design, substation integration, and commissioning. Mr. Borgmeyer graduated from Iowa State University with a BSEE degree.

Charles R. Hanson, PE is the founder and owner of HANSON Engineering, LLC, a firm that provides structural engineering services to contractors, architects, owners, utilities, and government agencies. Previously, Mr. Hanson was a principal at a multi-discipline consulting engineering firm with offices in Madison and Milwaukee, where he was the chief structural engineer of the Madison office. His responsibilities included structural design of a wide variety of substation and building projects and project management for multi-discipline projects. Mr. Hanson is a member of the ASCE and the American Institute of Steel Construction. Mr. Hanson earned his civil engineering degree from the University of Wisconsin–Platteville.

Sheldon I. Silberman, PE is manager of engineering/design outsourcing in substation services at Xcel Energy in Minneapolis, Minnesota. In this role, Mr. Silberman manages all consulting services for the engineering and design of Northern States Power (NSP) substation and transmission line projects. He has been with Xcel Energy/NSP for more than 25 years, working in various engineering and management positions related to substation design, construction, and maintenance. Mr. Silberman received a BSEE degree in electric power systems from the University of Minnesota.

Valuable Take-home References

You will receive extensive course materials that will serve as valuable references in your work.
Principles of Substation Design and Construction
February 1–3, 2012 in Orlando, Florida ▪ October 15–17, 2012 in Madison, Wisconsin

Course Outline

Day 1
7:30 Registration
February 1–3 in Orlando:
The International Palms Resort and Conference Center
6515 International Drive
October 15–17 in Madison:
The Pyle Center
702 Langdon Street
8:00 Welcome
John A. Raksany, PE
Program Director, Department of Engineering Professional Development
University of Wisconsin–Madison
8:15 Instruction Begins
1 Substation Types and Purposes
Sheldon Silberman, PE
• Fundamentals of power system operation
• Objectives of substation design
2 Overview of the Substation Design and Construction Process
Kevin Borgmeyer, PE
• Establishing the need for substation facilities
• The project scope document
– what it is and what it should contain
• Site selection and environmental issues
• Working with the project manager
• Engineering design
– equipment specifications and drawings
• Specifying and procuring material and equipment
• Construction
• Testing, start-up, commissioning
• Documenting field revisions
3 Initial Steps in the Design Process: Setting the Bounds for the Overall Project
Sheldon Silberman, PE
• Reviewing and understanding the project scope document
• Information to gather before the first site visit
• What to look for on the initial site visit
• Determining site adequacy for initial and future requirements
• Environmental, zoning, and public perception issues
• Construction and construction outage requirements
– access for construction and O&M equipment
• Ordering material/delivery date issues
4 Site Selection and Design
Kevin Borgmeyer, PE
Sheldon Silberman, PE
• General requirements
• Environmental and permitting issues
• Site preparation
• Drainage and erosion protection
• Surface materials
• Roads and access
5 Permitting and Environmental Issues
Sheldon Silberman, PE
Kevin Borgmeyer, PE
• Acquiring necessary permits
• Zoning and ordinance restrictions
• Long-term site impacts
• Impacts during construction
– runoff/stream pollution
6 Foundation Design
Chuck Hanson, PE
• The site visit and what to look for
• Understanding soil test reports
• Slab on grade design example
7 Bus Designs for Reliability
Kevin Borgmeyer, PE
• Bus configurations and 1-line diagrams
• Forced and planned outage performance
• Cost-reliability comparisons
5:00 Adjournment

Day 2
8:00 Instruction Continues
8 Substation Layout: Converting 1-line Diagrams to Physical Layouts
Sheldon Silberman, PE
• Substation components and required code clearances
• BIL, insulation coordination, and surge arresters
• Future expansion
• Access for O&M
5:00 Adjournment

Day 3
8:00 Instruction Continues
9 Grounding and Ground Grid Design
Sheldon Silberman, PE
• Purpose of grounding
• Field-testing ground grid resistance and soil resistivity
• Materials and installation
10 Substation Structures
Sheldon Silberman, PE
• Choice of structure for substation designs
• Specifying a structure
11 Major Substation Equipment
Kevin Borgmeyer, PE
• Circuit breakers
• High-voltage and low-voltage switches
• Metal-clad and metal-enclosed switchgear
12 Secondary Substation Equipment
Kevin Borgmeyer, PE
• Surge arresters
5:00 Adjournment

Past Participants Say
“This is the fourth course I’ve taken from UW and I would recommend their courses to anyone. Always very helpful, especially the practical examples and real-world issues presented. Sheldon Silberman is very knowledgeable and personable! Kevin Borgmeyer is a great teacher; I hope some day I’ll know as much as he does (or even half that much)!”
Annette Jessen, Stations Structural Designer, Idaho Power Company, Boise, Idaho

“Great course. Very well done as usual (this is my third UW course).”
Ward Arms, Electric Department Manager, Hallberg Engineering, White Bear Lake, Minnesota

“I think all of the speakers have great knowledge of their subjects and present it very professionally. Thank you!”
Mohammed E. Mohtati, Substation and Transmission Engineer, Vectren Energy Delivery, Evansville, Indiana

“The reference materials you provided were excellent. It was extremely valuable having the instructors share real-world experiences. All the speakers were excellent, well-prepared, goal-focused, well-versed, as well as being very personable.”
Steve Lacaire, Senior Service Engineer, Eaton Electrical Corp., West Boylston, Massachusetts

“This course exceeded my expectations. I anticipate using a majority of the material in the near future.”
Michael Wilson, Substation Design Engineer, Power System Engineering, Inc., Madison, Wisconsin

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**Upcoming Related Courses in Madison and Orlando**

**Computerized Transmission Line Design:**
- PLS-CADD Hands-On Training
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  - Course #M877
- December 3–7, 2012, Orlando, Florida
  - Course #M998

**Design of Transmission Lines, Structures, and Foundations**
- February 27–March 2, 2012, Orlando, Florida
  - Course #M878
- August 13–17, 2012, Madison, Wisconsin
  - Course #M991

**Fundamentals of Substation Equipment and Control Systems**
- March 26–28, 2012, Orlando, Florida
  - Course #M879
- October 29–31, 2012, Madison, Wisconsin
  - Course #M995

**Power System Analysis Skills for Engineers and Technicians**
- July 18–20, 2012, Madison, Wisconsin
  - Course #M848

**Introduction to Electric Motors and Power Transformers:**
- Applications and Principles of Operation
  - July 23–26, 2012, Madison, Wisconsin
  - Course #N188

**National Electrical Safety Code**
- IEEE C2-2012
  - September 18–20, 2012, Madison, Wisconsin
  - Course #N189

To learn more about these and other courses, please contact us.

Web: [epd.engr.wisc.edu](http://epd.engr.wisc.edu)
E-mail: custserv@epd.engr.wisc.edu
Phone: 800-462-0876

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**Four Easy Ways to Enroll**

**Internet:**
http://epd.engr.wisc.edu

**Phone:**
800-462-0876 or 608-262-1299 (TDD 265-2370)

**Mail to:**
Engineering Registration
The Pyle Center, Dept. 106
702 Langdon Street
Madison, Wisconsin 53706

**Fax:**
800-442-4214 or 608-265-3448

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**General Information**

- Fee of $1395 ($1495 for October course)
  - Covers Course materials, break refreshments, lunches, and certificate.

**Cancellation**
If you cannot attend, please notify us at least 7 days prior to the first day of the course, and we will refund your fee. Cancellations received after that date and no-shows are subject to a $150 administrative fee. You may enroll a substitute at any time before the course starts.

**Location**

- **February Course:** The International Palms Resort and Conference Center, 6515 International Drive, Orlando, FL. Phone messages: 407-351-3500.
- **October Course:** The Pyle Center, 702 Langdon Street, Madison, WI. Phone messages: 608-262-1122.

**Accommodations**

- **February Course:** We have reserved a block of rooms for course participants at The International Palms Resort and Conference Center, 6515 International Drive, Orlando, FL. To reserve a room (rates starting at $89), call 800-354-8332 or 407-351-3500 by January 1 and mention the group reservation code "UW1." Room requests made after January 1 will be subject to availability and at prevailing rates. This block of rooms is for the convenience of those wishing to stay at the conference hotel. It is not necessary to stay at this hotel to attend the course.

- **October Course:** We have reserved a block of rooms (rates starting at $115, including airport shuttle) for course participants at The Madison Concourse Hotel, One West Dayton Street, Madison, WI. To reserve a room, call The Madison Concourse Hotel at 800-365-8293 or 608-257-6000 by September 25 and mention this course and reservation ID 178766. Room requests made later than September 25 will be subject to availability. Your enrollment confirmation will include other hotel/motel information.

**Hotel Room Availability in Orlando**
Please note that hotel rooms may be scarcer in Orlando during this course period. If you plan, or tentatively plan, to attend this course, please reserve your hotel room early and before the cut-off date listed in the accommodations section.

**Note:** The Orlando room blocks are for the convenience of those wishing to stay at the conference hotel. It is not necessary to stay at this hotel to attend the course.

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**Course Information**

**February Offering:**
- Course #M878, February 1–3, 2012 in Orlando, Florida
  - Fee: $1395

**Madison Offering:**
- Course #M994, October 15–17, 2012 in Madison, Wisconsin
  - Fee: (after September 17) $1395

**Save $100! Enroll by September 17.**

**I cannot attend at this time. Please send me brochures on future courses.**

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**General Information**

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  - Covers Course materials, break refreshments, lunches, and certificate.

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**Personal Information**

- Name __________________________
- Title __________________________
- Company _________________________
- Address __________________________
- City/State/Zip _____________________

**Phone (_____) _______ Fax (_____)**

**E-mail __________________________**

**Additional Enrollees**

Name __________________________
Title __________________________
E-mail __________________________

**Billing Information**

- **Bill my company** __________________________
- **P.O. or check enclosed** (Payable in U.S. funds to UW – Madison)

**Cardholder's Name __________________________**

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