EUCI COURSE

TRANSMISSION STRUCTURES AND FOUNDATIONS:

Materials, Standards, Analysis and Design

April 10-11, 2017
The Westin Michigan Avenue
Chicago, IL

AUTHORIZED IACET PROVIDER

EUCI is authorized by IACET to offer 1.1 CEUs for the course

OVERVIEW

The surging demand for electric power has led to upgrading, designing and building new transmission lines across North America. With the emergence of powerful computer methods for analysis and design, this demand in turn is mandating the need for experienced line designers, structural and geotechnical engineers. With the retirement of one generation of experienced engineers and designers, and regular revisions and updates to various codes and standards, it is becoming vital for the next generation of engineers to become more familiar with the various aspects of analysis, design and installation of transmission structures and foundations.

This one-and-a-half-day course is designed to introduce and provide a practical overview of important materials and standards to be considered in transmission structure and foundation design. The first day will cover structural materials and ASCE and RUS standards. The second day will focus on foundation design.

LEARNING OUTCOMES

- Discuss various materials and associated ASTM, IEEE and other standards used in building transmission structures and how they are input into analysis software
- Identify RUS/USDA Standards for transmission lines, structures and foundations
- Examine the difference and process of calculating RUS design parameters vis-à-vis NESC Rules
- Discuss various ASCE Standards, Guidelines and Manuals of Practice for transmission structures
- Examine current standards for steel, concrete, lattice, guyed and composite transmission structures
- Analyze upcoming changes to Steel Transmission Pole Design Standard (ASCE 48)
- Identify various soil conditions, foundation types and foundation selection criteria used in transmission structure design
- Discuss in detail; design of drilled concrete piers, performance criteria, detailing and software for lateral load analysis
- Describe direct embedment design, guy anchor design, mat footings and unconventional foundations

> ***"The speakers for this course were well organized and had very good topics for presentations. I would recommend this course to anyone new to the power industry."***
>
> Transmission Engineer, Electrical Consultants, Inc.

> ***"If you're a young engineer in the Transmission industry, this course is definitely very useful and helpful in giving an overview of what you need to know. I'm very grateful my boss encouraged me to sign-up for this course."***
>
> Engineer (Civil), Patterson & Dewar Engineering

AGENDA

MONDAY, APRIL 10, 2017

8:00 – 8:30 am **Registration and Continental Breakfast**

8:30 am – 5:00 pm **Course Timing**

12:00 – 1:00 pm **Group Luncheon**

Introduction/Overview
- Background
- Structural Materials
- Standards
- Foundations

Structural Materials
- Wood
  - Round Wood Poles
  - Laminated Poles
  - Cross Arms and Braces
  - Protective Treatments
- Steel
  - Angles
  - Round and Polygonal Poles
  - Davit Arms and Cross Arms
  - Base Plates
- Bolts
  - Tower and HS Bolts
- Concrete
  - Spun, Pre-stressed Concrete Poles
- Composite
  - Poles and Cross Arms
- Guy Wires
- Anchors
  - Log and Helical Anchors
- Foundations
  - Direct Embedment
  - Anchor Bolts
- Standards and Specifications
  - ASTM
  - ASCE, IEEE and RUS
- PLS Software
  - Inputting Material Data in PLS Programs

Overview of Standards
- Why Standards?
- Makeup and Administration of Standards Committees
- Content Definitions
  - Standard
  - Commentary
  - Appendix

AGENDA

MONDAY, APRIL 10, 2017 (CONTINUED)

RUS Standards

- Introduction to RUS
  - Difference between NESC and RUS
- Right of Way
  - Calculation of ROW Width
- Clearances
  - Vertical Clearances to Ground and Other Objects
  - Phase Separation at Structure
  - Vertical Clearance – Transmission to Under-build
  - Horizontal Clearance
- Load and Strength Factors (Grade B Construction)
- Insulator Loading Limits
- Wire Tension Limits
- Wood Poles
  - Material Properties
  - PLS-Pole RUS Standard Structure Database
- Steel Poles
  - Standard Class
- Concrete Poles
  - Standard Class
- Foundations
  - Direct Embedment Charts
  - Guy Anchors
- Distribution Structures

Relevant Transmission Structural Standards – Summaries and Updates

- ASCE 48-16 – Design of Steel Transmission Pole Structures
- ASCE 10-15 – Design of Latticed Steel Transmission Structures
- ASCE 123 – Pre-stressed Concrete Transmission Pole Structures (Manual of Practice)
- ASCE 104 – Recommended Practice for Fiber-Reinforced Polymer Products for Overhead Utility Line Structures (Manual of Practice)
- ASCE 91 – Design of Guyed Electrical Transmission Structures (Manual of Practice)
- ASCE 74 – Guidelines for Electrical Transmission Line Structural Loading (Manual of Practice)
- ASCE 7-10 – Minimum Design Loads for Buildings and Other Structures
- Seismic Loads: Guide to the Seismic Load Provisions of ASCE 7-10
- ASCE 37-14 – Design Loads on Structures During Construction
- Wood Structures

TUESDAY, APRIL 11, 2017

8:00 – 8:30 am **Continental Breakfast**

8:30 am – 12:00 pm **Course Timing**

Transmission Line Foundation Design

- Selection of Economical Foundation Type
  - Structure Types
  - Easement Agreements
  - Design Loads

AGENDA

TUESDAY, APRIL 11, 2017 (CONTINUED)

Transmission Line Foundation Design (continued)
- o Subsurface Conditions
  - Geotechnical Specifications
  - Geotechnical Reports
- Transmission Line "Foundation" Types
  - o Drilled Pier Foundations
  - o Direct Embed Poles
  - o Guy Anchor Design (Helical, Plate, Rock Anchor)
  - o Mat Foundations
  - o Alternative Foundations

Drilled Pier Foundation Design
- Efficient Design Methods
- Lateral Analysis
  - o Software Programs
    - CAISSON
    - Lpile
    - MFAD
  - o Deflection/Rotation Criteria
    - Total vs Non-Recoverable Deflection/Rotation
  - o Moment and Shear Capacity Design
- Detailing of Drilled Pier

Direct Embedment Design
- RUS Standard 10%+2ft vs Calculated Results
- Lateral Analysis
  - o Hand Calculations
    - Brom's Method
    - RUS Bulletin 1742E-205
  - o Software Programs
    - CAISSON
    - MFAD
  - o Deflection/Rotation Criteria
    - Total vs Non-Recoverable Deflection/Rotation

Guy Anchor Design
- Subsurface Conditions Dictate Anchor Type
  - o Sample Calculations for Different Anchor Types
  - o Safety Factors and Allowable Loads vs Ultimate Loads
- Specifications for Anchor Proof Testing in the Field

Mat Foundation
- Traditional Lattice Foundation Design
  - o Bearing Capacity Design
  - o Uplift Capacity Design
  - o Sliding Capacity Design

Non-Traditional Foundations Options
- Pile Cap with Micro Piles
- Post Tensioned Hollow Piers (P&H Foundations)
- Full Length Anchor Bolt Cages (No Additional Longitudinal Steel)

INSTRUCTORS

Greg Parent, PE, SE

Senior Engineer, Ulteig

Greg Parent, PE, SE is a Senior Engineer in the Transmission, Distribution and Communication division of Ulteig Engineering. Greg has over 10 years of structural design experience. Greg has spent the last 7 years performing the structural design of both transmission lines and Substations. He has been involved with the design and construction of over 600 miles of high voltage Transmission Lines and has performed the structural design of over 30 substations. Greg is a registered Structural Engineer, SE, in Illinois, Hawaii, Nevada and Utah.

Marlon Vogt, PE, F.SEI, M. ASCE

Senior Engineer, Ulteig

Marlon Vogt, PE, F.SEI, M. ASCE is a Senior Engineer in the Transmission, Distribution and Communication market at Ulteig Engineers. He has more than 38 years of experience with all aspects of planning, design, and construction of 12.5 kV-345 kV distribution and transmission systems. He is a member of the Iowa Engineering and Land Surveying Examining Board, the ASCE Design of Steel Transmission Pole Structures 48-16 committee, the steering committee for ASCE ETS 2015 Transmission and Substation Structures Conference and is a Lean Six Sigma Black Belt.

> ***"Best environment to meet people who speak the same professional language as you."***
>
> Sr. Supervising Engineer, Hawaiian Electric Co.

> ***"This course turned tower design and asthetics into a new area of interest."***
>
> Elect. Engineering Superintendant, Domtar

> ***"Great course for people with structural background or anyone looking for an introduction to power pole design."***
>
> Electrical Engineer, Domtar

REQUIREMENTS FOR SUCCESSFUL COMPLETION OF PROGRAM

Participants must sign in/out each day and be in attendance for the entirety of the course to be eligible for continuing education credit.

INSTRUCTIONAL METHODS

PowerPoint presentations will be used in this course.

PROCEEDINGS

The proceedings of the course will be published, and one copy will be distributed to each registrant at the course.

EVENT LOCATION

A room block has been reserved at the The Westin Michigan Avenue, 909 N. Michigan Ave, Chicago, IL 60611, for the nights of April 9-10, 2017. Room rates are $229 plus applicable tax. Call **312-943-7200** for reservations and mention the EUCI event to get the group rate. The cutoff date to receive the group rate is March 12, 2017 but as there are a limited number of rooms available at this rate, the room block may close sooner. ***Please make your reservations early.***

IACET CREDITS

EUCI has been accredited as an Authorized Provider by the International Association for Continuing Education and Training (IACET). In obtaining this accreditation, EUCI has demonstrated that it complies with the ANSI/IACET Standard which is recognized internationally as a standard of good practice. As a result of their Authorized Provider status, EUCI is authorized to offer IACET CEUs for its programs that qualify under the ANSI/IACET Standard.

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REGISTER 3, SEND THE 4TH FREE

Any organization wishing to send multiple attendees to these courses may send 1 FREE for every 3 delegates registered. Please note that all registrations must be made at the same time to qualify.

REGISTRATION
to register CLICK HERE or

Call: 201 871 0474
fax: 253 663 7224
email: register@pmaconference.com/
web: http://pmaconference.com/
Mail: POB 2303 Falls Church Va 22042

Please make checks payable to: "PMA"

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PLEASE REGISTER

○ **TRANSMISSION STRUCTURES AND FOUNDATIONS**
COURSE: APRIL 10-11, 2017: US $1395
EARLY BIRD on or before MARCH 24, 2017: US $1195

How did you hear about this event? (direct e-mail, colleague, speaker(s), etc.)

Print Name | Job Title

Company

What name do you prefer on your name badge?

Address

City | State/Province | Zip/Postal Code | Country

Phone | Email

List any dietary or accessibility needs here

CREDIT CARD INFORMATION

Name on Card | Account Number

Billing Address | Billing City | Billing State

Billing Zip Code/Postal Code | Exp. Date | Security Code (last 3 digits on the back of Visa and MC or 4 digits on front of AmEx)

OR Enclosed is a check for $ _____ to cover _____ registrations.

Substitutions & Cancellations
Your registration may be transferred to a member of your organization up to 24 hours in advance of the event. Cancellations must be received on or before March 10, 2017 in order to be refunded and will be subject to a US $195.00 processing fee per registrant. No refunds will be made after this date. Cancellations received after this date will create a credit of the tuition (less processing fee) good toward any other EUCI event. This credit will be good for six months from the cancellation date. In the event of non-attendance, all registration fees will be forfeited. In case of course cancellation, EUCI's liability is limited to refund of the event registration fee only. For more information regarding administrative policies, such as complaints and refunds, please contact our offices at (201) 871-0474.