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# FUNDAMENTALS OF TRANSMISSION LINE DESIGN

**May 4-5, 2020**

**Renaissance Orlando Hotel-Airport  
Orlando, FL**

**and**

**FUNDAMENTALS OF TRANSMISSION  
STRUCTURE DESIGN**

**May 5-6, 2020 | Orlando, FL**

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*“This course definitely broadened my understanding of transmission line design as well as the individual structures and their components.”*

Engineer II, Ampirical Solutions



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

## OVERVIEW

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This one-and-a-half-day course is designed to provide an introduction to transmission line concepts, definitions, and common design practices while infusing the technical tools needed to perform the work with the design concepts (PLS CADD Suite, MFAD, etc.) The first day will cover an introduction to transmission lines, electrical characteristics of lines, routing and structure spotting, conductor, hardware, and material information, and structure loading. The second day will pertain to electrical clearances, code requirements, structure spotting (ruling span vs. finite element), foundation design, and construction methods.

## LEARNING OUTCOMES

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- Review what conductors are used in based on weather conditions, tensions, & electric loadings
- Discuss the basics of ruling span design and structure spotting techniques
- Review physical transmission line design and the software used to perform analysis
- Examine and identify all parts, pieces, hardware, etc. of a transmission line
- Discuss the basic concepts of transmission structure foundation design
- Know the applicable codes and standards required to perform transmission line design

## WHO SHOULD ATTEND

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- Recent engineering graduates new to transmission structure design
- Experienced engineers new to transmission structure design
- Utility engineers requiring additional training
- Engineers new to transmission manufacturing
- Anyone interested in the design process of transmission lines



*“Very informative, learned a lot!”*

Engineer II, Ampirical Solutions

# AGENDA

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MONDAY, MAY 4, 2020

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

**8:30 am – 5:00 pm**      **Course Timing**

**12:00 – 1:00 pm**      **Group Luncheon**

## **Overview**

- What is a Transmission Line
  - o Conductors, Shield Wires, Communication Wires & Associated Hardware
  - o Structures & Foundations
  - o Electrical Characteristics & Grounding
  - o ROW
- Design Considerations
- Design Process

## **Transmission Planning**

- System Studies
- ROW
- Permitting
- Aerial Survey

## **Conductor Characteristics**

- Electrical Characteristics
- Sag Tension
- Conductor Selection
- Conductor Motion

## **Structure Configuration & Structure Types**

- Structure Types & Configurations
- Structure Materials
- Aesthetic Considerations
- Design Factors

## **Hardware & Assemblies**

- Conductor Hardware
- Insulators
- OPGW Hardware
- Shield Wire Hardware

# AGENDA

TUESDAY, MAY 5, 2020

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

**8:30 am – 12:00 pm**      **Course Timing**

**Electrical Clearances & Mechanical Loading**

- Design Criteria
- Weather & Load Cases
- Clearances

**Foundation Design**

- Types of Transmission Structure Foundation Design
- Software Used
- MFAD Examples

**Construction Methods & Design Considerations**

- Modifications to Existing Lines
- Stringing
- Structure Setting & Placement

## COURSE INSTRUCTORS



**Landon Schulze, PE**  
**President, ASEC Inc.**

Mr. Schulze earned his B.S. in civil engineering from Texas A&M University in 2006. Since then he has worked exclusively in the power delivery industry performing detailed structural design of transmission lines, transmission structures, and substation structures. Mr. Schulze's early experience was as a consultant performing detailed EPC projects. Mr. Schulze continued his experience serving utilities and leading project execution work on over 300 miles of 345kV double circuit lattice tower design.

In 2017, Mr. Schulze joined ASEC as a project manager and moved on to become President of ASEC Inc leading the company in project management, business development, internal employee professional development, proposals, budget and goal setting for the company.



**Ben Averill, PE**  
**Sr. Engineer, ASEC Inc.**

Mr. Averill earned his M.S. in Civil Engineering from the University of Wyoming in 2011 and B.S. in 2008. He received his California PE in 2013. Since then he has worked on a multitude of projects in the power delivery industry. His experience includes: designing greenfield transmission interconnects to deliver renewables to the grid, analysis and mitigation of existing structures in support of facility ratings assessments, and the rebuild of several transmission lines across the west mostly in mountainous areas. He has worked on projects incorporating transmission and distribution ranging from 4 to 345 kV. Most recently his work has included brownfield rebuilds of transmission lines. This includes analysis and mitigation of single pole structures and entire lines.

## OVERVIEW

The increase in demand for electric power has prompted the upgrading and building of new electrical transmission lines across North America. The demand for experienced line designers and structural engineers is ever increasing. This combined with aging and retiring experienced transmission structural engineers has made it vital for young and incoming structural engineers to become more familiar with the fundamental aspects of design, manufacturing and testing of different types of installations.

This day and a half course is designed to provide a practical overview of the important factors and economic efficiencies to consider in design, testing and manufacturing of these structures. The first day will cover structure types, industry standards, loading and methods of design. The second day will continue design and focus on available software, testing, manufacturing and the latest innovations in structural design.

## LEARNING OUTCOMES

- Define and describe the different types of structures and when to use them
- Identify the necessary loading criteria for which to design
- Examine the applicable design standards and manuals
- Apply structural design fundamentals for latticed self-supporting towers, tubular steel structures, guyed structures, and more
- Examine the appropriate design software applications
- Analyze the different methods of testing and when to apply them
- Identify the manufacturing and finishing process for towers, poles and other structures
- Examine the possibilities of aesthetics and innovation in transmission design

## WHO SHOULD ATTEND

- Transmission planners
- Transmission engineers new to line design
- Transmission project managers
- Regulators and regulator staff
- Utility construction contractors and engineering companies



*“The course gave me a new perspective on the difference of drilled shaft foundations for transmission towers vs. their use for bridge or building loading.”*

Lead Engineer-Civil/Structure, Duke Energy

# AGENDA

TUESDAY, MAY 5, 2020

**12:30 – 1:00 pm**

**Registration**

**1:00 pm – 5:00 pm**

**Course Timing**

**Overview**

- Structure study (types of transmission structures)
- Factors considered in selecting a structure type

**Structure Loading Criteria**

- NESC
- ASCE Standard 7
- ASCE Manual 74
- Other loading standards

**Design Manuals and Standards**

- ASCE Standard 48
- ASCE Standard 10
- ASCE Manual 91
- ASCE Manual 113

WEDNESDAY, MAY 6, 2020

**8:00 – 8:30 am**

**Continental Breakfast**

**8:30 am – 5:00 pm**

**Course Timing**

**12:00 – 1:00 pm**

**Group Luncheon**

**Design and Analysis of Structures**

- Design of lattice structures
- Design of steel pole structures
- Specialized foundations

**Software**

- PLS TOWER
- PLS POLE
- Other FEA software

**Testing**

- Full scale structure testing
- Computer simulation

**Innovation in Design**

- Importance of aesthetics in design
- Latest innovations

**Manufacturing**

- Latticed towers
- Steel poles
- Other types
- Types of finishes



*“Very informative; overall view of the topic. Deep and specific at times.”*

Principal/Department Manager, Terracon



# INSTRUCTORS



## Pankaj Deshmukh, PE

**Secretary of the Board of Directors, ASEC, Inc.**

Pankaj Deshmukh has extensive experience in analysis and design of lattice transmission towers. He is a registered professional engineer in the states of California and Texas. He has successfully designed and tested several lattice transmission towers including world's first double circuit guyed Y structure. He has performed work for several major utilities including PG&E, SDG&E, SCE, Oncor, Ameren and CenterPoint Energy. He is currently working as the Section Manager of engineering at ASEC Inc. Also, Pankaj has extensive knowledge of lattice tower manufacturing processes and full-scale tower testing.



## Mike Khavari, PE, P.Eng. M.

**Owner and Consultant Engineer, ASEC Inc.**

Mike Khavari received his Bachelor of Science in Civil Engineering from University of Texas in 1979. He has over 35 years of experience in the design and analysis, of new and existing lattice and tubular steel structures. Mr. Khavari has been involved with research and full-scale testing of various types of steel transmission structures. He serves on the following ASCE Manual and Standard Committees:

- Design of Latticed Steel Transmission Structures: ASCE Standard 10-97
- Design of Steel Transmission Pole Structures: ASCE Standard 48-11
- Substation Structures Design Guide: ASCE Manuals and Reports on Engineering Practice No. 113
- Design of Guyed Electrical Transmission Structures: ASCE Manuals and Reports on Engineering Practice No. 91

In 1991, Mr. Khavari started, ASEC Inc., an engineering consulting company specializing in the design and analysis of various types of transmission, communication and substation structures. In 1993, he started the North American Pole Corporation (NAPCO), a tubular steel manufacturing facility from the ground up. NAPCO is a manufacturer of tubular steel structures. An iconic structure manufactured by NAPCO is the famous mouse head steel tower located at the Walt Disney World in Orlando, Florida.

## INSTRUCTIONAL METHODS

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PowerPoint presentations and open discussion will be used in this event.

## REQUIREMENTS FOR SUCCESSFUL COMPLETION

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Participants must sign in/out each day and be in attendance for a minimum of four hours to be eligible for any continuing education credit.

## IACET CREDITS

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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.

**EUCI is authorized by IACET to offer 1.1 CEUs for this course**

## EVENT LOCATION

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A room block has been reserved at the **Renaissance Orlando Hotel-Airport**, 5445 Forbes Pl, Orlando, FL 32812, for the nights of MAY 3-5, 2020. Room rates are \$165 plus applicable tax. Call **1-407-240-1000** for reservations and mention the EUCI event to get the group rate. The cutoff date to receive the group rate is March 10, 2020 but as there are a limited number of rooms available at this rate, the room block may close sooner. ***Please make your reservations early.***

## REGISTER 3, SEND THE 4TH FREE

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



To Register Click Here, or

**Mail Directly To:**

PMA Conference Management  
PO Box 2303  
Falls Church VA 22042  
201 871 0474  
Fax 253 663 7224  
register@pmaconference.com

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## PLEASE REGISTER

**COMBO PRICE: BOTH FUNDAMENTALS OF TRANSMISSION LINE DESIGN AND FUNDAMENTALS OF TRANSMISSION STRUCTURE DESIGN COURSES**

MAY 4-6, 2020: US \$2395  
EARLY BIRD on or before APRIL 17, 2020: US \$2195

**FUNDAMENTALS OF TRANSMISSION LINE DESIGN COURSE**

MAY 4-5, 2020: US \$1395  
EARLY BIRD on or before APRIL 17, 2020: US \$1195

**FUNDAMENTALS OF TRANSMISSION STRUCTURE DESIGN COURSE**

MAY 5-6, 2020: US \$1395  
EARLY BIRD on or before APRIL 17, 2020: US \$1195

## ENERGIZE WEEKLY

Energize Weekly is EUCI's free weekly newsletter, delivered to your inbox every Wednesday. We provide you with the latest industry news as well as in-depth analysis from our own team of experts. Subscribers also receive free downloadable presentations from our past events.

Sign me up for Energize Weekly

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 Billing Address

Account Number Billing City Billing State

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

**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 April 17, 2020 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. EUCI reserves the right to alter this program without prior notice.