

STRUCTURES WEEK SW1

Part I: Loadings & Strengths; Wood Pole Design

Part II: O-Calc Pole Loading Software Tutorial

Part III: H-Frames for Long Spans Design



July 19-23, 2010
Myrtle Beach, SC

Featuring new discussions and new handouts

Instructors: Allen L. Clapp, PE, John B. Dagenhart, PE, and Jeff Giffen

About the seminar

This special Tutorial Week on Physical Design of Wood Pole Utility Lines addresses the increasing problem of accommodating larger numbers and sizes of cables and conductors on wood pole utility lines. Unfortunately, line failures have increased in recent years due to overloading poles. Attendees will be divided into teams to work exercises in each part. This course is particularly designed for engineers and technicians who want

to add or increase expertise in facility placement and structural design of wood pole lines. Written answers are given for each question of the practical exercises worked in class, including rule references. Additional exercises and answers are provided for later use by attendees.

Who should attend

- ◆ designers and staking technicians
- ◆ engineering technicians
- ◆ make-ready and final inspectors
- ◆ electrical engineers
- ◆ standards developers
- ◆ contractors

Important topics

Part I

- ◆ Determine if new facilities can be added to existing wood poles
- ◆ Determine required Grade of Construction
- ◆ Calculate wind & ice loadings on structures & supported facilities
- ◆ Calculate stress on poles & crossarms
- ◆ Calculate strength of poles & crossarms
- ◆ Determine required pole class
- ◆ Properly use the NESC to develop standards and joint-use contracts for new construction or check compliance of existing construction
- ◆ Increase pole life & reliability
- ◆ Responsibilities for meeting NESC requirements
- ◆ Rationale behind NESC requirements
- ◆ Determine required wood pole class

Part II

- ◆ Use O-Calc Wood Pole Loading Software to determine if new facilities can be added to existing wood poles
- ◆ Calculate stress on poles & crossarms
- ◆ Calculate strength of poles & crossarms
- ◆ Determine required wood pole class
- ◆ Increase pole life & reliability
- ◆ How to use O-Calc to calculate loading & required pole strength
- ◆ Determine sags and tensions using O-Calc

Part III

- ◆ Calculate x-brace stress and strengths
- ◆ Calculate vee brace stress and strength
- ◆ Calculate pole stress and strength at required locations
- ◆ Calculate uplift limits
- ◆ Calculate bearing limits

It is recommended that students bring a scientific calculator to Parts I & III.

Students must bring a laptop computer to use the software in class for Part II.

In addition, you receive

| | Part I | Part II | Part III |
|--|--------|---------|----------|
| 2007 National Electrical Safety Code and NESC Handbook | ✓ | | ✓ |
| Demo copy of O-Calc Pole Loading Software w/ 5% PCU Training Center discount coupon & 5% Osmose discount coupon if O-Calc is purchased from PCUtraining within 45 days of seminar: a total of 10% O-Calc discounts | ✓ | ✓ | ✓ |
| Bound Student Workbook | ✓ | ✓ | ✓ |
| Bound Appendix Book of helpful charts, tables and technical discussions | ✓ | | ✓ |
| Excerpts from Practical Utility Safety | ✓ | ✓ | ✓ |
| Exercise/Answer Sheets | ✓ | | ✓ |
| CEUs and NC PDHs awarded upon successful completion on workshop | ✓ | ✓ | ✓ |
| Plus continental breakfasts, lunches & refreshments | ✓ | ✓ | ✓ |

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STRUCTURES WEEK SCHEDULE



All 5 Days — \$1945

- **Parts I & II only — \$1640**
- **Part I only — \$1195**
- **Parts II & III only — \$1640**
- **Part II only — \$795**
- Part III only — \$1195**

| Part I: Loading & Strength Calculations | | Part II: O-CALC Pole Loading Soft- ware Tutorial | Part III: Wood Pole H-Frames for Long Spans | |
|---|---|--|--|---|
| Day 1 (8 am - 5 pm) | Day 2 (8 am - 3 pm) | Day 3 (8 am - 5 pm) | Day 4 (8 am - 5 pm) | Day 5 (8 am - 3 pm) |
| <ul style="list-style-type: none"> ◆ Introduction ◆ Practical consideration of: effects of difficulties in obtaining desired sag/tensions and guying tensions, long spans next to short spans, etc. ◆ Using sag and tension calculations ◆ Required Grades of Construction | <ul style="list-style-type: none"> ◆ Calculating required pole strength class for various configurations ◆ Guying for deadends and angles, including <ul style="list-style-type: none"> • Required guy strength • Effects on poles ◆ Buckling strength for deadend, angle and transformer poles ◆ Calculating maximum spans for various configurations | <ul style="list-style-type: none"> ◆ O-Calc – Fundamentals ◆ Program Overview ◆ Review functions and features ◆ Create groups and poles ◆ Basic design inputs ◆ How to model a pole ◆ Adding wires and attachments ◆ Guying ◆ Understanding loading results ◆ How to determine sag and tension | <ul style="list-style-type: none"> ◆ Basic H-frame designs <ul style="list-style-type: none"> • Poles and x-arm(s) only • Pole with x-braces • Points of contraflexure • X-arms with outside Vee braces • X-arms with inside Vee braces • X-arms with four braces ◆ Dimensions required for analysis <ul style="list-style-type: none"> • Calculation of contraflexure point ◆ Pole x-brace strength <ul style="list-style-type: none"> • Buckling in compression • Tension ◆ Forces from conductors <ul style="list-style-type: none"> • Wind • Weight • Effect of ice ◆ Weights of top assemblies ◆ Volume and weight of poles | <ul style="list-style-type: none"> ◆ Stress on pole x-braces ◆ Stress on crossarm braces <ul style="list-style-type: none"> • Outside braces • Inside braces ◆ Uplift ◆ Bearing |
| <p>Lunch (noon - 12:30)</p> <ul style="list-style-type: none"> ◆ Calculating the strength of poles and crossarms <ul style="list-style-type: none"> • At groundline • At supply space • At bolt holes • At intermediate points ◆ Required strength factors | <ul style="list-style-type: none"> ◆ Adding cables or conductors to existing lines <ul style="list-style-type: none"> • Effect of overlashed cables ◆ Determining appropriate clearance specifications and loading limits in joint-use contracts ◆ Calculating bending stresses caused by guys on poles ◆ Calculating the limitations on use of sidewalk street guys and pole push braces | <ul style="list-style-type: none"> ◆ Compare results using a variety of pole classes, NESC loading districts and grade of constructions ◆ O-Calc – Advanced ◆ Exercise: Angle pole ◆ Exercise: Deadend pole ◆ Exercise: Joint-use pole ◆ Use O-Calc to demonstrate and understand the impact of joint-use attachments ◆ Advanced tips & tricks ◆ How to set up pole templates ◆ How to share pole loading results | <ul style="list-style-type: none"> ◆ Pole strength at points of interest <ul style="list-style-type: none"> • Crossarm • Top of-brace • Bottom of x-brace • Ground line ◆ Stress on poles at points of interest <ul style="list-style-type: none"> • Rule 250B loading • Rule 250C loading • Rule 250D loading • With no x-arm braces • With outside x-arm braces • With inside x-arm braces • With outside & inside braces | <ul style="list-style-type: none"> ◆ Analyzing critical points for span limits based on: <ul style="list-style-type: none"> • Pole class • Crossarm brace • X-brace • Uplift • Bearing ◆ Optimizing H-frame design <ul style="list-style-type: none"> • Choice of braces • Location, number & spacing of x-braces • Embedment • Foundation improvement |

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