



# Power & Communication Utility Training Center

## In-House Seminars and Workshops

Clapp Research Associates, P.C. is the premier trainer for the National Electrical Safety Code (NESC)<sup>®</sup>. Over 24,000 participants of the following types from utilities, contractors, and regulatory agencies have attended our in-house and public courses on NESC<sup>®</sup> and OSHA requirements.

- design engineers
- standards engineers
- staking technicians
- make-ready inspectors
- construction inspectors
- line workers
- maintenance personnel
- managers
- claims investigators

Our instructors are engineers who participate on NESC subcommittees & are USDOL authorized OSHA instructors.

Our public seminars make great business sense—especially when you only have a few people to train at a time or you want to train an in-house instructor. For larger number of participants or specialized instruction, in-house seminars are very cost-effective. The most common standard seminar formats are shown immediately below. These can be modified, as desired. Complete descriptions of all standard seminars follow.

### 1. Development and Application of the National Electrical Safety Code

- a. 3.5 day DA-1 is a general course, including complete coverage of grounding and clearances rules with selected coverage of other code rules (2 instructors)
- b. 2.5 day DA-1 concentrates on clearances and grounding course, including complete coverage of grounding and clearance requirements for overhead, underground and supply stations (1 or 2 instructors)
- c. 2.5 day DA-2 concentrates on clearances and grounding for *joint-use* overhead lines and substitutes detailed practical exercises on using sag data to determine vertical spacing of joint-use facilities for the instruction on underground and supply stations clearances from (b) above. (1 or 2 instructors)

### 2. Tutorial on Physical Design of Joint-Use Wood Poles

- a. 3.5 day: 1.5 days on clearance calculations and 2 days on loading, stress, and strength calculations. Suitable for both engineers and design technicians. Attendees perform hand calculations in teams.

### 3. Utility Contact Accidents Investigation and Litigation

- a. 3.5 day UCA-1 covers actions required for successful investigations, analyzing and litigating of public and worker accidents. (4 instructors)
- b. 2.5 day UCA-1 includes most of the investigation instructions and team exercises from the full 3.5 day UCA-1 seminar on investigating and litigating utility contact accidents, but does not include instruction from the burn unit physician, human factors expert, or outside attorney.
- c. 2.5 day UCA-2 is an advanced continuation of UCA-1 that uses cases studies to emphasize the use of OSHA “Employee Misconduct” defense criteria and multi-employer work site citation policy to determine responsibility for any worker-related accident. Attendees should have attended UCA-1 or have extensive knowledge of its subjects.

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## Brief Seminar Descriptions (see PCU Training.com for full Descriptions)

### 1. DANESC™ Seminars on Development and Application of the National Electrical Safety Code

This seminar typically concentrates on clearances and grounding; longer seminars also additional topics such as strength requirements, NESC and OSHA work rules, etc. Some versions are general and others concentrate on an area, such as joint-use pole clearances. The range and depth of coverage varies from the 1 day introduction to the NESC to 3.5 day versions that discuss and provide exercises on practical applications, including selected table footnotes and other detailed requirements.

Participants work in teams to solve exercises involving areas of the NESC that are most difficult to understand or most often involved in accidents. Participants receive a workbook, reference materials, and exercises and answers. The most popular length for in-house presentations is 2.5 days, the maximum length without requiring multiple instructors. For longer seminars with more depth and coverage, or for more than 35 participants, two instructors are required. This seminar is intended for standards engineers, design technicians, line workers, and inspectors for power, telephone, CATV, and railroad utilities, contractors, and regulatory agencies, as well as attorneys and investigators involved in litigation.

N E S C ● is a registered trademark of the Institute of Electrical and Electronics Engineers, Inc.  
D A N E S C ™ is a trademark of Clapp Research, Inc.

### 2. Tutorial on Physical Design of Joint-Use Wood Pole Distribution Lines

This popular 3.5 day tutorial on joint-use pole design addresses the increasing problem of line failure and clearance problems due to overloading distribution poles with larger sizes and numbers of conductors, cables, and equipment. Participants learn how to (a) properly space conductors and cables on poles and calculate required pole height, (b) calculate loads on structures and supported facilities, and (c) determine required pole strength—all using hand calculations. Includes limited discussion of using pole loading software.

This workshop includes a workbook with code references, formulas and sample exercises; an appendix book of printed reference materials, “cheat sheets” and technical discussions; excerpts from *Practical Utility Safety*, and exercises and answers. This workshop is especially useful for standards engineers, design engineers, design technicians, make-ready inspectors and line inspectors for utilities, contractors, and regulatory agencies.

A special version of this seminar only discusses the loading and strength requirements and includes 1 full day of training on the use of O-Calc pole loading software.

### 3. Investigating, Documenting, Analyzing and Litigating Accidents on Power and Communication Utility Systems

This seminar includes investigation and litigation techniques, accident scenarios, applicable standards, etc. Two things are critical to successful litigation:

1. Appropriate information must be obtained and analyzed properly on a timely basis.
2. The litigation team must present evidence and arguments in a manner that can be both fully understood and believed.

In over 500 accident investigations, we have seen some of the best and worst investigations and litigation preparations imaginable. Both winning techniques and potential pitfalls are presented in our multiple-instructor 3.5 day public UCA-1 seminar covering applicable codes and regulations, investigation techniques, evidence control, presentation techniques, witness preparation and the human factors and medical issues related to electrical contact accidents. A one-instructor 2.5 day UCA-1 workshop on utility accident investigation is also available.

Participants receive a workbook containing discussions of various codes, standards and regulations; sample accident reports and calculation sheets; investigation “cheat sheets” for various kinds of accidents;

accident investigation tips; examples of good and bad exhibits; and other useful materials; as well as exercises and answers and excerpts from *Practical Utility Safety*.

An advanced extension of the UCA-1 seminar, UCA-2, uses case studies to emphasize analysis and determination of responsibilities for public and worker accident litigation and OSHA citations.

#### **4. Follow-Up Seminar for users of the DANESC™ Videotape Series**

Special 1 day live seminars are available for users of the NESC Videotaped Training available from Clapp Research, Inc. Presentations structured around questions supplied in advance by participants are given in the morning. The actual questions and written answers are discussed in the afternoon.

#### **5. Occupational Safety and Health Administration Regulations**

Clapp Research personnel are authorized to teach OSHA 10-hour and 30-hour courses on construction regulations. Instruction on OSHA regulations applicable to electric or communication utility personnel is normally combined with NESC work rules in special seminars.

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## **Customize Any Seminar**

Any combination or customization can be made. For example, if you can't spare everyone at the same time for long enough to cover the desired material, we can split the seminar and run multiple sets of each session at different times or mix and match subjects to suit your needs.

Prices vary with length of instruction, the costs and time of travel to your site, and materials provided. Call (877) 502-8900 to discuss your needs and to get price quotes for your location(s).

The daily starting and ending times and lunch breaks are typically predetermined based upon normal work hours of participants, travel requirements for participants and instructors, available places for lunch, etc. The hours shown herein are typical and may be adjusted as needed. If desired, the total length and class content may also be adjusted.

Seminars typically end at 11:00 a.m. (or 4:00 p.m.) to facilitate travel.

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## **Additional Information**

### **Required Course Material**

You will need to provide (or we can provide at extra cost) a copy of the *National Electrical Safety Code (2007 Edition)* for each student. Access to the *NESC Handbook (6th Edition)* is recommended but not required. These items are provided by Clapp Research in the public seminars, but are not provided in the participant materials for in-house seminars unless requested (at additional cost).

### **Planning For Effective Class Participation**

Inviting your joint-use utilities and contractors to your in-house seminar is an excellent way to get all interested parties working together to achieve common goals. If you don't have enough appropriate personnel to fill a class, we recommend inviting participation by your neighboring and/or joint-use utilities to make your seminar even more economical.

We do not recommend more than 35 participants—a larger number increases the time required for breaks and exercises, and thus, reduces course content, as well as reducing the questions asked by participants.

## Continuing Education Units

The Continuing Education Unit (CEU) is a nationally recognized unit of measure for continuing education programs. One CEU equals 10 class contact hours, which translates into 10 Professional Development Hours (PDH) for engineers or 10 Continuing Legal Education (CLE) for attorneys. We can provide CEU certificates and maintain permanent CEU records for participants upon completion of our seminars at additional cost.

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## Related Services

### Standards and Systems Reviews

Many clients have specific concerns about particular construction situations or standards used on their system and wish to have specific questions answered in conjunction with training. If the client so desires, instructors may (at extra cost):

1. Review client standards for NESC compliance, constructability, reliability, commonality of parts, etc., and/or
2. Travel to the seminar site a day or more early to review portions of the system construction or site-specific problems. Normal consulting rates and charges for applicable instructors apply to the additional time required for these additional services. This information can then be blended into the seminar.

Please note that the Power & Communication Utility Training Center is not a professional corporation and does not perform consulting services requiring a licensed professional engineer or land surveyor. If such services are provided by instructor personnel in conjunction with (or separate from) training provided through PCU Training Center, they will be performed under separate contract and billing through the applicable instructor's employer.

## Some Previous In-house Seminar Clients

### Investor-Owned Electric Utilities

Alabama Power Company  
 Alaska Electric Light & Power  
 Alliant Energy  
 Ameren CIPS  
 AmerenUE  
 Appalachian Power Company  
 Arizona Public Service Company  
 Atlantic City Electric Company  
 Baltimore Gas and Electric Co.  
 Boston Edison Co.  
 Carolina Power and Light Company  
 Centerior Energy Corporation\*  
 Central Hudson Gas & Electric  
 Central Illinois Public Service  
 Central Louisiana Electric Co./CLECO\*  
 Central Power and Light Company\*  
 Central Vermont Public Service  
 Cincinnati Gas & Electric Company  
 Cinergy Corp  
 Citizens Utilities  
 Cleveland Electric Illuminating Co.\*  
 Columbus Southern Power Co.\*  
 Commonwealth Edison Company  
 Connectiv  
 Consolidated Edison  
 Consumers Energy  
 Consumers Power  
 CP National  
 Dayton Power and Light Company\*  
 Delmarva Power and Light Co.  
 Detroit Edison  
 Duke Energy Corporation  
 Duquesne Light Company  
 El Paso Electric\*  
 Empire District Electric Company\*  
 Entergy Arkansas\*  
 Florida Power Corporation  
 Florida Power and Light Company\*  
 Georgia Power Company  
 Gulf Power Company\*  
 Gulf States Utilities  
 Hawaiian Electric Company\*  
 Houston Lighting and Power Co.\*  
 Idaho Power Company  
 IES Utilities  
 Illinois Power  
 Indiana-Michigan Electric Co.  
 Indianapolis Power & Light Co.  
 Kansas Power and Light Company  
 Kansas City Power and Light  
 Kauai Electric Company\*  
 Kentucky Utilities Company  
 Louisiana Power and Light Co.  
 Louisville Gas and Electric  
 Massachusetts Electric

Midwest Power Systems\*  
 MidAmerican Energy  
 Minnesota Power Co.\*  
 Mississippi Power Company\*  
 Mississippi Power and Light Co.  
 Monongahela Power Company  
 Montana-Dakota Utilities  
 Montana Power Company\*  
 Nevada Power Company  
 New England Power Service  
 New York State Electric and Gas Co.  
 Niagara Mohawk\*  
 North Carolina Power\*  
 Northeast Utilities  
 Northern Indiana Public Service Co.  
 Northern States Power Company  
 Ohio Edison  
 Ohio Power Company  
 Oklahoma Gas & Electric\*  
 Orange & Rockland Utilities, Inc.  
 Otter Tail Power Company  
 Pacific Gas and Electric  
 Pacific Power and Light Company\*  
 PacifiCorp  
 Pennsylvania Electric Company  
 Pennsylvania Power Company  
 Pennsylvania Power and Light Co.  
 PECO Energy (Philadelphia Elec.)  
 Portland General Electric  
 Potomac Edison Company\*  
 Potomac Electric Power Company  
 PPL Electric Utilities\*  
 Progress Energy Florida\*  
 Progress Energy Carolinas (Car. P&L)  
 PSI Energy (Public Service of IN)\*  
 Public Service Company of CO  
 Public Service Co. of NH  
 Public Service Company of NM\*  
 Puget Sound Power and Light Co\*.  
 Rochester Gas and Electric  
 San Diego Gas and Electric Co.  
 Savannah Electric and Power Co.  
 Sierra Pacific Power Company\*  
 South Carolina Electric and Gas Co.\*  
 Southern California Edison  
 Southwest Public Service Company  
 Southwestern Electric Power Co.  
 Tampa Electric Company\*  
 Texas Power and Light Company  
 Toledo Edison  
 TU Electric\*  
 Tucson Electric Power  
 Union Electric Company  
 United Illuminating\*  
 Utah Power and Light Company  
 Virginia Power Company\*

West Penn Power Company  
 West Plains Energy  
 West Virginia Power  
 West Texas Utilities  
 Wisconsin Electric Power Company  
 Wisconsin Power & Light Company  
 Wisconsin Public Service Company

### Cooperative Electric Utilities

Adams Electric Coop (IL)  
 Alaska Village Electric Cooperative  
 Amicalola EMC  
 Anoka Electric Cooperative (MN)  
 Baldwin EMC\*  
 Benton County REC (IA)  
 Blue Ridge Electric Cooperative (SC)  
 Brazos Electric Cooperative  
 Buckeye Rural Electrical Coop. (OH)  
 Cass County Electric Cooperative\*  
 Chugach Electric Association (AK)\*  
 Cimmaron Electric Cooperative (NM)  
 Claverack REC (PA)  
 Clay Electric Cooperative (FL)\*  
 Columbus Electric Cooperative (NM)  
 Consolidated Electric Cooperative, Inc. (OH)  
 Dairyland Power Cooperative (WI)  
 Delaware Electric Cooperative  
 Delta-Montrose Electric Association\*  
 Duck River EMC (TN)  
 East Kentucky Power Cooperative  
 Electric Cooperatives of S.C.\*  
 Electric Power Associations of MS\*  
 Florida Electric Cooperatives Asso.\*  
 Golden Valley Electric (AK)  
 Haywood EMC (NC)  
 Intermountain REA (CO)  
 Jackson EMC (GA)\*  
 Kauai Island Utility Cooperative\*  
 Kootenai Electric Coop (WA)  
 LaPlata Electric Association  
 Lee County Electrical Cooperative (FL)\*  
 Lumbee River EMC (NC)\*  
 Magic Valley Electric Cooperative (TX)  
 Meriwether Lewis electric Cooperative  
 Mohave Electric Cooperatives  
 Moonlake Electric Association (UT)  
 NC Association of Electric Coop.\*  
 North Central Mississippi EPA  
 North Dakota Association of REC\*  
 Okefenokee REMC (GA)  
 Owen County REC (KY)  
 Ozarks Electric Cooperative Corporation\*  
 Plateau Electric Coop (TN)

Rappahanock Electric Cooperative\*  
 Rural Electric Company (WY)  
 Santee Cooper/SC Pub. Serv. Authority\*  
 Southside Electric Cooperative\*  
 Southwest Electric Cooperative  
 SW Tennessee Membership Cooperative  
 Sumter Electric (FL)\*  
 Three Notch Electric Cooperative  
 The Middle Tenn. Elect. Membership Corp.\*  
 Tlingit-Haida REA (AK)  
 Tri-County Electric Cooperative  
 Virginia Association of Electric Coop.\*  
 Withlacoochee River EC (FL)  
 Yampa Valley Electric (CO)

#### **Municipal and Public Power**

Alexandria Light and Power  
 American Municipal Power (OH)  
 Chelan County PUD (WA)  
 City Electric System of Key West\*  
 City of Angoon, THREA, et al  
 City of Cleveland, Ohio\*  
 City of Franklin (TN)  
 City of Fremont, Nebraska  
 City of Gainesville, Florida  
 City of Gastonia, North Carolina  
 City of Gillette, (WY)  
 City of Huntsville, Alabama  
 City of La Follette, Tennessee  
 City of Lakeland, Florida\*  
 City of Lenior, Tennessee  
 City of Naperville (IL)  
 City of Petersburg, Alaska  
 City of Rockwood Tennessee  
 City of Smithville  
 City of Springfield\*  
 City of Wrangell  
 Colorado Springs Utilities\*  
 ElectriCities of North Carolina\*  
 Gainesville Regional Utilities  
 Jacksonville Electric Authority\*  
 Kissimee Utility Authority  
 Knoxville Utilities Board (TN)  
 Los Angeles Dept. of Water and Power  
 Moticello Electric Plant Board  
 Owensboro Municipal Utilities  
 Painesville Power Company (OH)  
 Public Works Commission of Fayetteville (NC)  
 San Antonio City Public Service Board\*  
 Seattle City Light\*  
 Tacoma (WA) Public Utilities Light Division  
 Tennessee Valley Public Power Association\*  
 Tennessee Valley Authority\*

Turlock Irrigation District  
 U.S. Virgin Islands Dept. of Water and Power  
 Village of Prospect, Ohio

#### **Investor-Owned Commun. Utilities**

Ameritech  
 AT&T Communications  
 Bell Atlantic (Verison)  
 Cablevision (CT)  
 Carolina Telephone  
 Central Telephone Company of Virginia  
 Chesapeake & Potomac Telephone Co.  
 Chester Telephone Company\*  
 Comcast Cablevision of Philadelphia  
 Cox Communications  
 Entergy Louisiana, Inc.  
 Entergy Mississippi, Inc.\*  
 General Telephone Company  
 GTE Corp.  
 Hawaiian Telecom\*  
 Hawaiian Telephone Company  
 Illinois Bell Telephone Company  
 Metricom, Inc.  
 New England Telephone Company  
 Ohio Cable Telecommunications  
 Sitka (Alaska) Telephone Company  
 South Central Bell Telephone Company  
 Southern Bell Telephone Company  
 South Western Bell Video Services, Inc.  
 Sprint/United (FL)  
 Telesat Cablevision Inc. (FL)  
 Telescripps Cablevision (KY)  
 Thomas Bay Power Authority  
 United Telephone Company of Kansas  
 US Cable  
 US West  
 Vision Cable  
 Wisconsin Bell Telephone Company

#### **Federal, State and Local Agencies**

Attorney General, State of Hawaii  
 Attorney General, State of Iowa  
 Attorney General, State of Washington  
 California Public Utility Comm.\*  
 Florida Department of Transportation  
 Kentucky Public Service Commission\*  
 New York Power Authority\*  
 New York State Dept. of Public Service\*  
 Oregon Public Utility Commission  
 Tennessee Valley Authority\*  
 Town of Garner (NC)  
 Town of Smithtown (NY)  
 US Army Corp of Engineers\*

US Attorney General, (AZ, NC)  
 USDA Rural Utilities Services\*  
 Virginia DOT

#### **Industrial/Commercial**

Aluminum Company of America (TX)  
 American Chrome & Chemical  
 AMFAC [Pioneer Mills](HI)  
 Amigo Stores (TX)  
 AKRO Corp (Ohio)  
 Boeing (TN)  
 Burndy  
 Burroughs Welcome (NC)  
 Carver Boats (NC)  
 Clearfield Conveyors  
 Coast Catamaran (Hobie Cat) (CA)  
 Commercial Companies  
 Consolidated Electrical Distributors  
 Cooper Power Systems  
 Dingess Rum Coal Company (WV)  
 Diversified Control Systems (NC)  
 Dixie Yarns (NC)  
 Eastern Lift Truck  
 Edwards Crane (NC)  
 Exxon (TX, WY)  
 Furst-McNess  
 General Injectibles  
 Global Stone  
 Hioki E.E. Corp. (MI)  
 Hostert Fotomata (PA)  
 IBM  
 INCO (WV)  
 Ingalls Shipbuilding  
 Intalco (WA)  
 International Power Devices  
 Louisville Ladder (KY)  
 LWG Corp.  
 Mallinckrodt  
 Maytag  
 MESA Petroleum  
 Mitsubishi Semiconductor America, Inc. (NC)  
 Mobile Tool International, Inc., et al.  
 Northern Telecom  
 Optical World  
 Osmose Wood Preserving (NY)  
 Piezo Electric Products  
 Pioneer Mills (HI)  
 RJ Reynolds Industries, Inc. (NC)  
 Royster-Clark, Inc. (NC)  
 Sara Lee (PA)  
 S&C Electric  
 Springer Peterson Roofing (FL)  
 St. Paul Fire & Marine Insurance  
 TAURUS Exploration  
 TEXACO  
 Texasgulf (NC)  
 Trane Company (PA)  
 Triplett Corporation (WV)

Underwriter's Laboratories  
 US Cable  
 US Steel Mining Company  
 UTILX Corp.  
 Wayne Industries (AL)  
 Westex Roofing Company  
 Westinghouse Hanford (WA)  
 WNCT

**Special NESC Seminars Sponsored by the Institute of Electrical and Electronics Engineers or the Power Engineering Society\***

Over 60 public and in-house seminars in various cities since 1980

**Contractors/Consultants**

Accident Reconstruction Analysis (NC)  
 Alaska Construction - (AK)  
 Coastal Distribution Contractors  
 Dillard Smith Construction (TN)  
 Electric Line Company (WV)  
 Finley Engineering\*  
 Fluor Daniel  
 FTI Corporation (MD)  
 Henkels & McCoy  
 Interstate Construction, Inc.  
 Itron, Inc.\*  
 Kokosing Construction Company (MA)  
 Langley Construction  
 Lee Electrical Construction, Inc.  
 McCarter Electrical Company (NC)  
 Metric Constructors  
 Moore Electrical Construction (TX)  
 Mountain Power (MT)\*  
 North Houston Pole Line (TX)  
 Parsons Brinckerhoff  
 Pike Electrical Contractors (NC, GA, OH, SC)\*

Power Delivery Associates (GA)  
 Shaum Electric (NC)  
 Sumpter Builders (SC)  
 Utilicon  
 WakeMed  
 Williams Construction (MT)  
 WC Teas (TN)

**Others**

American Electric Power Service Corp.\*  
 American Public Power Association\*  
 Central & Southwest Services, Inc.  
 Cinergy Services, Inc.  
 Cuyahoga County (OH) Court of Common Pleas  
 Duke University  
 Electric Council of New England\*  
 Federated Rural Electric Insurance Co.\*  
 Georgia Electrification Council\*  
 Georgia Electric Membership Corporation\*  
 Georgia EMC Engineering Association\*  
 Indiana Electric Association\*  
 Joint Engineers Conference\*  
 Kentucky Association of Electric Cooperatives\*  
 Kentucky Telephone Association\*  
 Midwest Electric Distribution Exchange\*  
 Municipal Association of South Carolina\*  
 National Rural Electric Cooperative Assoc.\*  
 North Dakota Power Use Council\*  
 Northwest Lineman College\*  
 Oklahoma Power & Communications Assoc.\*  
 Oregon Joint Use Association\*  
 Progress Energy Service Corporation  
 United Telecom Council\*  
 Wisconsin Utilities Association\*

\* NESC Seminar Clients

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# 1. DANESC Seminars on Development and Application of the 2007 National Electrical Safety Code

## About these seminars

The NESC is the basis for your construction standards and work procedures. Safe installations improve community relations and system reliability, while decreasing long-term costs. In these days of having to work smarter with fewer people, it is good business to make sure that your personnel understand how to meet their responsibilities in correctly applying the National Electrical Safety Code in both usual and unusual situations, particularly on joint-use pole lines. Students will work practical exercises in teams. Written answers are given for each question, including rule references. Additional exercises and answers are provided for later use by students.

## Who should attend

- ◆ design engineers
- ◆ staking technicians
- ◆ line workers
- ◆ standards developers
- ◆ contractors
- ◆ attorneys
- ◆ claims investigators
- ◆ training personnel
- ◆ make-ready and final and inspectors

## Learn from the experts

- ◆ How to apply the NESC in practical situations
- ◆ How to properly use the NESC to develop clearances, grounding, and strength standards for new construction or check compliance of existing construction, including using the “grandfather clause”
- ◆ Responsibilities for meeting NESC requirements
- ◆ Rationale behind NESC requirements
- ◆ How to treat a situation not directly addressed by the NESC
- ◆ How to use ANSI Z535 to meet NESC safety sign requirements for public and worker safety

## In addition

### **PCU Training Center will provide the following:**

- ◆ Bound Participant Workbook
- ◆ Excerpts from *Practical Utility Safety*
- ◆ Exercise/Answer sets
- ◆ CEUs and NC PDHs awarded upon successful completion of workshop(optional; at extra cost)

### **Each student will need access to the following:**

- ◆ National Electrical Safety Code – 2007 Edition (PCU Training Center can provide at extra cost)
- ◆ NESC Handbook – 6<sup>th</sup> Edition (optional; at extra cost)

Topics	Clearances	Supply Stations	Clearances & Grounding								Broad Coverage				Total Coverage		
											Intro to NESC	Detailed Discussions of NESC			Overhead Communication Clearances	Overhead & Underground Grounding & Bonding	
Number of Seminar Days **	0.5	0.5	1.0	1.0	1.5	1.5	2.0	2.0	2.5	2.5	1.0	3.0	3.0	3.5	1.0	1.0	1.5
Seminar Code**	DA-1	DA-2	DA-1	DA-2	DA-1	DA-2-JU	DA-1	DA-2-JU	DA-1	DA-2-JU	DA-1-IN	DA-1	DA-2-JU	DA-1	DA-3-CC	DA-4-GB	DA-4-GB
NESC Structure & Resp. of Utilities	⊕	○	⊕	○	●	●	■	■	■	■	⊕	■	■	■	●	■	■
Grounding			○	○	⊕	○	⊕	⊕	●	●	⊕	■	■	■		■!	■!
Overhead Lines—General							○		○	○	⊕	⊕	⊕	⊕		⊕	⊕
Development of Clearances	●		●		●	⊕	●	⊕	●	●	⊕	●	●	●	●	⊕	⊕
Overhead Clearances	○		⊕	●	⊕	⊕	⊕	⊕	●	●	⊕	●	●	■	⊕		
Supply Station Clearances									●			●	●	●			
Underground Clearances									●			●		●			
Exercises in Applying the NESC					⊕	⊕	●	⊕	●	●		■	■	■			
Exercises in Using Sag & Tension Charts for Loadings & Clearances						○		●		●		○	●	●	⊕		
Information Required to Determine Joint Use Clearances						●		●		●		●	●	●	●		
Pole Loading & Strength Calculation Exercises														○			
Overhead Strengths & Loadings											⊕			⊕			
Overhead Line Insulation											○			○			
Supply Stations		●															
Underground											⊕	○		⊕			
Work Rules											⊕	⊕		⊕		⊕	⊕
ANSI Z535 Utility Safety Signs														⊕			⊕
Continuing Education Units	0.35	0.35	0.60	0.60	1.00	1.00	1.35	1.35	1.70	1.70	0.60	2.05	2.05	2.40	0.60	0.60	1.00
Professional Development Hours	3.5	3.5	6.0	6.0	10.0	10.0	13.5	13.5	17.0	17.0	6.0	20.5	20.5	24.0	6.0	6.0	10.0

Legend	
○	Minimal Coverage
⊕	Selected Rules
●	Complete Rules
■	Expanded Discussion
■!	Plus Special Topics

\*This chart shows the standard seminar topics for different length seminars. The topics and the amount of coverage in each length seminar can be modified to fit the needs of any group. All desired modifications must be verified with the instructor. Class exercises are tailored to reinforce each subject.

\*\* Full seminar code = Number of days followed by seminar code suffix, such as 2.5-DA-2-JU



**1.5 day Applying the 2007 NESC Clearances & Grounding Rules**

(one instructor unless over 35 people)  
1.5-DA-1 [1.00 CEU; 10 PDH]

**Day 1 (8:00 am – 5:00 pm)**

Introduction  
Organization of the NESC  
Utility responsibilities: How to use the code: Grandfather Clause  
Definitions and references  
Development of Overhead Clearances  
Structure Location

**Lunch**

Clearances above railroads, roadways, parking lots, driveways, farm areas, pedestrian areas, and water areas  
Conductor crossing clearances

**Day 2 (8:00 am – 11:00 am)**

Clearances to other line structures  
Building clearances  
Bridge clearances  
Swimming pool clearances  
Grain bin clearances  
Joint Use clearances  

- supply space
- communication worker
- communication space
- safety zone

 Selected grounding methods of Section 9

**1.5 day Applying the 2007 NESC Clearances & Grounding Rules for Facilities on Joint-Use Lines Workshop**

(one instructor unless over 35 people)  
1.5-DA-2-JU [1.00 CEU; 10 PDH]

**Day 1 (8:00 am – 5:00 pm)**

Introduction  
Organization of the NESC  
Utility responsibilities: How to use the code: Grandfather Clause  
Definitions and references  
Development of Overhead Clearances (Selected)  
Structure Location

**Lunch**

Clearances above railroads, roadways, parking lots, driveways, farm areas, pedestrian areas, and water areas  
Conductor crossing clearances

**Day 2 (8:00 am – 11:00 am)**

Clearances to other line structures  
Building clearances  
Bridge clearances  
Swimming pool clearances  
Grain bin clearances  
Joint Use clearances  

- supply space
- communication worker
- communication space
- safety zone

 Developing clearances for various span lengths  
Selected grounding methods of Section 9

**2.0-day Applying the 2007 NESC Clearances & Grounding Rules**

(one instructor unless over 35 people)  
2.0-DA-1 [1.35 CEU; 13.5 PDH]

**Day 1 (8:00 am – 5:00 pm)**

Introduction  
Organization of the NESC  
Utility responsibilities: How to use the code: Grandfather Clause  
Definitions and references  
Development of Overhead Clearances  
Structure Location

**Lunch**

Clearances above railroads, roadways, parking lots, driveways, farm areas, pedestrian areas, and water areas  
Conductor crossing clearances

**Day 2 (8:00 am – 4:00 pm)**

Clearances to Other Line Structures  
Building clearances  
Bridge clearances  
Swimming pool clearances  
Grain bin clearances  
Conductor to conductor clearances  

**Lunch**

 Joint Use clearances  

- supply space
- communication worker
- communication space
- safety zone

 Climbing Space clearances  
Working Space clearances  
Clearances of vertical and lateral conductors and cables  
Selected grounding methods of Section 9

**2.0-day Applying the 2007 NESC Clearances & Grounding Rules for Facilities on Joint-Use Lines Workshop**

(one instructor unless over 35 people)  
2.0-DA-2-JU [1.35 CEU; 13.5 PDH]

**Day 1 (8:00 am – 5:00 pm)**

Introduction  
Organization of the NESC  
Utility responsibilities: How to use the code: Grandfather Clause  
Definitions and references  
Development of Overhead Clearances  
Structure Location

**Lunch**

Clearances above railroads, roadways, parking lots, driveways, farm areas, pedestrian areas, and water areas  
Conductor crossing clearances

**Day 2 (8:00 am – 4:00 pm)**

Clearances to Other Line Structures  
Building clearances  
Bridge clearances  
Swimming pool clearances  
Grain bin clearances  
Conductor to conductor clearances  

**Lunch**

 Joint Use clearances  

- supply space
- communication worker
- communication space
- safety zone

 Developing clearances for various span lengths  
Clearances of vertical and lateral conductors and cables  
Selected grounding methods of Section 9

**2.5-day Applying the 2007 NESC Clearances & Grounding Rules**

(one instructor unless over 35 people)  
2.5-DA-1 [1.70 CEU; 17.0 PDH]

***Day 1 (8:00 am – 5:00 pm)***

Introduction  
Organization of the NESC  
Utility responsibilities: How to use the code: Grandfather Clause  
Definitions and references  
Inspections  
Development of Overhead Clearances

**Lunch**

Structure Location  
Clearances above railroads, roadways, parking lots, driveways, farm areas, pedestrian areas, and water areas

***Day 2 (8:00 am – 5:00 pm)***

Conductor crossing clearances  
Clearances to Other Line Structures  
Building clearances  
Bridge clearances  
Swimming pool clearances  
Grain bin clearances

**Lunch**

Conductor to conductor clearances  
Joint Use clearances  

- supply space
- communication worker
- communication space
- safety zone

 Climbing Space clearances  
Working Space clearances  
Clearances of vertical and lateral conductors and cables  
Underground installation clearances

***Day 3 (8:00 am – 11:00 am)***

Supply Station Clearances  
Grounding requirements of NESC  
Parts 1, 2, and 3  
Grounding methods of Section 9

**2.5-day 2007 NESC Clearances & Grounding for Joint-Use Overhead Lines**

(one instructor unless over 35 people)  
2.5-DA-2-JU [1.70 CEU; 17.0 PDH]

***Day 1 (8:00 am – 5:00 pm)***

Introduction  
Organization of the NESC  
Utility responsibilities: How to use the code: Grandfather Clause  
Definitions and references  
Inspections  
Development of Overhead Clearances

**Lunch**

Structure Location  
Clearances above railroads, roadways, parking lots, driveways, farm areas, pedestrian areas, and water areas

***Day 2 (8:00 am – 5:00 pm)***

Conductor crossing clearances  
Clearances to Other Line Structures  
Building clearances  
Bridge clearances  
Swimming pool clearances  
Grain bin clearances

**Lunch**

Conductor to conductor clearances  
Joint Use clearances  

- supply space
- communication worker
- communication space
- safety zone

 Climbing Space clearances  
Working Space clearances  
Clearances of vertical and lateral conductors and cables  
Developing clearances for various span lengths

***Day 3 (8:00 am – 11:00 am)***

Developing clearances for various span lengths (continued)  
Grounding requirements of NESC  
Parts 1, 2, and 3  
Grounding methods of Section 9

**3.0-day Applying the 2007 NESC**  
 (one instructor unless over 35 people)  
 3.0-DA-1 [2.05 CEU; 20.5 PDH]

**Day 1 (8:00 am – 5:00 pm)**

Introduction  
 Organization of the NESC  
 Utility responsibilities: How to use the code: Grandfather Clause  
 Definitions and References  
 Inspections  
 Development of Overhead Clearances  
 Structure Location

**Lunch**

Vertical Clearances above Railroads, roadways, Parking Lots,  
 Driveways, Farm areas, Pedestrian Areas, and Water Areas

**Day 2 (8:00 am – 5:00 pm)**

Conductor Crossing Clearances  
 Clearances to Other Line Structures  
 Clearances to Buildings, Signs, Tanks and other Installations  
 Bridge Clearances  
 Swimming Pool Clearances  
 Clearances to Grain Bins, Coal Silos, etc.

**Lunch**

Conductor to conductor clearances  
 Climbing Space clearances  
 Working Space clearances  
 Clearances to vertical and lateral conductors and cables

**Day 3 (8:00 am – 4:00 pm)**

Joint Use clearances  
 ■ supply space                      ■ communication worker  
 ■ communication space              safety zone

Overhead General  
 Vegetation Management  
 Grounding requirements of Parts 1, 2, and 3  
 Grounding methods of Section 9

**Lunch**

Supply Station clearances  
 Underground Installation Clearances  
 Selected Work Rules

**3.0-day 2007 NESC Clearances & Grounding Rules for Joint-Use Overhead Lines**

(one instructor unless over 35 people)  
 3.0-DA-2-JU [2.05 CEU; 20.5 PDH]

**Day 1 (8:00 am – 5:00 pm)**

Introduction  
 Organization of the NESC  
 Utility responsibilities: How to use the code: Grandfather Clause  
 Definitions and References  
 Inspections  
 Grounding Requirements of Parts 1, 2, and 3

**Lunch**

Grounding Methods of Section 9  
 Development of Overhead Clearances

**Day 2 (8:00 am – 5:00 pm)**

Vertical clearances continued  
 Conductor Crossing Clearances  
 Clearances to Other Line Structures  
 Building Clearances

**Lunch**

Bridge clearances  
 Swimming pool clearances  
 Grain bin clearances  
 Conductor to conductor clearances  
 Joint Use clearances

- supply space                      ■ communication worker
- communication space              safety zone

**Day 3 (8:00 am – 4:00 pm)**

Climbing Space clearances\*  
 Working Space clearances\*  
 Clearances of vertical and lateral conductors and cables\*  
 Developing clearances for various span lengths\*  
 Loadings & Strength considerations

- Grades of Construction
- Required loadings
- Overload factors
- Strength factors
- Overlashed cables
- Abandoned cables
- Effect of unguyed service drops
- Sidewalk guys

**3.5-day Applying the 2007 NESC (one instructor unless over 35 people) 3.5-DA-1 [2.40 CEU; 24.0 PDH]**

**Day 1 (8:00 am – 5:00 pm)**

Introduction  
 Organization of the NESC  
 Utility responsibilities: How to use the code: Grandfather Clause  
 Definitions and References  
 Inspections  
 Development of Overhead Clearances  
 Structure Location

**Lunch**

Vertical Clearances above Railroads, roadways, Parking Lots,  
 Driveways, Farm areas, Pedestrian Areas, and Water Areas

**Day 2 (8:00 am – 5:00 pm)**

Conductor Crossing Clearances  
 Clearances to Other Line Structures  
 Clearances to Buildings, Signs, Tanks and other Installations  
 Bridge Clearances  
 Swimming pool clearances  
 Clearances to Grain Bins, Coal Silos, etc.

**Lunch**

Conductor to conductor clearances  
 Climbing Space clearances  
 Working Space clearances  
 Clearances to vertical and lateral conductors and cables

**Day 3 (8:00 am – 5:00 pm)**

Joint Use clearances  
 ■ supply space                      ■ communication worker  
 ■ communication space              safety zone

NESC and ANSI Z535 Safety Sign Requirements  
 Selected Strengths and Loadings  
 Selected Line Installation Rules

**Lunch**

Supply Station clearances  
 Underground Installation Clearances  
 Selected Work Rules

**Day 4 (8:00 am – 11:00 am)**

Overhead General  
 Vegetation Management  
 Grounding Requirements of Parts 1, 2, and 3  
 Grounding Methods of Section 9

## 1.0-day Grounding & Bonding Workshop

(one instructor unless over 35 people)  
1.0-DA-4-GB [0.60 CEU; 6 PDH]

### Day 1 (8:00 am – 4:00 pm)

Code compliance, emphasizing the requirements of the National Electrical Safety Code  
 Different requirements of different state  
 Grounding *requirements* for overhead and underground electric distribution systems, communication systems and electric supply stations  
 Grounding *methods* and techniques on overhead and underground lines  
 Required and recommended bonding  
 Grounding analysis and calculations  
 Grounding of communication messengers  
 A comparison and analysis of multigrounded neutral distribution systems versus other types  
 Requirements for connecting to customer-owned delta systems and single-grounded systems  
 The interconnection of communication messengers and electric supply neutrals

#### Lunch

"Stray voltage"  
 "Objectionable current"  
 The relationship of grounding to corrosion  
 Facts versus myths
 

- 25 ohm electrode impedance
- Using 40 ohms (and other values) as an assumed ground fault impedance

 Customer grounding problems - covering some aspects of the NESC and NEC.  
 Ground fault impedance values, system protection and reliability  
 Transient overvoltages and grounding  
 Short-term and long-term ampacity of made electrodes.  
 A review of IEEE, ANSI and other grounding standards  
 Code compliance, emphasizing the requirements of the National Electrical Safety Code  
 Special considerations for fiber-optic cables

## 1.5-day Grounding & Bonding Workshop

(one instructor unless over 35 people)  
1.5-DA-4-GB [1.00 CEU; 10 PDH]

### Day 1 (8:00 am – 4:00 pm)

Code compliance, emphasizing the requirements of the National Electrical Safety Code  
 Different requirements of different state  
 Grounding *requirements* for overhead and underground electric distribution systems, communication systems and electric supply stations  
 Grounding *methods* and techniques on overhead and underground lines  
 Required and recommended bonding  
 Grounding analysis and calculations  
 Grounding of communication messengers  
 A comparison and analysis of multigrounded neutral distribution systems versus other types  
 Requirements for connecting to customer-owned delta systems and single-grounded systems  
 The interconnection of communication messengers and electric supply neutrals

#### Lunch

"Stray voltage"  
 "Objectionable current"  
 The relationship of grounding to corrosion  
 Facts versus myths
 

- 25 ohm electrode impedance
- Using 40 ohms (and other values) as an assumed ground fault impedance

 Customer grounding problems - covering some aspects of the NESC and NEC.  
 Ground fault impedance values, system protection and reliability  
 Transient overvoltages and grounding  
 Short-term and long-term ampacity of made electrodes.  
 A review of IEEE, ANSI and other grounding standards  
 Code compliance, emphasizing the requirements of the National Electrical Safety Code  
 Special considerations for fiber-optic cables

### Day 2 (8:00 am – 11:00 pm)

Customer grounding problems - covering some aspects of the NESC and NEC.  
 Ground fault impedance values, system protection and reliability  
 Transient overvoltages and grounding  
 Short-term and long-term ampacity of made electrodes.  
 Temporary grounding requirements for line workers  
 A review of IEEE, ANSI and other grounding standards

**Note:** *When registering, please note if there are special topics you would like to be covered.*

The covered subjects will remove some of the mystery from this often-misunderstood area. Case studies of past experiences will be covered, along with discussions on techniques others have used successfully. Participants will leave this seminar with a greater confidence in their ability to handle unique situations.

## 2. Tutorials on the Physical Design of Joint-Use Wood Pole Distribution Lines

### About these seminars

The 3.5 day (3.5-JU-1) *Tutorial on Joint-Use Wood Pole Line Designs: Require Clearance, Loading & Strengths* addresses the increasing problem of accommodating larger numbers and sizes of cables, conductors and equipment on wood pole utility lines. Unfortunately, line failures and clearance problems have increased in recent years due to overloading poles. Attendees will calculate attachment heights for conductors and cables for various span lengths. Attendees will also calculate individual loads and strengths by hand. Computer computations will be briefly discussed. This course is particularly designed for engineers, technicians and inspectors who want to add or increase expertise in facility placement and structural engineering of wood pole lines. Students will work practical exercises in teams. Written answers are given for each question, including rule references. Additional exercises and answers are provided for later use by students.

The Special Edition (3.5-JU-2-OC) concentrates only on Required Loadings & Strengths. It includes all the discussions and exercises on loadings and strengths from JU-1 plus a full day tutorial on using O-Calc pole loading software.

### Who should attend

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

### Learn from the experts

- ◆ Determine required attachment spacings to meet required clearances at the poles and midspan\*
- ◆ Determine required wood pole height and class\*
- ◆ Determine if available clearances allow new facilities to be added to existing wood poles\*
- ◆ Determine required clearances between wires and cables at the pole and required pole height\*
- ◆ Determine required Grade of Construction
- ◆ Calculate wind and ice loadings on structures and supported facilities
- ◆ Calculate stress on poles and cross arms
- ◆ Calculate strength of poles and cross arms
- ◆ Determine required pole class
- ◆ Determine if available strengths allows new facilities to be added to existing wood poles
- ◆ Properly use the NESC to develop standards and joint-use contracts for new construction or check compliance of existing construction
- ◆ Increase pole life and reliability
- ◆ Responsibilities for meeting NESC requirements
- ◆ Rationale behind NESC requirements
- ◆ 1 day tutorial on using O-Calc pole loading software\*\*

\* Included in JU-1 seminars only

\*\* Included in JU-2-OC seminars only

### In addition

**PCU Training Center will provide the following for both seminars:**

- ◆ Bound Participant Workbook
- ◆ Bound Appendix Book of helpful charts, tables and technical discussions
- ◆ Excerpts from Practical Utility Safety
- ◆ Exercise/Answer sets
- ◆ CEUs and NC or FL PDHs awarded upon successful completion of workshop
- ◆ Demo copy of O-Calc pole loading software

**Each participant will need access to:**

- ◆ National Electrical Safety Code – 2007 Edition (PCU Training Center can provide at extra cost)
- ◆ NESC Handbook – 6th Edition (optional; at extra cost)
- ◆ Scientific calculator trigonometry and power root functions

**3.5-day Tutorial on Joint-Use Wood Pole Line Design: Required Clearances, Loadings, & Strengths (one instructor unless over 35 people)**

**3.5-JU-1 [2.40CEU; 24.0PDH]**

**Day 1 (8:00 am – 5:00 pm)**

Introduction  
 Organization of the NESC  
 Utility responsibilities: How to use the code: Grandfather Clause  
 Definitions and References  
 Development of Overhead Clearances  
 Vertical clearances of lowest wires or cables above ground, rails, and water

**Lunch**

Vertical and horizontal clearances between wires, conductors, and cables

- At the pole
- In the span

Using sag and tension calculations

Effects of differences in sags and tensions on clearances and loads

**Day 2 (8:00 am – 5:00 pm)**

Calculations of required clearances at poles for various spans, types, and sizes of power conductors and cables and telephone and CATV cables

- supply space
- communication worker safety zone
- communication

Special considerations for fiber-optic cables

Selection of pole heights for various spans and configurations

**Lunch**

Required Grades of Construction

Calculation of wind, ice and weight loads on poles and supported facilities

Overload factors

Calculation of overturning moments from wind loads, weight loads, and transformer loads for various configurations

Effect of leaning poles and pole deflection

**Day 3 (8:00 am – 5:00 pm)**

Calculating the strength of poles and crossarms

- At groundline
- At bolt holes
- At intermediate points

Required strength factors

Calculating required pole strength class for various configurations

**Lunch**

Guying for deadends and angles

- Required guy strength
- Effects on poles

Buckling strength for deadend, angle, and transformer poles

Calculating maximum spans for various configurations

**Day 4 (8:00 am – 11:00 am)**

Adding cables or conductors to existing lines

- Effect of overlashed cables

Determining appropriate clearance specifications and loading limits in joint-use contracts

Practical consideration of: effects of difficulties in obtaining desired sag/tensions and guying tensions, long spans next to short spans, etc.

Roundtable discussion of related problems and issues

**Adjourn**

**3.5-day Tutorial on Required Loadings, & Strengths for Joint-Use Wood Pole Lines for power, telephone, CATV and railroad utilities (one instructor unless over 35 people)**

**3.5-JU-2-OC [2.40CEU; 24.0PDH]**

**Day 1 (8:00 am – 5:00 pm)**

Introduction  
 Organization of the NESC  
 Utility Responsibilities: How and when to use the code: Grandfather Clause  
 Definitions and References  
 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

**Lunch**

Brief review of pole clearances

Required Grades of Construction

Calculations of required clearances at poles for various spans, types and sizes of power conductors, cables, telephone & CATV cables

- supply space
- communication worker safety zone
- communication space

**Day 2 (8:00 am – 5:00 pm)**

Calculating the strength of poles and crossarms at groundline

- At groundline
- At bolt holes
- At supply space
- At intermediate points

Required strength factors

**Lunch**

Calculating required pole strength class for various configurations

Guying for deadends and angles, including

- required guy strength
- effects on poles

Buckling strength for deadend, angle and transformer poles

Calculating maximum spans for various configurations

**Day 3 (8:00 am – 5:00 pm)**

Adding cables or conductors to existing lines

- 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 & pole push braces

**Lunch**

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

Compare results using a variety of pole classes, NESC loading districts and grade of constructions

**Day 4 (8:00 am – 11:00 am)**

O-Calc - Advanced

Exercise: Angle pole

Exercise: Deadend pole

Exercise: Joint-use pole

Use O-Calc to demonstrate & understand the impact of joint use attachments

Advanced tips & tricks

How to setup pole templates

How to share pole loading results

**Adjourn**

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## 3. Investigating, Documenting, Analyzing and Litigating Accidents on Power and Communication Utility Systems

### About the seminars

When there is an accident, you need to gather and analyze the appropriate data yesterday—before it goes away. You need to quickly (a) determine whether you met the appropriate requirements and (b) secure information concerning the actions, qualifications, tools and equipment of other parties.

Regardless of whether you are on the team gathering data and analyzing the accident or you are developing the appropriate litigation strategy, it is vital that you understand what data is required, how to analyze it, and how it should be presented most effectively in litigation.

All seminars include discussions by one or more forensic engineers with extensive experience in investigating and analyzing utility contact accidents and testifying in court. Some seminars also include discussions by a litigating attorney, OSHA human factors specialist, and/or a burn specialist help you to put allegations and facts into proper perspective.

### Who should attend

- ◆ Attorneys
- ◆ paralegals
- ◆ engineers
- ◆ claims agents
- ◆ claims managers
- ◆ risk managers
- ◆ investigators
- ◆ OSHA compliance officers
- ◆ OSHA hearing officers

### Learn from the experts

- ◆ Responsibilities of utilities
- ◆ Responsibilities of others
- ◆ How to investigate the scene
- ◆ How to document and control evidence
- ◆ How to reconstruct accidents
- ◆ How to apply codes and standards
- ◆ How to consider the effects of electricity on the body
- ◆ How to prepare and use witnesses effectively
- ◆ How to use exhibits effectively

### In addition

#### PCU Training Center will provide the following:

- ◆ Bound Participant Workbook, including applicable OSHA regulations/ references
- ◆ Excerpts from Practical Utility Safety
- ◆ Exercise/Answer sets
- ◆ CEUs and NC PDHs awarded upon successful completion of workshop (optional; at extra cost)

#### Each participant will need access to:

- ◆ National Electrical Safety Code – 2007 Edition (PCU Training Center can provide at extra cost)
- ◆ NESC Handbook – 6th Edition (optional; at extra cost)

# Standard UPCA-1 Seminars on Investigating and Litigating Utility Accidents

(See separate schedule at the end for the advanced course UCA-2)

Topics	1	1.5	2	2.5	3.5*
Seminar Code	1.0-UPCA-1	1.5-UPCA-1	2.0-UPCA-1	2.5-UPCA-1	3.5-UPCA-1
Construction Accidents	●	●	●	●	●
Farm Accidents			●	●	●
Tree Accidents			●	●	●
Boating and Aircraft Accidents			●	●	●
Climbing and Equipment Contact Accidents			●	●	●
Vehicle Accidents	☆	●	●	●	●
Electrical Work Accidents				●	●
Documenting and Analyzing of Evidence	●	●	●	●	●
Accident Site Investigation and Analysis Tools	☆	●	●	●	●
Accident report check list	☆	●	●	●	●
Burn mechanisms and treatment					●
Preparation of Fact Witnesses and Expert Witnesses				☆	●
Human Factors Issues and Considerations					●
Applicable Codes and Standards			●	●	●
Occupational Safety and Health Act		●	●	●	●
Relevant OSHA Industry Regulations			●	●	●
Relevant OSHA Construction Regulations	●	●	●	●	●
Building Connection/Wiring Standards		☆	☆	●	●
Relevant ANSI Standards	●	●	●	●	●
Relevant Industry Association Standards	●	●	●	●	●
Why High Voltage Overhead Lines Are Necessary				☆	●
Operation of Fuses, Breakers and Reclosers		☆	☆	●	●
Electric Shock Effects				●	●
OSHA Utility Worker Regulations			☆	☆	●
ANSI Z535 Safety Sign Standard			☆	●	●
Investigation Exercise and Mock Summary Trial				●	●
Continuing Education Units (CEUs)	0.65	1.00	1.35	1.70	2.40
Professional Development Hours (PDHs)	6.5	10.0	13.5	17.0	24.00

\*The 3.5 day program requires 4 instructors

● — full coverage

☆ — selected coverage

## 1.0-day Investigating Utility Accidents Involving Public Contact

0.5-UPCA-1 [0.65 CEU; 6.5 PDH]

### Day 1 (8:00 am – 4:30 pm)

How to determine compliance with codes and standards

- ◆ Which NESC edition applies
- ◆ Old vs. new NESC clearance system
- ◆ Standard vs. nonstandard clearances
- ◆ Effect of temperature, wind, and ice loading on clearances

Case Studies: Using codes, regulations, and standards

Accident #1—Dump truck

- |                                 |                                  |
|---------------------------------|----------------------------------|
| ◆ Responsibilities of Utilities | ◆ Responsibilities of contractor |
| ■ Applicable NESC edition       | ■ OSHA regulations               |
| ■ Required vertical clearance   | ■ State regulations              |

Accident #1A—Crane

- |                                       |  |
|---------------------------------------|--|
| ◆ Required vertical clearance         | ◆ OSHA regulations                     |
| ◆ Responsibilities of crane operators | ◆ Insulating or grounding nearby lines |

Accident #1B—Backhoe

- ◆ Responsibilities of equipment operators
- ◆ OSHA regulations

#### Lunch

Case Studies cont.

Accident #2—Sailboat

- ◆ Required vertical clearance

Accident #3—Antenna removal

- |                                       |                                   |
|---------------------------------------|-----------------------------------|
| ◆ NEC antenna requirements            | ◆ Wind displacement of conductors |
| ◆ NESC antenna clearance requirements | ◆ Sag & tension effects           |

Accident #3A—Gutter installations

- ◆ Clearances to buildings
- ◆ OSHA

Accident #3B—Billboard

- ◆ “Building” vs. “Other Installation”

Accident #3C—Painting a metal gas station canopy

- ◆ “Building” vs. “Other Installation”
- ◆ Moving a ladder
- ◆ OSHA

Documenting & preserving evidence

- ◆ Matching evidence marks
- ◆ Measurements
- ◆ Photographs vs. videos
- ◆ Accident report check list
- ◆ Accident site investigation & analysis tools

Brief discussion of pole hits

- ◆ NESC pole location requirements
- ◆ Site information to record
- ◆ AASHTO & related documents
- ◆ Example affidavit
- ◆ Practical pole placement constraints
- ◆ Breakaway poles

Brief comments on other types of accidents

- ◆ Scaffold accidents
- ◆ Ladder accidents
- ◆ Over-height vehicle accidents

#### Adjourn

## 1.5-day Investigating Utility Accidents Involving Public Contact

1.5-UA-1 [1.00 CEU; 10.0 PDH]

### Day 1 (8:00 am – 5:00 pm)

How to determine compliance with codes and standards

- ◆ Which NESC edition applies
- ◆ Old vs. new NESC clearance system
- ◆ Standard vs. nonstandard clearances
- ◆ Effect of temperature, wind, and ice loading on clearances

Case Studies: Using codes, regulations, and standards

Accident #1—Dump truck

- |                                 |                                  |
|---------------------------------|----------------------------------|
| ◆ Responsibilities of Utilities | ◆ Responsibilities of contractor |
| ■ Applicable NESC edition       | ■ OSHA regulations               |
| ■ Required vertical clearance   | ■ State regulations              |

Accident #1A—Crane

- |                                       |  |
|---------------------------------------|--|
| ◆ Required vertical clearance         | ◆ OSHA regulations                     |
| ◆ Responsibilities of crane operators | ◆ Insulating or grounding nearby lines |

Accident #1B—Backhoe

- ◆ Responsibilities of equipment operators
- ◆ OSHA regulations

#### Lunch

Case Studies cont.

Accident #2—Sailboat

- ◆ Required vertical clearance

Accident #3—Antenna removal

- |                                       |                                   |
|---------------------------------------|-----------------------------------|
| ◆ NEC antenna requirements            | ◆ Wind displacement of conductors |
| ◆ NESC antenna clearance requirements | ◆ Sag & tension effects           |

Accident #3A—Gutter installations

- ◆ Clearances to buildings
- ◆ OSHA

Accident #3B—Billboard

- ◆ “Building” vs. “Other Installation”

Accident #3C—Painting a metal gas station canopy

- |                                       |                   |
|---------------------------------------|-------------------|
| ◆ “Building” vs. “Other Installation” | ◆ Moving a ladder |
|                                       | ◆ OSHA            |

Accident #4—Antenna mounting failure

- ◆ NEC clearance requirements
- ◆ NEC grounding requirements
- ◆ Ground fault protection

Pole hits

- |                                   |  |
|-----------------------------------|--|
| ◆ NESC pole location requirements | ◆ Example affidavit                    |
| ◆ Site information to record      | ◆ Practical pole placement constraints |
| ◆ AASHTO & related documents      | ◆ Breakaway poles                      |

Brief comments on other types of accidents

- |                      |                                 |
|----------------------|---------------------------------|
| ◆ Scaffold accidents | ◆ Over-height vehicle accidents |
| ◆ Ladder accidents   |                                 |

### Day 2 (8:00 am – 11:00 am)

Requirements for Safety Signs

- |                                     |                                   |
|-------------------------------------|-----------------------------------|
| ◆ NESC Rules requiring safety signs | ◆ Applicable ANSI standards       |
|                                     | ◆ Attributes of good safety signs |

Documenting & preserving evidence

- |                           |  |
|---------------------------|--|
| ◆ Matching evidence marks | ◆ Accident report check list                   |
| ◆ Measurements            | ◆ Accident site investigation & analysis tools |
| ◆ Photographs vs. videos  |  |

#### Adjourn

## 2.0-day Investigating Utility Accidents Involving Public Contact

2.0-UPCA-1 [1.35 CEU; 13.5 PDH]

### Day 1 (8:00 am – 5:00 pm)

How to determine compliance with codes and standards

- ◆ NESC vs. NEC & OSHA
- ◆ Which NESC edition applies
- ◆ Old vs. new NESC clearance system
- ◆ Standard vs. nonstandard clearances
- ◆ Effect of temperature, wind, and ice loading on clearances
- ◆ Examples of conductor movement

Case Studies: Using codes, regulations, and standards

Accident #1—Dump truck

- ◆ Responsibilities of Utilities
  - Applicable NESC edition
  - Required vertical clearance
- ◆ Responsibilities of contractor
  - OSHA regulations
  - State regulations

Accident #1A—Crane

- ◆ Required vertical clearance
- ◆ Responsibilities of crane operators
- ◆ OSHA regulations
- ◆ Insulating or grounding nearby lines

Accident #1B—Backhoe

- ◆ Responsibilities of equipment operators
- ◆ OSHA regulations

#### Lunch

Case Studies cont.

Accident #2—Sailboat

- ◆ Required vertical clearance

Accident #3—Antenna removal

- ◆ NEC antenna requirements
- ◆ NESC antenna clearance requirements
- ◆ Wind displacement of conductors
- ◆ Sag & tension effects

Accident #3A—Gutter installations

- ◆ Clearances to buildings
- ◆ OSHA

Accident #3B—Billboard

- ◆ “Building” vs. “Other Installation”

Accident #3C—Painting a metal gas station canopy

- ◆ “Building” vs. “Other Installation”
- ◆ Moving a ladder
- ◆ OSHA

Accident #4—Antenna mounting failure

- ◆ NEC clearance requirements
- ◆ NEC grounding requirements
- ◆ Ground fault protection

Electrical work accidents

- ◆ Electricians
- ◆ Power line workers

Communication line workers

- ◆ Using the Employee Misconduct defense

Electrical installations

- ◆ Operation of fuses, breakers, reclosers

### Day 2 (8:00 am – 4:00 pm)

Requirements for Safety Signs

- ◆ NESC Rules requiring safety signs
- ◆ Applicable ANSI standards
- ◆ Attributes of good safety signs

Electric shock effects

- ◆ Electrical phenomena
- ◆ Resistance to electrical flow through the body
- ◆ Effects of current flow
- ◆ Ventricular fibrillation

Documenting & preserving evidence

- ◆ Matching evidence marks
- ◆ Measurements
- ◆ Photographs vs. videos
- ◆ Accident report check list
- ◆ Accident site investigation & analysis tools

#### Lunch

Documenting & preserving evidence (cont.)

Pole hits

- ◆ NESC pole location requirements
- ◆ Site information to record
- ◆ AASHTO & related documents
- ◆ Example affidavit
- ◆ Practical pole placement constraints
- ◆ Breakaway poles

Improperly guyed structures

- ◆ Effect of guy tension on line clearances
- ◆ Clearances to other structures

Case Studies cont.

- ◆ Scaffold accidents
- ◆ Ladder accidents
- ◆ Over-height vehicle accidents
- ◆ Farm accidents
- ◆ Off-road vehicle accidents
- ◆ Tree-trimming & decorating accidents
- ◆ Boating Accidents
- ◆ Aircraft accidents
- ◆ Substation accidents

#### Adjourn

## 2.5-day Investigating Utility Accidents Involving Public Contact

2.5-UPCA-1 [1.70 CEU; 17.0 PDH]

### Day 1 (8:00 am – 5:00 pm)

#### Introduction

#### How to determine compliance with codes and standards

- ◆ NESC vs. NEC & OSHA
- ◆ Required Inspections
- ◆ Which NESC edition applies
- ◆ Old vs. new NESC clearance system
- ◆ Standard vs. nonstandard clearances
- ◆ Effect of temperature, wind, and ice loading on clearances
- ◆ Examples of conductor movement

#### Case Studies: Using codes, regulations, and standards

#### Accident #1—Dump truck

- ◆ Responsibilities of Utilities
  - Applicable NESC edition
  - Required vertical clearance
- ◆ Responsibilities of contractor
  - OSHA regulations
  - State regulations

#### Accident #1A—Crane

- ◆ Required vertical clearance
- ◆ Responsibilities of crane operators
- ◆ OSHA regulations
- ◆ Insulating or grounding nearby lines

#### Accident #1B—Backhoe

- ◆ Responsibilities of equipment operators
- ◆ OSHA regulations

#### Lunch

#### Case Studies cont.

#### Accident #2—Sailboat

- ◆ Required vertical clearance

#### Accident #3—Antenna mounting failure

*(not used in this seminar)*

#### Accident #4—Antenna removal

- ◆ NEC antenna requirements
- ◆ NESC antenna clearance requirements
- ◆ Wind displacement of conductors
- ◆ Sag & tension effects

#### Accident #4A—Gutter installations

- ◆ Clearances to buildings
- ◆ OSHA

#### Accident #4B—Billboard (NESC)

- ◆ “Building” vs. “Other Installation”

#### Accident #4C—Painting a metal gas station canopy

- ◆ “Building” vs. “Other Installation”
- ◆ Moving a ladder
- ◆ OSHA

#### Electrical work accidents

- ◆ Electricians
- ◆ Power line workers
- ◆ Communication line workers
- ◆ Using the Employee Misconduct defense

#### Electrical installations

- ◆ Operation of fuses, breakers, reclosers

### Day 2 (8:00 am – 5:00 pm)

#### Requirements for Safety Signs

- ◆ NESC Rules requiring safety signs
- ◆ Applicable ANSI standards
- ◆ Attributes of good safety signs

#### Electric shock effects

- ◆ Electrical phenomena
- ◆ Resistance to electrical flow through the body
- ◆ Effects of current flow
- ◆ Ventricular fibrillation

#### Documenting & preserving evidence

- ◆ Matching evidence marks
- ◆ Measurements
- ◆ Photographs vs. videos
- ◆ Accident report check list
- ◆ Accident site investigation & analysis tools

#### Lunch

#### Pole hits

- ◆ NESC pole location requirements
- ◆ Site information to record
- ◆ AASHTO & related documents
- ◆ Example affidavit
- ◆ Practical pole placement constraints
- ◆ Breakaway poles

#### Improperly guyed structures

- ◆ Effect of guy tension on line clearances
- ◆ Clearances to other structures

#### Case Studies cont.

- ◆ Scaffold accidents
- ◆ Ladder accidents
- ◆ Over-height vehicle accidents
- ◆ Farm accidents
- ◆ Off-road vehicle accidents
- ◆ Tree-trimming & decorating accidents
- ◆ Boating Accidents
- ◆ Aircraft accidents
- ◆ Substation accidents

### Day 3 (8:00 am – 11:00 am)

#### Putting it all together

#### Investigation

- ◆ Participants will be split into groups to investigate and develop trial presentation for plaintiff and defendant for selected accident scenarios (provided at start of course)
- ◆ Develop information to get at site
  - Present to class
  - Feedback from class

#### Summary jury trial

- ◆ Use data found at site (provided to groups after investigation presentations)
  - Develop trial strategy
  - Plaintiff group presents significant points
  - Defense group presents significant counterpoints
  - Plaintiff group rebuts defense
  - Feedback from class

#### Roundtable Discussion of Issues & Techniques Presented in Course

Adjourn

## 3.5-day Investigating and Documenting Utility Contact Accidents

3.5-UPCA-1  
[2.40 CEU; 24.0 PDH]

### *Day 1 (8:00 am – 5:00 pm)*

Case studies: Using codes, regulations and standards

- ◆ Accidents: #1 - Dump truck, #1A - Crane, #1B - Backhoe, #2 - Sailboat

How to determine compliance with codes and standards

- ◆ NESC vs. NEC and OSHA
- ◆ Which NESC edition applies
- ◆ Old vs. new NESC clearance system
- ◆ Standard vs. nonstandard clearances
- ◆ Effect of temperature, wind and ice loading on clearances

Electric shock effects

Responsibilities of contractor

- ◆ OSHA & state regulations

### *Day 2 (8:00 am – 5:00 pm)*

Case studies cont: Accident #3 - Antenna mounting failure

Electrical work accidents

- ◆ Electricians
- ◆ Power line workers
- ◆ Communication line workers
- ◆ Using the Employee Misconduct defense

Electrical installations

- ◆ Operation of fuses, breakers, reclosers

Accident reference information

- ◆ Scaffold accidents
- ◆ Ladder accidents
- ◆ Over-height vehicle accidents
- ◆ Farm accidents
- ◆ Off-road vehicle accidents
- ◆ Tree-trimming & decorating accidents
- ◆ Boating accidents
- ◆ Aircraft accidents
- ◆ Substation accidents

Accident site investigation & analysis tools

- ◆ Vertical clearances above ground
- ◆ Using hand tools for estimations of wire clearances
- ◆ Outdoor exercise in making measurements with hand tools
- ◆ Vertical & horizontal clearances to buildings & other installations
- ◆ Exercise in determining if wire clearances are met

### *Day 3 (8:00 am – 5:00 pm)*

Documenting and preserving evidence

- ◆ Matching evidence marks
- ◆ Photographs vs videos; film vs digital
- ◆ Accident check list

Case studies cont: Accidents

- ◆ #4 – Roof Replacement, #5 – Antenna Removal, #5A - Gutter installation, #5B - Billboard, and #5C - Painting a metal gas station canopy

Pole hits

Improperly guyed structures

Making effective exhibits for depositions & trials

Making effective videos

Maintenance & control of evidence

Additional useful information

- ◆ Analysis of construction fatalities
- ◆ Relevant OSHA regulations
- ◆ Relevant ANSI standards
- ◆ Relevant industry association standards
- ◆ National Safety Council Industrial Data Sheets

### *Day 4 (8:00 am – 11:00 am)*

Putting it all together

Investigation

- ◆ Split into groups to investigate for plaintiff and defendants for selected accident scenarios
- ◆ Develop information to get at site
- ◆ Present to class for feedback

Summary jury trial

- ◆ Use data found at site (provided to groups after investigation presentations)
- ◆ Develop trial strategy
- ◆ Plaintiff group presents significant points
- ◆ Defense groups present significant counterpoints
- ◆ Plaintiff group rebuts defense
- ◆ Feedback from class

**Adjourn**

# 2.5-day Investigating and Litigating Utility Contact Accidents: Advanced Topics – Analyzing and Litigating OSHA Citations & Civil Actions

2.5-UPCA-2  
[2.40 CEU; 24.0 PDH]

## Day 1 (8:00 am – 5:00 pm)

### Introduction to Case Study 1: Worker injured constructing new building beside joint-use power & communication line

- ◆ History of building planning & construction
- ◆ Details of accident
- ◆ Entities involved at each stage of construction

### Brief Review of NESC Clearances

- ◆ Clearances of conductors & cables above ground
- ◆ Clearances of conductors & cables to buildings, billboards
- ◆ Clearances of conductors & cables to tanks & other installations

### Basic worker safety standards applying to work on a building construction site near overhead utility lines

- ◆ OSH Act of 1970
- ◆ Responsibilities of employers
- ◆ Responsibilities of employees
- ◆ Application of OSHA: number of employees
- ◆ • OSHA Construction Industry regulations in 29 CFR Part 1926 • Rules of construction
- ◆ Accident prevention responsibilities
- ◆ Safety training & education
- ◆ Personal protective equipment
- ◆ Protection of employees from energized lines passing through or near job site
- ◆ Cranes & derricks
- ◆ Vehicles & Mechanized equipment
- ◆ Concrete & masonry construction
- ◆ Concrete pumps
- ◆ Fall protection
- ◆ State regulations
- ◆ High-Voltage Line Safety Acts
- ◆ State vs federal OSHA regulations
- ◆ American National Standards
- ◆ ANSI B30.5 Crane use
- ◆ Insulating or grounding nearby lines

### Lunch

### Using the OSHA Employee Misconduct Defense requirements as a tool to analyze the responsibilities of employers & employees

- ◆ Appropriate work rules addressing behavior and conditions
- ◆ Communication of work rules to employees
- ◆ Supervision of employees
- ◆ Enforcement of work rules

### Using OSHA regulations and ANSI standards for multiemployer work sites to analyze employer responsibilities

- ◆ How OSHA views the responsibilities of multiple employers
- ◆ OSHA Directives to compliance officers
- ◆ How to meet OSHA regulations using ANSI A10.33

## Day 2 (8:00 am – 5:00 pm)

### OSHA investigations

- ◆ Accident investigation vs. general inspection
- ◆ Process of OSHA investigations
- ◆ Management interviews/rights
- ◆ Employee interviews/rights

### Using injury information

- ◆ Electricity transmission injuries
- ◆ Arc flash injuries
- ◆ Ventricular fibrillation
- ◆ Blunt trauma
- ◆ Using injuries to analyze position/actions of injured

### Analysis of responsibilities of parties in Case Study 1

- ◆ Power utility
- ◆ Communication utility
- ◆ Landowner
- ◆ General contractor
- ◆ Subcontractor
- ◆ Excavator
- ◆ Concrete pumper
- ◆ Concrete finisher
- ◆ Reinforcing rod crew
- ◆ Concrete form crew

### How to train, instruct, supervise, and discipline employees to assure compliance with safe work practices:

- ◆ Human behavior & errors
- ◆ Remediation of errors
- ◆ Supervision
- ◆ Retraining
- ◆ Training responsibilities & requirements
- ◆ Developing training programs
- ◆ Personnel that should be trained
- ◆ Documenting training
- ◆ Evaluation of training

### Lunch

### Introduction to Case Study 2: Communication worker injured by contact with power lines on joint-use pole

- ◆ History of work at this site
- ◆ Details of accident
- ◆ Entities involved

### OSHA & NESC work rules applicable to communication line work

- ◆ Communication operation, maintenance, & construction
- ◆ National Electrical Safety Code Sections 41-43

### Analysis of responsibilities of parties in Case Study 2

- ◆ Power utility
- ◆ Communication utility
- ◆ Communication utility contractor
- ◆ Communication utility contractor employees

***Day 3 (8:00 am – 11:00 am)***

**Introduction to Case Study 3: Power line worker injured while working on pole**

- ◆ Work being performed
- ◆ Personnel at scene
- ◆ Initial testimony vs. final testimony

**OSHA & NESC work rules applicable to supply line work**

- ◆ Operation and maintenance
- ◆ Construction
- ◆ National Electrical Safety Code Sections 41, 42 & 44

**Analysis of responsibilities of parties in Case Study 3**

- ◆ Power utility
- ◆ Power utility contractor
- ◆ Power utility contractor employees

**Additional Regulations often involved in construction site utility line contacts**

- ◆ Use of ladders & ladder requirements
- ◆ Training for ladder use
- ◆ Excavations around power lines
- ◆ State call-before-you-dig programs
- ◆ Scaffold requirements
- ◆ Helicopter work near power lines

**Additional standards often involved in construction site utility line contacts**

- ◆ Using cranes around power lines
- ◆ Using equipment under power lines
- ◆ Ladder requirements
- ◆ Scaffold requirements
- ◆ Vegetation Management
- ◆ Concrete pumping — Am. Concrete Pumper Assoc. Certified Operator Study Guide

***Adjourn***

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## 4. Follow-up Training for DANESC™ Videotape Users

PCU Training Center offers a series of videotapes on the DANESC™ Series. In response to client requests, Clapp Research Associates, P.C. offers a personalized, on-site one-day follow-up session to address special concerns after personnel have watched the videotapes and worked the exercises. This seminar allows the client to explore code requirements of special interest in detail.

Prior to the seminar, participants provide specific written questions. The instructor prepares written answers for each question to be provided to all participants at the seminar. From these questions, the instructor prepares short presentations on the various areas of the code involved; these presentations generally take the full morning and early portion of the afternoon. In mid-afternoon, the individual questions and answers are reviewed. The late afternoon is reserved for additional questions that arise during these discussions.

Due to the special preparation time involved with this special one-day seminar, the fee for the normal 1.5 day seminar applies; this fee includes the time for preparation, travel, and teaching. Additional costs are charged for travel expense and for copying the questions and answers.

If the client needs to run two sessions of this special seminar to keep personnel available at all times, there are two options.

- ◆ **Option 1** is to delete the morning in-depth lecture session and repeat the normal afternoon session in the morning and afternoon. Often this is not cost-effective.
- ◆ **Option 2** is to run two full one-day sessions back-to-back on the same trip. This is usually the most cost-effective, because it allows time to fully explore the concerns in depth. The fee for the 2.5 day seminar applies to Option 2.