

---

# 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	Clearances & Grounding							Broad Coverage				Total Coverage		
		1.0	1.5	1.5	2.0	2.0	2.5	2.5	Intro to NESC	Detailed Discussions of NESC			Overhead Communication Clearances	Overhead & Underground Grounding & Bonding	
Number of Seminar Days **	0.5	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-1	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									○			○			
Underground									⊕	○		⊕			
Work Rules									⊕	⊕		⊕		⊕	⊕
ANSI Z535 Utility Safety Signs												⊕			⊕
Continuing Education Units	0.35	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	6.0	10.0	100	13.5	13.5	17.0	17.0	6.0	20.5	20.5	24.0	6.0	6.0	100

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*

**0.5-day Applying the 2007 NESC Clearances Rules**

(one instructor unless over 35 people)  
0.5-DA-1 [0.35 CEU; 3.5 PDH]

**Day 1 (8:00 am – 12:00 pm)**

Introduction  
Development of Overhead Clearances  
Structure Location  
Clearances above railroads, roadways, parking lots, driveways, farm areas, pedestrian areas, and water areas  
Building clearances

**1.0-day Clearances for Communication Facilities on Joint-Use Lines Workshop**

(one instructor unless over 35 people)  
1.0-DA-3-CC [0.60 CEU; 6.0 PDH]

**Day 1 (8:00 am – 4:00 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, & water  
Vertical and horizontal clearances between wires, conductors, & cables  

- At the pole
- In the span

**Lunch**

Using sag and tension calculations  
Effects of differences in sags and tensions on clearances and loads  
Calculations of required clearances at poles for various spans, types, and sizes of power conductors and cables and telephone and CATV cables  

- in the supply space
- in the communication
- in the communication space
- worker safety zone

Special considerations for fiber-optic cables  
Selection of pole heights for various spans and configurations

**1-day Introduction to the NESC (one instructor unless over 35 people) 1.0-DA-3-CC [0.60 CEU; 6.0 PDH]**

**Day 1 (8:00 am – 4:00 pm)**

Applying the National Electrical Safety Code  
Inspection of Utility Facilities  
Grounding  
Electric Supply Stations and Equipment  
Underground Lines  
Work Rules for the Operation of Electric Supply and Communication Lines and Equipment  
Relations Between Various Classes of Overhead Lines & Equipment  
Conductor Movement and Resulting Clearances

**Lunch**

Clearances Above Ground, Rails and Water  
Clearances to Buildings and Other Installations  
Crossing Clearances  
Overhead Strengths and Loadings

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

(one instructor unless over 35 people)  
1.0-DA-1 [0.60 CEU; 6 PDH]

**Day 1 (8:00 am – 4:00 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  
Building clearances  
Swimming pool clearances  
Grain bin clearances  
Limited discussion of grounding methods of Section 9

**1.0-day Clearances for Communication Facilities on Joint-Use Lines Workshop**

(one instructor unless over 35 people)  
1.0-DA-3-CC [0.60 CEU; 6 PDH]

**Day 1 (8:00 am – 4:00 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, & water  
Vertical and horizontal clearances between wires, conductors, & cables  

- At the pole
- In the span

**Lunch**

Using sag and tension calculations  
Effects of differences in sags and tensions on clearances and loads  
Calculations of required clearances at poles for various spans, types, and sizes of power conductors and cables and telephone and CATV cables  

- in the supply space
- in the communication
- in the communication space
- worker safety zone

Special considerations for fiber-optic cables  
Selection of pole heights for various spans and configurations

**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
- Lunch**
- Required loadings                      ■ Abandoned cables
  - Overload factors                      ■ Effect of unguyed service drops
  - Strength factors
  - Overlashed cables                      ■ 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.