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# 1. DANESC Seminars on Development and Application of the 2012 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 – 2012 Edition (PCU Training Center can provide at extra cost)
- ◆ NESC Handbook – 7<sup>th</sup> Edition (optional; at extra cost)

**Power & Communication Utility Training Center DANESC In-House Seminars**

Topics	Clearances	Supply Stations	Clearances & Grounding								Broad Coverage				Targeted 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	1.5	2.5	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 <sup>1</sup>	DA-2-JU	DA-1-IN	DA-1	DA-2-JU	DA-1	DA-3	DA-3	DA-3	DA-4-GB	DA-4-GB
NESC Structure & General Rules	Sel	Min	Sel	Min	Full	Full	Ext	Ext	Ext	Ext	Sel	Ext	Ext	Ext	Full	Full	Ext	Ext	Ext
Grounding Requirements			Full	Full	Full	Full	Full	Full	Full	Full	Full	Full	Full	Full	Full	Full	Full	Full	Full
Grounding Methods			Min	Min	Sel	Min	Sel	Sel	Full	Full	Sel	Ext	Ext	Ext	Min	Min	Sel	SpTop	SpTop
Overhead Lines—General							Min		Min	Min	Sel	Sel	Sel	Sel			Min	Sel	Sel
Overhead Clearances	Min		Sel	Full	Sel	Sel	Sel	Sel	Full	Full	Sel	Full	Full	Ext	Sel	Sel	Sel		
Supply Station Clearances									Full			Full		Full					
Underground Clearances									Full			Full		Full					
Exercises in Applying the NESC					Sel	Sel	Full	Sel	Full	Full		Ext	Ext	Ext		SpTop	Full		
Exercises in Using Sag & Tension Charts for Loadings & Clearances						Min		Full		Full		Min	Full	Full	Min	Sel	Full		
Information Required to Determine Joint Use Clearances						Full		Full		Full		Full	Full	Full	Full	Full	Full		
Pole Loading & Strength Calculation Exercises														Min					
Overhead Strengths & Loadings											Sel			Sel					
Overhead Line Insulation											Min			Min					
Supply Stations		Full																	
Underground											Sel	Min		Sel					
Work Rules											Sel	Sel		Sel				Sel	Sel
ANSI Z535 Utility Safety Signs														Sel					Sel
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	0.95		0.60	1.00
Professional Development Hours	3.5	3.5	6.0	6.0	10.0	100	13.5	13.5	17.0	17.0	6.0	20.5	20.5	24.0	6.0	9.5		6.0	100

Legend	
Min	Minimal Coverage
Sel	Selected Rules
Full	Complete Rules
Ext	Expanded Discussion
SpTop	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*

<sup>1</sup> DA-1A omits supply station clearances;  
DA-1B omits underground clearances

**0.5-day Applying the 2012 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

**0.5-day Applying the 2012 NESC Electric Supply Stations**

**(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  
 Protective arrangements: lighting, fence clearances, storage  
 Installation & maintenance: inspections, guarding & clearances to live parts, grounding  
 Rotating Equipment  
 Storage Batteries  
 Transformers & Regulations: location, fire hazard requirements  
 Conductors  
 Circuit breakers, reclosures, matches, fuses  
 Switchgear and metal-enclosed bus  
 Surge arresters

**1.0-day Introduction to the NESC**

**(one instructor unless over 35 people)**  
 1.0-DA-1-IN [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 2012 NESC Overhead Clearances**

**(one instructor unless over 35 people)**  
 1.0-DA-2 [0.60 CEU; 6 PDH]

*Day 1 (8:00 am – 4:00 pm)*

Introduction  
 Utility responsibilities: How to use the code: Grandfather Clause  
 Inspections  
 Clearances above railroads, roadways, parking lots, driveways, farm areas, pedestrian areas, and water areas  
**Lunch**  
 Clearances to other line structures, buildings, swimming pools, and grain bins  
 Cable to cable and cable to conductor clearances  
 Joint-use clearances: supply space, communication space, communication worker safety zone  
 Clearances of vertical and lateral conductors and cables  
 Antenna clearances  
 Cable and conductor crossing clearances

## 1.0-day Major Changes in the 2012 NESC

(one instructor unless over 35 people)  
0.5-DA-1 [0.6 CEU; 6 PDH]

*Day 1 (8:00 am – 4:00 pm)*

**Section 1-Introduction:** American Nat'l Std, 010A,B,C, Fig 011-1, 011C1-C2, 013A2c, 013B2, 014A2, 015D, 016

**Section 2-Definitions:** Area lighting, delivery point, exclusive control of utility, premises wiring, service point, utility, utilization equip, public utility, private utility, authorized person, exclusive control, premises, supervised installation, clearance, vertical conductor, effectively grounded neutral conductor, communication line in supply space, joint-use lines, vault, lateral conductor, effectively grounded, supported facility

**Section 9-Grounding Methods:** 091, 093D, 094B7, 099B

**Part 1-Electric Supply Stations:** 110B2, 111A, Table 111-1, 114-Exception, 124A1, 124A3, 124D

**Part 2-Overhead:** 214A4-A5, 215C1-C6, 217A1a, 217A2b, 217A4, 218A1, 230A3, 230A4, 230B, Fig 230-1, Table 230-1, -2, Table 232-1, 233B, 234B-C, 234C3, Table 234-1 & Key FN, 235B1b, 235C, Table 235-5 FN, 235C2, 235G, 235G3, 235H2, Table 235-6, 238A, Table 242-1, 250B, Table 250-1, 250C2, 253, Table 253-1 & FN, Table 253-2, 260A1, 261B, 261H1b, Table 277-1, 279A1b

**Part 3-Underground:** Sect 32 Note 2, 323E5, 350F&G, 352A2, 352D1&2, Table 351-1, 354A2, 380D-Exception 2

**Part 4-Work Rules:** 410A3, Table 410-2, -3, 420K8, 421A6, 422A2, 431C, Table 431-1, 441, 441A1, A4, Table 441-1, 444D, 445

**Appendixes:** Appendix A-1 Table, Appendix C, Appendix E

## 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 2012 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 safety zone
- communication space

Selected grounding methods of Section 9

## 1.5 day Applying the 2012 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 safety zone
- communication space

Developing clearances for various span lengths

Selected 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 states  
 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 states  
 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 am)

Customer grounding problems - covering some aspects of the NESC and NEC.  
 Temporary grounding requirements for line workers

*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.