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 – 7th Edition (optional; at extra cost)
## Power & Communication Utility Training Center DANESC In-House Seminars

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### Legend
- Min: Minimal Coverage
- Sel: Selected Rules
- Full: Complete Rules
- Ext: Expanded Discussion
- Sp/Top: 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 DA-1A omits supply station clearances; DA-1B omits underground clearance
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** Full seminar code = Number of days followed by seminar code suffix, such as 2.5-DA-2-JU

1 DA-1A omits supply station clearances;
DA-1B omits underground clearance
### 0.5-day Applying the 2012 NESC Clearances Rules
**Day 1 (8:00 am – 12:00 pm)**
- Introduction
- 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
**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

### 0.5-day Applying the 2012 NESC Underground Rules
**Day 1 (8:00 am – 12:00 pm)**
- Introduction
- Grandfather Clause
- Installation & maintenance reqmts
- Inspection reqmts
- Grounding reqmts
- Conduit Systems: materials, clearances
- Supply cable requirements
- Cables in underground structures: manhole clearances; grounding, bonding
- Direct-buried cables & cable in duct-not part of a conduit system: clearances, cable requirements; burial depths; deliberate separation versus random separation between cables
- Risers for poles & padmounted installations
- Supply cable terminations; clearances & grounding
- Equipment: design; location; grounding & bonding
- Installations in tunnels

### 0.5-day Applying the 2012 Strengths & Loadings Rules
**Day 1 (8:00 am – 12:00 pm)**
- Introduction
- Which NESC Edition applies; Grandfather Clause
- Section 24: Grades of construction for conductors and line supports
- Section 25: Loads for Grades B and C
  - Rule 250B combined ice and wind loading
  - Rule 250C extreme wind loading
  - Rule 250D extreme ice (from freezing rain) and concurrent wind loading
- Rule 251 conductor loading
- Rule 252 loads on line supports
- Rule 253 Load factors
- Section 26: Strength requirements
  - Preliminary assumptions
    - Grades B & C construction: allowed strengths of different materials; Stress limits for different structural components, conductors, and cable messengers; Strength factors
    - Grade N construction
  - Section 27: Line insulation requirements
    - Stress limits

### 1.0-day Introduction to the NESC
**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
**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 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

Appendices: 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-JUI [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

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 CATV cables

- in the supply space
- in the communication

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

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 space

- safety zone

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

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 space

- safety zone

Developing clearances for various span lengths

Selected grounding methods of Section 9
**1.5 day Clearances Rules for Joint-Use Overhead Lines**  
(one instructor unless over 35 people)  
1.5-DA-3-JUI [1.00 CEU; 10 PDH]  

**Day 1 (8:00 am – 5:00 pm)**  
Introduction  
Utility responsibilities: How to use the code: Grandfather Clause  
Definitions and references  
Inspections  
Structure Location  
Lunch  
Ground, Rail & Water clearances  
Conductor to Conductor clearances  
Joint-Use clearances: supply space, communication space, communication worker safety zone  
Climbing space clearances  
Working Space clearances  
Clearances of vertical and lateral conductors and cables  
Developing clearances for various span lengths  

**Day 2 (8:00 am – 11:00 am)**  
Exercises to determine required clearances using photographs of actual installations

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**2.0-day Applying the 2012 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  
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 space  
- communication worker safety zone  
Climbing Space clearances  
Working Space clearances  
Clearances of vertical and lateral conductors and cables  
Selected grounding methods of Section 9

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**2.0-day Applying the 2012 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  
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 space  
- communication worker 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 2012 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
- **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
- Swimming pool clearances
- **Grain bin clearances**
- **Lunch**
- Conductor to conductor clearances
  - Supply space
  - Communication space
  - Communication worker
  - 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 2012 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
- **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
  - Supply space
  - Communication space
  - Communication worker
  - 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
### 2.5-day Joint-Use Overhead Line Clearances and Inspection

(one instructor unless over 35 people)

2.5-DA-3-JUI [1.70 CEU; 17.0 PDH]

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<td>Exercises to determine required clearances using photographs of actual installations</td>
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### 2.5-day Overhead Clearances

Grounding Loadings & Strengths

(one instructor unless over 35 people)

2.5-DA-4-OH [1.70 CEU; 17.0 PDH]

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<td>Safety zone</td>
</tr>
<tr>
<td>Lunch</td>
</tr>
<tr>
<td>Climbing Space Clearances*</td>
</tr>
<tr>
<td>Working space Clearances*</td>
</tr>
<tr>
<td>Clearances of Vertical and Lateral Conductors and Cables*</td>
</tr>
<tr>
<td>Overhead loading &amp; strengths</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Day 3 (8:00 – 11:00 am)</th>
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</thead>
<tbody>
<tr>
<td>Overhead loading &amp; strengths cont’d</td>
</tr>
<tr>
<td>Grounding requirements of parts 1 and 2</td>
</tr>
<tr>
<td>Grounding methods of Section 9*</td>
</tr>
</tbody>
</table>

Adjourn
2.5-day Overhead Transmission Clearances & Grounding
(one instructor unless over 35 people)
2.5-DA-4-TR [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

Lunch
Structure Location*
Vertical clearances above railroads, roadways, parking lots, driveways, farm areas, pedestrian areas, and water areas
History of vertical clearance changes applicable to transmission line ratings

Day 2 (8:00 am – 5:00 pm)
Vertical clearances cont’d
Cable and conductor crossing clearances*
Clearances to other line structures*
Building clearances
Bridge clearances
Swimming pool clearances
Grain Bin clearances

Lunch
Cable to cable and cable to conductor clearances*
Joint-use clearances
■ supply space
■ communication space
■ communication worker
■ safety zone
■ antennas, cameras, etc.

Climbing space clearances*
Working space clearances
Clearances of vertical and lateral conductors and cables*
Introduction to NESC strengths and loadings rules

Day 3 (8:00 – 11:00 am)
Supply station clearances
Grounding requirements of parts 1 and 2
Grounding methods of Section 9* applicable to transmission

Adjourn
3.0-day Applying the 2012 NESC  
(two instructors required)  
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

**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 space
  - communication worker
  - 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 2012 NESC Clearances & Grounding Rules for Joint-Use Overhead Lines  
(two instructors required)  
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

**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 space
  - communication worker
  - 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

**Lunch**

Supply Station clearances
Underground Installation Clearances
Selected Work Rules

3.5-day Applying the 2012 NESC (two instructors required)  
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
- 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 space
  - communication worker
  - safety zone
- Grounding requirements of Parts 1, 2, and 3
- Grounding Methods of Section 9

**Day 4 (8:00 am – 11:00 am)**
- Overhead General
- Vegetation Management
- Selected Line Installation Rules

**Day 4 (8:00 am – 11:00 am)**
- Selected Strengths and Loadings
- Abandoned cables
- Effect of unguyed service drops
- Sidewalk guys
1.0-day Grounding & Bonding Workshop
(one instructor unless over 35 people)
1.0-DA-5-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"
"Objectable 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

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.

1.5-day Grounding & Bonding Workshop
(one instructor unless over 35 people)
1.5-DA-5-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
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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