2017 National Electric Safety Code

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2017 NESC

• Pre-Print published Sept 1, 2014
  – Proposed rule changes
  – 934 pages of text

• Draft text of 2017 NESC
  – Available to committee members
  – Implies which changes were approved
  – NOT final
    • Some material presented herein may not be reflected in
      the final version of the 2017 NESC

• 2017 NESC is schedule for publication in August 2016
2015 NESC Summit

• Held to discuss future direction of the NESC
  - Safety Code or
  - Design Code or
  - Both?

• Should the NESC address safety
  - And other standards address design
  - ASCE Manual 74 – Guidelines for Electrical Transmission Line Structural Loading

• Some wish NESC to address Resiliency
  - Substation safety for the Public
  - Substation Safety FROM the public (vandalism)

• No conclusions but expect more movement in the future
Major Changes in 2017 NESC

• Add exemptions to 4 grounds per mile
• Substation fences cannot be connected to another fence
• Add/modify rules for solar panels on poles
  – Treat as supply equipment
• Grade B if lines can fall on highway/railroad
• Change in tension limits
• Change in Extreme Wind/Extreme Ice
• Work Rules to match 29 CFR 1910
• Hundreds of minor changes
096C – Multi-Grounded Systems

• Defines the grounding intervals for the neutral conductor
  – Connected to made electrode at each transformer and at a sufficient number of additional points to total not less than 4 grounds in each mile, excluding grounds at individual services

• New Exceptions
  1. Cable crossing water
  2. Buried cables in conditions where meeting the rule would be difficult
  3. Overhead river crossings or mountainous terrain
096C – Multi-Grounded Systems

• Exception 1: Underwater crossings
  – Included in the 2012 NESC
  – Allows grounding each end of the cable
  – New requirement
    • All locations where the cable is accessible to personnel, the neutral shall be effectively grounded.
**096C – Multi-Grounded Systems**

- Exception 2: Buried cables where meeting the Rule would be difficult
  - No need to meet 4 grounds per mile
- Underground cable between riser pole and transformer exceeds 1,320 feet (1/4 mile)
  - Should install a ground in the middle of the cable run
- 2017 NESC recognizes that this is not practical
  - Concrete encased duct lines
  - Cable in conduit
  - Need to remove protective jacket
    - Reduces life of the cable
096C – Multi-Ground Systems

• Exception 3: River Crossing/Mountainous Terrain
  – Where terrain (river crossings or mountainous areas) limits the installation of supporting structures every ¼ mile or less
    • Requirement for 4 per mile does not apply for THIS portion of the line
    • ALL available structures should be grounded

• Consistent with Rule 092C
Part 1 Safety Rules for Electric Supply Substations

The words “safety rules for” was added to the title to be consistent with Parts 2 and 3.
Section 11 - Protective Arrangements

• Rule 110A1 – New Rule
• Substation station fence shall not be connected to or located within 6 feet of another fence.
  – Exception: Substation fence can be connected if a non-conductive section is inserted in the fence such that no portion of the conductive substation fence is located within 6 feet of the other fence
• If substation fence is electrically in contact with an adjacent fence:
  – Individuals are at risk of receiving hazardous voltages
  – If there is a 1 or 2 foot gap, utility personnel and the public are at risk if they are touching both fences during an event in the substation.
Isolating Substation Fences

• To provide protection
  – Separate fences by 6 feet
  – Insert non-conductive elements to create a fence in the gap if needed

• Existing fences may be grandfathered
  – Not a bad idea to review existing substation fences
Part 2 – Safety Rules for Overhead Lines
217C Protection and Marking of Guys

- The ground end of anchor guys exposed to pedestrian traffic shall be provided with a substantial and conspicuous marker.
  - Required only where there is pedestrian traffic
- Addition to the Rule
  - In the case of two or more guys attached to a single anchor, a marker may be placed on each, but only one is required for the assembly
  - Consistent with an interpretation (IR350) in 1984
• Marker only required on one guy
232 Vertical Clearances of Wire Conductors, Cables and Equipment Above Ground, Roadway, Rail or Water Surfaces

- Rule 232 is vertical clearance only
- Added the NOTE:

  *Horizontal clearances are not specified in this rule. As a result, Rule 012C requires good practice for the given local conditions.*
Table 232 - Clearance over Roads

- Table 232-1, footnote 7 -
  - Where residential buildings do not permit service drops to meet these values (16 feet) the clearance over residential driveways only may be reduced as follows: 12 feet for triplex conductors 150V phase to ground

- New Text
  - Where vehicles exceeding 8 ft in height are not normally encountered nor reasonably anticipated, the clearance over residential driveways only may be reduced to the following

- Driveway may limit big trucks.
- Now very subjective for the designer
Table 232 - Clearance over Roads

6 - 12 feet when the height of the residential building limits the height of the service and service is crossing a residential driveway. 16 feet required for commercial driveways.
234C3 Conductors Attached to Building

- 234C3d: Vertical clearance for service drops
  - 2012 NESC expanded description of balcony to include porch and attached deck
  - Vertical clearance over accessible balconies 10 feet

- 2017 NESC Change
  - Delete porch (porch has a roof per NESC)
  - Add fire escapes and readily accessible roofs
  - Conductors within 3 of deck need 10 feet of clearance
234E(1) Swimming Pools

- Swimming pool clearance based on use of a skimmer, vacuum or Sheppard's hook

**Clearance Over* or Near Swimming Pools NESC 234E1**

Reference NESC Rule 234E for Diving platforms, water slide, or other pool objects greater than 8 feet in height.

**Height above ground per NESC Table 232-1**

**Required NESC Clearance Zone**

**Exception:** Vertical clearance does not apply to neutral, comm, grounded guy, or TPX that are 10 feet or more from edge of pool, diving platform, slide, or pool objects.
234E(1) Swimming Pools

- Added the words “in-ground or permanently installed above ground” to clarify the type of pool.
- Also added from what point the vertical clearance is to be measured from, i.e., “the top of the pool wall or from the highest point from where people can stand.
- Added NOTE: *Permanently installed aboveground pools are ones that are not intended to be moved or routinely disassembled.*
Aboveground swimming pool with deck. Clearance is maintained from the highest point of the installation upon which people can stand.

Aboveground swimming pool without a deck. Required clearance is maintained above ground.
235I - Communication Antenna Clearances

- NESC Committee notes that rules for antennas are hard to find and understand
- Rule 235I modified to help with clarity
- Antenna defined as 3kHz to 300 GHz
- “Antennas function as rigid (vertical or lateral) open wire communication conductor”
  - Helps in the application of Table 235-6
- Also see Footnotes in Table 235-6
  - Modified Footnote 13
  - New Footnote 17
236 - Climbing Space

- 236D. – Location of equipment relative to climbing space
  - Equipment can not impede climbing space
  - 2017 NESC - Adds photovoltaic panels and power supplies to the equipment list.
  - New definition of power supplies
    - Power supplies supporting CATV or communication amplifiers
200,000 Poles with 200 watt Solar
Grades of Construction
Rule 241C at Crossings

• This rule defines “at crossings” which is used in load factors and grades of construction.
  – At Crossing ➔ crossing another utility
• Mostly editorial change to make it easier to read.
• “Wires...when they cross over, overhang, or can fall into a railroad track, traveled way of a limited access highway, or navigable waterways requiring permits.”
• “can fall into” is an expansion of this rule
250C and 250D

• For several years, the NESC has considered eliminating the exemption of distribution facilities from extreme wind and extreme ice

• Distribution engineers argue
  – Trees fail from ice and wind
  – Added strength would not improve reliability

• Transmission engineers argue
  – Wind does not stop blowing below 60 feet
  – Data from Florida used to confirm

• Exclusion will continue in the 2017 NESC
Rule 250C Extreme Wind

• ACSE updated their weather loading maps in 2010
  – Not available in time for 2012 NESC

• New computer models indicate that wind speeds decay faster once the storm moves inland.
  – Areas once in hurricane-prone regions will not be in the ASCE-7 2010 Extreme Wind Maps
2012 Wind Speed (Red)
2017 Wind Speed (Black)
Rule 250D Extreme Ice with Concurrent Wind Loading

- ACSE updated their weather loading maps for extreme ice in 2010
  - Not available in time for 2012 NESC
  - In addition new Figures to be consistent with temperatures specified in the 2010 ACSE 7-2010 at which the ice and wind are intended to be applied
Rule 250D Extreme Ice

Figure 250-4(a)—Temperatures concurrent with ice thickness due to freezing rain: Contiguous 48 states
Linear vs Non-Linear Analysis

- **Rule 252D**
  - Structure shall be designed to withstand the simultaneous application of vertical, transverse and longitudinal loads.

- **Rule 260A**
  - Deformation, deflections or displacement of the structure may change the effects of the loads assumed.
  - When the effects can be evaluated.

- **Push to go to non-linear analysis**
  - No hand calculations
Linear vs Non-Linear Analysis

- Proposal to have two sets of load factors
  - Linear Loads
    - Increase load factors for extreme wind and extreme ice
  - Non-Linear Loads
    - Same Table 253-1 as in 2012 NESC
- Not clear at this time if this change will be approved.
261H Tension Limits

• A major change in the tension limits
• Underlying reason is the need to control Aeolian vibration
  – Wind induced vibration causes fatigue of the conductor
• Tension limits per 2012 NESC:
  – Initial unloaded tension 35% at 60F
  – Final unloaded tension 25% at 60F
  – Reducing the tension of the conductor helps to mitigate this vibration
261H Tension Limits

• Unloaded tension limits used by the 2012 NESC:
  – May not always adequately protect against wear and fatigue due to vibration.
  – But, conductor failure from Aeolian vibration is rare seemingly because utility designs provide alternate means of control

• Conductor manufacturers recommend:
  – Less tension
    • Unloaded and loaded conditions have less tension
261H Tension Limits

- 2017 NESC allows designers to use different means to control vibration for the type of conductor
- 2017 NESC reduces tension
  - Changed the unloaded condition
  - 35% based on Loading District temperature (Table 251-1)
  - 25% based on Loading District temperature (Table 251-1)
  - Similar to manufacturer recommendations
Part 4 Work Rules

- In response to OSHA 29CFR 1910.269 and 1926 Subpart V final rulings published April 11, 2014
  - NESC made changes to harmonize Part 4 with current OSHA rules
- Items changed
  - Rule 410A3
  - Rule 420K
  - Table 431-1
  - Rule 441
  - Table 441-1
  - Table 441-2, 441-3 and 441-4
410A3b – Arc Rated Clothing

• Require employees to cover the entire body with arc rated clothing and equipment having an arc rating not less than anticipated level of arc energy
  – Underline text is new

• Exceptions, Added 2-5
  – Exception 1 – if clothing creates a greater hazard
  – Exception 2 – Rubber insulating gloves with protectors up to 14 cal/cm²
  – Exception 3 – Heavy duty boots
  – Exception 4 – Hardhat meeting 29 CFR 1910.135 for incident energy less than 9 cal/cm²
  – Exception 5 – DC systems 50V to 250 V
420K Fall Protection

• Change in rule
  – Harmonize with OSHA 1910.269(g)(2)(v):
    – Fall arrest equipment shall be used by employees working at elevated locations more than 4 feet above ground on poles, towers, or similar structures.
  
• At elevation above 4 feet (not 10 feet as in old rule)
  – Employees shall use a fall protection system

• Rule expanded but consistent with OSHA requirements
Summary

• 2017 NESC is still being developed
  – Changes will be made for release in August
• NESC Committee trying to decide
  – A Design code?
  – A Safety Code?
• Final NESC available in August 2016
2016 Tech Advantage

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