National Electrical Safety Code

Nelson G. Bingel III
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NESC
Chairman Strength & Loading
Executive Subcommittee
Main Committee

ASC O5 Committee - New Pole Specs
Chairman

Osmose Utilities Services, Inc
Vice President – Engineering

April 28, 2016
Inaugural NESC Summit

The NESC Summit — the first meeting of its kind to help guide the future of safety in the electrical power and communications environments.

100 Year NESC Anniversary
Keynote Speakers & Bios

Ms. Patricia Hoffman
Assistant Secretary
U.S. Department of Energy
Office of Electricity Delivery and Energy Reliability

Patricia Hoffman is the Assistant Secretary for the Office of Electricity Delivery and Energy Reliability at the U.S. Department of Energy. The Office of Electricity Delivery and Energy Reliability leads the Department of Energy’s (DOE) efforts to modernize the electric grid through the development and implementation of national policy pertaining to electric grid reliability and the management of research, development, and demonstration activities for “next generation” electric grid infrastructure technologies.

Mr. James Maddux
Director of the OSHA Directorate of Construction, Department of Labor, Occupational Safety and Health Administration (OSHA)

Jim Maddux is Director of the OSHA Directorate of Construction. Before being appointed to the construction position in 2011, Jim held several leadership positions at OSHA, including Director of the Office of Physical Hazards, the Office of Maritime, the Office of Biological Hazards, the Office of Safety Systems, and Acting Deputy Director for the Directorate of Standards and Guidance. Jim has been a project director, author and contributor to numerous OSHA
High Powered Speakers

Bob W. Bradish  AEP
Vice President – Transmission Grid Development

Daniel K. Glover  Southern Company
Vice President – Power Delivery - Distribution

Robert Woods  Southern California Edison
Managing Director of Asset Management and Operations Support

Stephen A. Cauffman  NIST-National Institute of Standards & Tech
Manager, Community Resilience Program

Jorge A. Camacho,PE  PSC – District of Columbia
Chief, Infrastructure and System Planning
2015 NESC Summit
Schedule for 2017 NESC

Submit change proposals:
Jan 2012 - July 2013

First Subcommittees Votes:
Sept-Oct 2013

Preprint Distributed:
September 2014

Public Comments Until:
May 2015

Subcommittees Vote on Comments:
Sept-Oct 2015

Draft Submitted for Letter Ballot:
January 2016

Revisions Submitted to ANSI:
May 2016

Published:
August 2016

Effective:
January 2017

19 Months
13 Months
13 Months
9 Months
6 Months
3 Months
3 Months
3 Months

2017 NESC

National Electrical Safety Code® C2-2017

IEEE STANDARDS ASSOCIATION

3 Park Avenue, New York, NY 10016-5997, USA
Insulators – New Rating System

Old Line Post ratings:
Rating equal to average
Lowest not less than 85% of average

New Line Post ratings:
Rating = Minimum of all insulators
Insulators – New Rating System

Old Transmission Suspension ratings:
1.2 standard deviations

New Transmission Suspension ratings:
3.0 standard deviations
Insulators

CP Intention:

- Adjust allowable stresses
- Mostly equivalent insulator applications
- Introduce Classes: Distribution & Trans
- Different allowables for Rule 250B vs 250C, D
Aeolian Vibration – Rule 261H.1.b

261. Grades B and C construction

H. Open supply conductors and overhead shield wires

b. The potential for Aeolian vibration damage to conductors and related hardware shall be considered. Aeolian vibration mitigation shall be based on a qualified engineering study, manufacturer’s recommendations, or experience from comparable installations. Consideration shall include but is not limited to: conductor material, stranding, type, size, tension, conductor attachment hardware, span length, wind exposure, and expected atmospheric loadings.

If from these considerations, mitigation actions are considered necessary, recognized vibration mitigation methods include, but are not limited to, the appropriate use of one or more of the following:

— vibration control devices
— stress-reduction devices
— self-damping conductors and (or) vibration resistant conductors
— reducing design tension limits for cold weather condition
Aeolian Vibration – Rule 261H.1.b

261. Grades B and C construction

Final Action: Accept

H. Open supply conductors and overhead shield wires

c. If limiting tension in Rule 261H1b(4) is the only method applied to mitigate any potential Aeolian vibration damage, the tension at the applicable temperature listed in Table 251-1 shall not exceed the following percentages of the conductor’s rated breaking strength:

- 35% at initial tension without external loading
- 25% at final tension without external loading

NOTE 1: Initial tension in this application is a conductor condition that exists immediately after installation. This condition exists before inelastic elongation, creep or stress relaxation occurs and before the conductor is subjected to external loads.

NOTE 2: Final tension in this application is intended to be the tension that exists after long term creep and prior to ice or wind loading.

NOTE 3: The above percentage limits may not protect the conductor or facilities from damage due to Aeolian vibration.
2017 NESC Changes

The Future of the NESC
Loading Directions

TRANSVERSE

LONGITUDINAL

NESC

IEEE STANDARDS ASSOCIATION
Transverse Load
Wind Pressure vs Wind Speed

Wind Pressure - PSF

Wind Speed - MPH

125%

50%
Maximum Stress Point

Solid, Round, Tapered, Cantilever

Load
(Wind Force on Wires, Equip., etc.)

Max Stress @ 1.5 Diameter Load Point

Distribution Usually Groundline
GO95 District Loading

GO 95 Light
0” Ice - 56 MPH
<3000 ft elevation
8 PSF

GO 95 Heavy
½” Ice - 48 MPH
>3000 ft elevation
6 PSF
NESC District Loading

- ½" Ice – 40 mph
- ¼" Ice – 40 mph
- 0" Ice – 60 mph
GO95 District Loading

GO 95 Heavy

0” Ice – 56 MPH
<3000 ft elevation
8 PSF

1/4” Ice – 40 mph
4 PSF

1/2” Ice – 48 MPH
6 PSF

NESC Medium

NESC Light

0” Ice – 60 mph
9 PSF
Wood NESC Safety Factors

1977 NESC

Grade B  Safety Factor = 4

Grade C  Safety Factor = 2

1977 NESC

.65 Strength Factor
2.50 Load Factor

.85 Strength Factor
1.75 Load Factor
Wood NESC Safety Factors

Load Resistance Factor Design

Load * Factor < Resistance * Factor

(Strength)

1997 NESC

Pole Strength x 0.65 > Storm Load x 2.5 (B)
Pole Strength x 0.85 > Storm Load x 1.75 (C)
## Safety Factor Comparison

<table>
<thead>
<tr>
<th>Grade</th>
<th>Wood SF</th>
<th>Grade</th>
<th>Wood SF</th>
<th>Grade</th>
</tr>
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<tbody>
<tr>
<td>B</td>
<td>3.85</td>
<td>A</td>
<td>4</td>
<td>A</td>
</tr>
<tr>
<td></td>
<td></td>
<td>B</td>
<td>3</td>
<td>B</td>
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<tr>
<td>C</td>
<td>2.06</td>
<td>C</td>
<td>2</td>
<td>C</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Grade</th>
<th>Wood SF</th>
<th>Grade</th>
<th>Wood SF</th>
<th>Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>B</td>
<td>2.5</td>
<td>A</td>
<td>1.5</td>
<td>A</td>
</tr>
<tr>
<td></td>
<td></td>
<td>B</td>
<td>1.25</td>
<td>B</td>
</tr>
<tr>
<td>C</td>
<td>1.75</td>
<td>C</td>
<td>1.25</td>
<td>C</td>
</tr>
</tbody>
</table>
Safety Factor Reductions

Increasing Load Requires:
1. Knowing Remaining Strength
   or
2. Applying 4.0

GO 95
+33%

NESC
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Strength
-33%

Load
-33%
## Load Safety Factor Comparisons

<table>
<thead>
<tr>
<th>Code</th>
<th>District</th>
<th>Grade</th>
<th>Wind Pressure</th>
<th>Safety Factor</th>
<th>Factored Pressure</th>
</tr>
</thead>
<tbody>
<tr>
<td>GO 95</td>
<td>Light</td>
<td>A</td>
<td>8</td>
<td>4</td>
<td>32</td>
</tr>
<tr>
<td>GO 95</td>
<td>Light</td>
<td>A</td>
<td>8</td>
<td>2.67</td>
<td>21</td>
</tr>
<tr>
<td>NESC</td>
<td>Light</td>
<td>B</td>
<td>9</td>
<td>3.85</td>
<td>35</td>
</tr>
<tr>
<td>NESC</td>
<td>Light</td>
<td>C</td>
<td>9</td>
<td>2.06</td>
<td>19</td>
</tr>
</tbody>
</table>
Load Safety Factor Comparisons

- GO 95-A
  - When Installed
  - At Replace
- NESC B
- NESC C
The NESC Going Forward

Safety

Reliability

Resilience
NIST Announces Two Grant Programs for Middle School Teachers
Release Date: 01/07/2015
The 2014 NIST Summer Institute for Middle School Teachers class, The National Institute of Standards and Technology (NIST) has announced two ... more

NIST Contributes to Media’s Top Science Stories of 2014
Release Date: 01/07/2015
Cool instruments—literally—made by the National Institute of Standards and Technology (NIST) contributed to the media’s top science stories of ... more

NIST Grants for Undergraduate Research Announced
Release Date: 01/07/2015
The National Institute of Standards and Technology (NIST) is
Disaster Resilience Framework Document

The Disaster Resilience Framework will identify typical performance goals; existing standards, codes, and practices to enhance resilience; and gaps that must be addressed to enhance community resilience. The first version of the Framework will provide the basis for convening a Disaster Resilience Standards Panel (DRSP) representing the broad spectrum of the stakeholder community to further develop and refine the Framework.

Credit: NIST
The Future

National Institute of Standards & Technology
Department of Energy
California Public Utility Commission
Edison Electric Institute
American Society of Civil Engineers
Non-linear Analysis
Solar
Wind
2017 NESC Changes
The Future of the NESC
National Electrical Safety Code

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