REVIEW OF 2007 ELECTRIC INFRASTRUCTURE STORM HARDENING PLAN FILED PURSUANT TO RULE 25-6.034, F.A.C., SUBMITTED BY PROGRESS ENERGY FLORIDA, INC.

DOCKET NO. 070298-EI

DIRECT TESTIMONY OF

MICKEY GUNTER

August 24, 2007

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07 AUG 24 AM 11:59
COMMISSION CLERK

Q. Please state your name and business address.

A. My name is Mickey B. Gunter. My address is 415 Bells Ferry Road NE, Rome, Georgia 30161.

Q. By whom are you employed and in what capacity?

A. I am currently a consulting engineer and a retired engineer from Georgia Power Company.

Q: Please describe your responsibilities during your employment with Georgia Power Company?

A: I started work at Georgia Power Company in 1966 as a Junior Engineer and was promoted to District Engineer in 1971 for the Austell District where I was responsible for the distribution engineering, operations and maintenance activities. From 1973 through 1990, I held several positions in the company and my responsibilities included, at various times, the supervision of all distribution engineering, line construction, supervising mapping, metering, reviewing and

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approving of all large distribution engineering projects, support planning, and training activities all of which were in the Rome Division of Georgia Power Company. From 1990 to 2004, I held several positions and was responsible for developing and maintaining Georgia Power Company's Distribution Specifications. I was also involved in conducting Construction Standards update forums for line personnel and engineers along with assisting in developing and teaching distribution engineering personnel which included line design, NESC and other engineering related topics. I held this position until I retired in 2004. I am currently involved in teaching NESC schools for the Southern Company and various other electric utilities. Some of the electric utilities and/or organizations that I have taught NESC classes and/or conducted NESC update seminars other than Georgia Power Company include: Gulf Power Company, Savannah Power Company, Mississippi Power Company, Tampa Electric Company, Colorado Springs Utility, AEGIS Insurance Company (various electric utilities), Central Louisiana Electric Company, Entergy, South Carolina Gas & Electric, Jackson EMC, Blue Ridge EMC, Patterson & Dewar Engineering, Tri-County EMC, Entergy Council of the NE, the Southeastern Electric Exchange, and Utility Support Systems.

Q. Please describe your educational background and professional experience.

A. I graduated in 1966 with a Bachelor of Science degree in Industrial Engineering from Georgia Institute of Technology in Atlanta, GA. After serving in the Army for two years, I began my career with Georgia Power Company. I have over 38 years of experience in Distribution Engineering Design, Standards and Training. I presently serve on three ANSI C-2 National Electrical Safety Code (NESC) Sub-committees, the Edison Electric Institute (EEI) NESC, and am Chairman of the Southeastern Electric Exchange NESC Committee. I have been active in the NESC since December 1993 and have had active participation in the 1997, 2002 and 2007 NESC revisions.

Q. What is the purpose of your testimony?

A. The purpose of my testimony is to discuss the Extreme Wind Loading Standard ("EWL") found in Rule 250C of the National Electrical Safety Code ("NESC") and the applicability of EWL to different types of electric power poles.

Q. Are you sponsoring any exhibits with your testimony?

A. Yes. I am sponsoring the following exhibits that I prepared or that were prepared under my supervision and control:

- Exhibit No. ___ (MG-1T), a copy of my resume;
- Exhibit No. ___ (MG-2T), a copy of the 2007 NESC Rule 250C;
- Exhibit No. ___ (MG-3T), a copy of the 1977 NESC Rule 250C;
- Exhibit No. ___ (MG-4T), a copy of the 1987 NESC Rule 250C;
- Exhibit No. ___ (MG-5T), a copy of the 2005 comments from Sub-committee 5 (Strength and Loading) rejecting the originally approved/modified NESC 2007 change proposals 2766, 2673, and 2798 in 2003; and

- Exhibit No. ___ (MG-6T), copies of the original 2007 NESC change proposals 2766, 2673, and 2798 which were originally approved/modified in 2003 to eliminate the 60' exemption.

Q. What is the EWL standard in the NESC?

A. The EWL (extreme wind loading) standard is in Rule 250C of the 2007 NESC and describes the application of the extreme wind loading (one of three weather related loads) required in Rule 250A1 on structures and their supported facilities such as wires, etc. The rule states how the wind pressures on structures and its supported facilities are to be calculated and applied to structures in order to determine the strength of a structure. The rule also states that *"If no portion of a structure or its supported facilities exceeds 60 ft above ground or water level, the provisions of this rule are not required, except as specified in Rule 261A1c, 261A2e, or 261A3d."* Thus, except in limited circumstances, the EWL standard does not apply to poles and facilities that are 60 feet or less in height above ground or water level.

Q. What is the history of the EWL standard in the NESC?

A. The extreme wind loading first appeared in the 1977 NESC edition with language referencing "tall structures." It further stated that "If any portion of a structure or its supported facilities is located in excess of 60 feet above ground or water level, these wind pressures shall be applied to the entire structure and supported facilities without ice covering." The current language found in the 2007 NESC that states, *"If no portion of a structure or its supported facilities exceeds 60 ft above ground* *or water level, the provisions of this rule are not required, ...",* was first placed in the 1984 NESC edition. I am not aware of any resource that explains the exact reasons the EWL was added in 1977, but as an engineer, I would think that since taller structures were probably being installed at that time and with better weather data being available, additional forces were actually being imposed on tall structures and this needed to be reflected in the way calculations were made to determine the strength of a structure other than the traditional method of using the "heavy, medium, and light" weather loadings used exclusively before 1977.

Q. Under the current edition of the NESC, does the EWL standard apply to distribution poles that are 60 feet or less in height?

A. No. The current edition of the 2007 NESC, as did all prior versions since 1977, exempts any structure or its supported facilities that are 60 feet or less above ground from the EWL.

Q. Why does that exemption exist?

A. Most distribution poles and their supported facilities are less than 60 feet in height above ground. Additionally, most distribution pole lines are somewhat shielded from extreme winds due to their lower height, trees, and the structures they are serving. Also, based on my and many utility personnel's experience, most distribution pole failures during abnormally high wind conditions, such as those found in hurricanes, are due to falling trees, tree limbs, flying debris, etc. This is reflected in the 2005 comments from the NESC Sub-committee 5 (strength and loading) when they rejected the change proposals to eliminate the 60 foot exemption to EWL.

Conversely, most transmission poles, due to their height and lack of shielding by trees, buildings, etc. have much more exposure to high winds. Transmission poles also typically have wider easements, more stringent vegetation clearing rights and requirements, danger tree removals, and far fewer miles of line to maintain. That is why the EWL standard is used for those poles and not distribution poles.

Q. Please describe the history of this exemption that has led to the to the current NESC standards?

A. The efforts to eliminate the 60 foot exemption was originally approved in the 2003 NESC discussions and placed in the 2007 NESC pre-print that was published for public comment. Much of the effort to remove the exemption was based on factors that were not rooted in the many years of actual experience of distribution utility engineering personnel that distribution poles (less than 60 feet above ground) fail in high winds due to trees, flying debris, and the like. NESC Sub-committee 5 (strength and loading) received many comments in 2005 regarding this subject. Among the comments received, 14 supported the decision to delete the 60 foot exemption, while 217 supported the rejection of eliminating the 60 foot exemption and retaining it in the 2007 NESC edition. The bottom line reason given for keeping the exemption was that by eliminating the 60 foot exemption, additional unnecessary costs would be added to utilities, without significantly improving or increasing safety.

Q. Do you agree with this exemption as it exists in the current 2007 edition of the NESC?

A. Yes.

Q. Why do you agree?

A. I have over 38 years of distribution engineering experience and have worked many storms related to high winds such as tornadoes, hurricanes, etc. Based on my experience, I don't recall ever having seen any hard data or evidence to suggest that distribution poles fail due to high winds only, which is the purpose of the EWL standard. Instead, my experience, as well as those of utilities from around the country, shows that distribution poles and facilities generally fail in high wind conditions due to trees, tree limbs, and flying debris. I agree with the 217 others who supported the rejection of eliminating the 60 foot exemption and retaining it in the 2007 NESC edition because eliminating the 60 foot exemption would yield additional unnecessary costs without significantly improving or increasing safety.

Q. Does this conclude your testimony?

A. Yes it does.

Mickey B. Gunter
Consulting Engineer
Georgia Power Company
(Retired)

415 Bells Ferry Road, NE
Rome, Georgia 30161
706-235-7552
E-mail: mgtech@bellsouth.net

Summary:

BS, Industrial Engineering, 1966 Georgia Institute of Technology.

38+ years experience in Distribution Engineering Design, Standards, and Training.

Presently serve on (3) ANSI C-2 National Electrical Safety Code (NESC) Sub-committees (Sub-committee 4, Sub-committee 7, and the Interpretations Committee); the Southeastern Electric Exchange (SEE) NESC (Chairman); and the Edison Electric Institute (EEI) NESC (Sub-committee 4). Active in the NESC since December 1993. Active participation on the 1997, 2002, and 2007 NESC revisions.

Currently involved in teaching National Electrical Safety Code schools for the Southern Company and various other electric utilities.

Work Experience:

September 2004 - Retired

1990 - 2004
Responsible for developing and maintaining Georgia Power Company's Distribution Specifications. Also involved in conducting Construction Standards update forums for line personnel and engineers along with assisting in developing and teaching distribution engineering schools (line design, NESC, and other engineering related topics).

1984 - 1990
Responsible for approving all large engineering projects, and supervising mapping, metering and fleet activities for the Rome Division of Georgia Power Company.

1983 - 1984
Responsible for supervising all distribution engineering, line construction, metering, and training activities in the Rome District of Georgia Power Company.

1973 - 1983
Responsible for reviewing and approving all large distribution engineering projects, and supporting planning and training activities in the Rome Division of Georgia Power Company.

1971 - 1973
Responsible for distribution engineering, operations, and maintenance activities in the Austell District of Georgia Power Company.

1966 - 1971
Duties included general field engineering, planning, and trouble restoration in Metro Atlanta. This period also includes two years in the US Army (November 1966 – November 1968).

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2007 NESC Rule 250C
Exhibit No. ___ (MG-2T)
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Section 25.
Loadings for Grades B and C

250. General loading requirements and maps

A. General

1. It is necessary to assume the wind and ice loads that may occur on a line. Three weather loadings are specified in Rules 250B, 250C, and 250D. Where all three rules apply, the required loading shall be the one that has the greatest effect.

2. Where construction or maintenance loads exceed those imposed by Rule 250A1, the assumed loadings shall be increased accordingly. When temporary loads, such as lifting of equipment, stringing operations, or a worker on a structure or its component, are to be imposed on a structure or component, the strength of the structure or component should be taken into account or other provisions should be made to limit the likelihood of adverse effects of structure or component failure.

   NOTE: Other provisions could include cranes that can support the equipment loads, guard poles and spotters with radios, and stringing equipment capable of promptly halting stringing operations.

3. It is recognized that loadings actually experienced in certain areas in each of the loading districts may be greater, or in some cases, may be less than those specified in these rules. In the absence of a detailed loading analysis, using the same respective statistical methodologies used to develop the maps in Rule 250C or 250D, no reduction in the loadings specified therein shall be made without the approval of the administrative authority.

4. The structural capacity provided by meeting the loading and strength requirements of Sections 25 and 26 provides sufficient capability to resist earthquake ground motions.

B. Combined ice and wind district loading

Three general degrees of district loading due to weather conditions are recognized and are designated as heavy, medium, and light loading. Figure 250-1 shows the districts where these loadings apply.

NOTE: The localities are classified in the different loading districts according to the relative simultaneous prevalence of the wind velocity and thickness of ice that accumulates on wires. Light loading is for places where little, if any, ice accumulates on wires.

Table 250-1 shows the radial thickness of ice and the wind pressures to be used in calculating loads. Ice is assumed to weigh 913 kg/m^3 (57 lb/ft^3).

C. Extreme wind loading

If no portion of a structure or its supported facilities exceeds 18 m (60 ft) above ground or water level, the provisions of this rule are not required, except as specified in Rule 261A1c, 261A2e, or 261A3d. Where a structure or its supported facilities exceeds 18 m (60 ft) above ground or water level the structure and its supported facilities shall be designed to withstand the extreme wind load associated with the Basic Wind Speed, as specified by Figure 250-2. The wind pressures calculated shall be applied to the entire structure and supported facilities without ice. The following formula shall be used to calculate wind load.

Load in newtons $= 0.613 \cdot (V_{m/s})^2 \cdot k_z \cdot G_{RF} \cdot I \cdot C_f \cdot A(m^2)$

Load in pounds $= 0.00256 \cdot (V_{mi/h})^2 \cdot k_z \cdot G_{RF} \cdot I \cdot C_f \cdot A(ft^2)$

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where

0.613 0.00256	Velocity-pressure numerical coefficient reflects the mass density of air for the standard atmosphere, i.e., temperature of 15 °C (59 °F) and sea level pressure of 760 mm (29.92 in) of mercury. The numerical coefficient 0.613 metric (0.00256 customary) shall be used except where sufficient climatic data are available to justify the selection of a different value of this factor for a design application. Ambient air density value, the constants 0.613, metric, and 0.00256, customary, reflects the mass density of air for the standard atmosphere, i.e., temperature of 15 °C (59 °F) and sea level pressure of 760 mm (29.92 in) of mercury
k_z	Velocity pressure exposure coefficient, as defined in Rule 250C1, Table 250-2
V	Basic wind speed, 3 s gust wind speed in m/s at 10 m (mi/h at 33 ft) aboveground, Figure 250-2
G_{RF}	Gust response factor, as defined in Rule 250C2
I	Importance factor, 1.0 for utility structures and their supported facilities
C_f	Force coefficient (shape factor), As defined in Rule 252B.
A	Projected wind area, m^2 (ft^2)

The wind pressure parameters (k_z, V, and G_{RF}) are based on open terrain with scattered obstructions (Exposure Category C as defined in ASCE 7-05). Exposure Category C is the basis of the NESC extreme wind criteria. Topographical features such as ridges, hills, and escarpments may increase the wind loads on site-specific structures. A Topographic Factor, K_{zt}, from ASCE 7-05, may be used to account for these special cases.

1. Velocity pressure exposure coefficient, k_z

   The velocity pressure exposure coefficient, k_z, is based on the height, h, to the center-of-pressure of the wind area for the following load applications:

   a. k_z for the structure is based on 0.67 of the total height, h, of the structure above ground line.

      NOTE: In Table 250-2, for h ≤ 75 m (250 ft), the structure k_z values are adjusted for the wind load to be determined at the center-of-pressure of the structure assumed to be at 0.67 h. The wind pressure is assumed uniformly distributed over the structure face normal to the wind.

   b. k_z for the wire is based on the height, h, of the wire at the structure.

      NOTE: In special terrain conditions (i.e., mountainous terrain and canyon) where the height of the wire aboveground at mid-span may be substantially higher than at the structure, engineering judgment may be used in determining an appropriate value for the wire k_z.

   c. k_z for a specific structure location or component is based on the height, h, to the center-of-pressure of the wind area being considered.

   The selected values of k_z, are tabulated in Table 250-2. When h is > 75 m (250 ft), the formulas shall be used to determine a k_z value.

2. Gust response factor, G_{RF}

   Selected values of the structure and wire gust response factors are tabulated in Table 250-3. The structure gust response factor, G_{RF}, is determined using the total structure height, h. The wire gust response factor is determined using the height of the wire at the structure, h, and the design wind span, L. The structure and wire gust response factors may also be determined using the formulas in Table 250-3. For values of h > 75 m (250 ft) and L > 600 m (2000 ft) the G_{RF} shall be determined using the formulas in Table 250-3. In special terrain conditions (i.e., mountainous terrain and canyon) where the height of the conductor aboveground at mid-span

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may be substantially higher than at the attachment point, engineering judgment may be used in determining an appropriate value for the wire G_{RF}. Wire attachment points that are 18 m (60 ft) or less above ground or water level must be considered if the total structure height is greater than 18 m (60 ft) above ground or water.

When calculating a wind load at a specific structure location, the structure gust response factor, G_{RF}, determined using the total structure height, h, shall be used. The gust response factor, G_{RF}, to be used on components, such as antennas, transformers, etc., shall be the structure gust response factor.

D. Extreme ice with concurrent wind loading

If no portion of a structure or its supported facilities exceeds 18 m (60 ft) above ground or water level, the provisions of this rule are not required. Where a structure or its supported facilities exceeds 18 m (60 ft) above ground or water level, the structure and its supported facilities shall be designed to withstand the ice and wind load associated with the Uniform Ice Thickness and Concurrent Wind Speed, as specified by Figure 250-3. The wind pressures for the concurrent wind speed shall be as indicated in Table 250-4. The wind pressures calculated shall be applied to the entire structure and supported facilities without ice and to the iced wire diameter determined in accordance with Rule 251.

Ice is assumed to weigh 913 kg/m^3 (57 lb/ft^3).

1. For Grade B, the radial thickness of ice from Figure 250-3 shall be multiplied by a factor of 1.00.
2. For Grade C, the radial thickness of ice from Figure 250-3 shall be multiplied by a factor of 0.80.
3. The concurrent wind shall be applied to the projected area resulting from Rules 250D1 and 250D2 multiplied by a factor of 1.00.

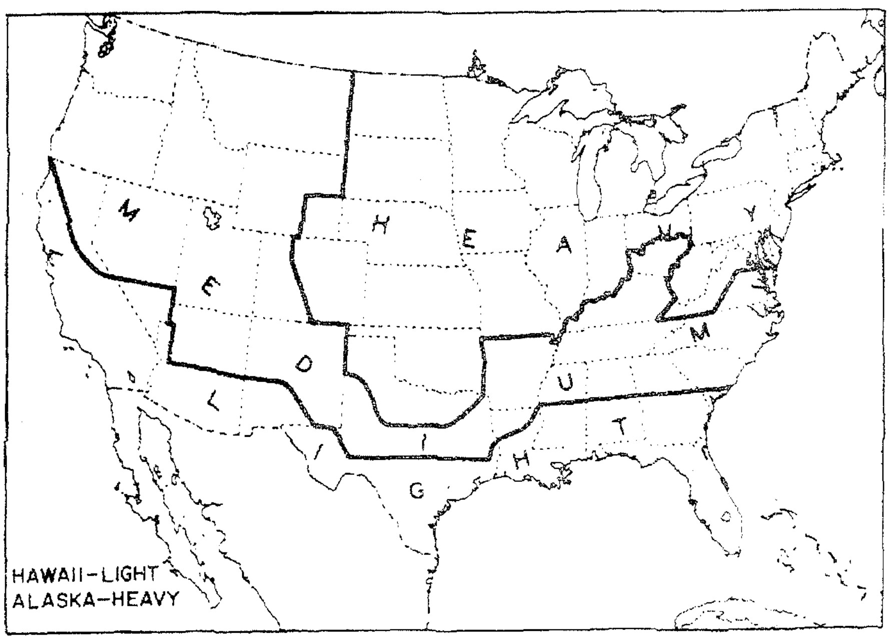

Figure 250-1—General loading map of United States with respect to loading of overhead lines

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NOTE: The localities are classified in the different loading districts according to the relative simultaneous prevalence of wind velocity and thickness of ice which accumulates on wires. Light loading is for places where little, if any, ice accumulates on wires.

Table 250-1 shows the minimum radial thicknesses of ice and the wind pressures to be used in calculating loadings. Ice is assumed to weigh 57 pounds per cubic foot.

Table 250-1. Ice and Wind Loads

	Loading district		
	Heavy	Medium	Light
Radial thickness of ice (in)	0.50	0.25	0
Horizontal wind pressure (lb/sq ft)	4	4	9

C. Extreme Wind Loading

Figure 250-2 is a wind map of the United States which shows the minimum horizontal wind pressures to be used for calculating loads upon tall structures. For wind pressure at a specific location use a value not less than that of the nearest pressure line. If any portion of a structure of supported facilities is located in excess of 60 feet above ground or water level, these wind pressures shall be applied to the entire structure and supported facilities without ice covering.

NOTE 1: The values of wind pressure given in Figure 250-2 represent the loading of wind upon cylindrical surfaces at 30 feet above ground level. They are based upon 50 year isotachs given in ANSI A58.1-1972, Building Code Requirements for Minimum Design Loads in Buildings and Other Structures, converted from miles per hour to pressure on cylindrical surfaces by the factor of 0.00256 times the square of the velocity.

NOTE 2: Wind velocity usually increases with height; therefore, experience may show that the wind pressures specified herein need to be further increased.

251. Conductor Loading

A. General

Ice and wind loads shall be as specified in Rule 250.

1. Where a cable is attached to a messenger, the specified loadings shall be applied to both cable and messenger.
2. In applying wind loadings to a bare stranded conductor or multiconductor cable, the assumed projected area shall be that of a smooth cylinder whose outside diameter is the same as that of the conductor or cable.

Section 25. Loading for Grades B, C, and D

General Loading Requirements and Maps

A. General

1. It is necessary to assume the loadings which may be expected to occur on a line because of wind and ice during all seasons of the year. These weather loadings shall be the values of loading resulting from the application of Rules 250B or 250C. Where both rules apply, the required loading shall be the one that which, when combined with the appropriate overload capacity factors, has the greater effect on strength requirements.
2. Where construction or maintenance loads exceed those imposed by Rule 250A1, which may occur more frequently in light loading areas, the assumed loadings shall be increased accordingly.
3. It is recognized that loadings actually experienced in certain areas in each of the loading districts may be greater, or in some cases, may be less than those specified in these rules. In the absence of a detailed loading analysis, no reduction in the loadings specified therein shall be made without the approval of the administrative authority.

B. Combined Ice and Wind Loading

Three general degrees of loading due to weather conditions are recognized and are designated as heavy, medium, and light loading. Figure 250-1 shows the districts in the states in which these loadings are normally applicable.

NOTE: The localities are classified in the different loading districts according to the relative simultaneous prevalence of wind velocity and thickness of ice which accumulates on wires. Light loading is for places where little, if any, ice accumulates on wires.

Table 250-1 shows the radial thickness of ice and the wind pressures to be used in calculating loadings. Ice is assumed to weigh 57 pounds per cubic foot (913 kg/m^3).

C. Extreme Wind Loading

If any portion of a structure or its supported facilities exceeds 60 ft (18 m) above ground or water level, the applicable horizontal wind speed of Fig 250-2, as determined by the linear interpolation, shall be used to calculate horizontal wind pressures. These pressures shall be applied to the entire structure and supported facilities without ice loading. The following formulas shall be used to calculate wind pressures on cylindrical surfaces:

pressure in lbf/ft² $= 0.00256\ (\nu_{mi/h})^2$

pressure in pascals $= 0.613\ (\nu_{m/s})^2$

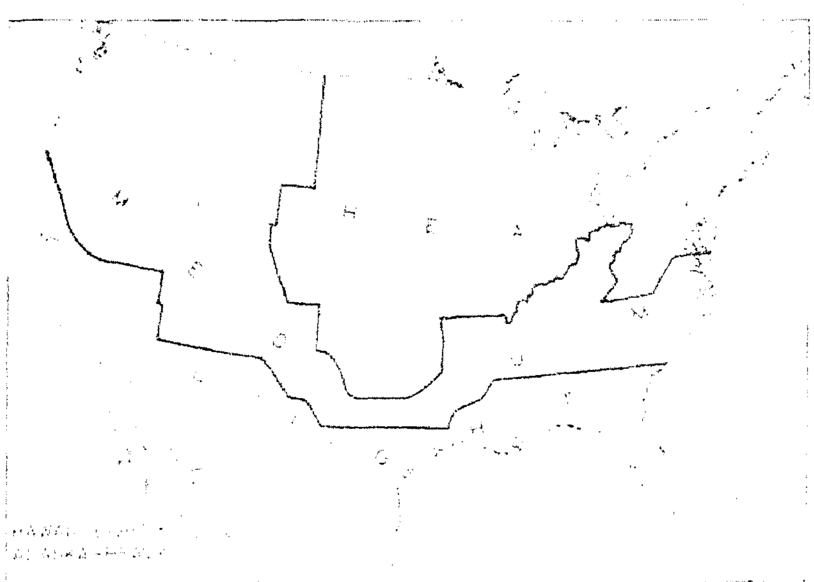
Table 250-2 lists the conversions of velocities to pressures for typical wind speeds as calculated by the formulas listed above.

If no portion of the structure or its supported facilities exceeds 60 ft (18 m) above ground or water level, the provisions of this rule are not required.

Fig 250-2 is a wind map of the contiguous United States and Alaska reproduced from ANSI A58.1-1982 [6]. For Hawaii and Puerto Rico, the basic wind speeds are 80 mi/h and 95 mi/h, respectively.

NOTE: Wind velocity usually increases with height; therefore, experience may show that the wind pressures specified herein need to be further increased.

Fig 250-1
General Loading Map of United States with Respect to Loading of Overhead Lines



Subcommittee Recommendation: Reject
Subcommittee Comment:
CP's 2766, 2673, and 2798 are rejected based on information obtained from public comments. Utility experience has demonstrated that electrical distribution and communication line structures, under 60 ft in height, are damaged during extreme wind events by trees, tree limbs, and other flying debris. Designing structures with heights less than 60 ft for extreme winds will increase pole strengths for distribution systems resulting in large increases in cost and design complexity without commensurate increase in safety. Safety of employees and the public is provided using the current NESC loading requirements.

Items 3) and 4) offset each other in that the use of an alternate method for at least one code cycle (NESC-2007) would in fact allow the industry the luxury of obtaining the necessary experience, prior to the time when this may become the only allowable method in the NESC. This philosophy is also consistent with initially limiting the scope to one very important category (single-pole structures, etc.)—as per item 5)—during this interim period. While it is recognized that the alternate method may provide results different than the present method, this is inherent in any process that revises an important standard and should be accepted as inevitable. Nonetheless, the deliberate calibration of the proposed RBD method to past NESC practice assures that any such differences are minimized, corresponding to an evolutionary process in which the NESC is revised to reflect the latest technology.

Rule 250A1

CP 2766

Submitter

Donald Heald

Proposed Change

Remove the 60-ft exclusion from Grade B and Grade C construction and show a maximum wind load for Grade B and Grade C construction under 60 ft for Tables 253-1 and 253-2. Minor formatting changes of these tables is also suggested so the wording "Vertical Loads" will line up with "Transverse Loads" and "Longitudinal Loads." This change proposal is based a previously submitted change proposal which provides appropriate load factors for Grade C construction from Grade B construction under 250C wind loads (extreme wind). The proposed changes are shown below:

Table 253-1—Overload Factors for Structures,[1] Crossarms, Support Hardware, Guys, Foundations, and Anchors to Be Used with the Strength Factors of Table 261-1A

Overload Factors		
	Grade B	Grade C
Rule 250B Loads ~~Vertical Loads~~ Vertical Loads[3]	 ~~1.50~~ 1.50	 ~~1.90[6]~~ 1.90[6]
Transverse Loads Wind Wire Tension	 2.50 1.65 [2]	 2.20 [4] 1.30 [5]
Longitudinal Loads At Crossings In general At deadends	 1.10 1.65 [2]	 No requirement 1.30 [5]
Elsewhere In general At deadends	 1.00 1.65 [2]	 No requirement 1.30 [5]
Rule 250C Loads	1.00[9]	1.00 [7,8]

[7] For wind velocities above 100 mph (except Alaska), a factor of 0.75 may be used.

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Table 253-2—Alternate Overload Factors for Wood and Reinforced (Not Prestressed) Concrete Structures[1, 5] to Be Used with the Strength Factors of Table 261-1B

	Overload Factors			
	Grade B		Grade C	
	When Installed	At Replacement[2, 3]	When Installed	At Replacement[2, 3]
Rule 250B Loads				
~~Vertical Loads~~	~~2.20~~	~~1.50~~	~~2.20~~	~~1.50~~
Vertical loads[4]	2.20	1.50	2.20	1.50
Transverse loads				
Wind (at crossings)	4.00	2.67	2.67	1.33
Wind (elsewhere)	4.00	2.67	2.00	1.33
Wire tension	2.00	1.33	1.33	1.00
Longitudinal loads				
In general	1.33	1.00	No requirement	No requirement
At deadends	2.00[6]	1.33[7]	1.33	1.00
Rule 250C Loads	1.33[10]	1.00[10]	~~1.33~~ 1.00[9]	~~1.00~~ 0.87[8,9]

[8] For wind velocities above 100 mph (except Alaska) a factor of 0.75 may be used.

[9] ~~For wire attachments points that are 18 m (60 ft) or less above ground or water level and for structure height (h) under 60 ft. the wind pressures defined by 0.00256 V^2 k_z G_{RF} need not exceed 15 psf~~ If no portion of the structure or its supported facilities exceeds 18 m (60 ft) above ground or water level, the wind pressure defined by 0.00256 V^2 k_z G_{RF} times the overload factor need not exceed 15psf.

[10] ~~For wire attachments points that are 18 m (60 ft) or less above ground or water level and for structure height (h) under 60 ft. the wind pressures defined by 0.00256 V^2 k_z G_{RF} need not exceed 30 psf~~ If no portion of the structure or its supported facilities exceeds 18 m (60 ft) above ground or water level, the wind pressure defined by 0.00256 V^2 k_z G_{RF} times the overload factor need not exceed 22.5 psf.

Additional changes:

The following additional rules need to be changed to accommodate the above change:

1. Rule 250A.1:

250. General Loading Requirements and Maps

A. General

1. It is necessary to assume the wind and ice loads that may occur on a line. Two weather loadings are specified in Rules 250B and 250C. ~~Where both rules apply,~~ The required loading shall be the one that has the greater effect.

The removal of the 60-ft exclusion makes the wording "where both rules apply" no longer applicable. Both loading conditions apply at all times.

2. Rule 250C:

C. Extreme Wind Loading

~~If no potion of a structure or its supported facilities exceeds 18m (60 ft) above ground or water level, the provisions of this rule are not required except as specified in Rule 261A1c or Rule 261A2f. Where a structure of its supported facilities exceeds 18 m (60 ft) above ground or water level the~~ Structures

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and ~~its~~ their supported facilities shall be designed to withstand the extreme wind load associated with the Basic Wind Speed, as specified by Figure 250-2.

Reference to the 60-ft exclusion is no longer necessary.

3. Delete the last sentence to Rule 250C.2:

~~Wire attachment points that are 18m (60 ft) or less above ground or water level must be considered if the total structure height is greater than 18m (60 ft) above ground or water.~~

This sentence is moved to footnote 8 of Table 253-1 and footnote 9 of Table 253-2.

4. At the bottom of Tables 250-2, in the equations, replace the lower limits of 18 m and 60 ft with 10 m and 33 ft.

Reference to these heights are no longer needed.

5. Change Rule 261.A.1.c to read:

All structures ~~including those below 18 m (60 ft)~~ shall be designed to withstand, without conductors, the extreme wind load in Rule 250C applied in any direction on the structure.

The phrase "including those below 18 m (60 ft)" is no longer needed.

6. Change Rule 261.A.2.f to read:

All structures ~~including those below 18 m (60 ft)~~ shall be designed to withstand, without conductors, the extreme wind load in Rule 250C applied in any direction on the structure.

The phrase "including those below 18 m (60 ft)" is no longer needed.

Vote on Subcommittee 5 Recommendation

Affirmative: (14) Aichinger, Bingel, Clem, Denbrock, DeSantis, Freimark, Harrel, Heald, Kempner, Kinghorn, Peters, Rempe, Slavin, Standford

Negative: (7) Amato, Bullinger, Clapp, Hensel, Kluge, Shultz, Wong

Abstention: (0)

Explanation of Vote

Amato: I do not believe there is sufficient technical justification to remove the 60-ft exclusion.

Bullinger: 60-ft exclusion removal is not justified by data. Anecdotes are insufficient to justify the possible unintended consequences that could result. It is not clear that the 60-ft exclusion removal will improve safety. The calibration back to past practice is fraught with possible unintended consequences as illustrated by the discussions of the committee.

Clapp: I understand the desire to show a relative 2/3 relationship between Grade C and Grade B, but I think it should be achieved by raising the 15 psf limit to 20 psf (i.e., use 20 psf/30 psf) rather than reducing the 30 psf to 22.5 psf (i.e., 15/22.5).

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Slavin: This is an important proposal, providing the overall format for upgrading the strength and loading section consistent with the latest technical information, in a logical, integrated manner. Although somewhat controversial when originally proposed many code cycles ago, much of CP 2737 has already been incorporated into the NESC (e.g., the 3-second gust map of ASCE 7), agrees with the latest accepted standards and information (e.g., 50-year combined ice and wind map of ASCE 7-02), or is generally consistent with various other change proposals accepted by SC5 (e.g., extreme wind below 60 ft). It is recognized that CP 2737 does not treat extreme wind below 60 ft in exactly the same manner as the accepted CP, but it does provide significant load reduction for Grade C and/or sheltered environments. In any case, it is anticipated that CP 2737 would be modified, as appropriate, based upon public comments on the various CPs. Since CP 2737 is proposed as an "alternate method," it will allow the industry at least one code cycle to adjust to the new overall methodology. While an alternate method that produces dissimilar results may raise some short-term issues, this nonetheless represents the most practical procedure for introducing potentially significant changes into the NESC.

Wong: Many issues in the CP have already been taken care of by others. Also many other issues, such as structures below 60 ft, may have better foundation than CP 2766. However, the ice map is only for freezing rain. Tension limit (1.15 factor) has not been justified and could produce a totally different answer than Code (2002 NESC) requires currently. It should not be considered as "alternate method." Alternate methods should have equivalent results as the main method. AISC and ACI have done that.

Rule 250

CP 2673

Submitter

Allen Clapp

Proposed Change

Revise Rule 250C to eliminate the 60-ft exemption for application of extreme winds, as follows:

250. General Loading Requirements and Maps

A. General

1. It is necessary to assume the wind and ice loads that may occur on a line. Two weather loadings are specified in Rules 250B and 250C. ~~Where both rules apply,~~ The ~~the~~ required loading shall be the one that has the greater effect.
2. Where construction or maintenance loads exceed those imposed by Rule 250A1, which may occur more frequently in light loading areas, the assumed loadings shall be increased accordingly.
3. It is recognized that loadings actually experienced in certain areas in each of the loading districts may be greater, or in some cases, may be less than those specified in these rules. In the absence of a detailed loading analysis, no reduction in the loadings specified therein shall be made without the approval of the administrative authority.
4. The structural capacity provided by meeting the loading and strength requirements of Sections 25 and 26 provides sufficient capability to resist earthquake ground motions.

B. Combined Ice and Wind Loading

Three general degrees of loading due to weather conditions are recognized and are designated as heavy, medium, and light loading. Figure 250-1 shows the districts where these loadings apply.

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NOTE: The localities are classified in the different loading districts according to the relative sim neous prevalence of the wind velocity and thickness of ice that accumulates on wires. Light loa is for places where little, if any, ice accumulates on wires.

Table 250-1 shows the radial thickness of ice and the wind pressures to be used in calculating lo Ice is assumed to weigh 913 kg/m^3 (57 lb/ft^3).

C. Extreme Wind Loading

~~If no portion of a structure or its supported facilities exceeds 18 m (60 ft) above ground or level, the provisions of this rule are not required, except as specified in Rule 261A1c or 261A2f. Where a structure or its supported facilities exceeds 18 m (60 ft) above ground or level the structure~~ Structures and ~~its~~ supported facilities shall be designed to withstand the extr wind load associated with the Basic Wind Speed, as specified by Figure 250-2. The wind press calculated shall be applied to the entire structure and supported facilities without ice. The follo formula shall be used to calculate wind load.

No further changes to the rule.

Supporting Comment

When the extreme wind loading requirements were added to the NESC in the 1977 edition, the predomina distribution pole length was still 35 ft. With a 6-ft setting depth, the top of the pole is 29 ft above groun conductors were located below the 10-m (33-ft) level used to take wind speed data. The structural fa caused by high winds on bare wires up to that time were only seen on transmission structures with larger ductor sizes. I do not recall any data on distribution line failures attributed to this phenomenon at that ti There was a general desire to exempt distribution facilities from the extreme wind calculations. The me chosen was to limit application of the extreme wind requirements in Rule 250C to those structures or supp ed facilities where one or both were more than 60 ft above ground.

Wind pressure is a function of the square of the wind speed. Wind force loading is a function of the pres times the exposed area. With small wires and cables, the wind on ice-loaded cables and conductors requi by Rule 250B (essentially a 40 mph wind) can produce a greater loading than an extreme wind loading f much of the nation. For larger wires and larger or overlashed cables, the extreme wind loading produces higher loading, especially in areas subject to hurricane winds. As the size and number of cables and conduc tors on overhead lines grows, more distribution lines will experience a greater loading under extreme winc on bare facilities than lesser winds on ice-covered facilities.

Since the mid-1970s, CATV cables and additional and larger telephone and fiber optic cables have bee stalled on overhead lines and power distribution line conductors and cables have grown larger. As a resu heavier conductors and cables with greater sag and greater numbers of communication cables on overh lines, the typical poles are taller and wider. It is not unusual for the standard pole length to be 40 or 45 ft some urban utilities, the standard distribution pole length is 50 ft. Whereas earlier facilities on 35-ft pol were located at lower levels and experienced slower wind speeds (wind speed increases with height), the c ductors and cables suspended from these taller poles are located at the level where the wind data is take higher and do experience that level of wind. There is no longer any engineering justification for exemp the distribution facilities.

In earlier days, it was rare to find a pole loaded near its capacity. Today, it is not unusual to find poles loade near capacity, particularly when alternative communication providers add extra cables, but also due to large power conductors and cables. As a result, we are now beginning to see pole lines that can meet the tradit ice/wind loads of Rule 250B, but cannot meet extreme wind the loads of Rule 250C. I have personally in

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tigated pole line failure accidents where this has been the case.

It is past time to eliminate the exemption for distribution lines from consideration of extreme wind loads. If we do not, the failure rate will increase as more of the plant is installed with taller poles and heavier loading.

Subcommittee 5 Recommendation

Accept in principle. See action on CP 2766 on p. 390.

Vote on Subcommittee 5 Recommendation

Affirmative: (14) Aichinger, Bingel, Clapp, Clem, Denbrock, DeSantis, Freimark, Heald, Kempner, Peters, Rempe, Slavin, Standford, Wong

Negative: (6) Amato, Bullinger, Harrel, Hensel, Kluge, Shultz

Abstention: (1) Kinghorn

Explanation of Vote

Amato: I do not believe there is sufficient technical justification to remove the 60-ft exclusion.

Bullinger: 60-ft exclusion removal is not justified by data. Anecdotes are insufficient to justify the possible unintended consequences that could result. It is not clear that the 60-ft exclusion removal will improve safety. The calibration back to past practice is fraught with possible unintended consequences as illustrated by the discussions of the committee.

Hensel and *Harrel:* I am not in favor of removing the 60-ft exclusion.

Kluge: I prefer CP 2766 as modified.

Shultz: Removing the 60 ft exemption unilaterally will likely result in considerable increase in strength requirements in many loading situations, particularly in coastal areas. The public comments on a similar proposal for the 2002 revision cycle overwhelmingly cited collateral loading as the predominant cause of extreme wind failures. This proposal offers nothing to refute those statements of experience. In addition, in the 2002 cycle, several utilities in the South reviewed their records to see what claims for injury could be attributed to extreme wind failures. Those utilities could not identify any such claims for the previous several years. If this experience is anywhere near typical, the safety record is very good, and no support is provided in this proposal to demonstrate that removal of the exemption will improve on this safety performance.

Rule 250

CP 2802

Submitter

Clayton Clem

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an e-mail at rkluge@atcllc.com and ask for the NESC wind computation sheet. Your opinions of these pr posals are extremely valuable to the NESC Subcommittee.

For your reference, there are several change proposals addressing wind load—CPs 2673, 2739, 2766, 2... 2718, 2787.

Rule 250A1

CP 2798

Submitter

Donald Heald

Proposed Change

Remove the 60-ft exclusion from Grade B and Grade C construction and show a maximum wind lo... Grade B and Grade C construction under 60 ft for Tables 253-1 and 253-2. Minor formatting changes o... tables are also suggested so the wording "Vertical Loads" would line up with "Transverse Loads" and "... gitudinal Loads." This change proposal is based on a previously submitted change proposal which pr... appropriate load factors for Grade B and Grade C construction under Rule 250C loads (extreme wind). Th proposed changes are shown below:

Table 253-1—Overload Factors for Structures,[1] Crossarms, Support Hardware, Guys, Foundations, and Anchors to Be Used with the Strength Factors of Table 261-1A

	Overload Factors	
	Grade B	Grade C
Rule 250B Loads ~~Vertical Loads~~ Vertical Loads[3]	 ~~1.50~~ 1.50	 ~~1.90[6]~~ 1.90[6]
Transverse Loads Wind Wire Tension	 2.50 1.65 [2]	 2.20 [4] 1.30 [5]
Longitudinal Loads At Crossings In general At deadends	 1.10 1.65 [2]	 No requirement 1.30 [5]
Elsewhere In general At deadends	 1.00 1.65 [2]	 No requirement 1.30 [5]
Rule 250C Loads	1.00[9]	1.00 [7,8]

[7] For wind speeds above 100 mph (except Alaska), a factor of 0.75 may be used.
[8] For wire attachments points that are 18 m (60 ft) or less above ground or water level and for structure heights (h) ... 60 ft, the wind pressures defined by $0.00256\ V^2\ k_z\ G_{RF}$ need not exceed 15 psf for locations where basic wind sp... [Figure 250-2(b)] are greater than 90 mph and 10 psf for 90 mph and less.
[9] For wire attachments points that are 18 m (60 ft) or less above ground or water level and for structure height (h) under 60 ft, the wind pressures defined by $0.00256\ V^2\ k_z\ G_{RF}$ need not exceed 30 psf.

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Table 253-2—Alternate Overload Factors for Wood and Reinforced (Not Prestressed) Concrete Structures[1, 5] to Be Used with the Strength Factors of Table 261-1B

	Overload Factors			
	Grade B		Grade C	
	When Installed	At Replacement[2, 3]	When Installed	At Replacement[2, 3]
Rule 250B Loads				
~~Vertical Loads~~	~~2.20~~	~~1.50~~	~~2.20~~	~~1.50~~
Vertical loads[4]	2.20	1.50	2.20	1.50
Transverse loads				
Wind (at crossings)	4.00	2.67	2.67	1.33
Wind (elsewhere)	4.00	2.67	2.00	1.33
Wire tension	2.00	1.33	1.33	1.00
Longitudinal loads				
In general	1.33	1.00	No requirement	No requirement
At deadends	2.00[6]	1.33[7]	1.33	1.00
Rule 250C Loads	1.33[10]	1.00[10]	~~1.33~~ 1.00[9]	~~1.00~~ 0.87[8,9]

[8] For wind speeds above 100 mph (except Alaska), a factor of 0.75 may be used.
[9] For wire attachments points that are 18 m (60 ft) or less above ground or water level and for structure height (h) under 60 ft, the wind pressures defined by $0.00256\ V^2\ k_z\ G_{RF}$ need not exceed 15 psf for wind velocities greater than 90 mph and 10 psf for wind velocities 90 mph and less.
[10] For wire attachments points that are 18 m (60 ft) or less above ground or water level and for structure height (h) under 60 ft, the wind pressures defined by $0.00256\ V^2\ k_z\ G_{RF}$ need not exceed 30 psf.

Additional changes:

The following additional rules need to be changed to accommodate the above change:

1. Rule 250A1:

250. General Loading Requirements and Maps

1. It is necessary to assume the wind and ice loads that may occur on a line. Two weather loadings are specified in Rules 250B and 250C. ~~Where both rules apply.~~ The required loading shall be the one that has the greater effect.

The removal of the 60-ft exclusion makes the wording "where both rules apply" no longer applicable. Both loading conditions apply at all times.

2. Rule 250C:

C. Extreme Wind Loading
~~If no potion of a structure or its supported facilities exceeds 18 m (60 ft) above ground or water level, the provisions of this rule are not required except as specified in Rule 261A1c or Rule 261A2f. Where a structure of its supported facilities exceeds 18 m (60 ft) above ground or water level the~~ Structures and ~~its~~ their supported facilities shall be designed to withstand the extreme wind load associated with the Basic Wind Speed, as specified by Figure 250-2.

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Subcommittee 5 Recommendation

Accept in principle. See action on CP 2766 on p. 390.

Vote on Subcommittee 5 Recommendation

Affirmative: (13) Aichinger, Clapp, Clem, Denbrock, DeSantis, Freimark, Heald, Hensel, Kempner, Peters, Rempe, Slavin, Wong

Negative: (7) Amato, Bingel, Bullinger, Harrel, Kluge, Shultz, Standford

Abstention: (1) Kinghorn

Explanation of Vote

Amato: I do not believe there is sufficient technical justification to remove the 60-ft exclusion.

Bingel: This CP follows CP 2766 which already passed in eliminating the 60-ft exclusion for extreme wind. However, CP 2798 adds an additional cap for Grade C wind pressure. This only applies to regions in the country where the extreme wind speed is 90 mph or less. By not accepting this CP, the load requirement for Grade C construction in the medium load district will increase. No proof was presented to justify this load increase. A few subcommittee members expressed feeling that the load should be higher. That's not reason enough to reject this CP.

Bullinger: 60-ft exclusion removal is not justified by data. Anecdotes are insufficient to justify the possible unintended consequences that could result. It is not clear that the 60-ft exclusion removal will improve safety. The calibration back to past practice is fraught with possible unintended consequences as illustrated by the discussions of the committee.

Harrel: I am not in favor of the removal of the 60-ft exclusion.

Shultz: I prefer to keep the 60-ft exemption, but if it is removed, I prefer CP 2798 rather than CP 2766, which was accepted. I do support the same revisions to the footnotes in CP 2798 as were made in CP 2766. The 10 psf cap for Grade C continental extreme winds is reasonably comparable to present loading requirements for structures 60 ft and less in height which have served well.

Standford: I feel that the cap of 10 psf (62.5 mph) is too low for extreme wind and believe that it should be 15 psf as it is in CP 2677.

Wong: CP 2766 has higher requirements to Grade C construction located at medium load district. CP 2798 footnote 8 is written to address this issue. 10 psf wind pressure is more closely related to current 2002 NESC requirements. Yet, is 10 psf (60 mph plus) adequate? We need Code user input.

Kluge: I prefer CP 2739 as long as the district loads remain. The present district loads provide adequate strength for structures <= 60 ft tall.

I encourage you to evaluate the impact of this proposal on your current designs. To assist you, I have calculated the wind pressure for a typical 40 ft distribution pole, buried 6 ft, with phase conductors at the top, neutral conductors 8 ft below the phases, and communication cables located 3-1/2 ft below the neutral, and have displayed the results in the following table. Look at the pressure associated with the wind speed that represents your service territory.

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