Ex Parte Presentation of

NextG Networks®

Attachment 2

NESC Rule 235I and Table 235-6,
(submitted in Attachment 2 of NextG's Initial Comments in WC Docket No. 07-245 (filed March 7, 2008))

Accredited
Standards
Committee
C2-2007

National Electrical Safety Code®

Secretariat
Institute of Electrical and Electronics Engineers, Inc.

Approved 20 April 2006
Institute of Electrical and Electronics Engineers, Inc.

Approved 16 June 2006
American National Standards Institute

2007 Edition

Abstract: This standard covers basic provisions for safeguarding of persons from hazards arising from the installation, operation, or maintenance of (1) conductors and equipment in electric supply stations, and (2) overhead and underground electric supply and communication lines. It also includes work rules for the construction, maintenance, and operation of electric supply and communication lines and equipment. The standard is applicable to the systems and equipment operated by utilities, or similar systems and equipment, of an industrial establishment or complex under the control of qualified persons. This standard consists of the introduction, definitions, grounding rules, list of referenced and bibliographic documents, and Parts 1, 2, 3, and 4 of the 2007 Edition of the National Electrical Safety Code.

Keywords: communications industry safety; construction of communication lines; construction of electric supply lines; electrical safety; electric supply stations; electric utility stations; high-voltage safety; operation of communications systems; operation of electric supply systems; power station equipment; power station safety; public utility safety; safety work rules; underground communication line safety; underground electric line safety

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3. Conductors shall be arranged so that the vertical spacing shall be not less than that specified in Table 235-8 under the conditions specified in Rule 235C2b(1)(c)
4. A supporting neutral conductor of a supply cable meeting Rule 230C3 or an effectively grounded messenger of a supply cable meeting Rule 230C1 or 230C2 may attach to the same insulator or bracket as a neutral conductor meeting Rule 230E1, so long as the clearances of Table 235-8 are maintained in mid-span and the insulated energized conductors are positioned away from the open supply neutral at the attachment.

H. Clearance and spacing between communication conductors, cables, and equipment

1. The spacing between messengers supporting communication cables should be not less than 300 mm (12 in) except by agreement between the parties involved.
2. The clearances between the conductors, cables, and equipment of one communication utility to those of another, anywhere in the span, shall be not less than 100 mm (4 in), except by agreement between the parties involved.

I. Clearances in any direction from supply line conductors to communication antennas in the supply space attached to the same supporting structure

1. General

   Communication antennas located in the supply space shall be installed and maintained only by personnel authorized and qualified to work in the supply space in accordance with the applicable rules of Sections 42 and 44. See also Rule 224A.

2. Communication antenna

   The clearance between a communication antenna operated at a radio frequency of 3 kHz to 300 GHz and a supply line conductor shall be not less than the value given in Table 235-6, row 1b.

   NOTE 1: The antenna functions as a rigid, vertical, or lateral open wire communication conductor.

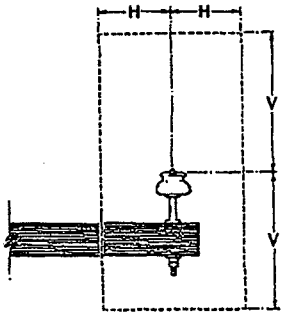
   NOTE 2: See Rule 420Q.

3. Equipment case that supports a communication antenna

   The clearance between an equipment case that supports a communication antenna and a supply line conductor shall be not less than the value given in Table 235-6, Row 4a.

4. Vertical or lateral communication conductors and cables attached to a communication antenna

   The clearance between a supply line conductor and the vertical or lateral communication conductor and cable attached to a communication antenna shall be not less than the value given in Rule 239.



V = Vertical clearance
H = Horizontal clearance

Figure 235-1—Clearance diagram for energized conductor

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Table 235-6— *(continued)*
Clearance in any direction from line conductors to supports and to vertical or lateral conductors, span, or guy wires attached to the same support
[See also Rules 235E1, 235E3b(2), and 235I.]

Clearance of line conductors from	Communication lines in general (in)	Communication lines on jointly used structures; neutral conductors meeting Rule230E1 (in)	Supply lines — Circuit phase-to-phase voltage		
			0 to 8.7 kV ⑫ (in)	Over 8.7 to 50 kV (in)	Over 50 to 814 kV ④⑨ (in)
4. Surface of structures:					
a. On jointly used structures	—	5 ②⑥	5 ③⑥	5 plus 0.2 per kV in excess of 8.7 kV ⑨⑫	13 plus 0.2 per kV in excess of 50 kV
b. All other	3 ②⑥	—	3 ⑧	3 plus 0.2 per kV in excess of 8.7 kV ⑨⑫	11 plus 0.2 per kV in excess of 50 kV

①For guy wires, if practical. For clearances between span wires and communication conductors, see Rule 238C.

On jointly used structures, guys that pass within 12 in of supply conductors, and also pass within 12 in of communication cables, shall be protected with a suitable insulating covering where the guy passes the supply conductors, unless the guy is effectively grounded or insulated with a strain insulator at a point below the lowest supply conductor and above the highest communication cable.

The clearance from an insulated or effectively grounded guy to a communication cable may be reduced to 3 in when abrasion protection is provided on the guy or communication cable.

②Communication conductors may be attached to supports on the sides or bottom of crossarms or surfaces of poles with less clearance.

③This clearance applies only to supply conductors at the support below communication conductors, on jointly used structures.

Where supply conductors are above communication conductors, this clearance may be reduced to 3 in.

④All clearances for line over 50 kV shall be based on the maximum operating voltage. For voltages exceeding 814 kV, the clearance shall be determined by the alternate method given by Rule 235E3.

⑤For supply circuits of 0 to 750 V, this clearance may be reduced to 3 in.

⑥A neutral conductor meeting Rule 230E1 may be attached directly to the structure surface.

⑦Guys and messengers may be attached to the same strain plates or to the same through bolts.

⑧For open supply circuits of 0 to 750 V and supply cables of all voltages meeting Rule 230C1, 2 or 3, this clearance may be reduced to 1 in. No clearance is specified for phase conductors of such cables where they are physically restrained by a suitable bracket from abrasion against the pole.

⑨The additional clearance for voltages in excess of 50 kV specified in Table 235-6 shall be increased 3% for each 1000 ft in excess of 3300 ft above mean sea level.

⑩Where the circuit is effectively grounded and the neutral conductor meets Rule 230E1, phase-to-neutral voltage shall be used to determine the clearance from the surface of support arms and structures.

⑪These clearances may be reduced by not more than 25% to a guy insulator, provided that full clearance is maintained to its metallic end fittings and the guy wires. The clearance to an insulated section of a guy between two insulators may be reduced by not more than 25% provided that full clearance is maintained to the uninsulated portion of the guy.

⑫Phase-to-phase voltages shall be determined according to Rule 235A3.

⑬These clearances apply to communication antennas operated at a radio frequency of 3 kHz to 300 GHz. Also see Rules 235I4 and 239.

⑭Does not include neutral conductors meeting Rule 230E1.

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Table 235-6—
Clearance in any direction from line conductors to supports and to vertical or lateral conductors, span, or guy wires attached to the same support
[See also Rules 235E1, 235E3b(2), and 235I.]

Clearance of line conductors from	Communication lines in general (in)	Communication lines on jointly used structures; neutral conductors meeting Rule 230E1 (in)	Supply lines — Circuit phase-to-phase voltage		
			0 to 8.7 kV [14] (in)	Over 8.7 to 50 kV (in)	Over 50 to 814 kV [4] [5] (in)
1. Vertical and lateral conductors:					
a. Of the same circuit	3	3	3	3 plus 0.25 per kV in excess of 8.7 kV	No value specified
b. Of other circuits [12] [9]	3	3	6 [5]	6 plus 0.4 per kV in excess of 8.7 kV	23 plus 0.4 per kV in excess of 50 kV
2. Span or guy wires,[11] or messengers attached to same structure:					
a. When parallel to line	3 [7]	6 [1] [7]	12 [1]	12 plus 0.4 per kV in excess of 8.7 kV	29 plus 0.4 per kV in excess of 50 kV
b. Anchor guys	3 [7]	6 [1] [7]	6 [7]	6 plus 0.25 per kV in excess of 8.7 kV	16 plus 0.25 per kV in excess of 50 kV
c. All other	3 [7]	6 [1] [7]	6	6 plus 0.4 per kV in excess of 8.7 kV	23 plus 0.4 per kV in excess of 50 kV
3. Surface of support arms	3 [2] [6]	3 [2] [6]	3 [6]	3 plus 0.2 per kV in excess of 8.7 kV [6] [8]	11 plus 0.2 per kV in excess of 50 kV

Ex Parte Presentation of

NextG Networks

Attachment 3

Declaration of NESC Expert David Marne submitted to the New York PSC with NextG's comments in *Proceeding on Motion of the Commission Concerning Wireless Facility Attachments to Utility Distribution Poles*, NY PSC Case No. Case 07-M-0741 (filed Sept. 10, 2007) (submitted as Attachment 3 of NextG's Initial Comments in WC Docket No. 07-245 (filed March 7, 2008))

STATE OF NEW YORK
PUBLIC SERVICE COMMISSION

CASE 07-M-0741 –	Proceeding on Motion of the Commission Concerning Wireless Facility Attachments to Utility Distribution Poles

DECLARATION OF DAVID MARNE

I, David Marne, do hereby state:

1. I am the company president and senior electrical engineer for Marne and Associates, Inc. in Missoula, Montana, where I specialize in National Electrical Safety Code ("NESC") training and engineering design. I am a registered Professional Engineer and I consult with both the electric and communication utilities on joint use pole attachment engineering issues, including with NextG.

2. I hold a bachelors of science degree in electrical engineering from Montana State University. Currently, I serve on NESC Subcommittee 4, which addresses overhead lines-clearances issues. I am a senior member of the Institute of Electrical and Electronic Engineers, Inc. ("IEEE"). The IEEE is the publisher of the NESC. I am also the author of "McGraw-Hill's National Electrical Safety Code 2007 Handbook," and frequently present seminars on the NESC to a variety of electric power and communication utility professionals. My associate at Marne and Associates, Grant Glaus, is also a registered professional engineer and is on NESC Subcommittee 5, which addresses overhead lines-strength and loading issues.

3. Prior to founding Marne and Associations, I worked as a consulting electrical engineer for 22 years. I have been involved in NESC training for over 10 years.

4. In my role as a consultant to NextG, my company provides consulting on an as requested basis helping NextG assure compliance with the NESC. In that capacity, my company has performed a "typical" pole attachment loading calculation dated Mar. 21, 2007, attached hereto as Exhibit A. A summary of the calculations, which is shown below, indicates that pole line conductors (power and communication) put substantially more load on a pole than vertical antenna and pole top extension structures. Independent of the values, all loads on the structure must be considered when designing a pole line.

Mwp	**3,682** ft-lb moment due to wind on pole
(Sh)(Mwc)	**53,352** ft-lb moment due to wind on conductor (for a 275' span length)
Mwt	**1,449** ft-lb moment due to wind on transformer
Mwa	**777** ft-lb moment due to wind on antenna
Mwpe	**632** ft-lb moment due to wind on pole extension
Mwe	**560** ft-lb moment due to wind on communication equipment box

5. The National Electrical Safety Code ("NESC") addresses communication antennas on the top of power poles and refers to these installations as communication antennas in the supply (power) space. The rules in the NESC, including the rules related to communication antenna installations, are for the safety of electric power and communication workers and the public.

I declare under penalty of perjury that the statements contained in this Declaration are true and correct.

David Marne

David Marne

Dated September 7, 2007