



Interpretation

Section 23. Clearances

Rule 235C2b(1)(c)i Clearance for wires, conductors, or cables carried on the same supporting structure – Vertical clearance between line conductors – Additional clearances -- Sag-related clearances
(2007 Edition, pages 134-139)

Rule 235C2b(1)(c)i Clearance for wires, conductors, or cables carried on the same supporting structure – Vertical clearance between conductors at the support – Additional clearances -- Sag-related clearances
(2012 Edition, pages 145-150)

(26 March 2012) IR566

Reference: In 2007, NESC Rule 235C2b(1)(c) was changed by adding the underlined words. This addition remains in 2012.

- (b) For purposes of this determination the vertical clearances required in Rule 235C2b(1)(a) and (b) apply to the following conductor temperature and loading conditions whichever produces the greater vertical clearance at the structure when:
 - i. The upper conductor is at final sag at 120°F or the maximum operating temperature for which the line is designed to operate and the lower conductor is at final sag at the same ambient conditions as the upper conductor without electrical loading, or
 - ii. The upper conductor is at final sag at 32°F with the radial thickness of ice, if any...

Question: This rule was clear in the 2002 NESC. Since the 2007 change, it is unsure what ambient temperature is to be used with the 120°F temperature for the upper conductor. Additional clarity or definition to the intended requirements is requested.

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For a line that is limited by clearance to the circuit below it, the maximum operating temperature for which the line is designed to operate during the winter may be less than 120°F. Was it the intent of NESC to associate the 120°F temperature upper conductor temperature with a normal summer ambient temperature? If yes, that would be reasonable.

It seems unreasonable to require clearance for the upper conductor sagged at 120°F when the ambient temperature is -20°F because the assigned operating limits may not permit operation to 120°F during the winter season. Thus, the confusion regarding this rule as revised in 2007.

Explanation: Transmission operators have amp limits and, for a line with vertically arranged circuits, that limit would likely be the same for both winter and summer. This is accomplished by prescribing different maximum operating temperatures for winter than summer. In this manner, the required clearance is assured regardless how cold the ambient temperature may be.

For example, ATC may have a transmission line with an amp limit assigned for a max operating temperature of 150°F assuming an ambient of 90°F. This same line with a constant operating limit would only attain a conductor temperature of about 40°F when the ambient temperature was -20°F.

In practice, ATC and many utilities have used a more conservative approach. For the above line (with an operating limit defined to operate at 150°F assuming an ambient of 90°F), the utility may assume the lower conductor temperature is 60°F (not 90°F, which was the basis for the rating for the upper conductor). Considering this more conservative approach, is this new rule violated when the ambient temperature drops to -20°F? Note a clearance violation would not occur in real operation because the capacity limit restricts the operating temperature of the upper conductor to well below 120°F on a cold wintery day.

Utilities that have conservatively applied this rule prior to 2007 may now, depending on the interpretation, have to de-rate these vertically configured lines to ensure the upper conductor would not exceed 120°F during the coldest day of the year. It is not believed that was the committee's intent so long as the proper clearance is ensured throughout the year by appropriately restricting the operating capacity.

Interpretation

The clearances required by Rule 235C2b(1)(c) apply as specified in **either** (i) or (ii), whichever produces the greater vertical clearance at the structure. In the first case (i), the upper conductor is at either 120°F or the maximum operating temperature if greater than



120°F and the lower conductor is at the same ambient conditions as the upper conductor and without electrical loading. In the second case (ii), the upper conductor is at 32°F with ice loading as required, if any, and the lower conductor is at the same ambient conditions as the upper conductor and without either electrical loading or ice loading.

In essence, (i) is normally a summer condition and (ii) is a winter condition.

An interpretation was requested of the NESC 2007 and 2012 Editions. This interpretation is applicable to both.