National Electrical Safety Code Committee, Accredited Standards Committee C2

National Electrical Safety Code®

Interpretation

Section 25.
Loadings for Grades B and C

Rule 252A Loads on Line Supports–Assumed Vertical Loads (2002 Edition, page 171)
(28 July 2004) IR538
Rule 251A3 Conductor Loading–General (2002 Edition, page 170)
(28 July 2004) IR538

(Rule 252A) For installations located in NESC Medium and Heavy Load Districts, should radial ice be considered on vertically oriented communications cables running from the ground to PCS antennas installed near the upper portions of lattice, steel, or wood structures and poles?

(Rule 251A3) If yes, how should the ice coating be calculated in a multiple conductor bundle and can shielding from the wind be considered?

Discussion: In recent years, there have been numerous installations of PCS (wireless communications) antennas and cables added to overhead electric power line structures. These structures have included types such as lattice steel towers and poles made of steel, wood, and concrete.

In most instances, the antennas are multiple flat panels located near the top of the tower with either 2 or 4 coax cables running from the ground to each panel. A typical installation would have 3 or 4 panels pointed in 3 sectors for a total of 12 panels at one elevation. Up to 36 cables would then be routed from the ground to the antenna elevation. These cables are typically 1 in to 2 in in diameter each with individual weights per foot of 0.3 lb to 1.0 lb.

On poles, the cables are generally placed inside of conduit or covered. On lattice steel structures, they can be grouped in bundles and supported by brackets attached to legs or placed in cable ladders installed on the face of the tower.

The installations described above were probably not given a large amount of consideration over the years during the development of the NESC but have become common enough and involve loads substantial enough to require being addressed.

Rule 252A

While Rule 252A states “Loads due to radial ice shall be computed on wires, cables, and messengers, but need not be computed on supports” it is traditional to not consider ice on guy wires, ground wires, etc. presumably because these are vertically oriented and, in the case of guy wires, are considered a part of the “support”. Neither is ice considered on equipment such as antennas, transformers, cabinets, conduits, insulators, etc. Ice has traditionally only been considered on wires, cables, and conductors supported by the structure and running laterally.

Should vertically oriented communications cables be treated as “equipment” and not be subject to ice loading? If yes, should they be subject to ice loading when covered or located in conduit? Should the cover or conduit be considered as ice coated?

Rule 251A3

If the response to Rule 252A is that ice loading need not be considered, this second part of the request becomes partly mute. Otherwise, there are questions regarding how the ice should be calculated and whether wind shielding is appropriate.

1. If the cables are located in a cable ladder, it would seem appropriate to treat the cable ladder as a solid object and apply wind to the area defined by its width using a shape factor consistent with a flat surface. This could be less than the sum of areas represented by the total number of cables located in the ladder, especially if installed in layers. The ice (if required) could then be added to the assumed solid object and for weight purposes be calculated as coating a rectangular shape. This would seem to be consistent with Rule 252Bc.

2. If the cables are supported in a cylindrically shaped bundle on a “hoop” type support where each cable would be tightly spaced, it would seem appropriate to treat this as a hollow cylinder and apply the radial ice on the outside, especially if the gap between the cables was less than the ice thickness assumed. If agreed, should one also consider ice coating along the inside surface of the hollow cylinder? Is it appropriate then to apply the wind on the solid defined by the outer diameter using a shape factor consistent with a cylinder? If not, it would at least seem appropriate to use no more than 2/3rds the total area of the cables consistent with Rule 252B1−Exception?

Interpretation

The Interpretations Subcommittee has considered the subject Interpretation Request for Rule 252A and Rule 251A3 and has developed a consensus report as follows:

> “Rule 252A requires computation of radial ice loading on wires, cables, and messengers but does not specifically require such a computation on supports (“...need not be...”). The intent of this rule is to require ice loading computation on longitudinal and transverse spans running between supports but not on vertical runs. In other words, the intent of Rule 252A is to treat vertical runs on a single structure in the same manner as supports with respect to ice loading.
>
> However, the types of installations that have been described above have not been specifically considered in the development of Rules 251 and 252. As stated above, such installations are relatively new and may involve substantial loadings due to ice and wind. Consequently, Rule 012C may apply. This rule requires that construction and maintenance be done in accordance with accepted good practice for particulars not covered in the NESC rules. Both the weight of the ice and the wind loading due to the ice may adversely affect the stress on fasteners, support components, and even the supporting structure itself. This is of particular concern when the vertical run assembly is such that ice may bridge the components and become a solid mass.
>
> As additonal information and not as part of this interpretation, NESC Subcommittee 5 has been requested to review the ice loading rules applicable to the types of installations that have been described above.”