Chapter E 125

LOADING FOR GRADES B, C, AND D

E 125.01 Loading general. Three degrees of severity are recognized in the United States for the loading, due to weather conditions, and are designated, respectively as heavy, medium, and light loading. The districts in which these loadings apply are determined by weather reports as to wind and ice and by local experience of utilities using overhead lines. The state of Wisconsin is considered as being in the heavy loading district. No data will therefore be given on light and medium loading. (See section E 125.02).

History: Cr. Register, January, 1968, No. 145, eff. 2-1-68.

E 125.02 Conductor loading. (1) The loading on conductors shall be assumed to be the resultant loading per foot equivalent to the vertical load per foot of the conductor and ice combined with the transverse loading per foot due to a transverse, horizontal wind pressure upon the projected area of the conductor and ice to which equivalent resultant shall be added a constant. In the tabulation below are the values for ice, wind, temperature, and constants which shall be used to determine the conductor loading.

Radial thickness of ice (inches) ____________________________0.50
Horizontal wind pressure in pounds per square foot __________4
Temperature (°F.) ____0
Constant to be added to the resultant in pounds per foot
For bare conductors of copper, steel, copper-alloy, copper-covered steel, and combinations thereof __________________0.29
For bare conductors of aluminum (with or without steel reinforcement) ____0.31
For weatherproof and similar covered conductors (all materials)__0.31

Note: Since heavy ice does not often form on conductors in a heavy wind the transverse loading assumed is deemed sufficient for the purpose, but is not sufficient to represent the vertical (or combined) load which is imposed on conductors by the heavy deposits of ice which frequently form in comparatively still air. In order to apply a total loading to conductors representing more nearly the conditions encountered in practice, constants have been added to the conductor loading which makes no substantial change in the conductor loading specified in the fourth edition of this code.

(2) Where cables are concerned, the specified loadings shall be applied to both cable and messenger.

(3) In applying loadings to bare stranded conductors, the coating of ice shall be considered as a hollow cylinder touching the outer strands.

Note: If anyone desires to obtain a description of light and medium loading he should refer to "The National Electrical Safety Code" published by the Bureau of Standards.

History: Cr. Register, January, 1968, No. 145, eff. 2-1-68.

E 125.03 Loads upon line supports. (1) ASSUMED VERTICAL LOADING. The vertical loads upon poles, towers, foundations, crossarms, pins, insulators, and conductor fastenings shall be their own weight plus the superimposed weight which they support, including all ice covered wires and cables, together with the effect of any difference in elevation of supports. The radial thickness of ice shall be computed only upon wires, cables, and messengers, and shall be taken as 0.50 inch of ice. Ice is assumed to weigh 57 pounds per cubic foot.

Note: The weight of ice upon supports is ignored for the sake of simplicity.

(2) ASSUMED TRANSVERSE LOADING. In computing the stresses in poles, towers, and side guys the loading shall be taken as follows:

(a) *Cylindrical surfaces.* A horizontal wind pressure, at right angles to the direction of the line, of 4 pounds per square foot upon the projected area of cylindrical surfaces of all supported conductors and messengers, when covered with a layer of ice 0.5 inch in radial thickness and on surfaces of the poles and towers without ice covering, shall be assumed. (See (c) and (d) following.) For supporting structures carrying more than 10 wires, not including cables supported by messengers, where the pin spacing does not exceed 15 inches, the transverse load shall be calculated on two-thirds of the total number of such wires with a minimum of 10 wires.

(b) *Trolley contact conductors.* When a trolley contact conductor is supported on a commonly used pole it shall be included in the computation of the transverse load on the structure.

(c) *Flat surfaces.* For flat surfaces the assumed unit wind pressure shall be increased by 60%. Where latticed structures are concerned the actual exposed area of one lateral face shall be increased by 50% to allow for the pressure on the opposite face; this total, however, need not exceed the pressure which would occur on a solid structure of the same outside dimensions. The results obtained by more exact calculations may be substituted for the values obtained by this simple rule.

(d) At angles (combined longitudinal and transverse loading) where a change in direction of wires occurs, the loading upon the structure, including guys, shall be assumed to be a resultant load equal to the vector sum of the transverse wind load given in subsection E 125.03(2)(a) above and the resultant load imposed by the wires due to their change in direction. In obtaining these loadings, a wind direction shall be assumed which will give the maximum resultant load, proper reduction being made in loading to account for the reduced wind pressure on the wires resulting from the angularity of the wind to the wires.

(3) ASSUMED LONGITUDINAL LOADING. (a) *Change in grade of construction.* The longitudinal loading upon supporting structures, including poles, towers, and guys at ends of sections required to be of grade B construction, shall be taken as an unbalanced pull in the direction of the higher grade section equal to the larger of the following values:

1. The pull of two-thirds and in no case less than 2 of the conductors supported thereon which have ultimate strength of 3000 pounds or less, such two-thirds of the conductors being selected so as to produce the maximum stress in the support; the nearest whole number of conductors to be used, or

2. The pull of one conductor when there are 8 or less conductors (including overhead ground wires) having ultimate strength of more than 3,000 pounds, and the pull of 2 conductors when there are more than 8 conductors, such conductors being selected so as to produce the maximum stress in the support.

(b) *Jointly used poles at crossings over railroads or communication lines.* Where a joint line crosses over a railroad or a communication line and grade B is required for the crossing span, the tension in the communication conductors of the joint line may be considered as limited to one-half their breaking strength, provided they are smaller than No. 8 Stl. W.G., if of steel, or No. 6 A.W.G., if of copper, regardless of how small the initial sags of the communication conductors at 60°F.

(c) *Dead ends.* The longitudinal loading upon supporting structures at dead-ends for line terminations shall be taken as an unbalanced pull equal to the tensions of all conductors and messengers (including overhead ground wires), under the conditions of conductor loading specified in section E 125.02; except that with spans in each direction from the dead-end structure the unbalanced pull shall be taken as the difference in tensions plus, if applicable, the tensions with broken wire conditions specified in section E 125.03(3) (a).

(d) *Communication conductors on unguyed supports at railroad crossings.* The longitudinal loading shall be assumed equal to an unbalanced pull in the direction of the crossing of all open-wire conductors supported, the pull of each conductor being taken as 50% of its ultimate strength.

(4) AVERAGE SPAN LENGTHS. (a) *General.* The calculated transverse loads, upon poles, towers, and crossarms, except as provided in (b) below, shall be based upon the average span length of a section of line that is reasonably uniform as to height, number of wires, grade, and span length. In no case shall the average value taken be less than 75% or more than 125% of the actual average of the 2 spans adjacent to the structure concerned.

(b) *Crossings.* In the case of crossings over railroads or communication lines the actual lengths of the two spans adjacent to the two structures concerned shall be used.

(5) SIMULTANEOUS APPLICATION OF LOADS. (a) When calculating transverse strength, the assumed transverse and vertical loads shall be taken as acting simultaneously.

(b) In calculating longitudinal strength, the assumed longitudinal loads shall be taken without consideration of the vertical or transverse loads.

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