

1. Live Line Maintenance Requirements

- a. Adequate clearances shall be provided when live-line maintenance requirements are specified for a line design for any of the following maintenance activities:
 - i. Climbing inspection
 - ii. Hot stick maintenance for the specified line components
 - iii. Live line maintenance for the specified line components utilizing specified lift equipment
 - iv. Helicopter live line maintenance for the specified line components utilizing the specified helicopter
- b. All live line maintenance clearances shall be determined utilizing the OSHA calculation methods for the specified:
 - i. Circuit TOV
 - ii. Breaker design and maintenance program

2. Conductor Clearances

- a. The vertical conductor clearances of Section 23 of the 2017 NESC shall be maintained with the conductors under design at the NESC stated conditions unless modified herein.
 - i. The conductors' calculated positions shall be 3' greater than the clearances required by NESC Table 232-1.
 - ii. The short circuit current discharge requirements of NESC Rule 232D3(c) shall be met.
 1. All areas beneath the conductors shall assume to allow vehicle access.
 2. All terrain point under the conductors shall be considered vehicle-accessible.
 - iii. In land areas that may utilize farm, additional conductor clearances shall be provided in accordance with NESC Table 232-1 footnote 26.
- b. For conductor-to-conductor clearances between different circuits and where the line under design is crossing over an existing supply or communication line, the lower conductors' position shall be determined by a straight line between conductor attachment points unless specific sag/tension information for the lower conductors/cables are known. When the sag/tension characteristics of the lower conductors/cables are known, the conductor requirements of the NESC rules may be applied.
- c. Clearances shall be maintained applying the maximum operating voltages as defined in PJM Manual 3, "Baseline Voltage Limits", Exhibit 3 section 3.3.1.
- d. The system transient overvoltage's (TOV) shall be used when NESC Rule 232D is applied to determine the applicable NESC clearances.

3.2 Galloping Mitigation:

Lines shall be designed to limit the likelihood that conductor/shield wire galloping will result in a circuit operation. Galloping shall be addressed by one or a combination of the following methods:

- Performing a study which demonstrates that the route traversed by the line is not likely to be prone to the wind/ice conditions attributed to conductor galloping
- Providing conductor I clearances at the structure which produce the in-span conductor clearances defined below
- Install in-span interphase insulators or anti-galloping device designed to reduce the possibility and/or severity of conductor galloping
- Install T2 conductor

Conductor galloping ellipses shall be developed using either a combination of the A.E. Davison method for single loop galloping and the L.W. Toye method for double loop galloping, or the CIGRE method per Bulletin 322. The following load cases shall be used for galloping calculations for either stated method:

- 32°F, 0.5" Radial ice, 2 PSF wind (For determination of Swing Angle)
- 32°F, 0.5" Radial ice, No Wind (For determination of sag and conductor motion ellipses)

Single loop galloping shall be used for spans less than 700 feet. Double loop galloping shall be used for spans of 700 feet or greater or any span where the conductor has dead-end terminations on both ends. Long spans over eighteen hundred (1800) feet shall take into account existing line historical operation. If no data is available a study shall be performed to determine the proper mitigation methods.

The conductor clearance requirements have been achieved if the calculated galloping ellipses, developed by either of the stated methods, overlap no more than 10% of the major axis of the conductor's ellipses. Galloping clearances shall also be checked between the transmission conductors and shield wire.

Comment [TDP1]: Is a lot of this design manual material?

ACTION: Group agrees this is too prescriptive and in some cases conservative. Dave to suggest language.

Comment [TDP2]: Aren't the first two sentences part of the procedures recommended by each method? If so, do we need to repeat it here?

Comment [TDP3]: DE on only one end too?