



# Interpretation

## Section 2. Definitions of special terms

**Sag. 3. final sag – 4. final unloaded sag**  
**(2007 Edition, page 11)**  
**(10 April 2012) IR565**

**Request:** The definition of the term “*sag*” in the 2007 NESC, Section 2., has several definitions for different types of sag. The difference between definitions 3 and 4, of “*final sag*” and “*final unloaded sag*” respectively, is not understood. Both definitions are identical, except the expression “*under specified conditions of loading and temperature applied*” included at the beginning of the definition of “*final sag*.” It may be that the phrase “*and the loading removed,*” included in both definitions, should not be included in the definition of “*final sag,*” but only in the definition of “*final unloaded sag.*” It is thought that should be the difference between both. An interpretation is requested because the difference between these definitions needs to be understood.

### Interpretation

#### Summary

It is correctly stated in the Request that the definitions for “*final sag*” and “*final unloaded sag*” (definitions 3 and 4 under “*sag*” in the 2007 Edition) are identical except for the phrase “*under specified conditions of loading and temperature applied*” that is included only in the definition of “*final sag.*” Further, as stated in the Request, it is thought that the phrase “*and the loading removed*” should not be included in the definition of “*final sag.*”



To understand the difference between the two definitions, the following wording in both definitions must be considered in its entirety: “...*after it has been subjected for an appreciable period to the loading prescribed for the clearance zone in which it is situated, or equivalent loading, and the loading removed.*” The purpose of this wording is to account for inelastic deformation, or permanent stretch, that is required in both definitions. Consequently, the phrase “*and the loading removed*” must remain in the definition of “*final sag.*”

Inelastic deformation is discussed in the next section. The difference in applied loadings once permanent stretch has been obtained is discussed in the final section.

### **Inelastic Deformation**

When a conductor is initially installed, it is sagged or tensioned based on ambient temperature. At this point, the conductor has not been subjected to any external ice and/or wind loading. See definition for “*initial unloaded sag.*”

Ice and/or wind loading increases conductor tension, causing the conductor to elongate or stretch. While the conductor will tend to return to its original length as the loading is removed, some permanent elongation or stretch will remain. Successive loading and removal applications will increase the incremental stretch until final elongation is achieved. This incremental stretch occurs rapidly at first and then slows down; a ten-year time period to reach final elongation or inelastic deformation is typical.

Note that both “*final sag*” and “*final unloaded sag*” include the effect of inelastic deformation.

### **Application**

As noted in the Request, the definition of “*final sag*” includes the phrase “*under specified conditions of loading and temperature applied.*” This loading applies to the loading required by the rules **after the full effect of inelastic deformation has been achieved.**

“*Final unloaded sag*” is the sag without such ice and/or wind loading **after the full effect of inelastic deformation has been achieved.**

Note that industry sag/tension tables generally show initial and final sags but not final unloaded sags. However, the tables show various temperature, ice and wind conditions for final sags.