

Terrain Effects on Overhead Line Vibration

Joshua Senn, Applications Engineer – Accessories, AFL

The terrain across the United States widely varies and every overhead lines project will have its own considerations and challenges. One aspect of line design – where terrain plays a crucial role – is the effect it has on overhead conductor and cable motion.

In terms of conductor motion control, laminar flow is the main source of issues. Open, flat terrain has been found to exhibit both the highest likelihood and severity of vibration damage. The reason for this is that overhead line vibrations are caused by vortex shedding in the presence of smooth and steady wind. Trees, hills, buildings and similar features introduce turbulence and will break up the laminar flow of the wind. Without these features, vibrations are likely to occur.

To make the terrain category selection easier for the line designer, AFL separates terrain options into three wind speed categories:

15 mph (Normal Terrain)

The terrain for this category has a number of trees, underbrush and/or buildings in the surrounding area. The overhead lines would be mostly below or just above the tree line. Examples of this terrain are found throughout the Northeast, Mid-Atlantic and Pacific Northwest where transmission and distribution lines are surrounded by trees and/or buildings. Dampers are recommended less often in this case or are typically minimal.

20 mph (Flat Terrain)

This is the most commonly used terrain selection and areas of the Midwest and Southwest predominantly fall within this category. The lack of tall vegetation and relatively flat terrain makes lines more susceptible to vibration. It is important to note that regions mostly within the 15 mph zone can have areas where the 20 mph selection is more appropriate. If a project has towers which are well above the tree line (>20 ft) or are on a bare knoll, then it may fall within this category since the wind in these cases will be more laminar.

25 mph (Water/Canyon Crossing)

River or canyon crossings pose multiple challenges for transmission line designers and vibration mitigation in this case is no different. These areas experience the highest likelihood of fatigue damage if not dampened properly due to the higher tensions, long spans, and susceptibility to high winds. The wind is also often funneled directly in the direction of the lines due to the trees or river banks on either side. Due to the nature of these areas, please consult an AFL engineer for all river crossing projects to ensure proper protection is provided.

Terrain plays a large role in the likelihood of fatigue damage and what protection strategies are implemented in the field. AFL is here to help make this selection easier and is happy to assist in confirming your particular project's criteria. Please reach out to an AFL engineer for any questions or assistance you may need.



Trees and Shrubs/Rolling Hills –15 mph



Flat Terrain – 20 mph



www.AFLglobal.com