Design Considerations Using The ANSI/TIA-222-Rev G Standard

The Rev G TIA Standard contains new parameters that significantly affect the magnitude of wind, ice and earthquake loading. In addition to specifying the location of a structure for determining the basic wind speed, design ice thickness and earthquake accelerations, it is important to consider these new parameters for the design of proposed structures and for the modification of existing structures.

The following summary and explanations are intended to assist users of the Standard with these new parameters. Reference should also be made to the Rev G Standard, which contains more detailed information and an annex that provides additional procurement and user guidelines. In addition, please contact your ROHN Sales Representatives for any questions or for assistance in the use of the TIA Standard.

Classification of Structures (reliability)

Classification of structures allows for the adjustment of wind, ice and earthquake loading to match the reliability requirements for a specific application. Three reliability classes have been established based on the type of service provided and on the structure's potential hazard to human life and property. Wind, ice and earthquake loading requirements progressively increase from Class I to Class III structures.

Class I: Structures used for services where a delay in returning the service would be acceptable and the structure represents **a low hazard** to human life and/or property. Example services would be: residential wireless and conventional 2-way radio communications; television, radio, and scanner reception; wireless cable; amateur and CB radio communications. Structures of this classification are exempt from ice and earthquake loading and wind loads are reduced 13% compared to Class II structures.

Class II: Structures used for services that may be provided by other means or structures that represent **a significant hazard** to human life and/or property. Example services would be commercial wireless communications; television and radio broadcasting; cellular, PCS, CATV, and microwave communications.

Class III: Structures specifically designed for essential communications or structures that represent **a substantial hazard** to human life and/or property. Examples of essential communications would be: civil or national defense; emergency, rescue, or disaster operations; military and navigation facilities. Loadings are increased for structures of this classification compared to Class II structures (15% for wind, 25% for ice and 50% for earthquake).

Exposure Categories (terrain)

Exposure categories are used to adjust wind loading based on the type of terrain surrounding a site. Reduced wind loads are associated with rougher terrains that tend to slow the wind down. Three exposure categories have been defined based on terrain roughness. Wind loading is increased as the exposure designation changes from Exposure B (roughest terrain) to Exposure D (smoothest terrain).

Exposure B: Urban, suburban or wooden areas. The wind load at ground level is reduced by 18% compared to Exposure C. This reduction diminishes with height, making the overall wind reduction less significant for taller structures. In order to qualify for the wind load reduction, the rough terrain must extend in all directions from the site at least twenty times the height of the structure but not less than one-half mile [0.8 km].

Exposure C: Flat, open country and grasslands. Shorelines in hurricane prone areas are currently included in this exposure due to the roughness of waves generated during hurricanes; however, research is continuing regarding wind loading for hurricane areas.

Exposure D: Flat, unobstructed areas exposed to wind flowing over open water or smooth terrain for at least 1 mile [1.6 km]. Examples would be shorelines of large bodies of water and areas adjacent to or within mud or salt flats. The wind load at ground level is increased 21% compared to Exposure C. The higher wind load applies to structures located within 20 times their height from an Exposure D terrain. An exception is permitted for sites located in an Exposure B terrain that are at least 2 miles [3.2 km] from the Exposure D terrain. Under these conditions, the site may be classified as Exposure C.

Topographic Categories (elevated sites)

Topographic categories are used to determine increases in wind loading for sites located on hills and other elevated locations (other than buildings). The shape and size (topography) of an elevated site determines the increase in wind load. Although many elevated sites have their own unique features, the intent is to idealize these sites into one of the standard topographic categories described below. For structures supported on buildings, it is only necessary to specify the height of the building and the surrounding exposure category.

The height of an elevated site above the surrounding terrain must be specified in order to determine the full extent of wind loading in accordance with the Standard. This should not be confused with the elevation of the site. As described below, elevations of the site and the surrounding terrain may be used to determine height.

Category 1: Flat or rolling terrain with no abrupt changes in general topography. No increase in wind loading is required for this category.

Category 2: Sites separated from a lower elevation by a gently sloping terrain (escarpment). Wind loads at the crest are 2.0 times the wind loads for a flat site and diminish with height depending on the height of the escarpment.

Height for an escarpment is the difference in elevation between the upper and lower levels. Increased wind loads do not apply for structures located in the lower half of the sloping terrain or located beyond 8 times the escarpment's height from the crest.

Category 3: Sites located at the top or within the upper half of a hill. Wind loads at the top of a hill are 2.3 times the wind loads for a flat site and diminish with height depending on the height of the hill.

Height for sites on isolated hills is the difference in elevation between the top and bottom of the hill. For sites on prominent hills surrounded by other hills, height is the difference in the hill elevation at the site and the average elevation of the surrounding hills (within a 2-mile [3.2 km] radius). In other words, height is the projection of the hill exposed to wind. When there are hills surrounding the site, increased wind loads do not apply unless the height of the hill at the site is at least 3 times the average height of the surrounding hills.

Category 4: Sites located on a ridge. Wind loads at the top of a ridge are 3 times the wind loads for a flat site and diminish with height depending on the height of the ridge.

Height for a ridge is the difference between the top and bottom elevations of the ridge.

Category 5: This category is reserved for sites where site-specific investigations are performed to determine wind loading. A site-specific investigation may result in either higher or lower wind loads compared to using one of the standard topographic categories.