

## Antenna Support Structure Design Radius of Curvature Requirement

Radius of curvature is meant to be a definition of points on the surface of a circle. A radius of 800' represents a 2" deflection from a tangent line to a circle over 10' increment. Radius of curvatures should be above 800' at maximum design wind loads. [See Figure 1]

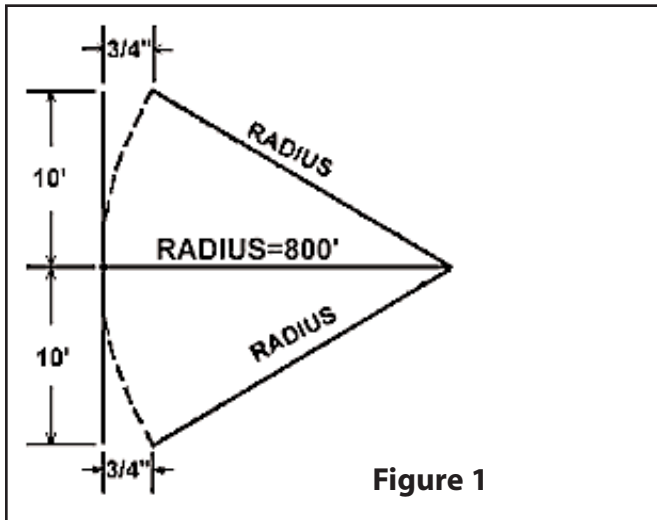


Figure 1

To determine minimum radius of curvatures, several points along the antenna length should be taken. Points at 5' increments are satisfactory. [See Figure 2]

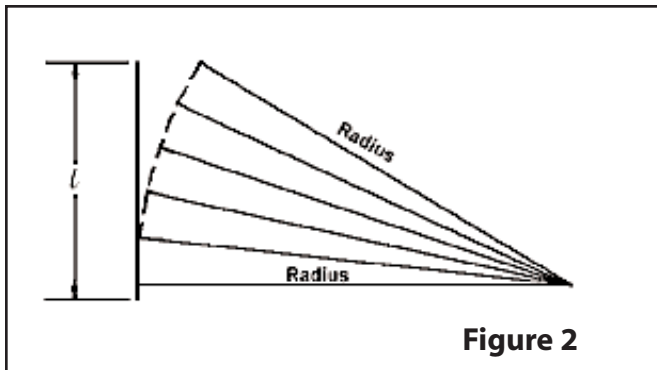


Figure 2

The purpose of minimum radius of curvature requirement is to limit a support structure's deflection in the area of the antenna array, thus avoiding structural damage to the FM antenna feed harness. ERI developed a minimum stiffness standard in the early 1980's. The following explanation is a restatement of that standard. Installation of an ERI antenna on a support structure that fails to meet the minimum

radius of curvature specification constitutes an "improper installation" and will void the antenna's warranty.

The radius of curvature identifies the length of an arc's radius and is a measure of an antenna pole's flexibility. This arc is formed when the antenna support structure is deflected due to applied external loading conditions. The arc is defined by the theoretical connection of any three points on the center line of the antenna support structure. The radius of curvature requirement assumes a selection of points that will generate the smallest possible radius curvature (maximum deflection).

In order to prevent unnecessary fatigue of the antenna's inter-bay transmission line and material wear of the electrical connection contact points, ERI recommends that the support structure's radius of curvature exceed 1500'.

In determining the radius of curvature (deflection) of an antenna support structure, the following criteria should be utilized.

EIA/TIA-222-E Standard at the tower's design wind speed.  
EIA-222-C Standard with a 50 psf loading for flat and 33.3 psf loading for round members.

Due to the reduction in the shape factor allowed for poles with the advent of the EIA/TIA-222-E design code, antenna poles manufactured utilizing the design forces indicated by the new code may not meet the radius of curvature requirement.

Failure of a support structure to meet the minimum radius of curvature of 800' produced by application of the design force generated by either version of the standard would constitute an improper installation and would result in voiding the manufacturer's antenna warranty.

A summary of the engineering notes and sample solutions of radius of curvature applications has been provided. A comparison of 3 support structures is also included. ERI will voluntarily verify any pole design's ability to meet the specified radius of curvature requirement at no cost to the requesting manufacturer or potential antenna customer.

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