ANALYTICAL COMPARISON OF TENSION VS. TWIST TO CONTROL GALLOPING

This analysis was performed for an operating utility to examine the effectiveness of increasing line tension on reducing galloping amplitudes for two different types of conductor, the FALCON and the CHUKAR, in use in the system. The study compares the results of this approach with those from introducing twist in the line by means of the **AR Windamper**.

High line tensions may be expected to reduce galloping by reducing line sag and its attendant slack which drives the galloping amplitudes. Figure 1 plots peak-to-peak galloping amplitudes against span length for the FALCON conductor at a wind speed of 35 mph in a light icing condition of ⅛ inch on the conductor's windward face. Two sets of curves are presented. The upper set demonstrates the effects of increasing line tension from 14,000 lb to 15,000 lb. At a span length of 1,000 feet, increasing tension is seen to reduce gallop amplitude by about 15%, from just over 16 feet to 14 feet. This minimal reduction is offset by increases in aeolian vibration and in structural loads on the towers.

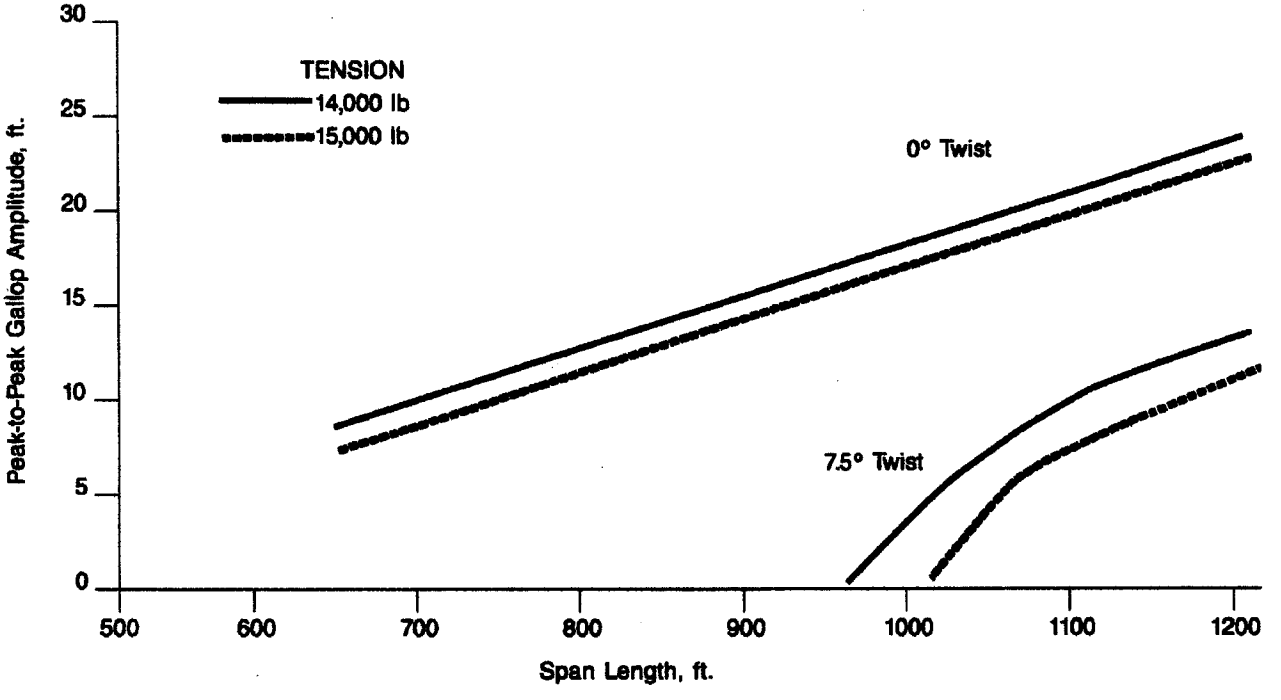

***FIGURE 1** – Effects of tension and twist in controlling gallop amplitude for the FALCON conductor.*

Introducing twist into the line, on the other hand, has a dramatic effect as shown by the lower set of curves in Figure 1, calculated for each line tension. Here it is seen that at a span length of 1,000 feet as little as 7½° of twist reduces galloping amplitude by nearly 75% to just over 5 feet at 14,000 lb tension. Galloping is reduced to zero for span lengths of 960 feet and below. Increasing tension to 15,000 lb increases the safe span length by 4% to 1,005 feet.

The results of a comparable analysis for the CHUKAR conductor are shown in Figure 2. Here line tensions for the upper set of curves are 15,000 lb and 17,000 lb. The lower set of curves is calculated for a twist angle of 7½° for each of the two line tensions. Here it is seen that with twist the safe span length is 995 feet at the lower tension and 1,080 feet at the higher tension. Thus conductor selection is not critical if the line is protected with a twisting device to control galloping.

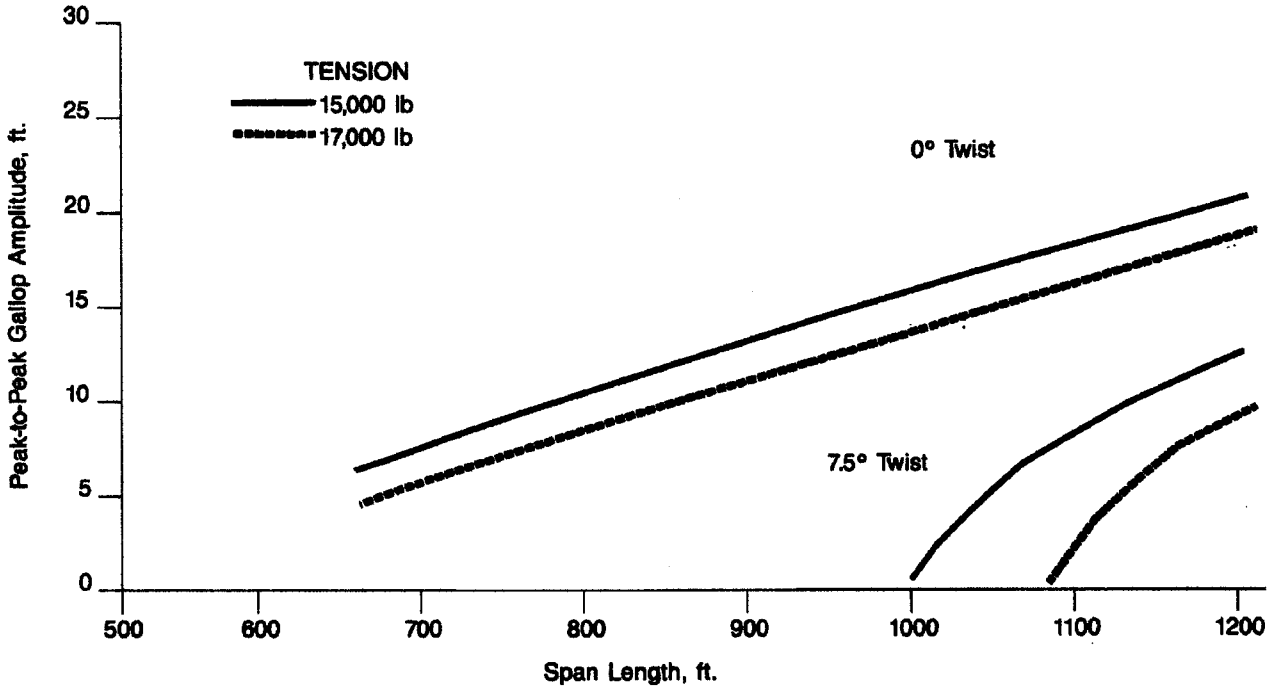

***FIGURE 2** – Effects of tension and twist in controlling gallop amplitude for the CHUKAR conductor.*

The modest amount of twist used in this analysis is well within the capacity of the **AR Windamper** which has demonstrated angular twist of 20° or more in 35 mph winds. This means that this device will fully control galloping at the span lengths of interest in wind speeds well above 35 mph.

In conclusion, this comparison clearly demonstrates the superiority of introducing line twist over increasing tension in controlling galloping. Increasing tension reduces galloping minimally, whereas a modest amount of twist eliminates galloping altogether at span lengths of the order of 1,000 feet.