

PERFORMANCE TESTING THE *BANNERHINGE*[™]
BY ENGINEERED HARDWARE, LLC

By

Thomas P. Kicher, Ph.D. and Joseph M. Prah, Ph.D., P.E.

SUMMARY

A test program for evaluating the performance of banner mounting hardware under actual weather condition for extended time periods is reported herein. Instrumented test poles were anchored to pier foundations and exposed to harsh weather conditions of high winds and low temperatures for a period of 6 months. Winds in excess of 60 mph and temperature well below zero were reported at a nearby ODOT meteorological station. Oversized, heavy duty banners were utilized throughout the winter testing to minimize the possibility of a banner failure and promote the first failure in the structural components of the mounting hardware. Failures were experienced in the hardware during this extended winter testing, resulting in modifications of the design and assembly, leading to a superior product. Another important lesson was observed in the banner behavior, both visually and through the instrument recorded data. The extreme flexibility of the test poles and the large size and heavy weight of the test banners generated a flutter of the test pole, particularly when the wind direction was parallel to the plane of the banner. These observations again identify the hazard of excessive vibrations in structures that are used to support signs and luminaries and display banners and flags. The AASHTO Code demands the attention to the details of pole design when selecting displays for attachment to the poles to provide a safe environment for the public.

The smaller banners provided a more realistic basis for evaluating the performance of the banner mounting hardware. During periods of modest to high winds and moderate temperatures, data on the bending moments at the base of the test poles and corresponding wind speeds and directions were observed and recorded with calibrated instruments and computerized data scanners. The data indicated the poles equipped with *BannerHinge*[™] hardware for attaching banners to the poles experienced measurably lower bending moments when compared to poles with the fixed banner mounts. Furthermore, the stresses from these bending moments are more favorably distributed about the base of the pole and will provide an extended fatigue life for the poles.

In summary, the attachment of banners, flags, wreathes and other displays add aerodynamic drag loading on the pole and must be considered in determining the design requirements of the structural capacity of the pole. The pole must have the inherent capacity to supports these displays, as guided by the AASHTO Code, otherwise they should not be added. The *BannerHinge*[™] articulates with the wind and reduces the damaging effects of the aerodynamic drag of banners, regardless of the wind's direction, and extends the fatigue life of the pole by reducing the magnitude of the bending moment and redistributing the maximum bending moments.