Studies Bridge

The first cable-stayed girder bridge in the United States has another first to its credit. The John W. O'Connell Bridge in Sitka is now the subject of the most extensive aerodynamic research project ever conducted on a bridge in the United States.

The structure has recently been instrumented for a study under joint sponsorship of the Alaska Department of Highways and the Federal Highways Administration, U.S. Department of Transportation, to investigate the aerodynamic behavior of the cable-stayed bridge under the relatively high winds that occur in the Sitka area.

This is the first project in the United States where instruments of this degree of sophistication have been used to read bridge responses.

Girder bridges in general are not subject to wind induced oscillation. However, suspension bridges may exhibit oscillation during relatively low wind velocities because they are designed to be more flexible.

This 450-foot main span bridge is somewhat of a compromise between a suspension bridge and girder bridge. Very little information is available on the aerodynamic characteristics of this type of structure, although several cable-stayed girder bridges are in use in Europe, Canada, and Japan.

Although the oscillations on this bridge should be minor, researchers are hoping to observe wind action sufficient to cause the bridge to react in one or more of its natural frequencies.

The data collected will be extremely valuable for the evaluation of various structure shapes in model-wind tunnel tests, which will then allow the safe use of this graceful, economical structure on larger spans.

Five extremely sensitive three directional wind velocity meters have been installed on the south side of the bridge, and ten motion sensing devices (accelerometers) have been installed along the edges of the concrete deck.

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Three additional acceleromeiers are located atop the cable supporting towers.

A seismograph has been provided to measure the earthquake motion and forces and to trigger the recording equipment in case of an earthquake.

Except for this seismograph triggering, the equipment will not record bridge motion until triggered by a set wind velocity (i.e. 30mph) or a set acceleration (i.e. 0.01 times the acceleration due to gravity) for a predetermined period of time, such as four seconds.

These "threshold" limits are presently being determined to make possible recording a resonant frequency motion of structure while neglecting random motions such as those caused by vehicular traffic.

The principal investigator for the Federal Highway Administration is Richard H. Gade, Structures & Applied Mechanics Division. Robert Lium and Ed Johnson represent the Alaska Department of Highways and Ken Likottee of Systems Technonogy Associates is the electronic contractor's representative.

Plans call for the instruments to remain on the bridge for about two years.