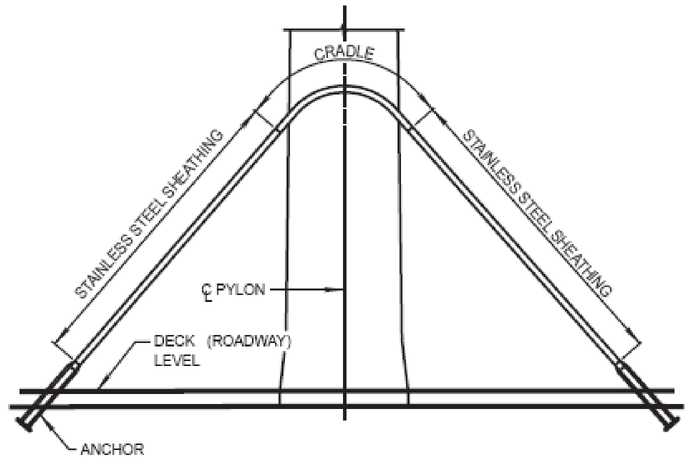
CABLE STAYED BRIDGE CRADLE



The innovative cable-stayed bridge system provides a continuous cable stay from the bridge deck, through the cradle on the pylon and back down to the bridge deck . Each strand passes through it's own individual stainless steel sleeve in the cradle assembly and is housed within stainless steel sheathing for it's free length.

The primary benefit of the new system is to allow engineers to design pylons that will be slender and aesthetically-pleasing by eliminating the anchors previously required in a typical pylon design. Additional benefits include cost-effectiveness, reduction in required construction time and the provision of 40 test strands that may be fully removed and inspected at 25 years, 80 years, etc. to verify the condition of the stays without compromising the design's integrity.

The system has been used in two major bridges:

- Penobscot Narrows Bridge and Observatory, Maine: Two pylons support the 1160 ft cable-stayed main span of the Penobscot River Bridge to carry Route 1 along the Main coastline. The bridge is adjacent to historic Fort Knox near Bucksport, Maine. The western pylon features a multi-level observatory open to the public.
- Veterans' Glass City Skyway, Toledo, Ohio, across the Maumee River: The main span cable-stayed unit consists of a single pylon with a single plane of stays and a 612 ft span on each side of the pylon. Traditional anchor systems would have required the pylon to be at least an additional ten feet in width. The series of 20 stay cables, each inside stainless steel sheathing for their free length, runs through the cradle within the pylon to support the bridge deck. *The 156 strand cable is the largest ever used on a cable-stayed bridge* with load capacity significantly exceeding the largest US stay cables.

Significant improvements included the following, for the Maumee River Crossing Bridge in particular:

- The cable-stayed cradle saved over $3 million on the Maumee River Crossing Bridge. When cable stay anchors are used in pylons, the pylons need to be large enough to permit internal access during construction for stressing operations of the stays and for inspection of the anchors after construction. Also, significant additional reinforcing is needed to overcome the large splitting stresses in the concrete pylon. By using our cradle internal to the pylon, access requirements are eliminated allowing the use of a smaller pylon cross section, saving not only concrete and steel, but also construction time. Additionally, the unit cost of a cradle is lower than that of the two anchors it replaces.
- Perceived concerns about strand-to-strand interaction in the curved portion of the cable are eliminated by the use of individual sleeves inside the cradle for each strand. All strands run parallel from anchor at deck level to cradle to anchor at deck level.
- Allows use of a continuous primary tensile element from deck level anchor to deck level anchor.
- The load transfer to the concrete pylon occurs in a natural compressive contact stress applied vertically to the pylon. Not only is this a more desirable structural condition, but it also saves time and money since no additional reinforcing is required in the pylon to control the high splitting forces introduced into a pylon by the use of anchors in the pylon.
- Provides the flexibility of 40 "reference" strands that can be removed in entirety at desired time intervals for inspection...15 years, 50 years, etc. so that ODOT will always know the condition of the stays. This is the only cable stay system with this "fool proof" stay inspection system.

The cable-stayed cradle was recognized by the History Channel's Modern Marvels series Invent Now in the top 25 inventions in 2006 (the only one in civil engineering), and it won National Society of Professional Engineers 2006 New Product Award.

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Penobscot Narrows Bridge & Observatory, Maine

I-280 Veterans' Glass City Skyway, Toledo, Ohio