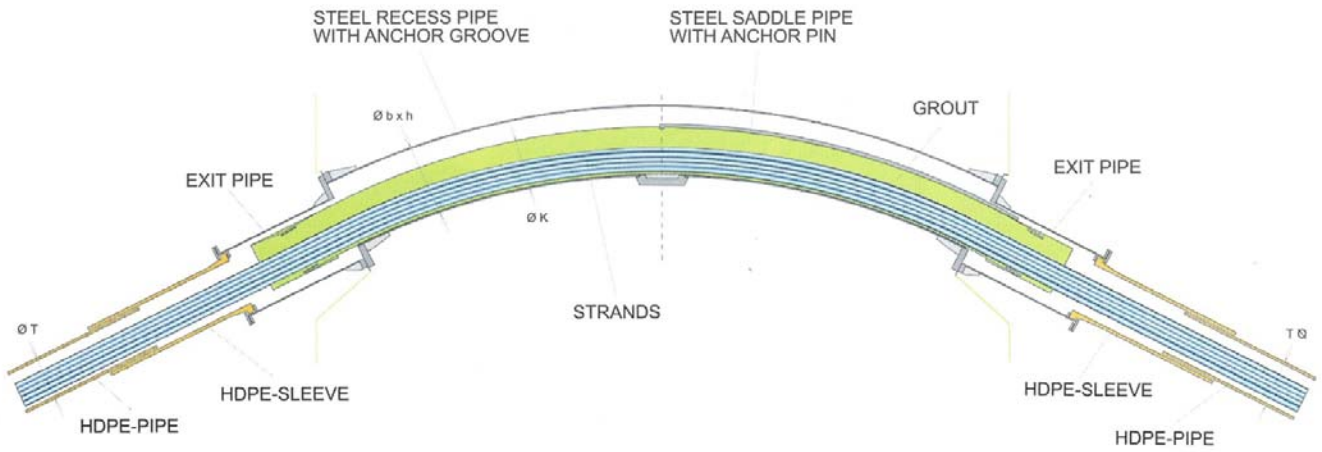
Maximum Flexibility for Cable Stayed Bridges: The DYNA® Link Anchor Box System

Modern cable stayed and extradosed bridges are often designed with saddles. The stay cables are deviated at the pylon and anchored to the superstructure at both sides of the pylon.

There are two types of saddles for strand bundle stays:

- Bundle saddle – the strand bundle is diverted in a curved tube and generally grouted in the deviation area using a special grout. The curved saddle pipe is guided through an curved recess pipe which is embedded into the concrete so that the strand bundle including saddle pipe can be exchanged if necessary. Differential forces in the stays at both sides of the saddle are reliably transferred via shear noses or ring nuts.



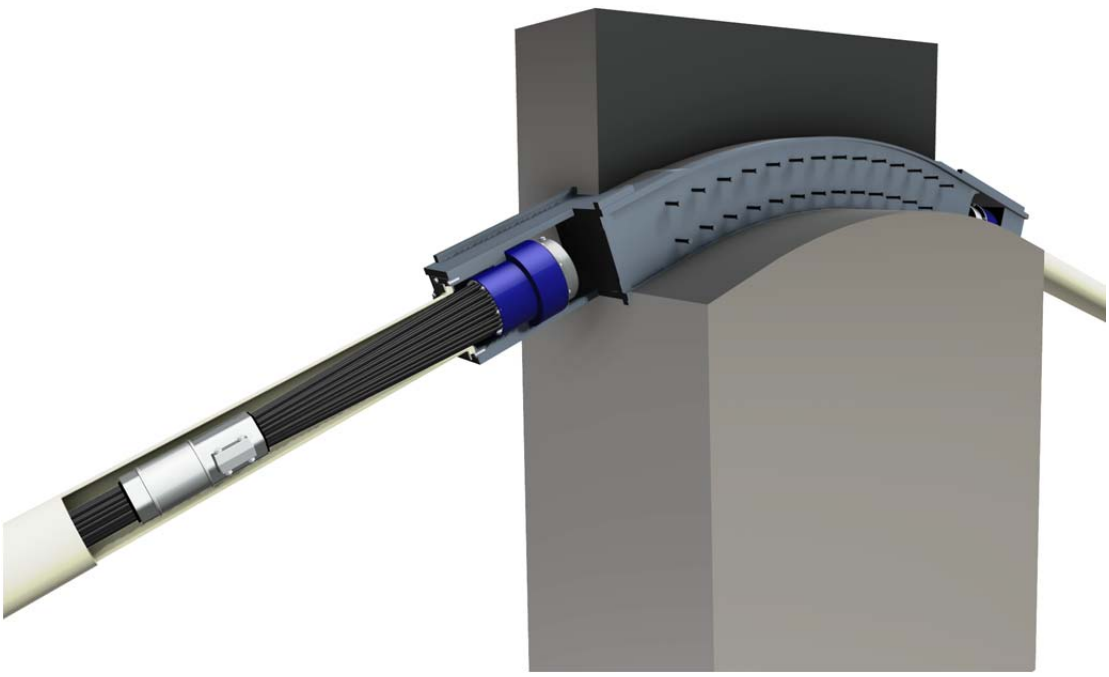
- Saddles with individual tubes; also called Cradle – the strands are conducted in a multitude of individual, curved recess tubes or individual holes. The saddle itself is embedded into the concrete and cannot be replaced. However, individual strands can be replaced if necessary. Differential forces are transferred by friction.

Both systems permit an economic design of the pylon because access shafts within the pylon can be omitted and the pylon can have slender dimensions. Nevertheless, both alternatives entail a few disadvantages:

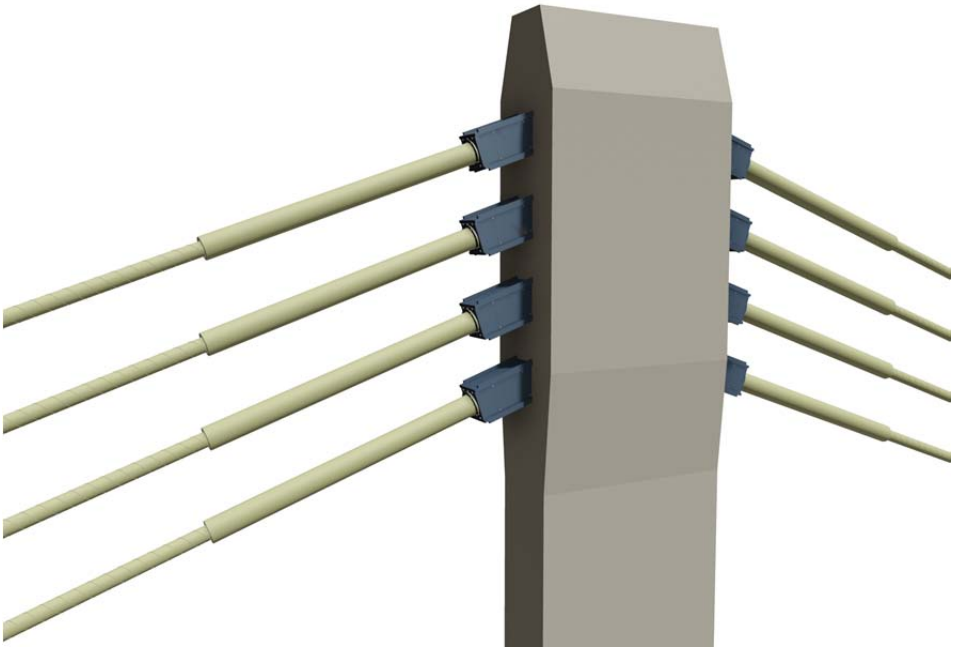
- Stay cable assembly requires simultaneous work cycles at both sides of the pylon when building the superstructure, which usually results in longer cycle times for cantilever construction.
- Strand assembly is complex because the strands have to be pulled across the saddle, and in some systems, the PE coating of the strand needs to be removed at the saddle.
- In some systems, differential forces are only transferred by friction so that the stay can slip over the saddle in cases of extreme load.
- The saddle structures have to undergo very complex and time-consuming qualification tests, and minimum radii must be taken into consideration.
- The exchange of individual strands is sometimes not possible or only feasible along the complete length of the stay cable from one superstructure anchorage to the opposite anchorage.
- Strand inspection in the critical deviation area is only possible by complex replacements.

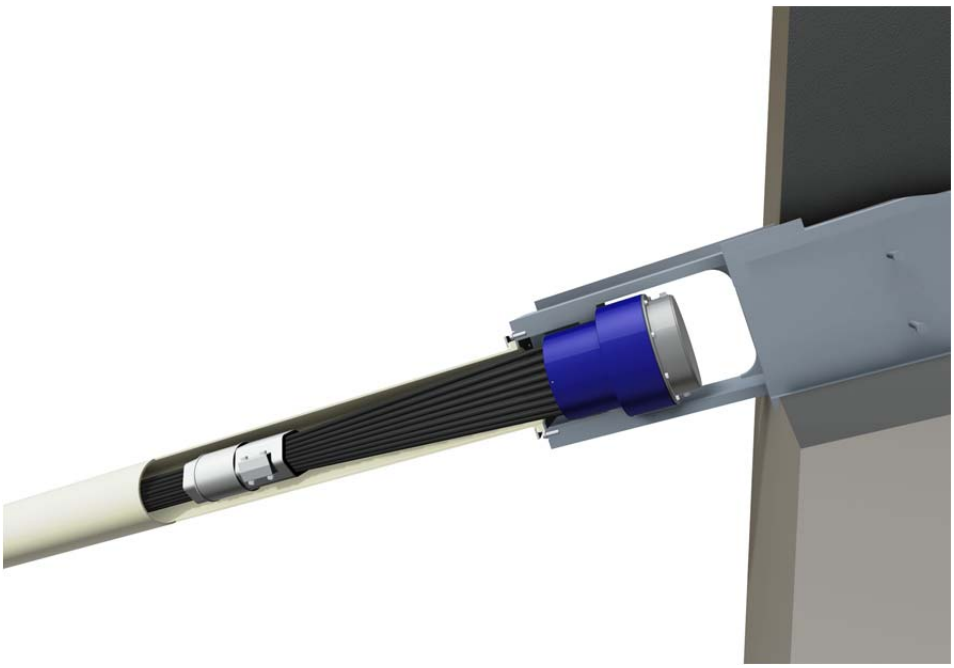
Due to these disadvantages, deviation saddles for stay cables in road bridge construction have been explicitly excluded in current regulations in some countries such as Germany.

As an alternative to conventional deviation saddles, DSI has developed a new system that includes the advantages of saddles without the disadvantages detailed above. The new DYNA® Link System is based on conventional steel anchor boxes in which stay cables are anchored inside the pylon in a steel anchor box. This way, the horizontal forces of the stay cables are transferred by the anchor box. What is new about the DYNA® Link Anchor Box System is that the stay cable anchorages are fitted at the outside of the pylon so that the pylon does not need to be accessible. Consequently, the pylon design can be economical and slender, and it can be accessed for inspection from the outside by industrial climbers or via hoisting platforms.



The DYNA® Link Curved Anchor Box can be assessed in terms of bearing capacity, service ability and fatigue in accordance with conventional steel construction standards and does not require any complex tests. The anchor box can be adjusted to the respective structure, and there are no limitations in terms of deviation radii or differential forces. It is even possible to only replace a single strand bundle on one side of the pylon or to carry out the assembly of the stay cables as flexible as in the case of common stay cables with anchorages at the inside of the pylon. The strand numbers on both sides of the pylon can also differ, so that the strand bundles can be economically designed. As the strands are not deviated across a saddle in the DYNA® Link Curved Anchor Box, there are no limitations in any national regulations.





The DYNA® Link Curved Anchor Box System is being used for the first time at the Chao Praya River Crossing Bridge in Bangkok, Thailand. The 96 Type DG-P 37 and DG-P 55 strand bundle stay cables that are used for this extradosed bridge are anchored at a total of 48 DYNA® Link Anchor Boxes.