



## DYNAProtect® – Novel Protection System for Stay Cables and Bracings

Perfect corrosion protection is an essential precondition for the durability of stay cables and bracing systems. Today, the construction industry uses coatings based on epoxy resin and polyurethane or similar products for full locked cables. These are usually applied on site before or after the installation of stay cables. This method is time-consuming and requires clearly defined climatic conditions. Once stay cables have been installed, scaffolding or lifting equipment is necessary to apply the coatings.

DYNAProtect® is a novel method in terms of both material and technology that avoids all of these disadvantages. It can both be used with new stay cables and stay cables and bracing systems that are already in use.

Corrosion protection tapes DYNAProtect® B and C are at the core of the corrosion protection system DYNAProtect®. These are wrapped around the stay cable or bracing to form an impervious surface. The exterior layer is laminated by means of a polyethylene carrier film that is available in several colors. On the market for over 40 years and tested and proven, multi-ply tapes by DENSO GmbH, Leverkusen, formed the basis of and were optimized for this special application, resulting in the development of corrosion protection tapes DYNAProtect® B and C.

DYNAProtect® B consists of 3 plies: 2 duroplastic layers that are based on butyl rubber and an interjacent stabilized polyethylene carrier film. DYNAProtect® C consists of 2 layers: an external polyethylene carrier film and an internal butyl rubber coating. The manufacturing process ensures that no boundary or intermediate layers form between the different materials. If the butyl rubber tapes overlap, there is cold vulcanization of the tapes beyond the layer edges. Thus, a closed, tubular, mechanically highly resistant and stable coating is formed that is practically impermeable to water vapor and oxygen.

The standard color of the outer polyethylene carrier film is white, which positively affects temperature behavior of stay cables and bracing systems. Other colors are available on request. The corrosion protection tapes are wrapped at a defined tensile stress and an overlap of approximately 50%. DYNAProtect® B is in immediate contact to the cable surface and shows good adhesive strength. DYNAProtect® C is used for exterior corrosion protection. The complete coating is approximately 2.6mm strong.

DYNAProtect® tapes can be applied immediately onto the metallic surface of the stay cable or onto existing coatings as long as the surface is dry and free of stains or loose particles. In the case of short, accessible stay cables, surfaces can be cleaned manually using brushes. For larger projects, a special mechanical cleaning unit equipped with a rotating brush is driven along the cable.

The tapes are wrapped helically onto the installed tension members. A manual wrapping device can be used for small, accessible cables, whereas fully automated equipment is used with large cables. An automatic wrapping device, which was specially developed for this purpose, automatically drives up the tension member and wraps the tapes by means of an auxiliary module. Thus, no scaffolding or other equipment, such as working platforms or lifts, is required for the free stay cable length. At the same time, required working space on the superstructure is reduced to a minimum.

The DYNAProtect® corrosion protection system was tested for corrosion protection properties and long-term durability during extensive tests at the material testing institute of the University of Stuttgart. The system complied with or exceeded values requested by TL/TP-KOR cables/ RKS bulletin in all relevant sectors. Excellent results were achieved in terms of condensation resistance or permeability to water vapor. Even at the impact of salt fog, no corrosion was detected beneath the wrapped tapes. In order to prove durability of material and color, the corrosion protection system was exposed to artificial weathering using xenon lamps and ultraviolet rays. No change whatsoever could be detected at the polyethylene surface.

In order to ensure constant good quality of the corrosion protection tapes, the certification authority DVGW carries out external inspection and testing. The DYNAProtect® corrosion protection system was first used at Passerelle des deux Rives Rhine Bridge, a footbridge between Kehl and Strasbourg that was designed by the Paris architect Marc Mimram for the national garden show in 2004. The bridge incorporates 76 60mm Ø to 139mm Ø full locked stay cables that are hot-dip galvanized for corrosion protection.

Some 3 years later, the contractor decided to apply additional corrosion protection. These measures proved to be necessary in retrospect because visual stay cable inspection showed slight corrosion on individual wires that had probably been caused by damage during stay cable installation.

Due to the architecturally challenging bridge design, the use of scaffolding or lifting equipment that would have been necessary for conventional wrapping methods was problematical. The same was true for sand blasting of the stay cable surfaces. Due to the fact that DYNAProtect® did not require any of these techniques and due to the positive test results at the Technical University of Stuttgart as well as a positive assessment by LAP Stuttgart consulting engineers, DSI GmbH were awarded the contract for the corrosion protection work. Work began in the summer of 2008 in cooperation with Alpin Technik and Ingenieurservice GmbH and has been carried out to the complete satisfaction of all parties involved.

