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Head made of stainless steel: expansion joints with hybrid profile

Maurer Söhne develops corrosion resistant clamping of sealing elements

Munich. A longer lifetime and a continuous sealing function – these are the advantages of the new hybrid edge beams type SW, which were developed by Maurer Söhne. The central element of innovation consists of the head made of stainless steel, which will be connected with the other part of the profile by way of a special welding procedure. Maurer Söhne is world wide market leader of watertight expansion joints for road bridges.

Conventional expansion joints are made of special fatigue proof and economic steel. For the sake of corrosion protection, paint systems are applied which however employ limited life time. In respect to the surface of the steel profile exposed to traffic this is no problem, but it may be one at footways, or at the edge of the carriageway where the rain water keeps staying. And this in particular at the edge beam, which connects to the adjacent asphalt. In addition, because the edge beam is exposed to very strong strain in its function as a protector of the edges, corrosion can occur. For example, mechanical damages of the corrosion protection are caused by snow ploughs, during the installation, or in the area of the footway, when the joints between the edge of the expansion joint and the adjacent concrete are cut. Corrosion that may be caused by this may be aesthetically questionable, and sometimes leads to complaints, however neither impedes the functionality nor reduces the lifetime. Of another impact however is the possible corrosion of the clamping nose caused by aggressive media like de-icing salt. The clamping nose, which is the upper part of the edge beam (steel), into which the sealing element (rubber) is clamped, is strongly exposed to corrosion by standing water.



Hybrid-edge beam extends lifetime

In respect to fatigue and corrosion, modular expansion joints that entail more than one sealing element are designed for a service life of 40 years. Weakest element in terms of resistance are the sealing elements, which due to ageing and wear have to be replaced about every 20 years. Latest after the second replacement, the corrosion of the edge beams in the clamping area has progressed to an extent that also a replacement of the upper steel parts is required. Due to their robust design, expansion joints with one sealing element can also exceed the aforementioned 40 years, provided that the corrosion of the clamping section for the sealing element can be prevented.

Due to quality reasons, steel profiles of Maurer modular expansion joints are hot rolled and not extruded. Caused by technical reasons, they have always been produced of 2 sections. A welding seam connects the upper part with the lower part. In order to prevent contact corrosion and due to reasons based in the welding technology, for the upper part and the lower part always the same material was used.

Especially optimised submerged welding

Now, together with a leading manufacturer of special rolled profiles, Maurer Söhne developed a new hybrid profile, whose surface, clamping and connection part consists of stainless steel (white = weiß = W) and the remaining parts consist of ordinary mild steel S235 (black = schwarz = S). The black-and-white-connection (SW) is achieved by a specially optimised submerged welding in the clamping area – this way, the strict quality requirements in particular in respect to the prevention of shape distortion and the avoidance of corrosion in the contact area of the 2 materials can be safeguarded.

The upper part of the clamping profile consists of austenitic steel with the material number 1.4571. The material is approved by the construction authorities. Due to its resistance to corrosion it



can be used even for non-accessible structural parts, and its corrosion resistance can be granted even after welding.

Double benefit

The production of the hybrid-profile is being supervised by the Materials Testing Institute (MPA) in Dortmund. Both materials stainless steel and mild steel are being used exactly according to the local operational demands. Thus the hybrid-profiles can be considered as a very economic solution with a double benefit: corrosion resistance at the exposed surface, and fatigue resistance in the highly strained anchorage area. The additional costs of expansion joints with hybrid edge beam as compared to the conventional design are being compensated several fold by the avoidance of extensive refurbishment measures that entail the disturbances of traffic.

In order to protect the welding seam from corrosion and to avoid surface rust, the stainless steel is coated in the same way as the other part of the edge beam. In the area of the clamping section however, only a primary layer is being carried out, which leads to an additional advantage of the hybrid profile. Whereas in case of a fully coated edge beam a tolerance of thickness is required, the hybrid profile allows for a constant fitting accuracy, and thus for a watertight clamping of the sealing element.

Maurer Söhne offers the new SW-edge beam for single seal and multi element expansion joints as well as especially for the footway sections. Dr.Christian Braun, managing director of the Structural Protection Systems Division at Maurer Söhne, explains: "According to our assessment, due to economic reasons all expansion joints with one sealing element should only be designed with the SW edge beams. In particular when combined with the Maurer D80 G sealing elements for footways, and in order to avoid cover plates at the footways, this new design is of highest functional and aesthetic effect." Also when multi element expansion joints are being employed, a design with SW profiles makes



sense, because in Maurer expansion joints the individual center beams can be replaced. The hybrid profile was the first time put into action in the region of the Road Authority of Ansbach, employing expansion joints of type D 80 and DT 160 in the Aisch Bridge Uhlfeld at the National Road B470.

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