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MECHANICAL INNOVATIONS DEVELOPED FOR THE LILLE LANGEBRO SWING BRIDGE, COPENHAGEN

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The Lille Langebro pedestrian and cyclist bridge is located in central Copenhagen and was officially opened to the public in August 2019. The design of the bridge was the subject of an international competition commissioned in 2014 by the client, Realdania, and won by a collaboration of BuroHappold, Wilkinson Eyre and Eadon Consulting. The bridge consists of five spans, the central portion is formed by a pair of rotating decks. The steel super structure has an overall length of 160m and a usable deck with of 7m. The main structural members are triangular in cross section and twist to follow the loads within the sturcture. In order to acheive the desired architectual form whilst complying with the clients clear technical requirements an innovative moment connection was developed to connect the two rotating spans at the mid span joint.

When a beam carries moment it is in compression on one edge and tension on the other. To replicate this at the joint between the two decks a unique mechanism was designed. This mechanim consisted of a compression element which includes a pin and hydrualic cylinder was installed at the top of the beam and a tension element which included a tension bar and hydarulic cylinder at the bottom. These are hydraulically linked and locked off to form a closed system. As the bridge expands and contracts the joint moves or ‘breathes’ with it. As live load is applied, the moment within the structure increases the compression and tension forces in the respective cylinders, this causes an increase in hydraulic pressure as the mechanism moment increases. When the bridge needs to open the joint disengages with the movement of the decks. This new moment connection also brings structural benefits in the form of damping of the structure when subject to dynamic loads. This paper will discuss the design, development and construction of this inovative active moment connection.

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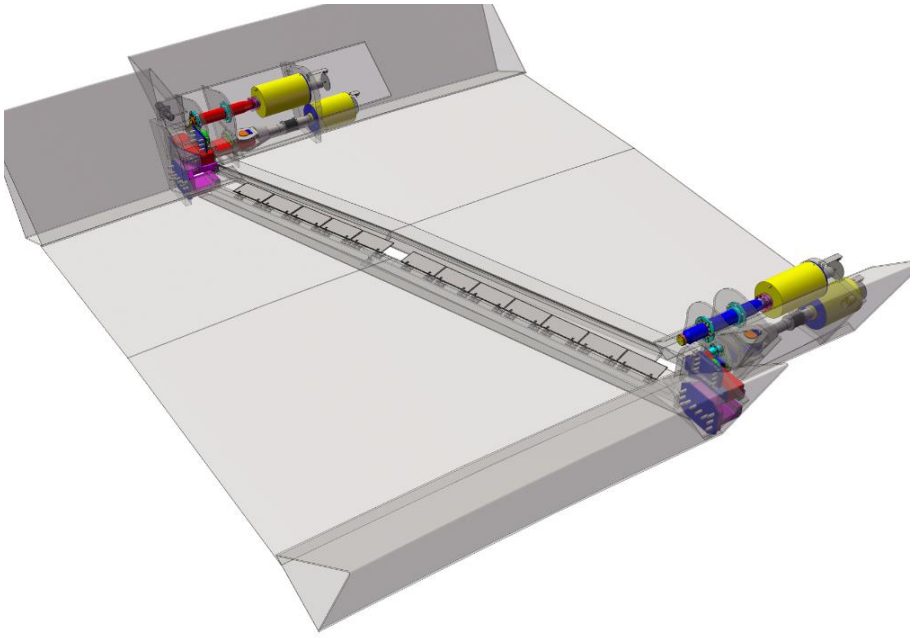

Fig. 1. Joint between the two moving spans as they return to the closed position.

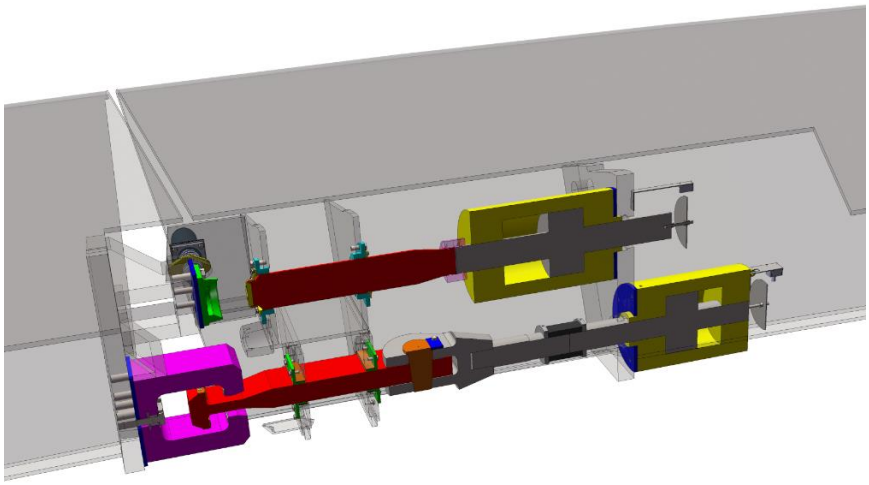

Fig. 2. Section through tension and compression elements in the disengaged condition.