1. Introduction

mageba's patented fuse box for modular expansion joints permits the expansion joint to break off the bridge during an earthquake without destroying the adjacent bridge structure and allows the passage of emergency traffic after the occurrence of an earthquake.

During the SLS case the expansion joint operates like a normal expansion joint, i.e. the movement is taken by the individual gaps between the lamellas. During the ULS case the triggered fuse box allows the usually large ULS movements to be taken.

After the occurrence of an earthquake, the expansion joint can be completely reused by welding to the fuse box back to its anchorage system.

In the following the function of the fuse box system, is explained for both, SLS and ULS case.

2. Functioning in the SLS-Case

In the SLS case (see Fig. 1) the joint takes the movements in transversal and horizontal direction, without requiring the fuse box to activated.

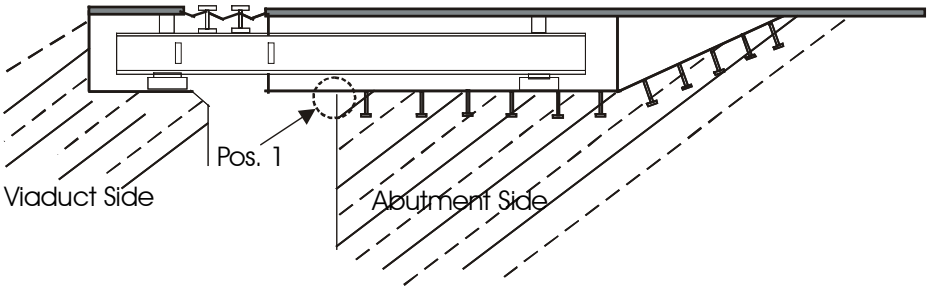

Fig. 1: Section through joist box, central position (SLS)

The fuse box is connected to the lower sliding plate with a nominal break point (see fig. 2). The nominal break point only breaks when the expansion joint is entering the ULS case.

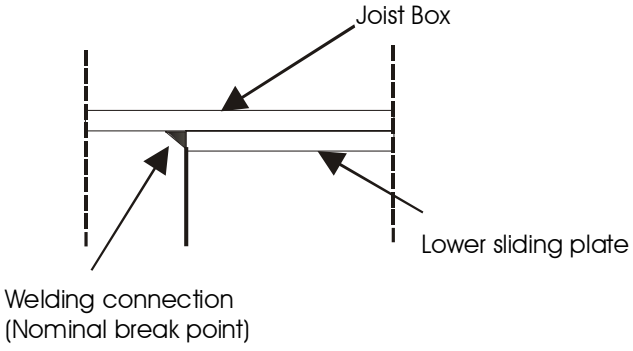

Fig. 2: Nominal break point at position 1

3. Function in the ULS case

Horizontal movements:

In the ULS case the movements and the forces acting on the fuse box strongly increase. If the forces reach the calculated forces of the nominal break point, the welding connection will break and the fuse box will slide on the lower sliding plate.

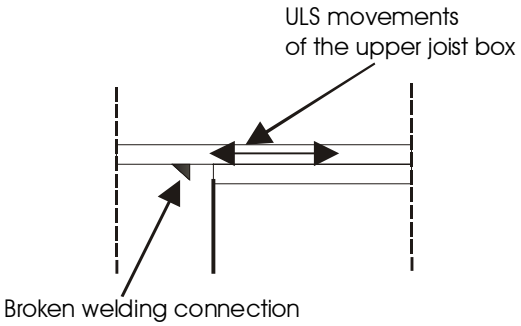

Fig. 3: Broken nominal break point at pos. 1

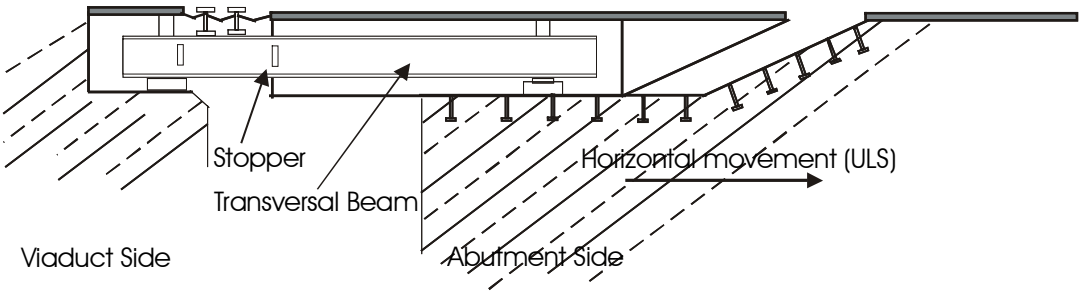

Fig. 4: Horizontal movements of the joist box (ULS-Case), opening of the gap

The movements to open the gap in the ULS case will be supported by a special stopper placed on the transversal beam. This stopper prevents the further opening of the expansion joint.

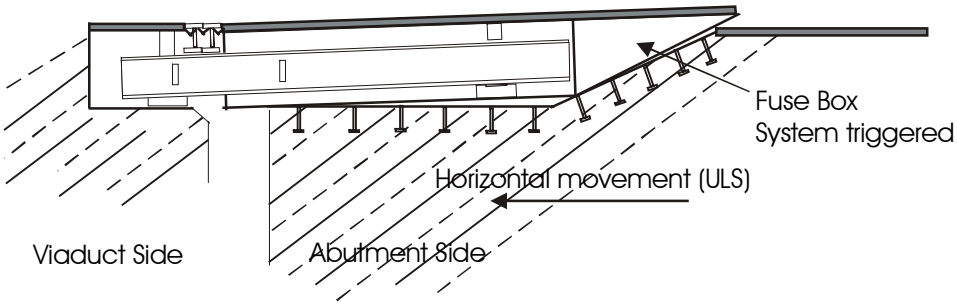

Fig. 5: Horizontal movements of the joist box (ULS-Case), closing of the gap

In case of an earthquake (ULS case), the joist box is pushed in direction of the abutment by transmitting the acting forces via the closed lamella beams.

Transversal movements:

Once the nominal break point between the lower sliding plate and the upper joist box is broken, the joist box can slide on the lower sliding plate in longitudinal as well as transversal direction (see fig. 6 and 7).

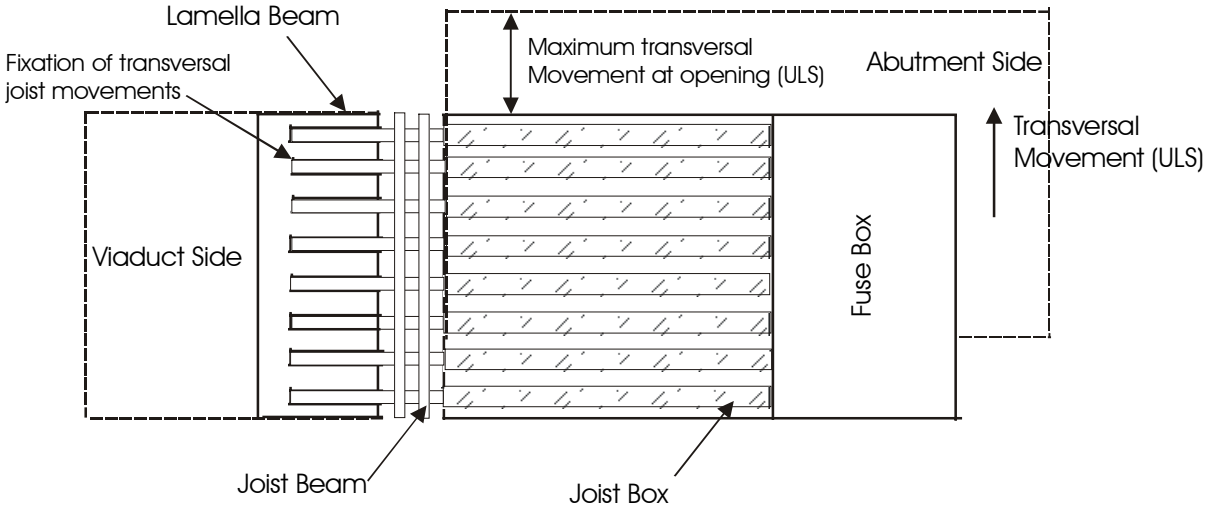

Fig. 6: Transversal movements of the joist box (ULS-Case), to the right side

The force required to overcome the friction is created by the fixation of the joist beams on the bridge side. The friction between the sliding plate and the joist box is reduced by lubricants placed between the steel surfaces.

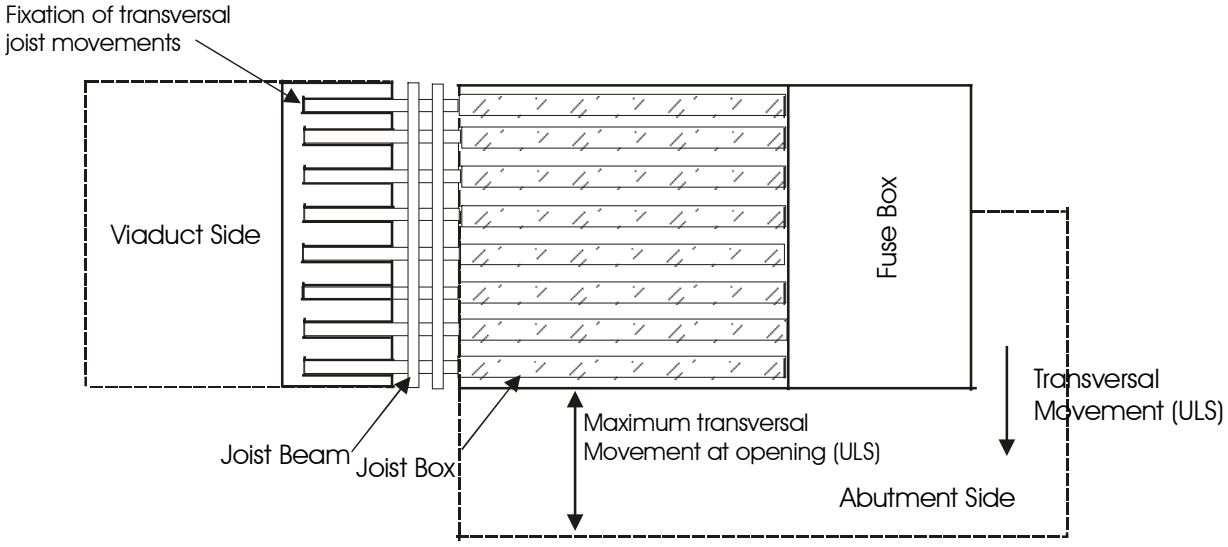

Fig 7: Transversal movements of the joist box (ULS-Case), to the left side