Design for Movements in Bridges

SØRENSEN, Ove
BLOOMSTINE, Matthew L.
BITSCH, Niels
LINNEBERG, Poul
COWI AS, Kongens Lyngby, Denmark

Summary

Many years of experience of design and maintenance of bridges shows that movement structures are among the more expensive as far as maintenance costs are concerned. These structures are the so-called mechanical ones and require regular maintenance from time to time, or part or full replacement.

The design philosophy should therefore be based on:

• as few as possible movement structures

• long durability

• easy to maintain and replace

This paper describes:

Typical movement structures like expansion joints, bearings, hydraulic and mechanical dampers and cable support arrangements that allow movements.

General arrangements of the articulation systems of some major bridges relating to the above mentioned design philosophies.

Installation, operation and maintenance experiences.

Special features in connection with replacement of the Teflon sliding disks in spherical bearings after 22 years of use.

Experience from replacement of a 35-year-old roller shutter expansion joint with a new water tight modular type on a suspension bridge.

Challenges in the future.

Keywords: Cable supported bridges, Articulation systems for bridges, Bearings, Expansion joint, Hydraulic supports.

1. Paying attention to movement elements during the design phase

Movement elements generally represent a minor portion of the total budget for construction of a new bridge. During the service life this ratio is generally quite different and the cost for maintenance, repair and replacement of movement elements is most often a major expense seen in relation to other maintenance costs.

Therefore, we strongly recommend that special attention be paid to movement elements during the design phase. We recommend that the following guidelines are generally applied:

- Generally as few movement elements as possible.
- The use of Life Cycle Cost Evaluation to determine the optimal solution, e.g. a local strengthening of the bridge girder contra incorporation of movement elements.
- High durability - more durable than expected to be necessary.
- Preferably well known, field tested and well documented solutions.

https://doi.org/10.2749/222137807796119492