



Bridge expansion joints – design for movements, performance and durability

Bo L. O. EDLUND

Professor em, Tekn Dr
Dept of Civ & Envi Engng
Chalmers Univ of Techn.
Göteborg, Sweden
bo.edlund@chalmers.se

Bo Edlund, born 1936, received his civil engineering degrees from Chalmers Univ. of Technology. Professor of Steel and Timber Structures from 1981. His current research interests are steel structures and bridges.



Roberto CROCETTI

Tekn Dr; Head Eng Dept,
Responsible Res & Dev,
Moelven Töreboda AB,
Töreboda, Sweden
roberto.crocetti@moelven.com

Roberto Crocetti, born 1968, received his civil engineering M Sc degree from the Univ. of Bologna, Italy, in 1995 and his Ph D in Steel and Timber Structures from Chalmers Univ of Technology, Göteborg, Sweden, in 2001.



Summary

Expansion joints in medium-size and long bridges should be regarded as important bridge components. There is a trend to minimize the number of joints, and design each joint to permit large movements. It is therefore important to develop suitable joint types that function smoothly for such large movements during a long time without damages or malfunctioning. A widely used, modern joint type for large joint movements is the Modular Bridge Expansion Joint (MBEJ). The paper mainly deals with different aspects of MBEJs (function, fatigue, durability, maintenance, noise etc). Traffic forces on MBEJs as well as quality requirements and assessment are discussed.

Keywords: Bridges; expansion joints; performance; acoustics; durability; dynamic loading; fatigue.

1. Introduction

The refurbishment or replacement of bridge expansion joints often causes severe traffic disturbances. For long bridges there is a trend to make fewer expansion joints, each permitting large joint movements. Such joints will be more complicated, which leads to more complicated and time-consuming inspection, maintenance and refurbishment operations. For an introduction with examples of different types of expansion joints see the book by Ramberger [1].

Durability issues seem to receive too little consideration in bridge work. A survey of the durability performance of highway bridges in the USA in the 1980's showed that among the worst performing subcomponents were the wearing surface and expansion joints [2]. Therefore, it is a challenge for the future to reduce the cost for maintenance and replacement of expansion joints. A starting point should be to change the attitude of those bridge owners and designers, who think of and treat these joints as secondary bridge details. Instead, the joints should be regarded and designed as important bridge components.

In the past, a major cause for corrosion damage in bridges has been drainage and debris through open expansion joints. Therefore, such joints have been replaced with sealed joints. For examples of simple sealed joints, see Fig. 1 in [2].

A widely used, modern joint type designed for large joint movements is the Modular Bridge Expansion Joint (MBEJ), lamellae joint in Europe, Fig. 1. The upper, movable part of a MBEJ consists of load carrying steel bars (called centre-beams) and rubber elements between them. The paper will mainly deal with different aspects of expansion joints, primarily MBEJs, concerning:

Movements (type, size etc), *Performance* (function, vibrations, noise, fatigue cracking, etc) and *Durability* (corrosion, wear, fatigue life, etc).