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Eurocódigo 1: Acciones en estructuras. Cargas de tráfico en puentes. Interacción vía-puente (Ratificada por la Asociación Española de Normalización en abril de 2019.)

Asociación Española
de Normalización
Génova, 6 - 28004 Madrid
915 294 900
info@une.org

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Eurocódigo 1: Acciones en estructuras. Cargas de tráfico en puentes. Interacción vía-puente (Ratificada por la Asociación Española de Normalización en abril de 2019.)

Eurocode 1: Actions on Structures - Traffic Loads on Bridges - Track-Bridge Interaction (Endorsed by Asociación Española de Normalización in April of 2019.)

Eurocode 1 : Actions sur les structures - Actions sur les ponts, dues au trafic - Interaction voie-pont (Entérinée par l'Asociación Española de Normalización en avril 2019.)

En cumplimiento del punto 11.2.5.4 de las Reglas Internas de CEN/CENELEC Parte 2, se ha otorgado el rango de documento normativo español UNE al documento normativo europeo CEN/TR 17231:2018 (Fecha de disponibilidad 2018-08-01)

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Asociación Española de Normalización
Génova, 6
28004 MADRID-España
Tel.: 915 294 900
info@une.org
www.une.org

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TECHNICAL REPORT

RAPPORT TECHNIQUE

TECHNISCHER BERICHT

CEN/TR 17231

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English Version

Eurocode 1: Actions on Structures - Traffic Loads on Bridges - Track-Bridge Interaction

Eurocode 1 : Actions sur les structures - Actions sur les ponts, dues au trafic - Interaction voie-pont

Eurocode 1: Einwirkungen auf Tragwerke - Verkehrslasten auf Brücken - Gleis-Brücken Interaktion

This Technical Report was approved by CEN on 16 April 2018. It has been drawn up by the Technical Committee CEN/TC 250.

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CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels

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European foreword

This document (CEN/TR 17231:2018) has been prepared by Technical Committee CEN/TC 250 “Structural Eurocodes”, the secretariat of which is held by BSI.

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Introduction

The subject of Track-Bridge Interaction has become particularly important with respect to longer span bridges and viaducts supporting tracks, especially for those carrying high speed trains. However, investigations which have been undertaken in order to address that specific issue have raised points which are relevant to all types of railway bridge. Consequently, the content of this Technical Report is intended to be applicable to all types of railway bridge, for both ballasted and ballastless track, and for all types of railway (e.g. conventional railways, metro and light rail systems, and high speed railways).

It is also clear that the increased availability of computational methods of analysis, since the basis for existing codes was laid down in the 1990s, has made it possible to consider approaches to calculation of Track-Bridge Interaction effects which could not be expected to be used in routine procedures in the past.

There are three principal 'outputs' set out in the final sections of this Technical Report. They are as follows:

1) Guidance for designers and maintainers of railway track and structures to assist them in adopting current best practice in taking Track-Bridge Interaction effects into account (Clause 12 of this report).

2) Recommendations for future development of standards, especially the revision of the relevant section of the Eurocode EN 1991-2:2003 6.5.4 (Clause 13 and Annex E of this report).

3) Identification of areas in which new research and development is needed to make further improvements in approaches to Track-Bridge Interaction (Clause 14 of this report).

1 Scope

This document reviews current practice with regard to designing, constructing and maintaining the parts of bridges and tracks where railway rails are installed across discontinuities in supporting structures. Current Standards and Codes of Practice are examined and some particular case histories are reviewed.

The document gives guidance with respect to current best practice and makes recommendations for future standards development and also identifies areas in which further research and development is needed.

2 Normative references

There are no normative references in this document.

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at http://www.electropedia.org/
- ISO Online browsing platform: available at http://www.iso.org/obp

3.1
track-bridge interaction
conditions under which forces and/or displacements in a railway track and its supporting bridge structure are influenced by the fact that rails span discontinuities in a bridge structure e.g. structural movement joints or bridge deck ends

3.2
additional load
load in an element of the track, (e.g. rail and rail fixing) on a bridge compared with what is expected in that element if the same track system were to be installed with the same loading actions away from any bridge

Note 1 to entry The word 'additional' is used in the same sense to describe additional stresses, additional forces and additional deformations.

3.3
thermal fixed point
point in the structure of the bridge, without the track, which is assumed not to be displaced when there is a change in temperature. (Otherwise known as the “centre of thermal displacement” or “thermal centre”)

3.4
deck length
L_D
distance between structural movement joints in the bridge deck

3.5
span length
L_S
distance between vertical supports, e.g. piers and abutments

3.6

expansion length, L_T of a deck

distance between the thermal fixed point and the free end of the deck

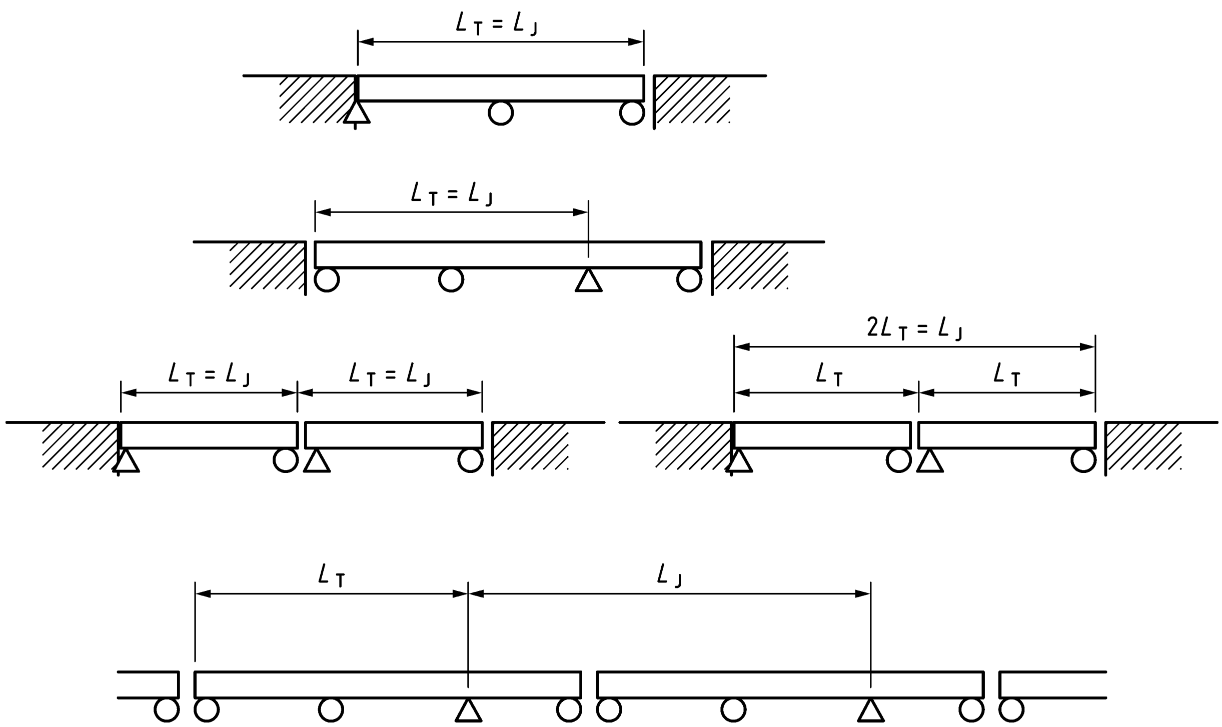
Note 1 to entry: For bridge designs in which the thermal fixed point is neither at one end nor at the mid-point of the deck, the distance from the thermal fixed point to the further free end is taken to be L_T. (See Figure1.)

3.7

effective expansion length, L_J at a joint

total of the distances from the joint to the thermal fixed point for the two bridge decks adjacent to the joint

Note 1 to entry: See Figure 1.



Key

△ represents a 'fixed' support

○ represents a 'free' support

Figure 1 — Examples of expansion lengths L_J and L_T

3.8

support stiffness

longitudinal stiffness of a single pier given by

$$K = \frac{F}{\delta_p + \delta_\varphi + \delta_h}$$

Note 1 to entry: Depending on the type of bearings used, the tolerance of the bearing and the shear stiffness may have to be considered by calculating the longitudinal stiffness.

Note 2 to entry: For the case represented in Figure 2 as an example.