Seismic Bracing for Bridge Abutments

Overview

Seismic retrofitting techniques, including seat extenders, catchers, gap fillings, L brackets, and various anchoring methods, are essential for enhancing the earthquake resistance of bridge abutments. Seismic bridge design has been improving and advancing based on research findings and lessons learned from past earthquakes, such as the 1989 Loma Prieta and the 1994 Northridge, USA, the 1995 Hyogo-ken Nanbu (Kobe) in Japan, the 1999 Jiji (Chi-Chi) in Taiwan, and the 2008 Wenchuan in China. The. Abstract: Depending on their seismic resistance, existing bridge abutments may be vulnerable to earthquakes. Seismic resistance may be quantified in terms of a threshold acceleration level beyond which permanent deformation will occur. Planar failure surface has been considered in conjunction with the pseudostatic limit equilibrium method for the calculation of the seismic active earth pressure.

Article Content

Sep 02, 2025

Challenges and opportunities for the application of integral abutment ...

Highlights • Comprehensive state-of-the-art-review on the seismic response of Integral Abutment Bridges (IABs). • Challenges in earthquake-resistant IABs are discussed with the view of

Jan 25, 2026

Numerical Assessment of Seismic Earth Pressures for Integral Abutment ...

Integral abutment bridges (IAB) consist of a continuous concrete deck integrated with abutments generally supported by a row of piles and they are cost-effective with less maintenance

Oct 03, 2025

Bridge Abutments and Seismic Retrofitting Techniques

The type of abutment selected depends largely on the span of the bridge and its seismic vulnerability. In this article, we will explore these two types of abutments, the seismic vulnerabilities

Jan 05, 2026

Seismic Analysis for Design or Retrofit of Gravity Bridge Abutments

Thus it is now possible to evaluate the seismic vulnerability of existing abutments. The theory also relates directly to design recommendations to increase the seismic capacity of both

Dec 15, 2025

Effect of abutment modeling on the seismic response of bridge ...

Abutment behavior significantly influences the seismic response of certain bridge structures. Specifically in the case of short bridges with relatively stiff superstructures typical of

Mar 11, 2026

Optimum Design of Bridge Abutments under Seismic

This study develops a reliability-based optimization methodology for bridge abutments under seismic conditions. Key failure modes include sliding,

Mar 28, 2026

On the seismic performance of straight integral

The seismic performance of integral abutment bridges (IABs) is affected by the interaction with the surrounding soil, and specifically by the development of

Apr 23, 2026

Soil-structure interaction for the seismic design of

The seismic performance of integral abutment bridges (IABs) is affected by the interaction with the surrounding soil, and specifically by the

Oct 27, 2025

BDP 11.1 Abutments

11.1.2 TYPES OF ABUTMENTS The most common types of abutments used for highway bridges are shown in Figure 11.1.2-1. In general, abutments can be classified as open-end and closed-end. The

Dec 31, 2025

SSI-induced seismic earth pressures on an integral abutment bridge ...

Equally, there is a notable lack of numerical studies of IABs focusing on seismic earth pressures validated by experimental data. A recent work by Fiorentino et al. 47 reported on the

Apr 21, 2026

Zero-Dimensional Seismic Design of Bridge Abutments: A Double ...

This approach is implemented in OpenSees and is validated against the results of a fully coupled soil-bridge finite-element model subjected to seismic loading. Finally, a seismic design procedure for

Oct 30, 2025

A procedure for addressing the soil-abutment ...

A comprehensive model addressing both the dynamic compliance of the soil-foundation system and the foundation input motion is recommended for reliable seismic assessment of bridge

Jan 19, 2026

On the seismic performance of straight integral

To this purpose, the present paper describes a design technique in which the frequency- and amplitude-dependency of the soil-structure interaction

Apr 14, 2026

(PDF) Soil-structure interaction for the seismic design of

This paper focuses on the seismic performance and design of a single-span integral abutment bridge (IAB), as a structural system characterised

Dec 02, 2025

Microsoft Word

SUMMARY: Abutments are not only earth-retaining systems, but also contribute to the earthquake resisting system (ERS) of bridges. The backfill-abutment-bridge interaction has been extensively

Nov 02, 2025

Comparative analysis of advanced bracing systems for lateral stability ...

This comprehensive analysis underscores the importance of incorporating advanced bracing systems in bridge substructures to mitigate seismic impacts, offering insights for future

Jul 04, 2025

Influence of the Pier-abutment-deck interaction on the Seismic

This work regards the analysis of the seismic response of bridges isolated with single concave friction pendulum devices, including or neglecting the presence of the rigid abutment. Two

Nov 08, 2025

CHAPTER 20.2 SEISMIC DESIGN OF STEEL BRIDGES

Significant research progress has been made on the seismic design of steel bridges, including shear links, buckling-restrained braces, ductile end cross frames, and integral bent cap connections.

Jun 08, 2026

A procedure for addressing the soil-abutment ...

The paper proposes a methodology for assessing the seismic soil-foundation-abutment response in the spirit of the sub-structure approach. The methodology is suitable for conventional

Oct 05, 2025

SEISMIC ANALYSIS OF BRIDGES INCLUDING SOIL-ABUTMENT

This study investigates the effects of the soil-abutment interaction on seismic analysis and design of integral bridges. Past experience and recent research indicates that soil-structure interaction plays a

Aug 30, 2025

Comparative Study of Seismic Analysis and Design of ...

An essential component of the economics of the entire bridge project is choosing the right kind of abutment given the site characteristics. This study involves the seismic analysis and

Aug 03, 2025

Influence of Abutment Stiffness and Strength on the Seismic

This paper investigates these limitations and evaluates the AASHTO code recommendations regarding the prediction of the seismic responses of curved bridges using an equivalent straight bridge for

Oct 15, 2025

Simplified method for the assessment of the seismic response of ...

This paper investigates the effect of abutment stoppers on the seismic response of motorway bridges in the longitudinal direction. A rigorous 3D finite element model of a representative

Jan 17, 2026

Seismic Performance Evaluation of a Fully Integral Concrete Bridge

Therefore, this study aims to investigate the nonlinear behavior and seismic capacity of the fully integral bridge and then to assess the appropriate stiffness of the end-restraining abutment

Jan 17, 2026

Seismic Damage Assessment of Integral Abutment Bridge

For assessment of seismic damages in bridges, damage states need to be established for the components. Although, past studies have focussed on the possible damage states, detailed

Mar 06, 2026

Assessment of the Seismic Vulnerability of Bridge

The role of abutments on the seismic vulnerability of bridges has been relatively little studied in geotechnical literature. To cover this gap, 3D

Dec 06, 2025

Design of bridges utilizing a novel earthquake resistant abutment with ...

During an earthquake the bridge movements are restrained by the high capacity wing walls and the backfill soil. The seismic performance of the new earthquake resistant abutment is

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