Recommended Seismic Bracing for Bridges in Senegal



Overview

Skills for Africa -Seismic Design, Analysis, and Retrofitting of. Explore strategies for assessing the seismic vulnerability of existing bridges. Underst.

Key Takeaways

For bridges in Senegal, seismic bracing should focus on ductile detailing, energy dissipation devices, and isolation systems, even though the region has a low seismic hazard.

Seismic Risk Context in Senegal

Senegal is considered a low seismic hazard region, with historical records indicating infrequent earthquakes and minimal tectonic activity. Despite this, bridges must be designed to withstand potential seismic events, as even low-probability earthquakes can cause significant structural damage if unaccounted for. Local soil conditions, such as soft soils prone to amplification or liquefaction, should also be considered in seismic design.

Key Seismic Bracing Recommendations

Ductile Detailing

Bridges should incorporate ductile components in piers, columns, and connections to allow controlled deformation without collapse. Reinforced concrete and steel members should follow performance-based seismic design principles, ensuring energy absorption during seismic events.

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Seismic Isolation Devices

Base isolators (e.g., elastomeric bearings) can decouple the bridge superstructure from ground motion, reducing seismic forces transmitted to the structure. Isolation is particularly effective for long-span bridges or those on soft soils.

Energy Dissipation Systems

Viscous dampers, friction dampers, and yielding devices can be installed to absorb seismic energy and limit structural damage. These devices are recommended for critical bridges where maintaining post-earthquake functionality is essential.

Cross-

Bracing and Lateral RestraintsSteel cross-bracing or moment-resisting frames can enhance lateral stability, especially for multi-span bridges. Bracing should be designed to accommodate expected seismic displacements without overstressing members.

Soil-

Structure Interaction Considerations

Conduct site-specific seismic hazard assessments to account for soil amplification and potential liquefaction. Foundations may require deep piles or ground improvement in areas with soft or loose soils.

Retrofitting Existing Bridges

For older bridges, retrofitting may include jacketing columns, adding dampers, or installing isolation bearings to improve seismic performance. Retrofitting should follow international seismic codes and consider local construction practices.

Design Standards and Analysis

Use probabilistic and deterministic seismic hazard assessments to determine design forces. Apply international codes such as Eurocode 8, AASHTO Seismic Provisions, or FEMA guidelines for seismic design and bracing. Advanced dynamic analysis methods, including time-history and response spectrum analysis, are recommended for critical bridges.

Summary

Even in Senegal's low seismic hazard context, bridges should be designed with ductile detailing, seismic isolation, energy dissipation devices, and lateral bracing. Site-specific soil conditions and performance-based design principles are essential to ensure safety, durability, and post-earthquake functionality. Retrofitting existing bridges with these measures can further enhance resilience against rare seismic events.

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Article Content

Skills for Africa -Seismic Design, Analysis, and Retrofitting of ...

Explore strategies for assessing the seismic vulnerability of existing bridges. Understand the importance of seismic retrofitting techniques and their application.

A new passive control device for seismic protection of bridges: The ...

The analysis results indicate that all three seismic isolation devices significantly improve the seismic performance of railroad cable-stayed bridges. Viscous dampers and lock-up devices

(PDF) Seismic performance assessment of deficient RC structures ...

The main objective of the current study is to find out the most effective bracing system to upgrading the seismic behavior of deficient RC structures.

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

Bridge Design to Eurocodes Worked examples

It summarises important points of the Eurocodes for the design of concrete, steel and composite road bridges, including foundations and seismic design. The worked examples utilise a common bridge

Seismic design and performance analysis of bridge bents retrofitted ...

Accordingly, multistage buckling-restrained braces (MSBRBs), consisting of steel cores with different yield strains, were used for the seismic retrofitting of bridge bents in this study.

Research on the Application of BRBs in Seismic Resistance of Bridge

The use of BRBs as seismic isolation elements in large-span bridges is discussed, and the effects of BRBs, other seismic isolation devices, and their joint application on the seismic

A Deep Dive into Types of Bracing in Structural Engineering

Which bracing type is best for seismic resistance? Buckling-Restrained Braced Frames (BRBFs) are considered the gold standard for seismic resistance. They handle both tension and

Bracing systems

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The suggested method is to use a 2-D structural model, representing the bridge steelwork in plan, and applying unit loads to all bracing positions, acting in the same direction, so as to give the worst case

Seismic Design of Steel Buckling-Restrained Braced Frames

tural and civil engineering firm with offices nationwide. He is a member of the American Institute of Steel Construction Task Committee 9 on Seismic Provisions and a member of the Building Seismic Safety

Passive seismic unseating prevention strategies implemented in

There are generally two kinds of passive measures taken to prevent seismic unseating for highway bridges, namely minimum support length requirements and unseating prevention

Optimizing Seismic Bracing Systems for Reinforced Concrete

The results showed that bracing with shear walls is the most effective for buildings over 21 meters high, while bracing with columns is recommended for buildings with six stories or less.

Life-cycle based optimal design of seismic retrofit interventions ...

This paper presents one such method, an optimal design procedure for seismic retrofit interventions through dissipative bracing. Life-cycle economic and environmental optimization is

Seismic Performance of RC Frames Retrofitted with Bracing: A

The past studies strongly recommend the use of X-type bracing for multi-story buildings requiring seismic retrofitting. Kulkarni et al. (2013) employed a numerical analysis approach to

Enhancing Seismic Performance of Bridges with a Novel ...

The friction The Friction Tension-Only Brace (FTOB) is an innovative seismic bracing device designed to enhance the earthquake resistance of structures, particularly bridges.

Displacement-based seismic design of bridge bents retrofitted with ...

Implementing energy dissipation braces can be an effective option for mitigating the seismic damage of double- or multi-column bridge bents. This stud

Seismic Retrofitting of Structures by Steel Bracings

Abstract Seismic retrofitting is the modification of existing structures so as to improve the system behaviour or its components repair/strengthening up to the performance it is expected.

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Comprehensive Specification for the Seismic Design of Bridges

This report contains the findings of a study to develop recommended specifications for the seismic design of highway bridges. The report describes the research effort lead-ing to the recommended

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