2011

AASHTO Guide Specifications for

LRFD Seismic Bridge Design

2nd Edition

2022 Interim Revisions

Published by the
American Association of State Highway and Transportation Officials

ISBN: 978-1-56051-784-9   Publicaton Code: LRFDSEIS-2-I4

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INSTRUCTIONS AND INFORMATION

General

AASHTO has issued interim revisions to *AASHTO Guide Specifications for LRFD Seismic Bridge Design*, Second Edition (2011). This packet contains the revised pages. They are not designed to replace the corresponding pages in the book but rather to be kept with the book for quick reference.

Affected Articles

Underlined text indicates revisions that were approved in 2021 by the AASHTO Committee on Bridges and Structures. ~~Strikethrough text~~ indicates any deletions that were likewise approved by the Subcommittee. A list of affected articles is included below.

All interim pages are printed on green paper to make the changes stand out when inserted in the second edition binder. They also have a page header displaying the section number affected and the interim publication year. Please note that these pages may also contain nontechnical (e.g. editorial) changes made by AASHTO publications staff; any changes of this type will not be marked in any way so as not to distract the reader from the technical changes.

Please note that in response to user concerns, page breaks are now being added within sections between noncontiguous articles. This change makes it an option to insert the changes closer to the affected articles.

2021 Changed Articles

FOREWARD

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REFERENCES

ISBN: 978-1-56051-621-7 Pub Code: LRFDSEIS-2-I4

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FOREWORD

Revise the 1st sentence of the 3rd paragraph of the Foreward as follows:
The scope of these Guide Specifications covers seismic design for typical bridge types and applies to ~~noncritical and non-essential~~ bridges classified as Ordinary.

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SECTION 3: GENERAL REQUIREMENTS

3.1—Application of Guide Specification

Revise the 2nd paragraph of Article 3.1 as follows:

Critical/~~essential~~ and Recovery bridges are not specifically addressed in these Guide Specifications. Bridges not classified as Critical or Recovery are classified as Ordinary. A bridge should be classified as ~~c~~Critical/~~essential~~ or Recovery as follows:

Revise the 5th paragraph of Article 3.1 as follows:

The provisions in these Guide Specifications should be taken as the minimum requirements. Additional provisions may be specified by the Owner to achieve higher performance criteria for repairable or minimum damage attributed to ~~essential or c~~Critical or Recovery bridges. Where such additional requirements are specified, they shall be site or project specific and are tailored to a particular structure type.

3.4—Seismic Ground Shaking Hazard

Revise the first and last bullets of Article 3.4 as follows:

- The bridge is ~~considered to be~~ classified as ~~c~~Critical or ~~essential~~ Recovery ~~according to Article 4.2.2~~, for which a higher degree of confidence of meeting the seismic performance objectives of Article 3.2 is desired.
- The bridge is ~~considered to be~~ classified as ~~c~~Critical or ~~essential~~ Recovery ~~according to Article 4.2.2~~, for which a higher degree of confidence of meeting the seismic performance objectives of Article 3.2 is desired.

C3.4

Revise the last paragraph of Article C3.4 as follows:

Article C3.4.3 describes near-fault ground-motion effects that are not included in national ground-motion mapping and could potentially increase the response of some bridges. Normally, site-specific evaluation of these effects would be considered only for ~~essential or very c~~Critical or Recovery bridges.

C3.4.3.1

Revise the 4th paragraph of Article C3.4.3.1 as follows:

If the active fault is included in the development of national ground motion maps, then the first effect is already included in the national ground motion maps. The second and third effects are not included in the national maps. These effects are significant only for periods longer than 0.5 sec and normally would be evaluated only for ~~essential or c~~Critical or Recovery bridges having natural periods of vibration longer than 0.5 sec. Further discussions of the second and third effects are contained in Somerville (1997) and Somerville et al. (1997). The ratio of vertical-to-horizontal ground motions increases for short-period motions in the near-fault environment.

C3.7

Revise the 2nd paragraph of Article C3.7 as follows:

At the discretion of the Owner, the effects of live load may be combined with seismic loads. When live and seismic loads are considered concurrently, a live load factor up to γ_{EQ} = 0.5 is recommended for typical cases. However, for certain structures, such as ~~c~~Critical~~/essential~~ or Recovery bridges or those that carry rail traffic, it is recommended that a more precise value of the live load factor be determined on a project-specific basis.

SECTION 4: ANALYSIS AND DESIGN REQUIREMENTS

4.2.2—Limitations and Special Requirements

Revise the 2nd paragraph of Article 4.2.2 as follows:

More rigorous methods of analysis shall be required for certain classes of important bridges that are considered to be ~~c~~Critical or ~~essential~~ Recovery structures and/or for those that are geometrically complex or close to active earthquake faults (see Article 3.4.3). Nonlinear time history analyses, Procedure 3, should generally be used for ~~c~~Critical~~/essential~~ or Recovery bridges as approved by the Owner. For bridges that require the use of nonlinear time history analysis, such analysis should meet the requirements of Section 5 of these Guide Specifications.

C4.2.2

Revise Article C4.2.2 as follows:

~~Essential or c~~Critical and Recovery bridges within 6 mi of an active fault require a site-specific study and inclusion of vertical ground motion in the seismic analysis. For normal bridges located within 6 mi of an active fault, the procedures in Article 4.7.2 are used to account for the response to vertical ground motion in lieu of including the vertical component in the seismic analysis. For bridges with long, flexible spans, C-bents, or other large eccentricity in the load path for vertical loads, it is recommended to include vertical ground motion in the dynamic analysis.

4.7.2—Vertical Ground Motion, Design Requirements for SDC D

Revise Article 4.7.2 as follows:

The effects of vertical ground motions for bridges in SDC D located within 6 mi of an active fault, as described in Article C3.4, should be considered for ~~essential and c~~Critical and Recovery bridges.

C4.7.2

Revise the 2nd paragraph of Article C4.7.2 as follows:

Specific recommendations for assessing vertical acceleration effects are not provided in these Guide Specifications until more information is known about the characteristics of vertical ground motion in the central and eastern United States and those areas affected by subduction zones in the Pacific. However, it is advisable for Designers to be aware that vertical acceleration effects may be important and should be assessed for ~~essential and c~~Critical and Recovery bridges. See Caltrans Seismic Design Criteria (Caltrans, 2006).

4.13.1—Longitudinal Restrainers

Revise the 3rd paragraph of Article 4.13.1 as follows:

For Critical or ~~Essential~~ Recovery bridges in SDC C and D and as determined by the Owner, longitudinal restrainers or equivalent extended support lengths (greater than that prescribed by Eq. 4.12.3-1) should be considered at expansion joints between superstructure segments.

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SECTION 5: ANALYTICAL MODELS AND PROCEDURES

5.4.1—General

Revise the 2nd paragraph of Article 5.4.1 as follows:

Nonlinear time history analysis should be used for ~~c~~Critical or ~~essential~~ Recovery bridges ~~as defined in Article 4.2.2~~ and in some cases for ~~normal~~ Ordinary bridges in SDC D using devices for isolation or energy dissipation. In this type of analysis, component capacities are characterized in the mathematical model used for the seismic response analysis. The procedures mentioned above are described in more detail in Article 5.4.4.

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SECTION 6: FOUNDATIN AND ABUTMENT DESIGN

6.2.2—Laboratory Testing

Revise Article 6.2.2 as follows:

Laboratory tests shall be performed to determine the soil type, strength, deformation, and flow characteristics of soil and rock or both, and their suitability for the foundation selected. In areas of higher seismicity (e.g., SDC D), if foundation is supporting a~~n essential or c~~Critical or Recovery bridge, it may be appropriate to conduct special dynamic or cyclic tests to establish the liquefaction potential or stiffness and material-damping properties of the soil at some sites.

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REFERENCES

~~Sharma~~ Shama, A. A., J. B. Mander, B. B. Blabac, and S. S. Chen. 2001. *Experimental Investigation and Retrofit of Steel Pile Foundations and Pile Bents under Cyclic Lateral Loading*, Technical Report. Multidisciplinary Center for Earthquake Engineering Research, State University of New York, Buffalo, NY.

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OF STATE HIGHWAY AND
TRANSPORTATION OFFICIALS
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Pub. Code: LRFDSEIS-2-I4
ISBN 978-1-56051-782-5

9781560517849