MCEER/ATC-49

Recommended LRFD Guidelines for the Seismic Design of Highway Bridges Part II: Commentary and Appendices

Based on
NCHRP Project 12-49, FY '98
"Comprehensive Specification for the Seismic Design of Bridges"
National Cooperative Highway Research Program

Prepared by
ATC/MCEER JOINT VENTURE
A partnership of the
Applied Technology Council
(www.ATCouncil.org)
and the
Multidisciplinary Center for Earthquake Engineering Research
(http://mceer.buffalo.edu)

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PREFACE

In 2003 the ATC/MCEER Joint Venture, a partnership of the Applied Technology Council (ATC) and the Multidisciplinary Center for Earthquake Engineering Research (MCEER), University at Buffalo, published the document, *Recommended LRFD Guidelines for the Seismic Design of Highway Bridges, Part I, Specifications*. As part of the developmental effort for *Part I, Specifications*, the ATC/MCEER Joint Venture also developed this companion document, *Part II, Commentary and Appendices,* which describes the technical basis, optional approaches, and related background information pertaining to the *Specifications. Part I* and *Part II* (also known as the MCEER/ATC-49 Report) are reformatted versions of the seismic design provisions (specifications and commentary) for highway bridges developed under NCHRP (National Cooperative Highway Research Program) Project 12-49, a recently completed project to develop seismic design provisions that would be compatible with the American Association of State Highway and Transportation Officials (AASHTO) *LRFD Bridge Design Specifications.* The reformatting effort, which was carried out to facilitate immediate use of the Project 12-49 provisions by bridge design professionals, was funded as a task under the Federal Highway Administration (FHWA) sponsored MCEER Highway Project.

NCHRP Project 12-49 also included companion studies to investigate the effects of liquefaction and an effort to develop design examples using the NCHRP 12-49 provisions. These studies are documented in two companion MCEER/ATC reports: (1) the MCEER/ATC-49-1 Report, *Liquefaction Study Report*, *Recommended LRFD Guidelines for the Seismic Design of Highway Bridges* (ATC/MCEER, 2003a), and (2) the MCEER/ATC-49-2 Report, *Design Examples, Recommended LRFD Guidelines for the Seismic Design of Highway Bridges* (ATC/MCEER, 2003b).

A broad array of engineering expertise was engaged by the ATC/MCEER Joint Venture to develop the original NCHRP 12-49 seismic design provisions, companion liquefaction study, and design examples. Ian Friedland of ATC (and formerly MCEER) served as the Project Principal Investigator and Ronald Mayes (Simpson Gumpertz & Heger, Inc.) served as the Project Technical Director. The NCHRP Project 12-49 team consisted of Donald Anderson (CH2M Hill, Inc.), Michel Bruneau (University at Buffalo), Gregory Fenves (University of California at Berkeley), John Kulicki (Modjeski and Masters, Inc.), John Mander (University of Canterbury, formerly University at Buffalo), Lee Marsh (BERGER/ABAM Engineers), Ronald Mayes (Simpson, Gumpertz & Heger, Inc.), Geoffrey Martin (University of Southern California), Andrzej Nowak (University of Michigan), Richard Nutt (bridge consultant), Maurice Power (Geomatrix Consultants, Inc.), and Andrei Reinhorn (University at Buffalo).

The project also included an advisory Project Engineering Panel; Ian Buckle, of the University of Nevada at Reno, co-chaired this committee with Christopher Rojahn of ATC, who also served as the Project Administrative Officer. Other members included Serafim Arzoumanidis (Steinman Engineers), Mark Capron (Sverdrup Civil Inc.), Ignatius Po Lam (Earth Mechanics), Paul Liles (Georgia DOT), Brian Maroney (California DOT), Joseph Nicoletti (URS Greiner Woodward Clyde), Charles Roeder (University of Washington), Frieder Seible (University of California at San Diego), and Theodore Zoli (HNTB Corporation).

NCHRP Project Panel C12-49, under the direction of NCHRP Senior Program Officer David Beal and chaired by Harry Capers of the New Jersey Department of Transportation (DOT), also provided a significant amount of input and guidance during the conduct of the project. The other members of the NCHRP Project Panel were D.W. Dearasaugh (Transportation Research Board), Gongkang Fu (Wayne State University), C. Stewart Gloyd (Parsons Brinckerhoff), Manoucher Karshenas (Illinois DOT), Richard Land (California DOT), Bryan Millar (Montana DOT), Amir Mirmirman (University of Central Florida), Charles Ruth (Washington State DOT), Steven Starkey (Oregon DOT), and Phillip Yen (FHWA).

Three drafts of the Project 12-49 specifications and commentary were prepared and reviewed by the ATC Project Engineering Panel, NCHRP Project Panel 12-49, and the AASHTO Highway Subcom-

mittee on Bridges and Structures seismic design technical committee (T-3), which was chaired by James Roberts of Caltrans.

A subset of the original NCHRP Project 12-49 team, consisting of Donald Anderson, Michel Bruneau, Ronald Mayes, Lee Marsh, Richard Nutt, and Maurice Power, prepared Parts I and II of the *Recommended LRFD Guidelines for the Seismic Design of Highway Bridges* (MCEER/ATC-49 Report). ATC and MCEER staff provided editorial and desktop publishing services during the preparation of *Part II, Commentary and Appendices*.

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