

AASHTO Guide Manual for Bridge Element Inspection

First Edition • 2011



Photo courtesy of Idaho Transportation Department



Photo courtesy of Caltrans



American Association
of State Highway and
Transportation Officials

This is a preview. [Click here to purchase the full publication.](#)

AASHTO Guide Manual for Bridge Element Inspection

First Edition • 2011



Photo courtesy of Idaho Transportation Department



Photo courtesy of Caltrans



American Association
of State Highway and
Transportation Officials

This is a preview. [Click here to purchase the full publication.](#)



American Association of State Highway and Transportation Officials
444 North Capitol Street, NW Suite 249
Washington, DC 20001
202-624-5800 phone/202-624-5806 fax
www.transportation.org

© 2011 by the American Association of State Highway and Transportation Officials. All rights reserved. Printed in the United States of America. This book or parts thereof may not be reproduced in any form without written permission of the publishers.

AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS

2010–2011 Executive Committee

President	Susan Martinovich, Nevada*
Vice President	Kirk Steudle, Michigan*
Secretary/Treasurer	Carlos Bracerias, Utah

Regional Representatives

REGION I	Gabe Klein, District of Columbia, One-Year Term George Campbell, New Hampshire, Two-Year Term
REGION II	Mike Hancock, Kentucky, One-Year Term H.B. “Buck” Limehouse, South Carolina, Two-Year Term
REGION III	Thomas K. Sorel, Minnesota, One-Year Term Jolene Molitoris, Ohio, Two-Year Term
REGION IV	Amadeo Saenz, Jr., Texas, One-Year Term Francis Ziegler, North Dakota, Two-Year Term

Nonvoting Members

Immediate Past President	Larry L. “Butch” Brown, Mississippi
AASHTO Executive Director	John Horsley, Washington, DC

***Elected at the 2010 Annual Meeting in Biloxi, Mississippi**

AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS SUBCOMMITTEE ON BRIDGES AND STRUCTURES, 2010

MALCOLM T. KERLEY, *Chair*

KEVIN THOMPSON, *Vice Chair*

M. MYINT LWIN, Federal Highway Administration, *Secretary*

RAJ AILANEY, Federal Highway Administration, *Assistant Secretary*

KELLEY REHM, *AASHTO Liaison*

KEN KOBETSKY, *AASHTO Liaison*

ALABAMA, John F. “Buddy” Black, Eric J. Christie,
William “Tim” Colquett

ALASKA, Richard A. Pratt

ARIZONA, Jean A. Nehme

ARKANSAS, Phil Brand

CALIFORNIA, Kevin Thompson, Susan Hida, Barton J.
Newton

COLORADO, Mark A. Leonard, Michael G. Salamon

CONNECTICUT, Julie F. Georges

DELAWARE, Jiten K. Soneji, Barry A. Benton

DISTRICT OF COLUMBIA, Nicolas Galdos,

L. Donald Cooney, Konjit “Connie” Eskender

FLORIDA, Marcus Ansley, Sam Fallaha, Jeff Pouliotte

GEORGIA, Paul V. Liles, Jr.

HAWAII, Paul T. Santo

IDAHO, Matthew M. Farrar

ILLINOIS, Ralph E. Anderson, Thomas J. Domagalski

INDIANA, Anne M. Rearick

IOWA, Norman L. McDonald

KANSAS, Kenneth F. Hurst, James J. Brennan, Loren R.
Risch

KENTUCKY, Mark Hite, Marvin Wolfe

LOUISIANA, Hossein Ghara, Arthur D’Andrea,
Paul Fossier

MAINE, David B. Sherlock, Jeffrey S. Folsom

MARYLAND, Earle S. Freedman, Robert J. Healy,
Jeffrey L. Robert

MASSACHUSETTS, Alexander K. Bardow,
Shoukry Elnahal

MICHIGAN, Steven P. Beck, David Juntunen

MINNESOTA, Daniel L. Dorgan, Kevin Western

MISSISSIPPI, Mitchell K. Carr, B. Keith Carr

MISSOURI, Dennis Heckman, Michael Harms

MONTANA, Kent M. Barnes

NEBRASKA, Mark J. Traynowicz, Mark Ahlman, Fouad
Jaber

NEVADA, Mark P. Elicegui, Todd Stefanowicz

NEW HAMPSHIRE, Mark W. Richardson,
David L. Scott

NEW JERSEY, Richard W. Dunne

NEW MEXICO, Raymond M. Trujillo, Jimmy D. Camp

NEW YORK, George A. Christian, Donald F. Dwyer,
Arthur P. Yannotti

NORTH CAROLINA, Greg R. Perfetti

NORTH DAKOTA, Terrence R. Udland

OHIO, Timothy J. Keller, Jawdat Siddiqi

OKLAHOMA, Robert J. Rusch, Gregory D. Allen,
John A. Schmiedel

OREGON, Bruce V. Johnson, Hormoz Seradj

PENNSYLVANIA, Thomas P. Macioce, Lou Ruzzi

PUERTO RICO, (Vacant)

RHODE ISLAND, David Fish

SOUTH CAROLINA, Barry W. Bowers, Jeff Sizemore

SOUTH DAKOTA, Kevin Goeden

TENNESSEE, Edward P. Wasserman

TEXAS, David P. Hohmann, Keith L. Ramsey

U.S. DOT, M. Myint Lwin, Raj Ailaney

UTAH, Carmen Swanwick, Fred Doehring

VERMONT, Wayne B. Symonds

VIRGINIA, Malcolm T. Kerley, Kendal “Ken” Walus,
Prasad L. Nallapaneni, Julius F. J. Volgyi, Jr.

WASHINGTON, Jugesh Kapur, Tony M. Allen,
Bijan Khaleghi

WEST VIRGINIA, Gregory Bailey, James D. Shook

WISCONSIN, Scot Becker, Beth A. Cannestra, William
Dreher

WYOMING, Gregg C. Fredrick, Keith R. Fulton

GOLDEN GATE BRIDGE, Kary H. Witt

MDTA, Dan Williams

N.J. TURNPIKE AUTHORITY, Richard J. Raczynski

N.Y. STATE BRIDGE AUTHORITY,
William J. Moreau

PENN. TURNPIKE COMMISSION, James L. Stump

U.S. ARMY CORPS OF ENGINEERS—

DEPARTMENT OF THE ARMY, Christopher H.
Westbrook, Phillip W. Sausers

**U.S. DEPARTMENT OF AGRICULTURE—FOREST
SERVICE**, John R. Kattell,
Scott F. Mitchell

ALBERTA, Lloyd Atkin

KOREA, Eui-Joon Lee, Sang-Soon Lee

NEWFOUNDLAND, Peter Lester

NOVA SCOTIA, Mark Pertus

ONTARIO, Bala Tharmabala

SASKATCHEWAN, Howard Yea

**TRANSPORTATION RESEARCH BOARD—Waseem
Dekelbab**

FOREWORD

This Manual is intended as a resource for agencies performing element level bridge inspections. It replaces the AASHTO Guide to Commonly Recognized Structural Elements (1994) and its interims as a reference for standardized element definitions, element quantity calculations, condition state definitions, element feasible actions, and inspection conventions.

AASHTO would like to recognize the dedication and tireless efforts of Michael B. Johnson of the California Department of Transportation and Paul Jensen of the Montana Department of Transportation in writing this manual.

AASHTO would also like to thank the following Steering Committee members for their support and guidance in developing this manual:

Name	Agency	Role
Matt Farrar	Idaho DOT	T-18 Chair
Barton Newton	Caltrans	T-18 Representative/Group Chair
Mike Johnson	Caltrans	Pontis Task Force Liaison
Paul Jensen	Montana DOT	Pontis Task Force Liaison
Dave Juntunen	Michigan DOT	T-18 Representative
George Christian	New York DOT	T-18 Representative
Tom Everett	FHWA	FHWA Liaison
Larry Hummel	Michigan County	Local Agency Liaison
John Thiel	FHWA	Federal Lands Highway Liaison
Wade Casey	FHWA	Office of Asset Management

CONTENTS

AASHTO Executive Committee 2010–2011	iii
AASHTO Highways Subcommittee on Bridges and Structures, 2010.....	iv
Foreword	v
Introduction.....	ix
Section 1—Background	1-1
1.1—Condition Assessment Philosophy: Multi-Path And Defect Concepts	1-1
1.2—National Bridge Elements (NBEs).....	1-1
1.3—Bridge Management Elements (BMEs).....	1-1
1.4—Agency Developed Elements.....	1-1
1.5—How to Use This Manual	1-2
Section 2—Element Location Matrix.....	2-1
2.1—National Bridge Elements.....	2-1
2.1.1—Decks/Slabs	2-1
2.1.2—Superstructure.....	2-2
2.1.3—Substructure	2-2
2.2—Bridge Management Elements.....	2-3
2.2.1—Decks/Slabs	2-3
2.2.2—Wearing Surfaces and Protection Systems	2-3
2.2.3—Smart Flags (Defect Flags).....	2-4
Section 3—Detailed Element Descriptions	3-1
3.1—National Bridge Elements.....	3-1
3.1.1—Decks/Slabs	3-1
3.1.2—Superstructure.....	3-9
3.1.2.1—Girders	3-9
3.1.2.2—Stringers	3-19
3.1.2.3—Trusses/Arches	3-25
3.1.2.4—Floor Beams	3-35
3.1.2.5—Miscellaneous Superstructure Elements.....	3-41
3.1.3—Substructure Elements.....	3-47
3.1.3.1—Columns/Pile/Pier Wall	3-47
3.1.3.2—Abutments	3-65
3.1.3.3—Submerged Pile/Caps/Footings	3-73
3.1.4—Culverts.....	3-87
3.1.5—Bearings.....	3-95
3.1.6—Bridge Rail.....	3-103

3.2—Bridge Management Elements.....	3-111
3.2.1—Joints.....	3-111
3.2.2—Approach Slabs.....	3-119
3.2.3—Smart Flags (Defect Flags).....	3-123
3.2.4—Protective Systems.....	3-125
3.2.5—Environmental Factors (States)	3-131
Appendix A—Agency Developed Elements	A-1
A.1—Agency Defined Subsets of the National Bridge Elements	A-1
A.2—Agency Defined Subsets of the Bridge Management Elements	A-1
A.3—Agency Developed Elements	A-2
Appendix B—Inspection Examples.....	B-1
B.1—Timber Bridge	B-1
B.2—Two Span Concrete AASHTO Girder Structure	B-3
B.3—Painted Steel Truss	B-6
Appendix C—Element Grouping	C-1
C.1—National Bridge Elements (NBE)	C-3
C.2—Bridge Management Elements (BME).....	C-4
C.3—Obsolete Elements from CoRe Guide.....	C-5
Appendix D—Migration from CoRe Elements.....	D-1
D.1—Deck Elements	D-1
D.1.1—Concrete.....	D-1
D.1.2—Steel	D-4
D.1.3—Timber.....	D-6
D.2—Superstructure, Substructure, and Culvert (SSC) Elements	D-8
D.2.1—Steel	D-8
D.2.2—Concrete.....	D-13
D.2.3—Timber.....	D-15
D.3—Other Elements	D-15
D.3.1—Joints.....	D-15
D.3.2—Bearings	D-16
D.3.3—Traffic Rails	D-17
References.....	R-1

INTRODUCTION

The proper assessment of the condition of bridge elements is the cornerstone of sound bridge management. The introduction of element inspection condition methods in the early 1990s represented a significant advancement in the bridge inspection practice and has been adopted by the vast majority of all State Transportation Departments in the United States. Bridge owners nationwide have recognized the benefits of detailed condition assessments through the use of the raw inspection information, expanded performance measures, and bridge management system deterioration forecasting and evaluation. As the use of element level inspection techniques has proliferated, the need for improvements has been identified. This manual incorporates improvements through changes in the measurement units of decks and slabs, the development of a wearing surface element, the standardization of the number of element states, the development of a protective coating element, and the incorporation of expanded element Smart Flags. The goal of this manual is to completely capture the condition of bridges in a simple way that can be standardized across the nation while providing the flexibility to be adapted to both large and small agency settings. This manual is not intended to supplant proper training or the exercise of engineering judgment by the inspector or professional engineer.