

AMERICAN ASSOCIATION OF
STATE HIGHWAY AND
TRANSPORTATION OFFICIALS

AASHTO
THE VOICE OF TRANSPORTATION

Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals



Sixth Edition 2013

AMERICAN ASSOCIATION OF
STATE HIGHWAY AND
TRANSPORTATION OFFICIALS

AASHTO
THE VOICE OF TRANSPORTATION

Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals



Sixth Edition 2013



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

© 2013 by the American Association of State Highway and Transportation Officials. All rights reserved. Duplication is a violation of applicable law. Cover photographs provided by Patricia Little of AASHTO.

ISBN: 978-1-56051-540-1

Publication Code: LTS-6

© 2013 by the American Association of State Highway and Transportation Officials.
All rights reserved. Duplication is a violation of applicable law.

EXECUTIVE COMMITTEE 2012–2013

Voting Members

Officers:

President: Michael P. Lewis, Rhode Island

Vice President: Mike Hancock, Kentucky

Secretary-Treasurer: Carlos Braceras, Utah

Regional Representatives:

REGION I: James P. Redeker, Connecticut, One-Year Term
Chris Clement, New Hampshire, Two-Year Term

REGION II: Anthony J. Tata, North Carolina, One-Year Term
Sheri LeBas, Louisiana, Two-Year Term

REGION III: Mark Gottlieb, Wisconsin, One-Year Term
Paul Trombino, Iowa, Two-Year Term

REGION IV: John Cox, Wyoming, One-Year Term
John Halikowski, Arizona, Two-Year Term

Nonvoting Members

Immediate Past President: Kirk T. Steudle, P.E., Michigan

AASHTO Executive Director: Bud Wright, Washington, DC

HIGHWAYS SUBCOMMITTEE ON BRIDGES AND STRUCTURES, 2012

GREGG FREDRICK, *Chair*

BRUCE V. JOHNSON, *Vice Chair*

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

RAJ AILANEY, Federal Highway Administration, *Assistant Secretary*

KELLEY REHM, *AASHTO Liaison*

KEITH PLATTE, *AASHTO Liaison*

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

ALASKA, Richard A. Pratt

ARIZONA, Jean A. Nehme

ARKANSAS, Carl Fuselier

CALIFORNIA, Barton J. Newton, Susan Hida,
Michael Keever

COLORADO, Mark A. Leonard, Michael G. Salamon

CONNECTICUT, Timothy D. Fields

DELAWARE, Barry A. Benton, Jason Hastings,
Douglass Robb

DISTRICT OF COLUMBIA, Ronaldo T. “Nick”
Nicholson, L. Donald Cooney, Konjit “Connie”
Eskender

FLORIDA, Sam Fallaha, Dennis Golabek, Jeff
Pouliotte

GEORGIA, Paul V. Liles, Jr.

HAWAII, Paul T. Santo

IDAHO, Matthew M. Farrar

ILLINOIS, D. Carl Puzey, Tim Armbrecht

INDIANA, Anne M. Rearick

IOWA, Norman L. McDonald

KANSAS, Loren R. Risch, James J. Brennan

KENTUCKY, Mark Hite, Marvin Wolfe

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

MAINE, David B. Sherlock, Jeffrey S. Folsom, Wayne
Frankhauser

MARYLAND, Earle S. Freedman, Jeffrey L. Robert

MASSACHUSETTS, Alexander K. Bardow, Shoukry
Elnahal, Walter P. Heller

MICHIGAN, David Juntunen, Matthew Chynoweth

MINNESOTA, Nancy Daubenberger, Kevin Western

MISSISSIPPI, Nick J. Altobelli, Justin Walker

MISSOURI, Dennis Heckman, Scott B. Stotlemeyer

MONTANA, Kent M. Barnes

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

NEVADA, Mark P. Elicegui, Todd Stefonowicz

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

NEW JERSEY, Eli “Dave” Lambert III

NEW MEXICO, Raymond M. Trujillo, Jeff C. Vigil

NEW YORK, Richard Marchione, Wahid Albert

NORTH CAROLINA, Greg R. Perfetti

NORTH DAKOTA, Terrence R. Udland

OHIO, Timothy J. Keller, Jawdat Siddiqi

OKLAHOMA, Robert J. Rusch, Walter Peters, 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, Wayne J. Seger, Henry Pate

TEXAS, Gregg A. Freeby, Keith L. Ramsey

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

UTAH, Carmen Swanwick, Joshua Sletten

VERMONT, Wayne B. Symonds

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

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

WEST VIRGINIA, Gregory Bailey

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

WYOMING, Keith R. Fulton, Paul G. Cortez, Michael
E. Menghini

**GOLDEN GATE BRIDGE, HIGHWAY AND
TRANSPORTATION DISTRICT**, 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**, Phillip W.
Sausser, Christopher H. Westbrook

U.S. COAST GUARD, Kamal Elnahal

**U.S. DEPARTMENT OF AGRICULTURE—
FOREST SERVICE**, Tom Gillens

ALBERTA, Lloyd Atkin

KOREA, Eui-Joon Lee, Sang-Soon Lee

NEWFOUNDLAND, Peter Lest

ONTARIO, Bala Tharmabala

SASKATCHEWAN, Howard Yea

TRANSPORTATION RESEARCH BOARD, Waseem
Dekelbab

Foreword

The sixth edition of *Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals* supersedes the fifth edition and its 2010 and 2011 interims. It includes changes approved by the Highways Subcommittee on Bridges and Structures in 2012.

Design guidelines for fatigue-critical multisided tubular sections are included in Section 5, “Steel Design.” Additional guidance is provided on longitudinal seam welds, tube-to-transverse plate connection welds, anchor bolt installation, and stiffened connections. New figures for fillet-welded gusseted box connections and ring-stiffened box connections are provided as commentary. Section 5 also includes updates to hand-hole welds, weld inspection, and provides new figures for holes and cutouts.

The scope of Section 11, “Fatigue Design,” is expanded to allow design of support structures using nominal stress-based classifications of typical connection details, or using the alternate local stress-based and/or experiment-based methodologies presented in Appendix D. New tables are provided for determining the fatigue resistance of typical connection details in support structures for finite and infinite life designs. The scope of Section 11 is expanded to include separate provisions for high-mast lighting towers, including a combined wind load for a simplified approach to derive fatigue damage from all the load effects due to natural wind.

The Specifications are based on the allowable stress design methodology and are intended to address the usual structural supports. Requirements more stringent than those in the Specifications may be appropriate for atypical structural supports. The commentary is intended to provide background on some of the considerations contained in the Specifications; however it does not provide a complete historical background, nor detailed discussions of the associated research studies. The Specifications and accompanying commentary do not replace sound engineering knowledge and judgment.

AASHTO Highways Subcommittee on Bridges and Structures

Preface

The sixth edition of *Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals* supersedes the fifth edition and its 2010 and 2011 interims. It includes changes approved by the Highways Subcommittee on Bridges and Structures in 2012.

AASHTO Publications Staff

ABBREVIATED TABLE OF CONTENTS

| | |
|---|------|
| SECTION 1: INTRODUCTION..... | 1-i |
| SECTION 2: GENERAL FEATURES OF DESIGN | 2-i |
| SECTION 3: LOADS | 3-i |
| SECTION 4: ANALYSIS AND DESIGN: GENERAL CONSIDERATION | 4-i |
| SECTION 5: STEEL DESIGN | 5-i |
| SECTION 6: ALUMINUM DESIGN..... | 6-i |
| SECTION 7: PRESTRESSED CONCRETE DESIGN | 7-i |
| SECTION 8: FIBER-REINFORCED COMPOSITE DESIGN | 8-i |
| SECTION 9: WOOD DESIGN..... | 9-i |
| SECTION 10: SERVICEABILITY REQUIREMENTS..... | 10-i |
| SECTION 11: FATIGUE DESIGN | 11-i |
| SECTION 12: BREAKAWAY SUPPORTS | 12-i |
| SECTION 13: FOUNDATION DESIGN..... | 13-i |
| APPENDIX A: ANALYSIS OF SPAN-WIRE STRUCTURES | A-i |
| APPENDIX B: DESIGN AIDS | B-i |
| APPENDIX C: ALTERNATIVE METHOD FOR WIND PRESSURES | C-i |
| APPENDIX D: ALTERNATIVE METHODS FOR FATIGUE DESIGN..... | D-i |

SECTION 1: INTRODUCTION

TABLE OF CONTENTS

1.1—SCOPE 1-1

1.2—DEFINITIONS 1-1

1.3—APPLICABLE SPECIFICATIONS 1-2

1.4—TYPES OF STRUCTURAL SUPPORTS 1-2

 1.4.1—Sign 1-2

 1.4.2—Luminaire 1-3

 1.4.3—Traffic Signal 1-5

 1.4.4—Combination Structures 1-6

1.5—REFERENCES 1-6

SECTION 1

INTRODUCTION

1.1—SCOPE

The provisions of these *Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals*, hereinafter referred to as the Specifications, are applicable to the structural design of supports for highway signs, luminaires, and traffic signals. The types of supports covered in these Specifications are discussed in Article 1.4. The Specifications are intended to serve as a standard and guide for the design, fabrication, and erection of these types of supports.

These Specifications are not intended to supplant proper training or the exercise of judgment by the designer, and they include only the minimum requirements necessary to provide for public safety. The Owner or the designer may require the design and quality of materials and construction to be higher than the minimum requirements.

The commentary directs attention to other documents that provide suggestions for carrying out the requirements and intent of these Specifications. However, those documents and the commentary are not intended to be a part of the Specifications.

1.2—DEFINITIONS

Arm—A cantilevered support, either horizontal or sloped.

Bridge Support—Also known as span-type support; a horizontal or sloped member or truss supported by at least two vertical supports.

Cantilever—A support, either horizontal or vertical, supported at one end only.

Designer—The person responsible for design of the structural support.

High-Level Luminaire Support—Truss-type or pole-type tower that provides lighting at heights greater than about 17 m (55 ft), typically using 4 to 12 luminaires.

High-Mast Lighting Tower (HMLT)—Another description for a pole-type high-level luminaire support.

Luminaire—A complete lighting unit consisting of a lamp or lamps together with the parts designed to distribute the light, to position and protect the lamps, and to connect the lamps to the electric power supply.

Mast Arm—A supporting arm designed to hold a sign, signal head, or luminaire in an approximately horizontal position.

Monotube—A support that is composed of a single tube.

C1.1

These Specifications are the result of National Cooperative Highway Research Program (NCHRP) Project 17-10 and the corresponding NCHRP Report 411. At the discretion of the Owner, proprietary solutions may be considered. These solutions may address both new structures and the repair or rehabilitation of existing structures. Testing of proprietary solutions shall model actual conditions as closely as possible, and the test methods and results shall be published. These Specifications are intended to replace the previous edition, *Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals* (2009).

The commentary discusses some provisions of the Specifications with emphasis given to the explanation of new or revised provisions that may be unfamiliar to users of the Specifications. The commentary is not intended to provide a complete historical background concerning the development of this and previous Specifications, nor is it intended to provide a detailed summary of the studies and research data reviewed in formulating the provisions of the Specifications. However, references to some of the research data are provided for those who wish to study the background material in depth.