STATE OF ILLINOIS
ILLINOIS COMMERCE COMMISSION

| | | |
|---|---|---|
| **STATE OF ILLINOIS, ILLINOIS DEPARTMENT OF TRANSPORTATION,** | ) | |
| **Petitioner,** | ) | |
| **v.** | ) | **Docket No. T09-0074** |
| **TERMINAL RAILROAD ASSOCIATION OF ST. LOUIS,** | ) | |
| **Respondent.** | ) | |



**TRRA'S AMENDED EXHIBIT LIST FOR JULY 30, 2009 HEARING REGARDING FENCING AND LIGHTING AT THE PROPOSED GRADE SEPARATION SPANNING TRRA'S YARD**

COMES NOW respondent, Terminal Railroad Association of St. Louis ("TRRA") and submits the following list of proposed exhibits which may be offered at the trial of this case. True and accurate copies of the exhibits are filed contemporaneously herewith. TRRA reserves the right to introduce other exhibits as may be necessary in rebuttal or for impeachment depending upon evidence presented by the Illinois Department of Transportation ("IDOT"). In addition to the exhibits listed below, TRRA may offer compilations from the exhibits and/or portions or enlargements of exhibits and/or exhibits listed by IDOT in this action.

A. Opinion letter from Ralph S. Stone, P.E. of Design Nine Engineering Services for Railroads and Industry to Katherine C. Lemley dated July 28, 2009;

B. BNSF Railway and Union Pacific Railroad, Guidelines for Railroad Grade Separation Projects dated January 24, 2007;

C. American Railway Engineering and Maintenance-of-Way Association (AREMA) Illumination Guidelines;

D. U.S. Department of Transportation, Federal Highway Administration, Memorandum Dated February 21, 2001, Re: ACTION: Railroad Guidelines for Design and

Construction of Grade Separation Underpass and Overhead Structures (emphasis added);

E. Curriculum Vitae for Ralph S. Stone, P.E.;

F. Depiction of locations of proposed lighting and fencing on the proposed grade separation structure spanning the TRRA Yard; and

G. Affidavit of Patrick G. Prososki, Manger of Structures and Design, Southern/Central Regions, for the Union Pacific Railroad.

H. 23 C.F.R. §§646.212 - 646.214 (2009).

I. American Association of State Highway and Transportation Officials (AASHTO) Standard Specifications for Highway Bridges, Seventeenth Edition (1996).

J. Photos and specifications for a variety of Bridge Inspection Units or "Snoopers", provided by N.E. Bridge Contractors, Inc.

K. Kansas City Southern Railway Company, Guidelines for the Design and Construction of Railroad Overpasses and Underpasses dated May, 2008.

L. Photos of examples of fencing and lighting on St. Louis, Missouri area overpasses taken by Design Nine on July 8, 2009.

M. Photos and specifications for a variety of Bridge Inspection Units provided by McClain & Co., Inc.

N. Photos showing current lighting in place on the TRRA Wiggins rail yard.

O. Chapters 17 and 22 from the South Carolina Department of Transportation Bridge Design Manual dated April, 2006.

P. Chapter 14 from the Request for Proposals issued by the Utah Department of Transportation for the Corridor Expansion of I-15 dated June 16, 2009.

Q. National Highway System Map for the St. Louis area.

R. Illinois Administrative Code, Title 92, Chapter III, Subchapter c, Part 1546, Employee Walkways in Railroad Yards.

S. Features and Specifications for Aspen UB-50 Bridge Inspection Unit as provided by Aspen Aerials.

True and accurate copies of the Exhibits were sent via electronic mail to all Counsel of Record on this 31st day of July, 2009.

Respectfully submitted,

By: _____

Katherine C. Lemley, #6271604
Douglas P. Borgmann, #6291412
One Metropolitan Square
211 North Broadway, Suite 3600
St. Louis, Missouri 63102-2750
(314) 259-2000
(314) 259-2020 (facsimile)
kclemley@bryancave.com

and

Timothy E. Duggan
Stine, Greer & Duggan
426 S. Fifth St.
Springfield, IL 62701
(217) 744-1776
(217) 725-2402 [facsimile]
td_sgdlaw@yahoo.com

Attorneys for Respondent
Terminal Railroad Association of St. Louis

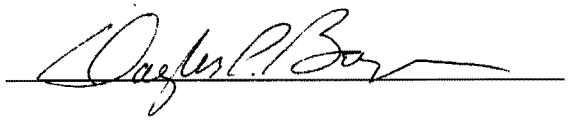
## CERTIFICATE OF SERVICE

I hereby certify that a copy of the foregoing was mailed via electronic mail to Cindy Bushur-Hallam, Gloria M. Camarena, and Richard A. Redmond, all Special Assistant Attorneys General, on this 31st day of July, 2009, as follows:

Cindy Bushur-Hallam
Cindy.Bushur-Hallam@illinois.gov

Gloria Camarena
Gloria.Camarena@illinois.gov

Richard A. Redmond
richard.redmond@hklaw.com



BRYAN CAVE

Douglas P. Borgmann
Associate
Voice: 314-259-2242
Facsimile: 314-552-8242
doug.borgmann@bryancave.com

August 3, 2009



**Bryan Cave LLP**
One Metropolitan Square
211 North Broadway
Suite 3600
St. Louis, MO 63102-2750
Tel (314) 259-2000
Fax (314) 259-2020
www.bryancave.com



**VIA FEDERAL EXPRESS**

Illinois Commerce Commission
527 East Capitol Avenue
Springfield, Illinois 62701
Attention: Chief Clerk

**Re: Docket No.: T09-0074**
**TRRA/IDOT - Amended Exhibit List dated July 31, 2009**

Dear Sir or Madam:

Enclosed please find one (1) original of the Terminal Railroad Association of St. Louis ("TRRA") Certificate of Service, to be filed in connection with the above-referenced matter.

Please let me know if you have any questions.

Sincerely,

Douglas P. Borgmann

Douglas P. Borgmann

cc:: B. Eddie Lowry, Jr., Esq.
Katherine C. Lemley, Esq.

3170071.1

STATE OF ILLINOIS
ILLINOIS COMMERCE COMMISSION



| | | |
|---|---|---|
| **STATE OF ILLINOIS, ILLINOIS DEPARTMENT OF TRANSPORTATION,** | ) | |
| **Petitioner,** | ) | |
| **v.** | ) | **Docket No. T09-0074** |
| **TERMINAL RAILROAD ASSOCIATION OF ST. LOUIS,** | ) | |
| **Respondent.** | ) | |

## CERTIFICATE OF SERVICE

The undersigned hereby certifies that Respondent's Amended Exhibit List for July 30, 2009 Hearing Regarding Fencing and Lighting at the Proposed Grade Separation Spanning TRRA's Yard was mailed via Federal Express to the individuals listed below, this 3rd day of August, 2009.

Ellen Schanzle-Haskins
Illinois Department of Transportation
2300 South Dirksen Parkway, Room 300
Springfield, Illinois 62764

Christine Reed
Illinois Department of Transportation
Attention: Jeff Harpring, Room 205
2300 South Dirksen Parkway
Springfield, Illinois 62764

Richard Redmond
Holland & Knight
131 S. Dearborn, 30th Floor
Chicago, Illinois 60603

Lance T. Jones
Deputy Chief Counsel
Illinois Department of Transportation
2300 South Dirksen Parkway, Suite 311
Springfield, Illinois 62764

Ted Ingram
General Superintendent
Terminal Railroad Association of St. Louis
1201 McKinley Street
Venice, Illinois 62090

Gloria M. Camarena
Assistant Chief Counsel
Illinois Department of Transportation
JRTC – Suite 6-600
100 West Randolph
Chicago, Illinois 60601

Cindy K. Bushur-Hallam
Special Assistant Chief Counsel
Illinois Department of Transportation
2300 S. Dirksen Parkway
Springfield, Illinois 62764

BRYAN CAVE LLP

By: _____

Katherine C. Lemley, #6271604
Douglas P. Borgmann, #6291412
One Metropolitan Square
211 North Broadway, Suite 3600
St. Louis, Missouri 63102-2750
(314) 259-2000
(314) 259-2020 (facsimile)
kclemley@bryancave.com

and

Timothy E. Duggan
Stine, Greer & Duggan
426 S. Fifth St.
Springfield, IL 62701
(217) 744-1776
(217) 725-2402 [facsimile]
td_sgdlaw@yahoo.com

Attorneys for Respondent
Terminal Railroad Association of St. Louis

(1) Where a grade crossing is eliminated by grade separation, the structure and approaches required to transition to a theoretical highway profile which would have been constructed if there were no railroad present, for the number of lanes on the existing highway and in accordance with the current design standards of the State highway agency.

(2) Where another facility, such as a highway or waterway, requiring a bridge structure is located within the limits of a grade separation project, the estimated cost of a theoretical structure and approaches as described in §646.210(c)(1) to eliminate the railroad-highway grade crossing without considering the presence of the waterway or other highway.

(3) Where a grade crossing is eliminated by railroad or highway relocation, the actual cost of the relocation project, the estimated cost of the relocation project, or the estimated cost of a structure and approaches as described in §646.210(c)(1), whichever is less.

(d) Railroads may voluntarily contribute a greater share of project costs than is required. Also, other parties may voluntarily assume the railroad's share.

### §646.212 Federal share.

(a) *General.* (1) Federal funds are not eligible to participate in costs incurred solely for the benefit of the railroad.

(2) At grade separations Federal funds are eligible to participate in costs to provide space for more tracks than are in place when the railroad establishes to the satisfaction of the State highway agency and FHWA that it has a definite demand and plans for installation of the additional tracks within a reasonable time.

(3) The Federal share of the cost of a grade separation project shall be based on the cost to provide horizontal and/or vertical clearances used by the railroad in its normal practice subject to limitations as shown in the appendix or as required by a State regulatory agency.

(b) The Federal share of railroad/highway crossing projects may be:

(1) Regular pro rata sharing as provided by 23 U.S.C. 120(a) and 120(b).

(2) One hundred percent Federal share, as provided by 23 U.S.C. 120(c).

(3) Ninety percent Federal share for funds made available through 23 U.S.C. 133(d)(1).

[40 FR 16059, Apr. 9, 1975, as amended at 47 FR 33955, Aug. 5, 1982; 53 FR 32218, Aug. 24, 1988; 62 FR 45328, Aug. 27, 1997]

### §646.214 Design.

(a) *General.* (1) Facilities that are the responsibility of the railroad for maintenance and operation shall conform to the specifications and design standards used by the railroad in its normal practice, subject to approval by the State highway agency and FHWA.

(2) Facilities that are the responsibility of the highway agency for maintenance and operation shall conform to the specifications and design standards and guides used by the highway agency in its normal practice for Federal-aid projects.

(b) *Grade crossing improvements.* (1) All traffic control devices proposed shall comply with the latest edition of the Manual on Uniform Traffic Control Devices for Streets and Highways supplemented to the extent applicable by State standards.

(2) Pursuant to 23 U.S.C. 109(e), where a railroad-highway grade crossing is located within the limits of or near the terminus of a Federal-aid highway project for construction of a new highway or improvement of the existing roadway, the crossing shall not be opened for unrestricted use by traffic or the project accepted by FHWA until adequate warning devices for the crossing are installed and functioning properly.

(3)(i) *Adequate warning devices,* under §646.214(b)(2) or on any project where Federal-aid funds participate in the installation of the devices are to include automatic gates with flashing light signals when one or more of the following conditions exist:

(A) Multiple main line railroad tracks.

(B) Multiple tracks at or in the vicinity of the crossing which may be occupied by a train or locomotive so as to obscure the movement of another train approaching the crossing.



EXHIBIT H

(C) High Speed train operation combined with limited sight distance at either single or multiple track crossings.

(D) A combination of high speeds and moderately high volumes of highway and railroad traffic.

(E) Either a high volume of vehicular traffic, high number of train movements, substantial numbers of schoolbuses or trucks carrying hazardous materials, unusually restricted sight distance, continuing accident occurrences, or any combination of these conditions.

(F) A diagnostic team recommends them.

(ii) In individual cases where a diagnostic team justifies that gates are not appropriate, FHWA may find that the above requirements are not applicable.

(4) For crossings where the requirements of §646.214(b)(3) are not applicable, the type of warning device to be installed, whether the determination is made by a State regulatory agency, State highway agency, and/or the railroad, is subject to the approval of FHWA.

(c) *Grade crossing elimination.* All crossings of railroads and highways at grade shall be eliminated where there is full control of access on the highway (a freeway) regardless of the volume of railroad or highway traffic.

[40 FR 16059, Apr. 9, 1975, as amended at 47 FR 33955, Aug. 5, 1982; 62 FR 45328, Aug. 27, 1997]

### §646.216 General procedures.

(a) *General.* Unless specifically modified herein, applicable Federal-aid procedures govern projects undertaken pursuant to this subpart.

(b) *Preliminary engineering and engineering services.* (1) As mutually agreed to by the State highway agency and railroad, and subject to the provisions of §646.216(b)(2), preliminary engineering work on railroad-highway projects may be accomplished by one of the following methods:

(i) The State or railroad's engineering forces;

(ii) An engineering consultant selected by the State after consultation with the railroad, and with the State administering the contract; or

(iii) An engineering consultant selected by the railroad, with the approval of the State and with the railroad administering the contract.

(2) Where a railroad is not adequately staffed, Federal-aid funds may participate in the amounts paid to engineering consultants and others for required services, provided such amounts are not based on a percentage of the cost of construction, either under contracts for individual projects or under existing written continuing contracts where such work is regularly performed for the railroad in its own work under such contracts at reasonable costs.

(c) *Rights-of-way.* (1) Acquisition of right-of-way by a State highway agency on behalf of a railroad or acquisition of nonoperating real property from a railroad shall be in accordance with the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 (42 U.S.C. 4601 *et seq.*) and applicable FHWA right-of-way procedures in 23 CFR, chapter I, subchapter H. On projects for the elimination of hazards of railroad-highway crossings by the relocation of railroads, acquisition or replacement right-of-way by a railroad shall be in accordance with 42 U.S.C. 4601 *et seq.*

(2) Where buildings and other depreciable structures of the railroad (such as signal towers, passenger stations, depots, and other buildings, and equipment housings) which are integral to operation of railroad traffic are wholly or partly affected by a highway project, the costs of work necessary to functionally restore such facilities are eligible for participation. However, when replacement of such facilities is necessary, credits shall be made to the cost of the project for:

(i) Accrued depreciation, which is that amount based on the ratio between the period of actual length of service and total life expectancy applied to the original cost.

(ii) Additions or improvements which provide higher quality or increased service capability of the facility and which are provided solely for the benefit of the railroad.

(iii) Actual salvage value of the material recovered from the facility being replaced. Total credits to a project shall not be required in excess of the replacement cost of the facility.

# STANDARD SPECIFICATIONS
# for
# HIGHWAY BRIDGES

## SIXTEENTH EDITION
## 1996


Adopted and Published by the
American Association of State Highway
and Transportation Officials, Inc.

444 North Capitol Street, N.W., Suite 249
Washington, D.C. 20001



ISBN 1-56051-040-4

EXHIBIT I

# AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS

## EXECUTIVE COMMITTEE
## 1995–1996

### VOTING MEMBERS

*Officers:*
*President:* Bill Burnett, Texas
*Vice President:* Darrell Rensink, Iowa
*Secretary/Treasurer:* Clyde E. Pyers, Maryland
*Regional Representatives:*
*Regions:*
I Carlos I. Pesquara, Puerto Rico
II Robert L. Robinson, Mississippi
III Patrick Nowak, Michigan
IV Marshall W. Moore, North Dakota

### NON-VOTING MEMBERS

*Immediate Past President:* Wayne Shackelford, Georgia
*Executive Director:* Francis B. Francois, Washington, D.C.

## HIGHWAY SUBCOMMITTEE ON BRIDGES AND STRUCTURES 1995

**JAMES E. SIEBELS, COLORADO, Chairman**
**G. CHARLES LEWIS, GEORGIA, Vice Chairman**
**STANLEY GORDON, Federal Highway Administration, Secretary**

ALABAMA, William F. Conway
ALASKA, Steve Bradford, Ray Shumway
ARIZONA, William R. Brucsch, F. Daniel Davis
ARKANSAS, Dale Loe
CALIFORNIA, James E. Roberts
COLORADO, Stephen Horton
CONNECTICUT, Gordon Barton
DELAWARE, Chao H. Hu
D.C., Jacob Patnaik, Luke DiPompo
FLORIDA, Jerry Potter
GEORGIA, Paul Liles
HAWAII, Donald C. Ornellas
IDAHO, Scott Stokes
ILLINOIS, Ralph E. Anderson
INDIANA, John J. White
IOWA, William A. Lundquist
KANSAS, Kennth F. Hurst
KENTUCKY, Richard Sutherland
LOUISIANA, Norval Knapp, Wayne Aymond
MAINE, Larry L. Roberts, James E. Tukey
MARYLAND, Earle S. Freedman
MASSACHUSETTS, Alexander K. Bardow
MICHIGAN, Sudhakar Kulkarni
MINNESOTA, Donald J. Flemming
MISSISSIPPI, Wilbur F. Massey
MISSOURI, Allen F. Laffoon
MONTANA, Joseph Kolman
NEBRASKA, Lyman D. Freemon
NEVADA, Floyd I. Marcucci
NEW HAMSPHIRE, James A. Moore
NEW JERSEY, Robert Pege
NEW MEXICO, Martin A. Gavurnick
NEW YORK, (vacant)
NORTH CAROLINA, John L. Smith
NORTH DAKOTA, Steven J. Miller
OHIO, Richard L. Engel
OKLAHOMA, Veldo M. Goins
OREGON, Terry J. Shike
PENNSYLVANIA, (vacant)
PUERTO RICO, Jorge L. Melendez, Hector Camacho
RHODE ISLAND, Kazem Farhoumand
SOUTH CAROLINA, Rocque L. Kneece
SOUTH DAKOTA, John Cole
TENNESSEE, Clellon Loveall, Ed Wasserman
TEXAS, Robert Wilson
U.S. DOT, Stanley Gordon (FHWA), Nick E. Mpars (USCG)
UTAH, Dave Christensen
VERMONT, Warren B. Tripp
VIRGINIA, Malcolm T. Kerley
WASHINGTON, Myint Lwin
WEST VIRGINIA, James Sothen
WISCONSIN, Stanley W. Woods
WYOMING, David Pope
ALBERTA, Bob Ramsay
BRITISH COLUMBIA, Peter Brett
MANITOBA, W. Saltzberg
MARIANA ISLANDS, Elizabeth H. Salas-Balajadia
NEW BRUNSWICK, G.A. Rushton
NEWFOUNDLAND, Peter Lester
NORTHWEST TERRITORIES, Jivko Jivkov
NOVA SCOTIA, Al MacRae
ONTARIO, Ranjit S. Reel
SASKATCHEWAN, Lorne J. Hamblin
MASS. METRO. DIST. COMM., David Lenhardt
N.J. TURNPIKE AUTHORITY, Wallace R. Grant
PORT AUTH. OF NY AND NJ, Joseph K. Kelly
NY STATE BRIDGE AUTHORITY, William Moreau
BUREAU OF INDIAN AFFAIRS, Wade Cosey
U.S. DEPARTMENT OF AGRICULTURE-FOREST SERVICE, Nelson Hernandez
MILITARY TRAFFIC MANAGEMENT COMMAND, Robert D. Franz
U.S. ARMY CORPS OF ENGINEERS-DEPT. OF THE ARMY, Paul C. T. Tan

# PREFACE
## to
## Sixteenth Edition

Major changes and revisions to this edition are as follows:

1. The Interim Specifications of 1993, 1994, 1995, and 1996 have been adopted and are included. (Note the 1996 interim, with commentary, were never published as a separate document.)
2. Entire Division I-A, Seismic Design, was revised. Entire section of Commentary and Supplements A & B of Division I-A were deleted.
3. Section 17, Soil-Reinforced Concrete Structure Interaction Systems, of Division I was revised.
4. Section 26, Metal Culverts, of Division II was revised.
5. Section 27, Concrete Culverts, of Division II was revised.
6. Section 29, Embedment Anchors, was added to Division II.

# INTRODUCTION

The compilation of these specifications began in 1921 with the organization of the Committee on Bridges and Structures of the American Association of State Highway Officials. During the period from 1921, until printed in 1931, the specifications were gradually developed, and as the several divisions were approved from time to time, they were made available in mimeographed form for use of the State Highway Departments and other organizations. A complete specification was available in 1926 and it was revised in 1928. Though not in printed form, the specifications were valuable to the bridge engineering profession during the period of development.

The first edition of the Standard Specifications was published in 1931, and it was followed by the 1935, 1941, 1944, 1949, 1953, 1957, 1961, 1965, 1969, 1973, 1977, 1983, 1989, and 1992 revised editions. The present sixteenth edition constitutes a revision of the 1992 specifications, including those changes adopted since the publication of the fifteenth edition and those through 1995. The constant research and development in steel, concrete, and timber structures practically dictates the necessity of revising the specifications every few years, and the 1996 edition continues this trend.

Interim Specifications are usually published in the middle of the calendar year, and a revised edition of this book is generally published every 4 years. The Interim Specifications have the same status as standards of the American Association of State Highway and Transportation Officials, but are tentative revisions approved by at least two-thirds of the Subcommittee on Bridges and Structures. These revisions are voted on by the Association Member Departments prior to the publication of each new edition of this book, and if approved by at least two-thirds of the members, they are included in the new edition as standards of the Association. Members of the Association are the 50 State Highway or Transportation Departments, the District of Columbia, and Puerto Rico. Each member has one vote. The U.S. Department of Transportation is a nonvoting member.

Annual Interim Specifications are generally used by the States after their adoption by the Bridge Subcommittee. Orders for these annual Interim Specifications should be sent to the Publication Sales Office of the Association at 444 North Capitol Street, N.W., Suite 249, Washington, D.C. 20001, (202)624-5800.

The *Standard Specifications for Highway Bridges* are intended to serve as a standard or guide for the preparation of State specifications and for reference by bridge engineers.

Primarily, the specifications set forth minimum requirements which are consistent with current practice, and certain modifications may be necessary to suit local conditions. They apply to ordinary highway bridges and supplemental specifications may be required for unusual types and for bridges with spans longer than 500 feet.

Specifications of the American Society for Testing and Materials, the American Welding Society, the American Wood Preservers Association, and the National Forest Products Association are referred to, or are recognized. Numerous research bulletins are noted for references.

The American Association of State Highway and Transportation Officials wishes to express its sincere appreciation to the above organizations, as well as to those universities and representatives of industry whose research efforts and consultations have been most helpful in continual improvement of these specifications.

Extensive references have been made to the *Standard Specifications for Transportation Materials* published by the American Association of State Highway and Transportation Officials, including equivalent ASTM specifications which have been reproduced in the Association's Standard Specifications by permission of the American Society for Testing and Materials.

Attention is also directed to the following publications prepared and published by the Bridge Subcommittee:

*Construction Manual for Highway Bridges and Incidental Structures*—1973 Edition

*Guide Specifications for Fracture Critical Non-Redundant Steel Bridge Members*—1978 Edition, updated to 1986

*Guide Specifications for Horizontally Curved Highway Bridges*—1980 Edition, updated to 1993

*Standard Specifications for Movable Highway Bridges*—1988 Edition

*Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals*—1985 Edition, updated to 1994

*Guide Specifications for Alternate Load Factor Design Procedures for Steel Beam Bridges Using Braced Compact Sections*—1991 Edition

*AASHTO Commentary on ANSI/AASHTO/AWS Bridge Welding Code D1.5-88*—1991 Edition

*Guide Specifications for Strength Design of Truss Bridges (Load Factor Design)*—1986 Edition

*Guide Specifications for Fatigue Evaluation of Existing Steel Bridges*—1990 Edition

*Guide Specifications for Strength Evaluation of Existing Steel and Concrete Bridges*—1989 Edition

*Guide Specifications for Design and Construction and Segmental Concrete Bridges*—1989 Edition

*Guide Specifications for Bridge Railings*—1989 Edition

*Guide Specifications for Structural Design of Sound Barriers*—1989 Edition

*AASHTO Guide Specifications—Thermal Effects in Concrete Bridge Superstructure*—1989 Edition

*ANSI/AASHTO/AWS Bridge Welding Code D1.5*

*Foundation Investigation Manual*—1978 Edition

*Guide Specification and Commentary for Vessel Collision Design of Highway Bridges*—1991 Edition

*Guide Specification for the Design of Stress-Laminated Wood Decks*—1991 Edition

*Guidelines for Bridge Management Systems*—1993 Edition

*Manual for Condition Evaluation of Bridges*—1994 Edition

*Guide Specifications for Distribution of Loads for Highway Bridges*—1994 Edition

*Guide Specifications for Aluminum Highway Bridges*—1991 Edition

*Guide Specifications for Seismic Isolation Design*—1991 Edition

*Guide Specifications for Fatigue Design of Steel Bridges*—1989 Edition

*AASHTO LRFD Bridge Design Specifications*—1994 U.S. Units Edition, 1994 SI Units Edition

*Guide Design Specifications for Bridge Temporary Work*—1995 Edition

*Construction Handbook for Bridge Temporary Work*—1995 Edition

*Guide for Painting Steel Structures*—1996 Edition

The following have served as chairmen of the Committee since its inception in 1921: Messrs, E.F. Kelley, who pioneered the work of the Committee, Albin L. Gemeny, R. B. McMinn, Raymond Archiband, G. S. Paxson, E. M. Johnson, Ward Goodman, Charles Matlock, Joseph S. Jones, Sidney Poleynard, Jack Freidenrich, Henry W. Derthick, Robert C. Cassano, Clellon Loveall, and James E. Siebels. The Committee expresses its sincere appreciation of the work of these men and of those active members of the past, whose names, because of retirement, are no longer on the roll.

Suggestions for the improvement of the specifications are welcomed. They should be sent to the Chairman, Subcommittee on Bridges and Structures, AASHTO, 444 North Capitol Street, N.W., Suite 249, Washington, D.C. 20001. Inquiries as to the intent or application of the specifications should be sent to the same address.

## ABBREVIATIONS

| | |
|---|---|
| AASHTO | —American Association of State Highway and Transportation Officials |
| ACI | —American Concrete Institute |
| AITC | —American Institute of Timber Construction |
| ASCE | —American Society of Civil Engineers |
| ASTM | —American Society for Testing and Materials |
| ANSI | —American National Standards Institute |
| AWS | —American Welding Society |
| AWPA | —American Wood Preservers Association |
| CS | —Commercial Standards |
| NDS | —National Design Specifications for Stress Grade Lumber and Its Fastenings |
| NFPA | —National Forest Products Association |
| SAE | —Society of Automotive Engineers |
| WPA | —Western Pine Association |
| WWPA | —Western Wood Products Association |

# AASHTO STANDARD SPECIFICATIONS
# TABLE OF CONTENTS

## DIVISION I
## DESIGN

### SECTION 1—GENERAL PROVISIONS



### SECTION 2—GENERAL FEATURES OF DESIGN

# Division I
# DESIGN

# Section 1
# GENERAL PROVISIONS

## 1.1 DESIGN ANALYSIS AND GENERAL STRUCTURAL INTEGRITY FOR BRIDGES

The intent of these Specifications is to produce integrity of design in bridges.

### 1.1.1 Design Analysis

When these Specifications provide for empirical formulae, alternate rational analyses, based on theories or tests and accepted by the authority having jurisdiction, will be considered as compliance with these Specifications.

### 1.1.2 Structural Integrity

Designs and details for new bridges should address structural integrity by considering the following:

(a) The use of continuity and redundancy to provide one or more alternate load paths.
(b) Structural members and bearing seat widths that are resistant to damage or instability.
(c) External protection systems to minimize the effects of reasonably conceived severe loads.

## 1.2 BRIDGE LOCATIONS

The general location of a bridge is governed by the route of the highway it carries, which, in the case of a new highway, could be one of several routes under consideration. The bridge location should be selected to suit the particular obstacle being crossed. Stream crossings should be located with regard to initial capital cost of bridgeworks and the minimization of total cost including river channel training works and the maintenance measures necessary to reduce erosion. Highway and railroad crossings should provide for possible future works such as road widening.

## 1.3 WATERWAYS

### 1.3.1 General

**1.3.1.1** Selecting favorable stream crossings should be considered in the preliminary route determination to minimize construction, maintenance, and replacement costs. Natural stream meanders should be studied and, if necessary, channel changes, river training works, and other construction that would reduce erosion problems and prevent possible loss of the structure should be considered. The foundations of bridges constructed across channels that have been realigned should be designed for possible deepening and widening of the relocated channel due to natural causes. On wide flood plains, the lowering of approach embankments to provide overflow sections that would pass unusual floods over the highway is a means of preventing loss of structures. Where relief bridges are needed to maintain the natural flow distribution and reduce backwater, caution must be exercised in proportioning the size and in locating such structures to avoid undue scour or changes in the course of the main river channel.

**1.3.1.2** Usually, bridge waterways are sized to pass a design flood of a magnitude and frequency consistent with the type or class of highway. In the selection of the waterway opening, consideration should be given to the amount of upstream ponding, the passage of ice and debris and possible scour of the bridge foundations. Where floods exceeding the design flood have occurred, or where superfloods would cause extensive damage to adjoining property or the loss of a costly structure, a larger waterway opening may be warranted. Due consideration should be given to any Federal, State, and local requirements.

**1.3.1.3** Relief openings, spur-dikes, debris deflectors and channel training works should be used where needed to minimize the effect of adverse flood flow conditions. Where scour is likely to occur, protection against damage from scour should be provided in the design of bridge piers and abutments. Embankment slopes adjacent to structures subject to erosion should be adequately pro-

tected by rip-rap, flexible mattresses, retards, spur dikes or other appropriate construction. Clearing of brush and trees along embankments in the vicinity of bridge openings should be avoided to prevent high flow velocities and possible scour. Borrow pits should not be located in areas which would increase velocities and the possibility of scour at bridges.

### 1.3.2 Hydraulic Studies

Hydraulic studies of bridge sites are a necessary part of the preliminary design of a bridge and reports of such studies should include applicable parts of the following outline:

#### 1.3.2.1 Site Data

(a) Maps, stream cross sections, aerial photographs.
(b) Complete data on existing bridges, including dates of construction and performance during past floods.
(c) Available high water marks with dates of occurrence.
(d) Information on ice, debris, and channel stability.
(e) Factors affecting water stages such as high water from other streams, reservoirs, flood control projects, and tides.
(f) Geomorphic changes in channel flow.

#### 1.3.2.2 Hydrologic Analysis

(a) Flood data applicable to estimating floods at site, including both historical floods and maximum floods of record.
(b) Flood-frequency curve for site.
(c) Distribution of flow and velocities at site for flood discharges to be considered in design of structure.
(d) Stage-discharge curve for site.

#### 1.3.2.3 Hydraulic Analysis

(a) Backwater and mean velocities at bridge opening for various trial bridge lengths and selected discharges.
(b) Estimated scour depth at piers and abutments of proposed structures.
(c) Effect of natural geomorphic stream pattern changes on the proposed structure.
(d) Consideration of geomorphic changes on nearby structures in the vicinity of the proposed structure.

## 1.4 CULVERT LOCATION, LENGTH, AND WATERWAY OPENINGS

Culvert location, length, and waterway openings should be in accordance with the AASHTO *Guide on the Hydraulic Design of Culverts* in *Highway Drainage Guidelines.*

## 1.5 ROADWAY DRAINAGE

The transverse drainage of the roadway should be provided by a suitable crown in the roadway surface and longitudinal drainage by camber or gradient. Water flowing downgrade in a gutter section should be intercepted and not permitted to run onto the bridge. Short, continuous span bridges, particularly overpasses, may be built without inlets and the water from the bridge roadway carried downslope by open or closed chutes near the end of the bridge structure. Longitudinal drainage on long bridges should be provided by scuppers or inlets which should be of sufficient size and number to drain the gutters adequately. Downspouts, where required, should be made of rigid corrosion-resistant material not less than 4 inches in least dimension and should be provided with cleanouts. The details of deck drains should be such as to prevent the discharge of drainage water against any portion of the structure or on moving traffic below, and to prevent erosion at the outlet of the downspout. Deck drains may be connected to conduits leading to storm water outfalls at ground level. Overhanging portions of concrete decks should be provided with a drip bead or notch.

## 1.6 RAILROAD OVERPASSES

### 1.6.1 Clearances

Structures designed to overpass a railroad shall be in accordance with standards established and used by the affected railroad in its normal practice. These overpass structures shall comply with applicable Federal, State, and local laws.

Regulations, codes, and standards should, as a minimum, meet the specifications and design standards of the American Railway Engineering Association, the Association of American Railroads, and AASHTO.

### 1.6.2 Blast Protection

On bridges over railroads with steam locomotives, metal likely to be damaged by locomotive gases, and all concrete surfaces less than 20 feet above the tracks, shall be protected by blast plates. The plates shall be placed to

take account of the direction of blast when the locomotive is on level or superelevated tracks by centering them on a line normal to the plane of the two rails at the centerline of the tracks. The plates shall be not less than 4 feet wide and shall be cast-iron, a corrosion and blast-resisting alloy, or asbestos-board shields, so supported that they may be readily replaced. The thickness of plates and other parts in direct contact with locomotive blast shall be not less than ¾ inch for cast iron, ⅜ inch for alloy, ½ inch for plain asbestos-board, and 7/16 inch for corrugated asbestos-board. Bolts shall be not less than ⅝ inch in diameter. Pockets which may hold locomotive gases shall be avoided as far as practical. All fastenings shall be galvanized or made of corrosion-resistant material.

## 1.7 SUPERELEVATION

The superelevation of the floor surface of a bridge on a horizontal curve shall be provided in accordance with the standard practice of the commission for the highway construction, except that the superelevation shall not exceed 0.10 foot per foot width of roadway.

## 1.8 FLOOR SURFACES

All bridge floors shall have skid-resistant characteristics.

## 1.9 UTILITIES

Where required, provisions shall be made for trolley wire supports and poles, lighting pillars, electric conduits, telephone conduits, water pipes, gas pipes, sanitary sewers, and other utility appurtenances.