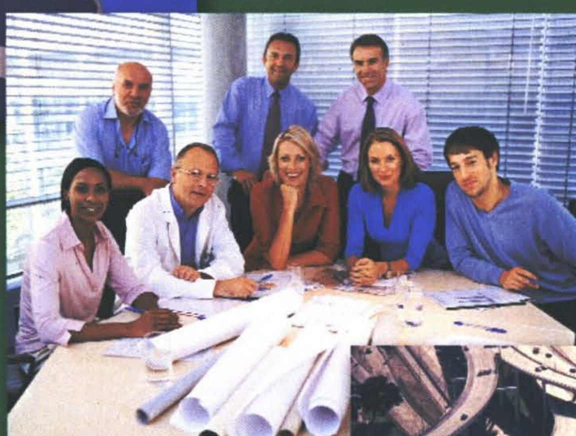
A POLICY ON

DESIGN STANDARDS INTERSTATE SYSTEM

January 2005



American Association of
State Highway and
Transportation Officials

A POLICY ON

DESIGN STANDARDS INTERSTATE SYSTEM

January 2005

Prepared by the
Standing Committee on Highways
AASHTO Highway Subcommittee on Design
Technical Committee on Geometric Design

American Association of State
Highway and Transportation Officials

AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS

EXECUTIVE COMMITTEE 2004–2005

VOTING MEMBERS

Officers:

President: Jack Lettiere, New Jersey

Vice President: Open Position

Secretary-Treasurer: Larry M. King, Pennsylvania

Regional Representatives:

REGION I:	Allen Biehler, Pennsylvania, One-Year Term Dan Tangherlini, District of Columbia, Two-Year Term
REGION II:	Gabriel Alcaraz, Puerto Rico, One-Year Term Harold Linnenkohl, Georgia, Two-Year Term
REGION III:	Gloria Jeff, Michigan, One-Year Term Frank Busalacchi, Wisconsin, Two-Year Term
REGION IV:	Tom Norton, Colorado, One-Year Term David Sprynczynatyk, North Dakota, Two-Year Term

NONVOTING MEMBERS

Immediate Past President:	John R. Njord, Utah
AASHTO Executive Director:	John Horsley, Washington, DC

TECHNICAL COMMITTEE ON GEOMETRIC DESIGN 2004

Members

Robert L. Walters,
Arkansas, Chair

William A. Prosser,
Federal Highway Administration, Secretary

Jim McDonnell,
AASHTO Liaison

Reza Amini,
Oklahoma

Don T. Arkle,
Alabama

Paul Bercich,
Wyoming

Kenneth T. Briggs,
Maryland

James O. Brewer,
Kansas

Philip J. Clark,
New York

David Hutchison,
National League of Cities

Jeff C. Jones,
Tennessee

Wayne Kinder,
Nevada

John LaPlante,
American Public Works Association

Donald A. Lyford,
New Hampshire

Reza Maleki,
Port Authority of New York and New Jersey

Mark A. Marek,
Texas

John Pickering,
Mississippi

James Rosenow,
Minnesota

Norman H. Roush,
West Virginia

Joe Ruffer,
National Association of County Engineers

Larry Sutherland,
Ohio

Karla Sutliff,
California

Max Valerio,
New Mexico

Ted Watson,
Nebraska

TABLE OF CONTENTS

GENERAL

The National System of Interstate and Defense Highways is the most important in the United States. It carries more traffic per kilometer (mile) than any other comparable national system and includes the roads of greatest significance to the economic welfare and defense of the nation. The highways of this system must be designed in keeping with their importance as the backbone of the nation's highway systems. To this end, they must be designed to ensure safety, permanence, utility, and flexibility to provide for predicted growth in traffic.

These objectives can be realized by conscientious attention to design. All interstate highways shall meet the following minimum standards for segments constructed on new right-of-way and segments undergoing complete reconstruction along existing right-of-way. The standards used for horizontal alignment, vertical alignment, and widths of median, traveled way, and shoulders for resurfacing, restoration, and rehabilitation projects may be the AASHTO interstate standards that were in effect at the time of original construction or inclusion into the interstate system. Designs will generally be made to values as high as are commensurate with conditions. Values approaching the minimums here in will be used only where the use of higher values will result in unacceptable social, economic, or environmental consequences.

Design values are presented in this document in both metric and U.S. customary units and were developed independently within each system. The relationship is neither exact (soft) nor a completely rationalized (hard) conversion. The values are those that would have been presented in either system. Therefore, the user is advised to work entirely in one system and not attempt to convert directly between the two. In addition, all projects, including 3R, or elements of projects that retain existing geometrics meeting the minimum standards for the selected design speed in one system of units are considered in compliance with comparable design speed standards in the other.

The current editions of AASHTO's *A Policy on Geometric Design of Highways and Streets* and the *Standard Specifications for Highway Bridges* shall be used as design guides where they do not conflict with these standards.

DESIGN TRAFFIC

Each section of interstate highway shall be designed to safely and efficiently accommodate the volumes of passenger vehicles, buses, trucks—including tractor-trailer and semi-trailer combinations, and corresponding military equipment estimated for the design year. In all but extraordinary circumstances, the design year for new construction and complete reconstruction is to be at least 20 years beyond the year in which the plans, specifications, and estimate for construction of the section are approved. In those extraordinary instances where environmental and/or political decisions intervene, the design year and resulting traffic will be consistent with that decision.

The traffic volumes used for design shall be the 30th highest hourly volume of the design year, usually referred to as the design hourly volume (DHV) in vehicles per hour (vph). DHV is the total traffic in both directions of travel. DDHV (vph) is the directional distribution of traffic on multi-lane facilities during the design hour.

RIGHT-OF-WAY

Right-of-Way

The width of right-of-way shall be sufficient to accommodate the roadway cross section elements and requisite appurtenances necessary for an adequate facility in the design year and for known future improvements.

Control of Access

Access to the interstate system shall be fully controlled. The interstate highway shall be grade separated at all railroad crossings and selected public crossroads. At-grade intersections shall not be allowed. To accomplish this, the intersecting roads are to be grade separated, terminated, rerouted, and/or intercepted by frontage roads. Access is to be achieved by interchanges at selected public roads.

Access control shall extend the full length of ramps and terminals on the crossroad. Such control

shall either be acquired outright prior to construction or by the construction of frontage roads or by a combination of both.

Access control beyond the ramp terminals should be affected by purchasing access rights, providing frontage roads, controlling added corner right-of-way areas, or prohibiting driveways. Such control should extend beyond the ramp terminal at least 30 m (100 ft) in urban areas and 90 m (300 ft) in rural areas. However, in areas of high traffic volume, where exists the potential for development which would create operational or safety problems, longer lengths of access control should be provided.

GEOMETRIC CONTROLS AND CRITERIA

Design Speed

A minimum design speed of 110 km/h (70 mph) should be used for rural areas. Where terrain is mountainous, a design speed from 80 to 100 km/h (50 to 60 mph) may be used. In urban areas, the design speed shall be at least 80 km/h (50 mph).

Sight Distance

The minimum stopping sight distance shall be the values established in the current edition of AASHTO's *A Policy on Geometric Design of Highways and Streets* for the appropriate design speed.

Curvature and Superelevation

Curvature, superelevation, and allied features, such as transition curves, shall be correlated with the design speed in accordance with the current edition of AASHTO's *A Policy on Geometric Design of Highways and Streets*.

Gradients

Maximum grades as a function of the design speed and the type of terrain are shown in the following table:

Type of Terrain	Metric						U.S. Customary						
	Design Speed (km/h)						Design Speed (mph)						
	80	90	100	110	120	130	50	55	60	65	70	75	80
	Grades (%)*						Grades (%)*						
Level	4	4	3	3	3	3	4	4	3	3	3	3	3
Rolling	5	5	4	4	4	4	5	5	4	4	4	4	4
Mountainous	6	6	6	5	–	–	6	6	6	5	5	–	–

* Grades up to one percent steeper than the value shown may be provided in urban areas with crucial right-of-way constraints or where needed in mountainous terrain.

CROSS SECTION ELEMENTS

Number of Lanes

A minimum of four traffic lanes shall be provided on the interstate system. The number of lanes shall be sufficient to accommodate the DHV at an acceptable level of service for the applicable conditions. A capacity analysis using the design year traffic should be performed to determine the number of lanes required to achieve the acceptable level of service. Refer to AASHTO's *A Policy on Geometric Design of Highways and Streets* for guidance in the selection of level of service.

On ascending grades, which exceed the critical design length, a climbing lane analysis should be performed and climbing lanes added where appropriate. Likewise, on extended lengths of maximum or near maximum descending grades, emergency escape ramps should be added where an analysis indicates they are required.

Width of Traffic Lanes

All traffic lanes shall be at least 3.6 m (12 ft) wide.

Shoulders

The paved width of the right shoulder shall not be less than 3.0 m (10 ft). Where truck traffic exceeds 250 DDHV, a paved shoulder width of 3.6 m (12 ft) should be considered. On a four-lane section, the paved width of the left shoulder shall be at least 1.2 m (4 ft). On sections with six or more lanes, a 3.0 m (10 ft) paved width for the left shoulder should be provided. Where truck traffic exceeds 250 DDHV, a paved width of 3.6 m (12 ft) should be considered.

In mountainous terrain, a reduced paved shoulder width together with a minimal median width may be used to reduce the high costs associated with providing a full width roadway cross section. In these instances, a 2.4 m (8 ft) minimum paved right shoulder and a 1.2 m (4 ft) minimum paved left shoulder may be used on a traveled way consisting of four or six lanes. Where eight or more lanes are provided, a 2.4 m (8 ft) minimum paved shoulder width should be used on both sides.

Pavement and Shoulder Cross Slope

On tangent sections, the pavement cross slope shall be a minimum of 1.5 percent and desirably two percent. In areas of intense rainfall, the cross slope may be increased to 2.5 percent. Paved shoulders should have a cross slope in the range of two to six percent but not less than the cross slope of the adjacent pavement.

Sideslopes

Foreslopes within the clear zone should not be steeper than 1V:4H and desirably should be 1V:6H or flatter. Where steeper slopes are used within the clear zone, roadside barriers shall be installed where warranted by the criteria in the current edition of AASHTO's *Roadside Design Guide.*

Medians

Medians in rural areas in level or rolling topography shall be at least 11 m (36 ft) wide. Medians in urban or mountainous areas shall be at least 3.0 m (10 ft) wide. AASHTO's *Roadside Design Guide* should be consulted to determine the details and warrants, based on consideration of average daily traffic, median width, and crash history, for barrier installation in the median. When economically feasible, consideration should be given to decking over the opening between parallel structures and extending a median barrier across the deck. Where continuous decking is not feasible, median barriers or guardrails should be installed to stop or redirect an errant vehicle safely.

Horizontal Clearance to Obstructions

The width of the clear recovery area shall be commensurate with the design speed and roadside conditions, and be determined through application of the currently accepted procedures in the AASHTO *Roadside Design Guide.* To the extent practicable, the piers and abutments of overcrossing structures should be designed to provide a horizontal clearance equal to the clear recovery area.

In restricted areas, it may be necessary to construct barriers, walls, piers, abutments or other unyielding objects nearer to the traveled way than the width required for a clear recovery area. Fixed objects within the limits of the clear recovery area shall be made breakaway, made yielding, or be shielded by installation of crashworthy barriers or attenuators. The minimum horizontal clearance from the edge of the traveled way to the face of the barrier shall be consistent with the requirements for the paved shoulder width.

Curbs

Vertical curbs shall not be used. Sloping curbs, when used, should be located at the outer edge of the paved shoulder. The height of sloping curb should be limited to 100 mm (4 in).

The use of curbs in conjunction with guardrail is discouraged. When the installation of curb is necessary in conjunction with a guardrail, the face of the curb should be located behind the face of the guardrail, or at least no closer to the traveled way than the face of the guardrail. AASHTO's *Roadside Design Guide* should be consulted for detailed information concerning installation of curb in conjunction with guardrail.

INTERCHANGES

Interchanges shall be provided between all intersecting interstate routes, between other selected access-controlled highways, and at other selected public highways to facilitate the distribution of traffic. Each interchange shall provide for all traffic movements.

The ramp curvature, pavement widths, and related elements, which constitute an interchange, shall be adequate to accommodate the appropriate design vehicles.

Spacing of interchanges has a significant effect on the operation of interstate highways. In areas of concentrated development, proper spacing may be difficult to obtain because of demand for frequent access. As a rule, minimum spacing should be 1.5 km (1 mi) in urban areas and 5 km (3 mi) in rural areas, based on crossroad to crossroad spacing. In urban areas, spacing of less than 1.5 km (1 mi) may be developed by grade-separated ramps or by collector-distributor roads.

BRIDGES AND OTHER STRUCTURES

General

The following standards apply to interstate highway bridges, overpasses and underpasses. Standards for crossroad overpasses and underpasses are to be those of the crossroad.

Vertical Clearance

On all rural sections, the clear height of structures shall be not less than 4.9 m (16 ft) over the entire roadway width, including the width of paved shoulder. In urban areas, the 4.9 m (16 ft) clearance shall apply at least to a single interstate routing. On other interstate urban routes, the clear height shall be not less than 4.3 m (14 ft). An allowance should be made for future resurfacing. The vertical clearance to sign trusses and pedestrian overpasses shall be 5.1 m (17 ft). On interstate urban routes with less than the 4.9 m (16 ft) clearance, the vertical clearance to sign trusses shall be 0.3 m (1 ft) greater than the minimum clearance of other structures. The vertical clearance from the deck to the cross bracing on through truss structures shall also be a minimum of 5.1 m (17 ft).

Cross Section

NEW

The width of all bridges, including grade separation structures, measured between rails, parapets, or barriers shall equal the full paved width of the approach roadways. The approach roadway includes the width of paved shoulders. Long bridges, defined as bridges having an overall length in excess of 60 m (200 ft), may have a lesser width. Such bridges shall be analyzed individually. On long bridges, offsets to parapet, rail or barrier shall be at least 1.2 m (4 ft) measured from the edge of the nearest traffic lane on both the left and the right.

Structural Capacity

All new bridges shall have at least an MS 18 (HS 20) structural capacity. A bridge can remain in place if the operating rating capacity can safely service the system for an additional 20-year service life.

Existing Bridges to Remain in Place

Mainline bridges on the interstate system and bridges on routes to be incorporated into the system may remain in place if, as a minimum, they meet the following: a) the bridge cross section consists of 3.6 m (12 ft) lanes, 3.0 m (10 ft) shoulder on the right and 1.1 m (3.5 ft) shoulder on the left; b) for long bridges, the offset to the face of parapet or bridge rail on both the left and right is 1.1 m (3.5 ft) measured from the edge of the nearest traveled lane; c) bridge railing shall meet or be upgraded to current standards.

Tunnels

From the standpoint of service to traffic, tunnels should not differ materially from grade separation structures. Essentially the same standards apply except the minimum values normally are used because of high cost and restricted right-of-way.

The vertical clearance for tunnels shall be at least 4.9 m (16 ft) except where an alternative routing providing the 4.9 m (16 ft) clearance is available. For those lesser situations, at least a 4.3 m (14 ft) clearance should be provided. An allowance for future resurfacing may be added to the minimum vertical clearance requirements.

The desirable cross section for tunnels is at least 13.1 m (44 ft). This width consists of two 3.6 m (12 ft) lanes, a 3.0 m (10 ft) right shoulder, a 1.5 m (5 ft) left shoulder, and a 0.7 m (2.5 ft) safety walk on each side. The roadway width may be distributed to either side in a different manner if needed to better fit the dimensions of the tunnel approach.

Because of the high cost associated with tunnels, a reduced width can be accepted. However, the total clearance between walls of a two-lane tunnel must be at least 9.0 m (30 ft). The minimum roadway width between curbs should be at least 0.6 m (2 ft) greater than the approach traveled way, but no less than 7.2 m (24 ft). The curb or sidewalk on either side should be a minimum of 0.5 m (1.5 ft). The roadway width and the curb or sidewalk width can be varied as needed within the 9.0 m (30 ft) minimum wall clearance; however each width should not be less than the minimum value stated above.

In lieu of a safety walk and offset to the curb on each side, a 1.0 m (3.0 ft) offset incorporating a safety shape at the wall can replace the safety shape and curb on one or both sides of the traveled way. A vertical wall may be used as an alternate for the safety shape.

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

Book Code: DS-5
ISBN: 1-56051-291-1