CSS in Massachusetts
MassDOT Project Development and Design Guide

CSS National Dialog Webcast
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Massachusetts Context
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Design Guide
Task Force

Design Guide Task Force Members

George Allaire
Massachusetts Highway Association

Neil Andres
District Director
Department of Public Works

John Blundo, P.E.
Chief Engineer
MassHighway

Thomas F. Broderick, P.E.
Director of Research and Materials
MassHighway

Harold D. Clarke, P.E.
Southbridge Department of Public Works

Joseph L. Costanzo
Memorial Valley Regional Transit Authority

Alexandra Davison
Massachusetts Association of Conservation Commissions

John DeBenedicts
Boston Transportation Department

Rob Debling
Division of Fishes and Wildlife

Thomas DiPaolo, P.E.
Assistant Chief Engineer
MassHighway

Jeffrey Douglass
Massachusetts Office on Disability

Linda Durlavy
Massachusetts Association of Regional Planning Agencies

Bill Edgerton
Concord Department of Public Works

Judith Eshman
Massachusetts Association of Conservation Commissions

Matthew Feher
Massachusetts Municipal Association

Margo Fenn
Cape Cod Commission

Stanley Gee
Division Administrator
Federal Highway Administration

Joshua Czegzelawski
Federal Highway Administration

Annie Hershberg
Walt Bosch

Beth Larkin, P.E.
American Council of Engineering Companies of Massachusetts

David Lautzemhler
Massachusetts Bicycle Coalition

Barbara Lucas
Metropolitan Area Planning Council

Cara Metz
Massachusetts Historical Commission

Kenneth S. Miller, P.E.
Executive Office of Transportation

Joseph Orfalt
Department of Conservation and Recreation

John D. Pafigli, A.I.C.E.
Massachusetts Association of Regional Planning Agencies

Luba Palevonsky
Commissioner
MassHighway

The Honorable Anne Paulson
House of Representatives

John Pourbaix
Construction Industries of Massachusetts

Cara Seideman
City of Cambridge

Albert Stegemann, P.E.
District 2 Highway Director
MassHighway

Stanley Wood, P.E.
Highway Design Engineer
MassHighway
Guiding Principles

• Provide for the **safety and mobility** of all users

• Incorporate the principles of **Context Sensitive Design** throughout the planning, design, and construction processes

• Provide a clear **Project Development Process**
## Project Development

- **Eight Step Process**
- **Encourages Early Dialog to Define Need (Step I)**
- **Emphasizes Good Planning and Outreach (Step II)**
- **New Project Initiation Process (Step III)**

<table>
<thead>
<tr>
<th>Step</th>
<th>Process</th>
</tr>
</thead>
<tbody>
<tr>
<td>One</td>
<td>PROBLEM/NEED/OPPORTUNITY IDENTIFICATION</td>
</tr>
<tr>
<td>Two</td>
<td>PLANNING</td>
</tr>
<tr>
<td>Three</td>
<td>PROJECT INITIATION</td>
</tr>
<tr>
<td>Four</td>
<td>ENVIRONMENTAL/DESIGN/ROW PROCESS</td>
</tr>
<tr>
<td>Five</td>
<td>PROGRAMMING</td>
</tr>
<tr>
<td>Six</td>
<td>PROCUREMENT</td>
</tr>
<tr>
<td>Seven</td>
<td>CONSTRUCTION</td>
</tr>
<tr>
<td>Eight</td>
<td>PROJECT ASSESSMENT</td>
</tr>
</tbody>
</table>
## Basic Design Controls

<table>
<thead>
<tr>
<th><strong>Traditional AASHTO</strong></th>
<th><strong>New MassDOT</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Functional Classification</td>
<td>Roadway Context</td>
</tr>
<tr>
<td>Design Vehicles</td>
<td>Roadway Users</td>
</tr>
<tr>
<td>Traffic Characteristics</td>
<td>Transportation Demand</td>
</tr>
<tr>
<td>Design Speed</td>
<td>Measures of Effectiveness</td>
</tr>
<tr>
<td>Highway Capacity</td>
<td>Design Speed</td>
</tr>
<tr>
<td>Access Control</td>
<td></td>
</tr>
</tbody>
</table>
Area Types

9 Area Types defined to compliment Roadway Types to aid with Context Sensitive Design
Measures of Effectiveness

**Transportation Measures** (for all users)
- Condition of facilities
- Safety and comfort
- Mode choice
- Network connectivity
- User population
- Traditional LOS
  - Travel time
  - Congestion
  - Specific measures elsewhere

**Other Measures**
- Environment preservation
- Cultural resource preservation
- Community enhancement
- Economic development
- Aesthetics
- Environmental justice/equity
- Impact mitigation
  - Noise
  - Air Quality
  - Wildlife Habitat
Flexible Multimodal Accommodation Framework

- **Type 1:** Independent Accommodation
- **Type 2:** Partial Bicycle/MV Sharing
- **Type 3:** Bicycle/MV Sharing
- **Type 4:** Pedestrian/Bicycle Sharing
- **Type 5:** Shared by All Users
Type 1 Accommodation
Independent Accommodation
Type 5 Accommodation

Shared by All Users
# Design Speeds

## Exhibit 3-7

### Design Speed Ranges (Miles per Hour)

<table>
<thead>
<tr>
<th>Area Type</th>
<th>Freeway</th>
<th>Arterials</th>
<th>Collectors</th>
<th>Local Roads</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Major*</td>
<td>Minor</td>
<td>Major</td>
</tr>
<tr>
<td>Rural Natural</td>
<td>50 to 75</td>
<td>40 to 60*</td>
<td>35 to 60</td>
<td>30 to 60</td>
</tr>
<tr>
<td>Rural Developed</td>
<td>50 to 75</td>
<td>40 to 60*</td>
<td>35 to 60</td>
<td>30 to 60</td>
</tr>
<tr>
<td>Rural Village</td>
<td>N/A</td>
<td>30 to 45</td>
<td>30 to 40</td>
<td>25 to 40</td>
</tr>
<tr>
<td>Suburban Low Intensity Development</td>
<td>50 to 75</td>
<td>30 to 60*</td>
<td>30 to 55</td>
<td>30 to 55</td>
</tr>
<tr>
<td>Suburban High Intensity Development</td>
<td>50 to 75</td>
<td>30 to 50*</td>
<td>30 to 50</td>
<td>25 to 50</td>
</tr>
<tr>
<td>Suburban Town Center</td>
<td>N/A</td>
<td>25 to 40</td>
<td>25 to 40</td>
<td>25 to 40</td>
</tr>
<tr>
<td>Urban</td>
<td>50 to 75</td>
<td>25 to 50</td>
<td>25 to 40</td>
<td>25 to 40</td>
</tr>
</tbody>
</table>

N/A  Not Applicable

* A higher design speed may be appropriate for arterials with full access control

Source: Adapted from A Policy on Geometric Design of Highways and Streets, AASHTO, 2004 – Chapter 3 Elements of Design
## Comparison of Design Speeds

<table>
<thead>
<tr>
<th>Roadway Type (Based on 1997)</th>
<th>1997 Manual</th>
<th>2006 Guidebook</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rural Arterial (Level Terrain)</td>
<td>60 to 75 mph</td>
<td>40 to 60 mph</td>
</tr>
<tr>
<td>Urban Arterial</td>
<td>30 to 60 mph</td>
<td>25 to 50 mph</td>
</tr>
<tr>
<td>Rural Collector (Level Terrain)</td>
<td>60 mph</td>
<td>30 to 60 mph</td>
</tr>
<tr>
<td>Urban Collector</td>
<td>30 mph (minimum)</td>
<td>25 to 40 mph</td>
</tr>
</tbody>
</table>

- Additional flexibility provided in the Guidebook by further definition of Roadway and Area Types to reduce the ambiguity of “urban vs. rural” and terrain type
Ranges of Acceptable Lane and Shoulder Widths

### Exhibit 6-12
**Widths of Usable Shoulders (in Feet)**

<table>
<thead>
<tr>
<th>Area Type</th>
<th>Freeways*</th>
<th>Arterials**</th>
<th>Collectors**</th>
<th>Local Roads</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rural Natural</td>
<td>10 to 12</td>
<td>4 to 12</td>
<td>4 to 10</td>
<td>2 to 8</td>
</tr>
<tr>
<td>Rural Developed</td>
<td>10 to 12</td>
<td>4 to 12</td>
<td>4 to 10</td>
<td>2 to 8</td>
</tr>
<tr>
<td>Rural Village</td>
<td>N/A</td>
<td>4 to 12</td>
<td>4 to 10</td>
<td>2 to 8</td>
</tr>
<tr>
<td>Suburban Low Density</td>
<td>10 to 12</td>
<td>4 to 12</td>
<td>4 to 10</td>
<td>2 to 8</td>
</tr>
<tr>
<td>Suburban High Density</td>
<td>10 to 12</td>
<td>4 to 12</td>
<td>4 to 10</td>
<td>2 to 8</td>
</tr>
<tr>
<td>Suburban Village/Town Center</td>
<td>N/A</td>
<td>4 to 12</td>
<td>4 to 10</td>
<td>2 to 8</td>
</tr>
<tr>
<td>Urban</td>
<td>10 to 12</td>
<td>4 to 12</td>
<td>4 to 10</td>
<td>2 to 8</td>
</tr>
</tbody>
</table>

* Least shoulders are required on Freeways and other divided roadways. See the AASHTO Green Book for least-shoulder guidance.
** Shoulder widths less than the values shown above may be used if a design exception is obtained. (See Chapter 2 for a description of the design exception procedure.) Situations where narrower shoulders may be considered are described below.

### Exhibit 6-14
**Range of Travel Lane Widths (in Feet)**

<table>
<thead>
<tr>
<th>Area Type</th>
<th>Freeways</th>
<th>Arterials*</th>
<th>Collectors*</th>
<th>Local Roads</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rural Natural</td>
<td>12</td>
<td>11 to 12</td>
<td>10 to 12</td>
<td>9 to 12</td>
</tr>
<tr>
<td>Rural Developed</td>
<td>12</td>
<td>11 to 12</td>
<td>10 to 12</td>
<td>9 to 12</td>
</tr>
<tr>
<td>Rural Village</td>
<td>N/A</td>
<td>11 to 12</td>
<td>10 to 12</td>
<td>9 to 12</td>
</tr>
<tr>
<td>Suburban Low Density</td>
<td>12</td>
<td>11 to 12</td>
<td>10 to 12</td>
<td>9 to 12</td>
</tr>
<tr>
<td>Suburban High Density</td>
<td>12</td>
<td>11 to 12</td>
<td>10 to 12</td>
<td>9 to 12</td>
</tr>
<tr>
<td>Suburban Village/Town Center</td>
<td>N/A</td>
<td>11 to 12</td>
<td>10 to 12</td>
<td>9 to 12</td>
</tr>
<tr>
<td>Urban</td>
<td>12</td>
<td>11 to 12</td>
<td>10 to 12</td>
<td>9 to 12</td>
</tr>
</tbody>
</table>

* Least travel lane widths are used in design examples. (See Chapter 2 for a description of the design exception procedure.) Situations where narrower lane ways may be considered are described below.
* Shoulder lane widths are required for design speeds of 45 miles per hour or greater.
NA N/A Applicable
## Comparison of Minimum Width for Two-Lane Roadways

<table>
<thead>
<tr>
<th>Roadway Type</th>
<th>1997 Manual</th>
<th>2006 Guidebook</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arterial</td>
<td>40 ft</td>
<td>30 ft</td>
</tr>
<tr>
<td>Collector</td>
<td>40 ft</td>
<td>28 ft</td>
</tr>
</tbody>
</table>

Addenda provided some flexibility at the low end of the speed and volume range - minimum width of 30 feet for arterials (<55 mph and <400 vpd), and 20 feet for collector roads (<35 mph and <400 vpd), but these conditions rarely exist.
CSS Examples

Preserving Scenic Value & Improving Safety in Chatham

The Mitchell River Bridge carries Bridge Street over the Mitchell River in the quaint seaside community of Chatham. Frequent by residents and tourists, the community has voiced the need for safe areas for cyclists and pedestrians and increased clearance for the area’s many boaters. The community values the existing bridge’s charming looks and would like to see extensive use of stone and timber to replicate the feel of the existing bridge as much as possible.

The ABP has worked with its design consultant to develop plans for a bridge that will have cyclist-friendly shoulders and ADA-compliant sidewalks protected by a crash-tested rail; that will open fully to allow boat passage; and that will incorporate timber and stone wherever possible.

The historic status of the existing bridge is currently being reconsidered at the national level. The ABP will adjust its approach accordingly.
CSS Examples

ABP Restores & Reopens Historic Bridge After Nearly 16 Years of Closure—Maple Street, Chester

Last month, MassDOT reopened the historic Maple Street truss bridge across the West Branch of the Westfield River for the first time in almost sixteen years. The complete rehabilitation and careful restoration of the bridge is one of the Accelerated Bridge Program’s first-year projects.

The ABP project team determined that restoring the truss structure—a community desire—would fulfill the interests of the stakeholders and meet structural needs.

The historic structure required special treatment. MassDOT’s contractor, Northern Construction Services, dismantled the bridge and sent individual members off-site to be restored. The pieces that were able to be restored were reused. The remainder of the pieces were replicated down to their rivets. In fact, rivet-faced bolts were added to the beams so that the new structural members would be indistinguishable from the originals.

The new bridge enables easier travel within the community, enjoyment of a scenic river view, and preserves a historic jewel for many decades.

The Maple Street Bridge in Chester. Above: Elevation view At left: Truss with false rivets At right: Crash-tested rail and restored historic railing.
Restoring Habitat and Function in the Berkshires

This May, line striping was added to McInerney Road where it crosses Shaker Mill brook— the final touch to a very successful bridge replacement project in Chester.

The ABP was pleased to have an opportunity to restore use of the bridge to road users and passage under the bridge for wildlife, especially in Located in an area that values its natural resources and outdoor recreation.

Thanks to multi-agency cooperation, MassDOT was able to widen the bridge’s span and restore the stream to natural conditions which provide great habitat for the brook’s native cold-water fish. Native stones and plants were used to create the diverse conditions needed for healthy wildlife habitat. The resident engineer for the project has already seen fish in the brook.

To top it off, the bridge was reopened to traffic one month ahead of schedule.
CSS Examples
CSS Examples

Current Allocation of Capacity

Existing Cross Section at Mid-Point of Bridge
CSS Examples

**2 lane approach – 2 lane release to Charles Circle**

- Vehicular and bicycle lane widths are narrower than MassDOT design guidelines
- Does not provide ADA compliant sidewalk widths
- Results in excessive queue lengths on the bridge
- Impacts on air quality due to vehicular idling on the bridge
- Impacts to adjacent communities and infrastructure with drivers seeking alternate routes
- Wall on south side would not have to be relocated
CSS Examples

1 lane approach – 3 lane release to Charles Circle
1 lane approach – 2 lane release to Charles Circle

- Provides vehicular and bike lane widths that meet MassDOT design guidelines
- Provides 16 ft wide sidewalks and 6 ft wide dedicated bike lanes
- Results in excessive queue lengths on the bridge
- Impacts on air quality due to vehicular idling on the bridge
- Impacts to adjacent communities and infrastructure with drivers seeking alternate routes
- Requires the use of the bike lane to accommodate emergency vehicles and disabled vehicles
Thomas A. DiPaolo, P.E.
Assistant Chief Engineer
MassDOT – Highway Division

thomas.dipaolo@.state.ma.us
(617) 973-7516