CHAPTER 4
DESIGN CRITERIA & GUIDANCE FOR
BRIDGE PROJECTS ON LOW VOLUME HIGHWAYS

4.1 INTRODUCTION

4.1.1 Purpose & Applicability

This chapter provides specific requirements and guidance for setting the design criteria for locally owned bridges and approaches on low-volume highways in rural and urban areas. It may be used regardless of the fund source. Low volume is defined as a current Average Daily Traffic (ADT) of 400 vehicles per day (vpd) or less. This chapter does not apply to:

- projects on the State highway system or the National Highway System (NHS);
- bridges with a current traffic volume over 400 vpd;
- projects with substantial, anticipated development and/or increases in traffic within the design life of the project (Refer to the latest Traffic Forecast Policy located in Appendix D of the “Scoping Procedure Manual” to determine the design year. For example, 30 years should be used for new bridges); or
- bridge work associated with a larger highway project. The standards for highway projects are Chapter 7, Section 7.3 for Non-Freeway 3R projects and Chapter 2, Section 2.7 for new and reconstruction projects. Bridge work associated with a larger highway project, such as a 3R project, should be designed in accordance with Section 2 of the Bridge Manual and either Chapter 2 or Chapter 7 of this manual.

Other chapters, manuals and Engineering Instructions provide requirements and guidance for design elements not included in this chapter, such as pavement design, traffic control devices, guide rail, accommodation of pedestrians and bicyclists, drainage, utilities, landscaping, driveways, etc. Therefore, these other chapters, manuals and Engineering Instructions must be used to produce an acceptable design product. For example, Chapter 10 of this manual should be consulted for the guide rail design on the bridge approaches.

4.1.2 Background

Historically, the bridge approach alignment was constructed to allow the shortest span bridge and achieve the most economical crossing. This often resulted in a “forced fit” of a right angle crossing, which was probably satisfactory when vehicle speeds were low due to the condition of the approach roadway and the limitations of early motor vehicles. Today, paved highways and modern vehicles have led to progressively faster operating speeds on the adjacent highway sections, the bridge and its approaches. In many cases, the safety and operational characteristics at the bridge site have remained satisfactory. However, in some situations, the combination of the alignment and speeds have violated the expectations of the reasonable and prudent driver and have resulted in an unsatisfactory accident history on the bridge and/or approaches.
When designing a bridge project, the designer’s responsibility is to evaluate the accident history for the bridge and approaches to determine if any adjustments in the geometrics or signing are necessary and cost effective. If the existing alignment is satisfactory from a safety and operational perspective, adjustments to the alignment are generally not cost effective, especially for a bridge rehabilitation project.

To provide a cost effective design, Section 4.4 of this chapter allows a design speed that is up to 24 km/h (15 mph) below the operating speed for low volume, local bridge projects with an acceptable accident history. The basis for allowable blanket reductions in the design speed is similar to the approach taken by the Non-Freeway 3R Standards referenced in Chapter 7, Section 7.3 of this manual for retaining horizontal and vertical alignment and is consistent with the philosophy contained in Transportation Research Board’s Special Report 214 “Designing Safer Roads”. Highway engineers have the benefit of working with the existing bridge site and can observe and measure the safety, design and operational characteristics of the bridge and its approaches, including the combined effects of the horizontal and vertical alignment. In contrast, the 3R Standards do not allow a design speed based on a reduction in the operating speed as the 3R Standards apply to long segments of highway rather than spot locations and such reductions would not occur over the length of a highway project.

Individual geometric elements, such as the minimum radius and stopping sight distance may be designed with a safe operating speed less than the design speed, if justified in accordance with Chapter 2, Section 2.8 of this manual. However, when the bridge must be constructed on new alignment in order to maintain traffic on the existing bridge, the geometrics of the bridge site can often be economically designed to meet the design criteria.

### 4.1.3 Definitions

The following definitions are provided to clarify terms used in this chapter. Additional definitions are provided in Chapter 2, Section 2.4 of this manual and Section 2.2 of the Bridge Manual.

**Adjacent Highway Segments** - The highway segment next to the bridge site that is unaffected by the geometrics of the bridge. The length of this segment may vary from 400 m (1/4 mi.) to 800 m (1/2 mi.) or more.

**Bridge Approach** - The portion of highway immediately adjacent to the bridge that affects the geometrics of the bridge (e.g., line, grade, width and location). The approach includes the horizontal and vertical curves and grades that connect the highway alignment to the bridge alignment. For examples, refer to the bridge sites (which include the bridge and approaches) shown in Figure 4-1. For approaches without horizontal and vertical curvature, the minimum length is 30 m (100 ft.).
Bridge Project - Defined as a project with the primary objective to rehabilitate, replace or construct a bridge. Incidental highway approach work is often needed for bridge rehabilitations while substantial approach work may be needed for bridge replacement projects.

Bridge Site - The bridge and its approaches.

4.2  HIGHWAY CLASSIFICATIONS

Low volume highways are defined as rural roads and urban streets with a current ADT of 400 vpd or less. This volume limitation and the following classifications are based on the “Manual: Guidelines for Rural Town and County Roads,” which was developed by the Local Road Classification Task Force, created by 1986 State Legislation. In rural New York State, these highways comprise a majority of the combined village, town and county highway system. The classifications establish a close relationship between the uses of low volume highways and their design, maintenance and operation. The classifications identify the traffic volumes, vehicle types and seasonal use characteristics, etc., present on New York State’s low volume highways.

- **Low Volume Collector** - collects traffic from any of the other classifications and channels it to higher level roads, such as arterials, interstates, etc.

- **Residential Access** - provides access to residences. The traffic volume generated depends on the number of residences. Year round access for fire trucks, ambulances and school buses must be provided.

- **Farm Access** - provides access to a farm’s center of operations, including the residence. Traffic volume is generally low, but may include occasional heavy trucks and farm equipment.

- **Resource/Industrial Access** - provides access to industrial or mining operations. Traffic volume can vary and can include heavy trucks and significant numbers of employees’ cars.

- **Agricultural Land Access** - provides access to farm land. Traffic volumes are low and vary seasonally. These roads should accommodate farm equipment that can be up to 6.0 m (20 ft.) wide.

- **Recreational Land Access** - provides access to recreational land including seasonal dwellings and parks. Volumes of traffic can vary with the type of recreation facility and season of the year, and may include recreational vehicles.

Subclassifications based on the type of operation anticipated on the highway are shown in the right-hand column of Table 4-1.
Table 4-1  Operational Type for Low Volume Highways

<table>
<thead>
<tr>
<th>Highway Classification</th>
<th>Vehicles Using Highway</th>
<th>Average Daily Traffic</th>
<th>Operational Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low Volume Collector</td>
<td>All types</td>
<td>50-400</td>
<td>A</td>
</tr>
<tr>
<td></td>
<td></td>
<td>&lt;50</td>
<td>B</td>
</tr>
<tr>
<td>Residential Access</td>
<td>Cars, emergency and service vehicles</td>
<td>50-400</td>
<td>B</td>
</tr>
<tr>
<td></td>
<td></td>
<td>&lt;50</td>
<td>C</td>
</tr>
<tr>
<td>Farm Access</td>
<td>Cars, light trucks, occasional heavy trucks, farm equip.</td>
<td>250-400</td>
<td>A</td>
</tr>
<tr>
<td></td>
<td></td>
<td>&lt;250</td>
<td>B</td>
</tr>
<tr>
<td>Resource/Industrial Access</td>
<td>Heavy trucks, employees’ cars</td>
<td>50-400</td>
<td>A</td>
</tr>
<tr>
<td></td>
<td></td>
<td>&lt;50</td>
<td>B</td>
</tr>
<tr>
<td>Agricultural Land Access</td>
<td>Occasional farm equip., seasonal</td>
<td>--</td>
<td>C</td>
</tr>
<tr>
<td>Recreational Land Access</td>
<td>Cars, R.V.’s, seasonal</td>
<td>50-400</td>
<td>B</td>
</tr>
<tr>
<td></td>
<td></td>
<td>&lt;50</td>
<td>C</td>
</tr>
</tbody>
</table>

The Operational Type refers to the three types of low volume highways. The following describe the functional and operating characteristics of each type of highway.

- An Operational **Type A Highway** is an all-purpose two-lane road or street where an operating speed of 70 km/h to 90 km/h (43 to 56 mph) or greater would be anticipated. Vehicles can pass in opposing directions with no reduction in speed.

- An Operational **Type B Highway** is a two-lane, two-way road or street serving primarily local access where an operating speed of 40 km/h to 70 km/h (25 to 43 mph) would be anticipated. Opposing trucks cannot pass without reducing speeds and cars cannot pass opposing trucks without reducing speeds, but opposing cars can pass with no reduction in speed.

- An Operational **Type C Highway** is a single lane, two-way road or street serving primarily local access where an operating speed of 40 km/h to 70 km/h (25 to 43 mph) would be anticipated. All opposing vehicles need to take special actions to avoid a collision.
4.3 ACCIDENT ANALYSIS

On a low volume highway, the number of accidents may be low, but the accident rate may be very high because of the low traffic volume and short study segment. Therefore, it is necessary to examine the accident history over a 5 year minimum (preferably 10 year) period for a distance of 0.5 km (1/3 mi) on each side of the bridge (or proposed bridge site). Run-off-the-road (ROTR), head-on, and sideswipe accidents indicate that roadway alignment may be a contributing factor. Note the number of accidents in Part A of Table 4-3.

In addition to accident records, a site inspection should be made to observe items such as damaged guide rail that would indicate past accidents. Also, since accidents often go unreported on low volume highways, discussions with local residents, police and maintenance crews may help identify an unreported accident problem or further quantify a marginal one.

If there were no accidents in the 5 to 10 year period at the existing bridge and the traffic volumes are not anticipated to increase substantially, it may be assumed that the existing horizontal and vertical alignment allows motorists to safely traverse that section of roadway and, therefore, consideration may be given to retaining the existing geometrics in accordance with the requirements of this chapter.

Conversely, a history of accidents is an indication that further analysis is required to determine the cause(s) of the accident(s) and to identify what actions, if any, could be taken to mitigate the accidents. There are 6 general elements that may contribute to or cause an accident. These are:

1. Condition or actions of the driver. Was the driver alert, asleep, or under the influence of drugs or alcohol? Was poor judgement exercised (e.g., extreme speed)?
2. Condition of the vehicle. Did the brakes fail? Were the tires worn?
3. Environmental conditions. Inclement weather, fog, or slippery pavement.
4. Condition of the engineering features of the bridge and bridge approach. Horizontal and vertical alignment, width of highway, superelevation, pavement condition, guide rail, and clear zone.
5. External causes such as deer and other motorists.
6. Missing or improper signing not in accordance with the "New York State Manual of Uniform Traffic Control Devices" (NYS MUTCD).

When analyzing the accident data, do not put too much weight on certain contributing circumstances which have tended to become "catch-alls". The fact that all the accidents are listed as due to "driver error", "speed too fast", or "following too close" is not a reason to conclude that highway geometrics were not involved and that no further consideration is required. Also, as part of the accident evaluation, it is important to take the accident summaries, reports, and collision diagrams into the field to examine them at the actual field locations. This will help determine both the factors contributing to the accidents and possible mitigation measures.
Identifying the cause(s) of the accidents usually will provide an insight into what corrective measures can be taken to minimize the potential for future accidents. Current estimates for the average cost of a fatal accident in the rural areas of New York State is over $3,700,000 and the average cost of an injury accident is over $100,000. Therefore, in addition to our normal duty and obligations, there are significant economic benefits to society to minimizing the frequency and severity of accidents.

Refer to Chapter 5, Section 5.3 of this manual for additional information on accident analysis.

4.4 DESIGN SPEED

The design speed for a highway is used to set the horizontal and vertical alignment criteria that allow motorists to safely negotiate the most restrictive portions of the highway at the design speed. In other words, the horizontal and vertical alignment and superelevation of a highway govern the safe operating speed. Therefore, the selection of an appropriate design speed, as well as proper signing and delineation, is paramount to designing a safe bridge and highway approaches.

4.4.1 Background

Since the primary function of low volume highways is to safely provide access to the abutting properties, the requirement to get from one point to another conveniently and with a minimum of delay may not always be the governing consideration in selecting the design speed. Therefore, less weight may be given to the traveler’s habits and desires (i.e., the off-peak 85th percentile speed) than to the functional classification of the highway.

The designer must consider the potential for an increase in the number and severity of accidents caused by selecting an arbitrary design speed that results in design features that violate driver expectations or are inconsistent with the speed limit. While motorists should be expected to drive at a reasonable and prudent speed for prevailing conditions, they should not be expected to safely adjust their speed to a sudden change in the prevailing conditions.

In urban and suburban areas, the traffic speeds may be incompatible with pedestrian and bicycle safety, mobility needs, local access needs and land use. While traffic speeds alone do not cause accidents, lower speeds are more compatible with turning movements, bicycle traffic and pedestrian traffic common in urban and suburban areas.

For the situations where there is a desire to reduce the current operating speeds, refer to Chapter 25 of this manual for guidance on traffic calming considerations.
The highway classifications discussed in Section 4.2 of this chapter provide the basis to select a reasonable and appropriate design speed based on the anticipated function and operation of the highway. The range of design speeds and the minimum design speeds are shown in Table 4-2 for each type of highway.

Table 4-2 Design Speeds

<table>
<thead>
<tr>
<th>Design Speeds</th>
<th>Operational Type of Highway</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A</td>
</tr>
<tr>
<td>Normal Design Speed (1)</td>
<td>70 km/h - 90 km/h (43 - 56 mph)</td>
</tr>
<tr>
<td>Minimum Design Speed</td>
<td>Level &amp; Rolling Terrain</td>
</tr>
<tr>
<td>Mountainous Terrain</td>
<td>30 km/h (20 mph)</td>
</tr>
</tbody>
</table>

NOTES:
1. The normal design speed range is shown for guidance only. The selected design speed for Type A and Type B highways may be outside the normal range due to consideration of the existing operating speeds and accident history.

4.4.2 Steps for Setting Design Speed

Use Table 4-3 to select design speed for Type A, B and C highways using the following steps:

Step 1 - Accident Analysis - Perform an accident analysis in accordance with section 4.3. Note the type and number of accidents which may be related to the approach highway or bridge geometrics in Part A of Table 4-3.

Step 2 - Existing Safe Operating Speed - The existing safe operating speed is the recommended speed of the existing bridge site as defined in Section 230 of the NYS MUTCD. The safe operating speed may be determined by using the existing geometry and calculating the safe operating speed from the geometric design criteria in Section 4.5 of this chapter and the tables and formulas from Chapter III of AASHTO’s “A Policy on Geometric Design of Highways and Streets,” 1994. The existing safe operating speed for the horizontal alignment may also be determined by using a ball bank indicator reading of 10Eor, when the radius and superelevation are known, by using Figure 231-1 of the NYS MUTCD.
Step 3 - **Operating Speed** - Determine the existing operating speed by using the 85th percentile speed on adjacent highway segments where the motorists are not affected by the bridge or approach alignment at the bridge site (or proposed bridge site). Designers should also consider whether successive curves in the adjacent highway segments should be analyzed singly or as a group. When determining the location for the speed study, the designer should consider the operating speed in each direction on the adjacent highway segments to ensure that the study measures the highest approach speeds.

Refer to Figure 4-1 for examples of how to locate the speed study and the area to be used when determining the 85th percentile operating speed on adjacent highway segments. For speed studies, the operating speed is the 85th percentile speed of the measured traffic. Operating speed can be determined or estimated by:

- a radar spot speed study of at least 30 vehicles (preferably 50 vehicles) that can be performed during peak periods. This is generally only practical for higher volume highways (250 vpd or greater).
- test cars or following car techniques where volumes are low.
- by using automated speed measuring devices.
- by using the data used to set a speed zone at the project site, if such data is still representative of current and anticipated operating conditions.
- by using 95 km/h (59 mph) from the State-wide operating speed study for rural collectors.

Step 4 - **Minimum Design Speed** - Determine the minimum design speed from Table 4-2.

Step 5 - **Design Speed** - For bridge rehabilitation or replacements (on existing or new alignment), determine the design speed as follows and round to the nearest 10 km/h (5 mph):

- If the proposed centerline of the bridge is within 15 m (50 ft.) of the existing centerline and there is no accident pattern at the site attributable to highway or bridge alignment, use Part B of Table 4-3 to select a design speed.
Figure 4-1  Example Speed Study Locations

Example 1

Measure 85th% speed on adjacent highway segment

Determine the safe operating speed of the existing bridge site

Example 2

Measure 85th% speed on adjacent highway segment

Determine the safe operating speed of the existing bridge site

Example 3

Measure 85th% speed on adjacent highway segment

Determine the safe operating speed of the existing bridge site

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If the centerline of the proposed bridge is within 15 m (50 ft.) of the existing centerline and there are accidents but they are not attributable to highway or bridge alignment, consider improvements, such as:

1. Improve signing and delineation
2. Improve skid resistance
3. Improve sight distance through clearing and grubbing
4. Improve superelevation and add spiral transitions
5. Widen the travel lanes and/or shoulder
6. Clean ditches and improve drainage if width of spread extends into the travel lanes

If the proposed improvements will mitigate the accident problem, select a design speed using Part B of Table 4-3. Otherwise, select a design speed using Part C of Table 4-3.

If the bridge is on a new centerline that is more than 15 m (50 ft.) from the existing centerline or there are accidents attributable to highway or bridge alignment, select a design speed using Part C of Table 4-3.

Since speeds often increase after construction of a project, engineering judgement should be used in determining the reasonableness and applicability of the design speed obtained using the above methods. The intent is to select a design speed that will accurately reflect speed conditions after the bridge is built or rehabilitated and ensure compatibility with the adjacent highway segments.

Ideally, the design speed should be consistent with the highest operating speed on the adjacent highway section. However, if there is a large difference in the operating speeds on the approaches to the bridge, the selected design speed should reflect the need for a transition from the higher speeds on one approach to the lower speeds on the other side of the bridge. In the end, the selected design speed of the bridge and approaches should be consistent (i.e. within 24 km/h (15 mph)) with the surrounding highway segments, since abrupt changes in either design or operating speeds have been linked to vehicle collisions.

Table 4-3 should be photocopied from this chapter and used in accordance with the above steps to determine the design speed.
### Table 4-3  Form For Selecting The Appropriate Design Speed

<table>
<thead>
<tr>
<th>Considerations</th>
<th>Type A Highway</th>
<th>Type B Highway</th>
<th>Type C Highway</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Part A - Existing Information:</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Normal Range for the Design Speed from Table 4-2</td>
<td>70 km/h - 90 km/h (43 - 56 mph)</td>
<td>40 km/h - 70 km/h (25 - 43 mph)</td>
<td>40 km/h - 70 km/h (25 - 43 mph)</td>
</tr>
<tr>
<td>Minimum Design Speed from Table 4-2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Level and Rolling Terrain</td>
<td>50 km/h (31 mph)</td>
<td>40 km/h (25 mph)</td>
<td>40 km/h (25 mph)</td>
</tr>
<tr>
<td>Mountainous Terrain</td>
<td>30 km/h (20 mph)</td>
<td>30 km/h (20 mph)</td>
<td>30 km/h (20 mph)</td>
</tr>
<tr>
<td>Accident History At Site (See Step 1)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fatalities (Yes or No, Number)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Personal Injuries (Yes or No, Number)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Property Damage Only (Yes or No, Number)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Are the accidents attributed to the bridge or highway geometrics? (Yes or No)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Part B - If the centerline of the proposed bridge is within 15 m (50') of the existing centerline and there ARE NO accidents attributed to the bridge or highway alignment, determine the Design Speed by using the greater of:**

- a. Safe Operating Speed at the Existing Bridge Site (Step 2)
- b. Existing Operating Speed Minus 24 km/h (15 mph) - (Step 3)
- c. Minimum Design Speed from Part A or Table 4-2 (Step 4)

**Part C - If the centerline of the proposed bridge is more than 15 m (50') from the existing centerline or there ARE accidents attributed to the bridge or highway alignment, determine the Design Speed by using the greater of:**

- a. Safe Operating Speed at the Existing Bridge Site (Step 2)
- b. Existing Operating Speed (Step 3)
- c. Minimum Design Speed from Part A or Table 4-2 (Step 4)

Selected Design Speed (Step 5) rounded to the nearest 10 km/h (5 mph).
4.5 DESIGN CRITERIA

The following is a list of the critical design elements for the design of off-system bridges on low volume highways. A definition of each of the critical design elements is contained in Chapter 2, Section 2.6 of this manual. Elements that will not meet the design criteria are to be justified in accordance with Chapter 2, Section 2.8 of this manual. A form that may be used to document the non-standard feature justification is included at the end of this chapter as Table 4-6.

While values for the following critical design elements represent the minimums or maximums, the proposed project should be consistent with any planned improvements for the highway. Note that the use of the minimum or maximum values may not result in the optimum design from a quality or cost effective perspective. Values more desirable should be used whenever it is practical to do so after consideration of factors such as the social, economic and environmental impacts.

A. Design Speed

The design speed is to be established in accordance with the methods in Sections 4.3 and 4.4 of this chapter. As an alternative, the design speed may be established in accordance with Chapter 2, Section 2.7.2.1 A, and: Section 2.7.4.1 A for local rural roads, Section 2.7.4.2 A for local urban streets, Section 2.7.3.1 A for rural collectors, or Section 2.7.3.2 A for urban collectors.

Note that a non-standard design speed is not to be used. A non-standard design speed cannot be justified since a reduction in the design speed effectively lowers several speed related critical design elements, which must be justified individually.

B. Lane Width

Travel lane widths shall be determined from Table 4-4. Existing widths should not be reduced unless greater than the maximum widths determined in accordance with Section 2 of the Bridge Manual.

C. Shoulder Width

The minimum shoulder width is 0.6 m (2 ft.). Existing widths should not be reduced unless greater than determined in accordance with Section 2 of the Bridge Manual. Wider widths may be used, however, at least 0.6 m (2 ft.) of the shoulder should be paved if the traveled-way is paved. Additionally, the total shoulder width is to be flush (contiguous) with the traveled-way. 1.2 m (4 ft.) paved shoulders are desirable for bicycle routes, where there is substantial bicycle traffic or, if substantial pedestrian traffic is anticipated and sidewalks will not be provided. See Chapter 18 of this manual for guidance on facilities for pedestrians and bicyclists.
In urban areas with no shoulder or curb offset, the approach width should transition to the bridge roadway width. Additionally, refer to Chapter 10 of this manual for the limitations on the use of curb based on the operating speed.

Table 4-4 Design Criteria & Guidance for Bridge Approaches

<table>
<thead>
<tr>
<th>Design Criteria &amp; Other Controlling Parameters</th>
<th>Type of Highway</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A</td>
</tr>
<tr>
<td>Minimum Width of Travelled way</td>
<td>6.0 m (20 ft.) (1)</td>
</tr>
<tr>
<td>Minimum Lane Width</td>
<td>3.0 m (10 ft.) (1)</td>
</tr>
<tr>
<td>Minimum Width of Shoulder (3)</td>
<td>0.6 m (2 ft.)</td>
</tr>
<tr>
<td>Normal Width of Clear Zone</td>
<td>3.0 m (10 ft.)</td>
</tr>
<tr>
<td>Typical Surface Material ADT&gt;150 vpd</td>
<td>Asphalt Concrete</td>
</tr>
<tr>
<td>Typical Surface Material ADT&lt;150 vpd</td>
<td>Aggregate</td>
</tr>
</tbody>
</table>

NOTES:
1. Add 0.6 m (2 ft.) to the traveled way if there are more than 10% trucks (including RV's, buses and trailers). This will add 0.3 m (1 ft.) to the lane widths. Wider widths may be used.
2. If farm vehicles are present, consider maintaining a 6.0 m (20 ft.) clear roadway width for the bridge. Widening of the traveled way should be provided at approximately 300 m (1000 ft.) intervals to allow opposing vehicles to pass.
3. In urban areas with no shoulder or curb offset, the approach width should transition to the bridge roadway width. Consider providing 1.2 m (4 ft.) paved shoulders for bicycle routes, where there is substantial bicycle traffic, or if substantial pedestrian traffic is anticipated and sidewalks will not be provided.
4. A minimum of 1.5 m (5 ft.) is preferred above 50 km/h (31 mph). Provide 3.0 m (10 ft.), if possible, on intersection approaches for sight distance and on the outside of sharp curves and curves at the bottom of long grades.
5. On low volume roads that have been designated and signed as a "Minimum Maintenance Road," a clear zone need not be provided.
D. Bridge Roadway Width

The bridge roadway width is the total width of the bridge, including shoulders or curb offsets. The clear roadway width for bridges carrying local roads shall be determined based on the provisions of Section 2 of the NYSDOT Bridge Manual with the following modifications and clarifications.

1. Bridge Replacements and New Bridges - For bridge replacements and new bridges carrying low volumes (design year volumes of 400 vpd or less), Section 2 of the NYSDOT Bridge Manual specifies that the approach roadway traveled-way width plus minimum shoulders be carried across the bridge. For low volume local roads classified according to this policy, the bridge roadway width should be the larger of the:

   - total width of the existing road and paved shoulders (with a maximum of the widths determined from Section 2 of the Bridge Manual),
   - traveled way and shoulder widths of the new approach roadway, or
   - the minimum traveled way and shoulder widths given in Table 4-4 for the classified type of roadway.

2. Bridge Rehabilitation - For bridge rehabilitations that are not part of a concurrent or planned highway project, the width should be determined from:

   - retaining the width of the existing bridge to be rehabilitated provided there are no operational or accident problems which would justify a width improvement,
   - determining the minimum rehabilitation width based on Section 2 of the NYSDOT Bridge Manual, or
   - providing consistency with the operational type by widening to the widths in Table 4-4.

NOTE: This section amends Section 2 of the NYSDOT Bridge Manual in two respects:

a. It modifies the One Lane Bridge Policy by allowing one-lane bridges to replace any bridges for low-volume highways classified as Operational Type C in accordance with Section 4.2 of this chapter and having a total roadway width (traveled way plus shoulders) of less than 4.9 m (16 ft.) provided the stopping sight distance and accident history meet the One Lane Bridge Policy requirements (items 4 & 6 on page 2B-2 of the Bridge Manual), and

b. If an existing bridge can be rehabilitated and any safety problems can be clearly mitigated by signing, delineation or other low cost countermeasures in accordance with the NYS MUTCD or by other means, this section allows rehabilitating the bridge with the proper mitigation.
E. Grade

Refer to Table 4-5 for the maximum grade based on the local terrain.

F. Horizontal Curvature

The minimum radius shall be determined from Table 4-5. Refer to Chapter 5, Section 5.8.3.2 of this manual for guidance on non-conforming alignment such as compound, broken back and reverse curves. The effects of the combinations of vertical and horizontal alignment should also be considered.

Table 4-5  Stopping Sight Distance, Minimum Radius of Curve & Maximum Grade

<table>
<thead>
<tr>
<th>Vehicle Speed</th>
<th>Stopping Sight Distance</th>
<th>Minimum Radius of Curve¹</th>
<th>Maximum Grade (%)²</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Level</td>
</tr>
<tr>
<td>30 km/h (19 mph)</td>
<td>30 m (98 ft.)</td>
<td>30 m (98 ft.)</td>
<td>8</td>
</tr>
<tr>
<td>40 km/h (25 mph)</td>
<td>50 m (164 ft.)</td>
<td>55 m (180 ft.)</td>
<td>7</td>
</tr>
<tr>
<td>50 km/h (31 mph)</td>
<td>60 m (197 ft.)</td>
<td>90 m (295 ft.)</td>
<td>7</td>
</tr>
<tr>
<td>60 km/h (37 mph)</td>
<td>80 m (262 ft.)</td>
<td>135 m (443 ft.)</td>
<td>7</td>
</tr>
<tr>
<td>70 km/h (43 mph)</td>
<td>100 m (328 ft.)</td>
<td>195 m (640 ft.)</td>
<td>7</td>
</tr>
<tr>
<td>80 km/h (50 mph)</td>
<td>120 m (394 ft.)</td>
<td>250 m (820 ft.)</td>
<td>6</td>
</tr>
<tr>
<td>90 km/h (56 mph)</td>
<td>140 m (459 ft.)</td>
<td>335 m (1099 ft.)</td>
<td>6</td>
</tr>
</tbody>
</table>

NOTES
1. Based on a superelevation of 6.0%. If the superelevation is less, the minimum radius of curve is greater. Refer to Chapter 2, Tables 2-9, 2-10 & 2-11 of this manual for other values.
2. Refer to Chapter 2, Section 2.5.2 of this manual to determine the appropriate terrain.

G. Superelevation

The maximum superelevation rate for local roads is 6%. However, an 8% maximum superelevation rate may be used if it currently exists and it is not contributing to the accident history. The superelevation transition should be based on Chapter 5, Section 5.8.3.1.

Increases in the superelevation rate from 6% to 8% for sharp horizontal curves require approval as a non-standard feature on a case by case basis. However, a rigorous non-standard feature justification is not necessary since AASHTO's "A Policy on Geometric Design of Highways and

2/5/99  § 4.5
H. Stopping Sight Distance (Horizontal & Vertical)

The minimum stopping sight distance is shown in Table 4-5. The road should be investigated to identify vertical crests and horizontal curves that restrict sight distance. Potential hazards include turning vehicles, sharp curves, cattle crossings, narrow bridges, or other conditions that demand specific driver responses.

I. Lateral Clearance

Not required.

J. Vertical Clearance

Determine from Section 2 of the NYSDOT Bridge Manual.

K. Pavement Cross Slope

Travel lane = 1.5% minimum to 2.0% maximum.

L. Rollover

Between travel lanes = 4.0% maximum. At edge of travel lanes = 8.0% maximum.

M. Structural Capacity

Determine from Section 2 of the NYSDOT Bridge Manual.
N. Pedestrian Accommodation

To assure access for persons with disabilities, pedestrian facilities shall be located and constructed in accordance with Chapter 18 of this manual and the “Americans with Disabilities Act Accessibility Guidelines for Buildings and Facilities.”

4.6 OTHER CONTROLLING DESIGN PARAMETERS

Other controlling design parameters determine the characteristics of important (critical and non-critical) design elements such as lane width, turning radii, etc. Significant other controlling design parameters are addressed in detail in other chapters of this manual. Examples include design storm, design vehicle, and clear zone.

4.7 SIGNING & DELINEATION

The bridge approaches on low volume local highways must be signed and delineated in accordance with the NYS MUTCD. Projects with a design speed of less than the regulatory speed (posted or 55 mph statutory speed) must provide the appropriate advisory and warning signs in accordance with the MUTCD.
Table 4-6  Non-Standard Feature Justification Form

NON-STANDARD FEATURE JUSTIFICATION (in accordance with HDM §2.8)

1. Description of Non-Standard Feature

<table>
<thead>
<tr>
<th>Type of Feature (e.g., horizontal curve radius):</th>
<th>Location:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard Value:</td>
<td>Design Speed: km/h (mph)</td>
</tr>
<tr>
<td>Existing Value:</td>
<td>Safe Operating Speed: km/h (mph)</td>
</tr>
<tr>
<td>Proposed Value:</td>
<td>Safe Operating Speed: km/h (mph)</td>
</tr>
</tbody>
</table>

2. Accident Analysis

<table>
<thead>
<tr>
<th>Current Accident Rate: acc/mvm</th>
<th>Statewide Rate (based on similar type highways): acc/mvm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Is the non-standard feature a contributing factor?</td>
<td>9 YES 9 NO</td>
</tr>
<tr>
<td>Potential for Future Accidents and Accident Severity:</td>
<td></td>
</tr>
</tbody>
</table>

3. Cost Estimates

| Cost to Fully Meet Standards: $ |
| Cost(s) For Incremental Improvements: $ |

4. Mitigation (e.g., increased superelevation and curve warning signs for a non-standard horizontal curve):

5. Compatibility with Adjacent Segments & Future Plans:

6. Other Factors (e.g., Social, Economic & Environmental):

7. Proposed Treatment (i.e., Recommendation):
4.8 REFERENCES


4.9 OTHER SOURCES

The publications listed below are additional sources of information related to the topics presented in this chapter:


