HIGHWAY DESIGN MANUAL

Revision 21

Chapter 2 Design Criteria

July 11, 1994
# CHAPTER 2

## DESIGN CRITERIA

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2.1 INTRODUCTION

Design criteria consist of a project specific listing of the values (standards) for critical design elements. The purpose of this chapter is to define the 17 critical design elements and provide the means to determine their appropriate values (standards) for Department highway projects which are either new construction, reconstruction, 3R (resurfacing, restoration, and rehabilitation) on the interstate system or 3R on freeways, and for all Department bridge projects. Design criteria for 3R projects not on interstates or freeways are included in the "Standards for Non-Freeway Resurfacing, Restoration and Rehabilitation Projects," July 1, 1992.

Design criteria are influenced by the functional classification of the highway, factors such as traffic volumes, operating speed, and terrain, and in some cases by the project type. They are presented to provide guidance to the designer by listing in the project documents the minimum or maximum values or other parameters that are normally used for the critical design elements.

The actual values (above or below those listed as design criteria) and the design parameters to be used for the project or the alternative(s) are normally determined during the scoping phase. In making these determinations, the scoping participants should be aware that the criteria are generally the least acceptable values and if routinely used, 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 social, economic, and environmental impacts. However, it is intended that minimum widths be used for travel lane and shoulder widths except for the desirable wider shoulders noted on certain interstates and other freeways (as explained in section 2.7.1). Further, the selection of lane and shoulder widths on bridges must be consistent with the New York State "Geometric Design Policy for Bridges," July, 1993. This policy recognizes the design life of the improved structure and requires that planned improvements for the adjoining roadway segments be considered when determining values for elements such as bridge width.

While it is Department policy to at least meet the design criteria values for the project types listed above, there may be some situations where values less desirable are appropriate for a particular situation and may provide the most cost effective, quality design. When this occurs and the design criteria value is not attained, a formal justification must be prepared in accordance with Department policy for use of the non-standard feature as specified in section 2.8.

For complex projects which encompass several highway types, there may be several sets of design criteria that apply to different portions of the project or to different alternatives. Separate criteria must be provided for sideroads when they are being reconstructed to tie into the new mainline.

There are other design elements with established values that must be considered in addition to the critical design elements when scoping and designing a project. These other elements can affect some of the critical design elements and have a considerable impact on the cost,
scope, and quality of a project. Examples include curb offset, length of acceleration and deceleration lanes, design vehicle, clear zone, and level of service (this is a critical design element on interstate projects only). Since these other elements are not listed as critical design elements, they are not being addressed in this chapter but will be discussed in Chapter 5, Basic Design and other chapters. The Scoping Procedure Manual and Design Procedure Manual require that many of these items be discussed and values established as appropriate.

The inclusion of specified design criteria in this chapter does not preclude the use of engineering judgment to consider alternative engineering values and does not necessarily mean that existing roadways which were designed and constructed using different criteria, are either substandard or unsafe. Many existing facilities are adequate to safely and efficiently accommodate current traffic demands and need not be reconstructed solely to meet current design criteria.

### 2.2 PROJECT TYPES

In order to provide consistent methods for developing projects and reporting program data, projects are categorized into types which are determined by their predominant purpose. When the project consists of two or more different kinds of work, judgment must be used to identify the predominant reason for the project in order to select the appropriate type.

When projects have more than a single type of work, it may not be appropriate to use a single set of design criteria. As indicated in Section 2.1, there may be several sets of design criteria that apply to different portions of the project or to different alternatives.

The design criteria included in this chapter applies to all Department highway projects which are new construction, reconstruction, or interstate and freeway 3R, and to all Department bridge projects. To assist the engineer in determining whether a project falls within these categories or others, the following four (4) project type definitions are provided. For additional information on all project types, see the "Design Traffic Forecast Policy" contained in the "Scoping Procedure Manual," and the "Geometric Design Policy for Bridges," July 1993.

#### 2.2.1 Reconstruction/New Construction

This classification of project includes work to replace an existing highway including any necessary geometric improvements. Work to provide a new highway alignment is included in this category. Projects generally involve extensive rebuilding of subgrade, drainage systems and utility work. Projects provide a full depth of new portland cement or asphalt concrete pavement.

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2.2.2 Resurfacing, Restoration & Rehabilitation (3R) on Interstates and Freeways

These are projects designed to extend the service life of an existing highway and enhance highway safety. Work is generally limited to pavement resurfacing, restoration, or rehabilitation (including crack and seat or rubblizing) along existing alignment, including correction of spot subgrade problems. Projects can include limited adjustment of vertical/horizontal alignment to mitigate identified accident problems, drainage improvement, slope flattening or regrading, and sign or guiderail replacement.

2.2.3 Intersection Reconstruction

The main purpose of these projects is operational improvements at one or more intersections. Work includes geometric changes such as turn lanes and widenings; and any other incidental improvements such as signs, lighting, drainage improvements, installation of signalized traffic control devices, channelization and/or pavement markings.

2.2.4 Bridge Projects

The main purpose of these projects is to construct a new bridge or to replace or rehabilitate an existing bridge. Some incidental highway work may be included on the approaches to the bridges, as a necessary transition between the bridge and the untouched existing highway.

2.3 DESIGN CRITERIA SOURCES

This section provides a brief description of the various sources used to establish geometric design criteria for all Department highway projects which are new construction, reconstruction, or interstate and freeway 3R, and for all Department bridge projects.

2.3.1 A Policy on Geometric Design of Highways and Streets (1990)

This policy was developed by AASHTO's Standing Committee on Highways. Guidance included in the policy is based on established practices and is supplemented by recent research. The policy is intended to form a comprehensive reference manual for assistance in administration, planning, and educational efforts pertaining to design formulation. A recommended range of design values for critical dimensions of various types of highway facilities are provided.
2.3.2 **A Policy on Design Standards, Interstate System (1991)**

This policy provides standards for design features specific to interstate highways. The standards outlined in this publication must be followed for projects on the interstate system in addition to the AASHTO geometric requirements in "A Policy on Geometric Design of Highways and Streets" 1990.

2.3.3 **New York State Department of Transportation Geometric Design Policy for Bridges (July 1993)**

This policy was developed by the NYSDOT Structures Design and Construction Division. The intention of this policy is to serve as a standard for designers in determining minimum requirements for bridge widths, clearances, and live loadings for all bridge replacement and bridge rehabilitation projects. It is also intended to clarify the above geometric design requirements for all types of bridge work except maintenance.

2.3.4 **Guidelines for Highways Within the Adirondack Park**

Although this document does not establish design criteria, it is being included here because it provides important guidelines for consideration when designing projects within the Adirondack Park.

These guidelines were developed by the Adirondack Park Task Force which is comprised of representatives of the Adirondack Park Agency, the Department of Environmental Conservation, and Regions 1, 2, and 7 of the Department of Transportation. They serve as an interagency guide for the design, construction, and maintenance of highways, bridges and maintenance facilities within the Adirondack Park. The purpose of this document is to ensure the preservation and enhancement of the unique character of the Adirondack Park, which may require extra effort by the designer to ensure that the project fits harmoniously into the natural surroundings. These guidelines do not apply to projects on Interstate Route 87 within the Adirondack Park.

When the use of these guidelines results in a value less desirable than that listed as design criteria, a justification must still be prepared in accordance with Department policy for the use of the non-standard feature. Part of this justification should be a reference to these standards.

2.4 **FUNCTIONAL CLASSIFICATION OF HIGHWAYS**

Functional classification is the grouping of roadways by the character of service they provide. Different roadways have different functions. Freeways move high traffic volumes at high speeds with limited local access. Local roads and streets sacrifice high speed and volume for increased local access. Arterials and collectors provide intermediate service. The functional
classification of a roadway is a major factor in determining the appropriate design criteria.

Because they have fundamentally different characteristics, urban and rural areas are classified separately. Project designers and developers have the responsibility to determine this classification. The classification should be made on the basis of the anticipated character of an area during the design life rather than political or urban area boundaries. If an area, within an urban boundary, is rural in character and is anticipated to remain rural in character for most of the design life of the project, it should be classified as rural. Roadside culture, bicycle and pedestrian transportation, driveway density and the presence of traffic generators are indicators of character. Urban boundaries were used to determine the urban and rural distinction on the Federal Aid System Functional Classification maps available from Regional Planning and Program Management Units. These maps should not be used without considering whether the urban-rural distinction is appropriate.

The Federal Aid System Functional Classification maps should also be used in determining the roadway type (i.e. Arterial, Collector,...). These maps indicate that non-interstate freeways, expressways and multi-lane divided parkways are functionally classified as arterials. Judgement should be used to determine the roadway classification. Normally, these roadways should be treated as Other Freeways, section 2.7.1.2, for determination of design criteria.

A National Highway System (NHS) was established by the Intermodal Surface Transportation Efficiency Act (ISTEA) of 1991. It presently consists of the interstate system and all roadways functionally classified as principal arterials. The NHS is separate and distinct from the functional classification system. Definitions of principal and minor arterials are found in Chapter I of AASHTO's "A Policy on Geometric Design of Highways and Streets" 1990.

2.4.1 Interstates and Other Freeways

2.4.1.1 Interstates

Interstate highways are on the interstate highway system. Generally, they are interregional high speed, high volume facilities with complete control of access.

2.4.1.2 Other Freeways

Other Freeways are local, intraregional and interregional high speed, high volume facilities with complete control of access. Historically, most freeways have been classified as principal arterials.

Expressways are divided highways for through traffic with full or partial control of access and generally with grade separations at major crossroads. Section 2.7.1.2 Other Freeways applies
to expressways and to multi-lane divided parkways, including parkways with occasional at grade intersections.

2.4.2 Arterials

2.4.2.1 Rural Arterials

A major part of the rural highway system consists of rural arterials, which range from two-lane roadways to multilane, divided controlled access facilities. Generally, they are high speed, high volume roadways for travel between major points.

2.4.2.2 Urban Arterials

Urban arterials carry large traffic volumes within and through urban areas. They vary from multilane, divided controlled access facilities to two lane streets. They serve major areas of activity, carrying a high proportion of an area's traffic on a small proportion of the area's lane mileage.

2.4.3 Collector Roads and Streets

Collectors serve a dual function. They collect and distribute traffic while providing access to abutting properties.

2.4.3.1 Rural Collectors

Rural collectors are two lane roadways connecting roadways of higher classification, larger towns and smaller communities. They link local traffic generators with rural areas.

2.4.3.2 Urban Collectors

Urban collector streets link neighborhoods or areas of homogeneous land use with arterial streets. They serve the dual function of land access and traffic circulation.
2.4.4 Local Roads and Streets

2.4.4.1 Local Rural Roads

Local rural roads are primarily town and county roads. Their primary purpose is access to the abutting property. They constitute a high proportion of the highway mileage but service a low proportion of the traffic volume.

2.4.4.2 Local Urban Streets

Local urban streets are primarily village and city streets. Their primary purpose is access to abutting property.

2.4.5 Other Roadways

The roadways defined in this section are not considered a functional classification. They have a different function than the highways discussed in the classifications above, and are defined here so the appropriate design criteria can be determined.

2.4.5.1 Parkways

These are usually divided highways for non-commercial traffic with full control of access, grade separations, interchanges, and occasional at-grade intersections. Parkways are designated by law.

2.4.5.2 Ramps

Ramps are turning roadways that connect two or more legs of an interchange. They may be multilane.

2.4.5.3 Speed Change Lanes

A speed change lane is an auxiliary lane, primarily for the acceleration or deceleration of vehicles entering or leaving through traffic.

2.4.5.4 Turning Roadways

Turning roadways are separate connecting roadways at high type intersections.

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2.4.5.5 Collector - Distributor Roads

Collector-Distributor roads are auxiliary roadways within or between interchanges. The purpose of these roadways is to remove weaving traffic from the mainline and to minimize entrances and exits.

2.4.5.6 Frontage Roads

Frontage or service roads are auxiliary roadways along controlled access facilities. They provide access to adjacent property.

2.4.5.7 Climbing Lanes

Climbing lanes are auxiliary lanes provided for slow moving vehicles ascending steep grades. They may be used along all types of roadways.

2.5 PROJECT DATA

The following items are factors in determining the values of some of the critical design elements.

2.5.1 Traffic

2.5.1.1 Traffic Volume

Traffic volume directly affects the geometric features selected for design of highway and bridge projects. The general unit of measure for traffic on a highway is the two-way, average daily traffic (ADT), defined as the total volume during a given time period (in whole days), greater than one day and less than one year, divided by the number of days in that time period. The ADT volume utilizing a time period of one year is referred to as the two-way, annual average daily traffic (AADT). An hourly traffic volume is also used for design purposes. The unit of measure for this traffic is the two-way, design hour volume (DHV) which usually represents the 30th highest hourly volume of the year chosen for design. This volume is adjusted to provide a one-way, directional design hour volume (DDHV).

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2.5.1.2 Large Vehicles

Large vehicles impose a greater effect on a highway or bridge than passenger cars do. The percentage of large vehicles is considered for design purposes. These vehicles are defined as having more than four tires touching the pavement and include trucks, buses, and recreational vehicles.

2.5.1.3 Traffic Design Year

Highway and bridge design should be based on traffic volumes that are expected to occur within the design life of the project. The year chosen for design must also be no further ahead than that for which traffic can be estimated with reasonable accuracy. To meet these criteria, the Department has developed a "Design Traffic Forecast Policy" contained in the "Scoping Procedure Manual" that shall be used to select the appropriate design year for the type of project being designed.

For interstate resurfacing, restoration and rehabilitation projects (I 3R) the design year is the estimated time of completion (ETC.). However, when any elements of the project (e.g. mainline, weaves, merges, diverges, ramps, ramp intersections, etc.) are at or approaching congestion levels (low D level of service or worse), traffic projections of ETC + 10 should be used to evaluate the appropriateness of an I 3R project versus a project scoped to overcome the existing or emerging problems.

2.5.2 Terrain

The topography of the land traversed has an influence on the horizontal and vertical alignment of a highway. For design purposes, variations in topography are categorized by terrain, utilizing the definitions in AASHTO's "A Policy on Geometric Design of Highways and Streets," 1990:

1. Level Terrain - That condition where highway sight distances, as governed by both horizontal and vertical restrictions, are generally long or could be made to be so without construction difficulty or major expenses.

2. Rolling Terrain - That condition where the natural slopes consistently rise above and fall below the road or street grade and where occasional steep slopes offer some restriction to normal horizontal and vertical roadway alignment.

3. Mountainous Terrain - That condition where longitudinal and transverse changes in the elevation of the ground with respect to the road or street are abrupt and where benching and side hill excavation are frequently required to obtain acceptable horizontal and vertical alignment.
2.5.3 **Special Routes**

There are special routes designated to serve specific purposes as shown below.

2.5.3.1 **Strategic Highway Corridor Network**

The United States Department of Defense has a program called Highways for National Defense (HND) to ensure the mobility of United States Forces during national defense operations. To support this program, a Strategic Highway Corridor Network (STRAHNET) was established. This system consists of some interstate and some non-interstate highways. The minimum vertical clearance on these routes is 4.9 m. The Department's Office of Planning and Program Management maintains complete information and maps concerning the STRAHNET system.

2.5.3.2 **Designated Truck Access Highway Network**

The Federal 1982 Surface Transportation Assistance Act (STAA) and the State 1990 Truck Safety Bill provided regulations concerning a system of reasonable access routes for special dimension vehicles. Minimum travel lane widths of 3.6 m must be provided along Designated Qualifying Highways. Minimum travel lane widths of 3.0 m are required along Designated Access Highways and for routes within 1.6 km of Qualifying Highways. The Traffic Engineering and Safety Groups maintain a listing of all designated highways in the publication "Official Description of Designated Qualifying and Access Highways in New York State."

2.6 **CRITICAL DESIGN ELEMENTS**

The seventeen (17) items discussed in this section are defined as the critical design elements. Usually, minimum or maximum values are specified for these elements.

2.6.1 **Design Speed**

Design speed is the maximum safe speed that can be maintained over a specified section of highway when conditions are so favorable that the design features of the highway govern. Once selected, many of the critical elements of the highway are related to the design speed.

2.6.2 **Lane Width**

A highway lane is the portion of the traveled way dedicated to the sole use of a single line of vehicles.

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2.6.3 **Shoulder Width**

The shoulder is the portion of the roadway contiguous with the traveled way for accommodation of stopped vehicles, for emergency use and for the lateral support of subbase and surface courses. The width of shoulder is the actual width that can be used when a driver makes an emergency or parking stop. Shoulders may be either fully or partially surfaced or stabilized.

2.6.4 **Bridge Roadway Width**

A bridge is a structure, erected to carry traffic over a depression or an obstruction, having an opening measured along the center of the roadway of more than 6.1 m. The bridge roadway width is the clear distance measured perpendicular to the center of the roadway between the inside faces of the bridge railing, or faces of the curb, whichever is less. The typical Department 150 mm brush curb introduced at the bridge is not considered to reduce the rail-to-rail dimension.

2.6.5 **Grade**

The maximum grade is the maximum allowable rate of change in vertical alignment of a highway. Since the rate of grade has a direct effect on the operating speed of vehicles on a highway, the maximum grade is chosen to encourage uniform operating speeds throughout the traffic stream while providing a cost effective design.

2.6.6 **Horizontal Curvature**

The minimum radius is a limiting value of curvature for a given design speed and is determined from the maximum rate of superelevation and the maximum side friction factor selected for design.

2.6.7 **Superelevation**

Superelevation is the cross slope of the pavement at a horizontal curve, provided to partially counterbalance the centrifugal force on a vehicle going around that curve. While a number of factors influence the maximum allowable rate of superelevation, only area type (i.e. urban or rural) is a variable in New York State.
2.6.8 **Stopping Sight Distance (Horizontal and Vertical)**

Sight distance is the length of roadway ahead visible to the driver. The minimum sight distance available on a roadway should be sufficiently long to enable a vehicle traveling at or near the design speed to stop before reaching a stationary object in its path. There are three types of stopping sight distance. These are: stopping sight distance for a crest vertical curve, stopping sight distance for sag vertical curves (also called "headlight sight distance") and stopping sight distance for horizontal curves.

2.6.9 **Lateral Clearance**

Lateral clearance is the unobstructed distance between the edge of the travel lane and a vertical element such as guide rail, median barrier, bridge piers and abutments, retaining walls, signal and utility poles, and sign posts and panels (does not apply to sign panels at or above the minimum vertical clearance).

2.6.10 **Vertical Clearance**

Vertical clearance is the minimum vertical clear distance to an obstruction over any part of the highway pavement or shoulders.

2.6.11 **Pavement Cross Slope**

Pavement cross slope is the minimum value of sustained cross slope of a pavement. This cross slope, commonly called "normal crown", is used in tangent sections. The purpose of pavement cross slope is to provide positive drainage from the pavement.

2.6.12 **Rollover**

Rollover is the measure of the difference in cross slope between two adjacent highway lanes or a highway lane and its adjacent shoulder.

2.6.13 **Structural Capacity**

Structural capacity is the ability of a bridge to carry its dead load and a given live load. The live load (which includes impact effects), is expressed in terms of standard AASHTO truck configurations or equivalent uniform lane loads.

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2.6.14 **Level of Service**

Level of Service is defined as a qualitative measure describing operational conditions within a traffic stream, and their perception by motorists and/or passengers. Level of service is described by a letter grade from A (best) to F (worst). Level of Service is a critical design element only for interstate highways.

2.6.15 **Control of Access**

Control of access is defined as the regulated limitation of access rights to and from properties abutting the highway facilities. Control of access is measured by the degree to which access is controlled, that is, fully controlled, partially controlled or uncontrolled. Control of access is a critical design element only for interstate highways and other freeways.

2.6.16 **Pedestrian Accommodation**

Pedestrian accommodations consist of sidewalks, ramps, crosswalks and other special features. The standards for pedestrian accommodations are concerned with the usability of those accommodations by persons with disabilities.

2.6.17 **Median Width**

A median is defined as the portion of a divided highway separating the traveled way for traffic traveling in opposing directions. The median width is expressed as the dimension between the through-lane edges and includes the left shoulders, if any. Median width is a critical design element only for interstate highways and other freeways.

2.7 **STANDARDS**

This section provides the standard values for the critical design elements.

The values are provided for each functional classification, with further division of arterials, collectors and local roads for rural and urban conditions, similar to the format of AASHTO's "A Policy on Geometric Design of Highways and Streets", 1990. In addition, values are provided for other roadways such as parkways, ramps, speed change lanes, turning roadways, climbing lanes, collector-distributor roadways and frontage roads. When these values are not met, concurrence with non-standard features must be obtained from FHWA or the Regional Director as described in Section 2.8 and in the Design Procedure Manual.

The values shown are the minimum or maximum values or other parameters as applicable. In some cases further refinement of the values, dependent on certain conditions, are provided.
Desirable values are also provided for a few of the critical design elements (horizontal and vertical stopping sight distance, wider shoulders on certain interstates and other freeways, curb offsets on urban streets and turning lanes). Whenever practicable, considering factors such as cost limitations and social, economic and environmental impacts, the designer should strive to achieve the desirable or other levels better than the minimum or maximum values shown. Stopping sight distance is a prime example. For a 100 km/h design speed the minimum stopping sight distance is based on an assumed wet weather average running speed of 85 km/h. AASHTO notes that studies show many operators drive just as fast on wet pavement as they do on dry pavement. Therefore the desirable values for stopping sight distance should be used for design whenever practicable, considering factors such as cost and impacts as noted above.

It is intended that the minimum widths be used for travel lanes and shoulder widths, except for the desirable wider shoulders noted on certain interstates and other freeways.

The values for bridge widths are established by the NYSDOT "Geometric Design Policy for Bridges," July 1993. They are influenced by future plans for the adjacent highway and should be considered both the minimum acceptable and the desirable values.

2.7.1 Interstates and Other Freeways

2.7.1.1 Interstates

The design criteria for interstate highways are detailed in sections A to Q below.

Note - For interstate resurfacing, restoration and rehabilitation (I 3R) projects the standards used for horizontal and vertical alignment, and travel lane, shoulder and median widths may be the AASHTO interstate standards that were in effect at the time of original construction or inclusion into the interstate system. However the design speed should be established in accordance with the guidance in this section.

A. Design Speed

The design speed selected should be consistent with any planned improvements for the facility or travel corridor and should be the higher speed of either:

1. a speed based on the functional class of the highway, the terrain (level, rolling or mountainous) and adjacent character of the area (rural or urban) which the highway traverses, or

2. a speed which fits the travel desires and habits of nearly all drivers (the 85th

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percentile) for the anticipated off-peak conditions.

In addition, the design speed selected should be consistent with the speed previously established on adjacent projects. However, significant changes in the highway environment or terrain may necessitate a different design speed for different highway segments within the project or between adjacent projects. The use of different design speeds for continuous segments of a facility should be kept to a minimum to better assure consistency of design features such as vertical and horizontal alignment.

With respect to the functional class, for interstates a design speed of 110 km/h should be used for rural areas. Where terrain is mountainous, a design speed of 100 km/h or 80 km/h, which is consistent with driver expectancy, may be used. A design speed of 100 km/h is acceptable for rolling terrain. In urban areas, the design speed shall be at least 80 km/h. Design speed shall equal or exceed the posted speed in every case.

One or more of the following methods should be used to establish a value for the anticipated off-peak 85th percentile speed for the proposed improvements:

1. Use statewide speed studies for a similar interstate or other freeway facility. Statewide 85th percentile speeds are provided in the "Annual Report on Highway Speeds" published each year by the NYSDOT Planning Division. The Regional Traffic Engineering and Safety Group must verify that the use of the statewide speed study to determine the anticipated off-peak 85th percentile speed for the project is acceptable.

2. Conduct spot speed studies for the project using radar or, where feasible, automatic traffic recorders. The Regional Traffic Engineering and Safety Group may do the radar study or must be consulted on how to conduct these studies in order to obtain statistically reliable results.

Since speeds often increase when there is a new pavement surface and when geometric improvements are made, engineering judgement should be exercised in determining the reasonableness and applicability of the design speed obtained using the above methods. Scoping documents, design approval documents, etc. must contain a statement that the design speed is consistent with or greater than the anticipated off-peak 85th percentile speed once the proposed improvements have been completed.

B. Lane Width

Travel lanes = 3.6 m minimum.
C. Shoulder Width

The right side shoulder = 3.0 m minimum. In mountainous terrain involving high cost for additional width, the right shoulder = 1.8 m minimum. The left side shoulder = 1.2 m minimum.

Where trucks exceed 250 DDHV (directional design hourly volume) the right side shoulder should desirably = 3.6 m. For interstates of six or more lanes the left side shoulder should desirably = 3.0 m and, where trucks exceed 250 DDHV, = 3.6 m.

D. Bridge Roadway Width

Determine from NYSDOT "Geometric Design Policy for Bridges."

E. Grade

Determine maximum from Table 2-1.

F. Horizontal Curvature

Determine minimum radius from Table 2-1. For curves flatter than the minimum radius, the radius and superelevation on each horizontal curve shall be correlated with the design speed in accordance with the $e_{\text{max}} = 6\%$ table, Table 2-10.

G. Superelevation

6% maximum

H. Stopping Sight Distance (Horizontal and Vertical)

Determine minimum and desirable distances from Table 2-1.

I. Lateral Clearance

Minimum = Shoulder width but never less than 1.2 m, except on bridges where the NYSDOT "Geometric Design Policy for Bridges" allows less than 1.2 m.

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J. Vertical Clearance

Determine minimum from NYSDOT "Geometric Design Policy for Bridges".

K. Pavement Cross Slope

Travel lanes = 1.5% minimum to 2% maximum.

L. Rollover

Between travel lanes = 4% maximum. At pavement edge = 8% maximum.

M. Structural Capacity

Determine from NYSDOT "Geometric Design Policy for Bridges".

N. Level of Service

A minimum of four traffic lanes shall be provided on the Interstate System. The number of lanes shall be sufficient to accommodate the selected DDHV (directional design hourly volume) at an acceptable level of service as listed below, and shall be determined on the basis of service volumes for the applicable conditions as given in AASHTO’s "A Policy on Geometric Design of Highways and Streets," 1990. On ascending grades which exceed the critical design length, a climbing lane analysis shall be made in accordance with TRB Special Report 209 "Highway Capacity Manual", and AASHTO's "A Policy on Geometric Design of Highways and Streets," 1990, and climbing lanes added where warranted.

The following levels of service are the criteria for interstates:

| Rural, level terrain      | LOS = B minimum |
| Rural, rolling terrain    | LOS = B minimum |
| Rural, mountainous terrain| LOS = C minimum |
| Urban and suburban¹       | LOS = C minimum |

¹In heavily developed sections of metropolitan areas conditions may necessitate LOS = D minimum. Scoping closure and design approval documents should include documentation of the heavily developed metropolitan area conditions.

Some interstate projects, especially in urban areas, will provide levels of service below those above due to social, economic and environmental and/or policy/intergovernmental decisions during project scoping and design. Such decisions for lesser levels of service...
should be made in accordance with National Environmental Policy Act (NEPA) and/or State Environmental Quality Review Act (SEQR) procedures and, where applicable, with the Major Metropolitan Transportation Investment process. These decisions should be supported and documented in the design approval documents.

O. Control of Access

Access to the interstate system shall be fully controlled.

Access is to be achieved by interchanges at selected public highways. 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.

Control for connections to the crossroad should be provided beyond the ramp terminals by purchasing access rights or providing frontage roads. Such control should extend beyond the ramp terminal at least 30 m in urban areas and 90 m in rural areas (see Chapter 6 of the Highway Design Manual for more specific details).

The interstate highway shall be grade separated at all railroad crossings and selected public crossroads. All at-grade intersections of public highways shall be eliminated. To accomplish this the connecting roads are to be terminated, rerouted, or intercepted by frontage roads.

P. Pedestrian Accommodation

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

Q. Median Width

Medians in rural areas in level or rolling terrain shall be at least 11.0 m wide. Medians in mountainous terrain or in urban areas shall be at least 3.0 m wide.

2.7.1.2 Other Freeways

The design criteria for freeways other than interstates is the same as Section 2.7.1.1 Interstates with the exception of Section 2.7.1.1N (Level of service is not a standard for other freeways).

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<table>
<thead>
<tr>
<th>Design Speed, km/h</th>
<th>Maximum Percent Grade</th>
<th>Stopping Sight Distance, m</th>
<th>Minimum Radius Curve, m</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Terrain</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Level</td>
<td>Rolling</td>
<td>Mount.</td>
</tr>
<tr>
<td>80</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>90</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>100</td>
<td>3</td>
<td>4</td>
<td>6</td>
</tr>
<tr>
<td>110</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>120</td>
<td>3</td>
<td>4</td>
<td>-</td>
</tr>
</tbody>
</table>

1 Grades 1 percent steeper may be used for extreme cases in urban areas where development precludes the use of flatter grades and for one-way down-grades except in mountainous terrain.
2.7.2 **Arterials**

2.7.2.1 **Rural Arterials**

The design criteria for undivided and divided rural arterials are as follows:

A. **Design Speed**

The design speed selected should be consistent with any planned improvements for the facility or travel corridor and should be the higher speed of either:

1. a speed based on the functional class of the highway, the terrain (level, rolling or mountainous) and adjacent character of the area (rural or urban) which the highway traverses, or

2. a speed which fits the travel desires and habits of nearly all drivers (85th percentile) for the anticipated off-peak conditions.

In addition, the design speed selected should be consistent with the speed previously established on adjacent projects. However, significant changes in highway environment or terrain may necessitate a different design speed for different highway segments within the project (i.e. rural, urban, flat, mountainous, side roads, etc.). The use of different design speeds for continuous segments of a facility should be kept to a minimum to better assure consistency of design features such as vertical and horizontal alignment.

With respect to the functional class, for rural arterials design speeds should be at least 100 km/h and normally 110 km/h in level terrain, at least 80 km/h and normally 100 km/h in rolling terrain and at least 60 km/h and normally 80 km/h in mountainous terrain.

One or more of the following methods should be used to establish a value for the anticipated off-peak 85th percentile speed for the proposed improvements:

1. Use statewide speed studies for a similar facility when the speed limit is 90 km/h. Statewide 85th percentile speeds are provided in the "Annual Report on Highway Speeds" published each year by the NYSDOT Planning Division. The Regional Traffic Engineering and Safety Group must verify that the use of the statewide speed study to determine the anticipated off-peak 85th percentile speed for the project is acceptable.

2. Use the data that was obtained to establish any regulatory speed zone or zones within the project limits if such data is still representative of current and anticipated conditions. This method should only apply where there will not be improvements which create substantial vertical and/or horizontal alignment or other changes that will increase speeds. The Regional Traffic Engineering and
Safety Group must verify the data is current and is suitable for use on the project.

3. Use the speed limit plus 10 km/h to set the design speed. This method should be used only when there are known off-peak, 85th percentile speeds on comparable existing facilities that approximate the speed limit plus 10 km/h. The Regional Traffic Engineering and Safety Group must verify the reasonableness of the anticipated off-peak 85th percentile speed as part of their field investigation of the project.

4. Conduct speed studies for the project using radar where volumes are high or using test cars or following car techniques where volumes are low. The Regional Traffic Engineering and Safety Group must be consulted on how to conduct these studies in order to obtain statistically reliable results.

For spot improvements (bridge replacements, intersection improvements, etc.) where there are no planned improvements to adjacent sections of the highway, the speed studies should be done on adjacent sections of the highway so that a design speed is established that is consistent with or greater than the adjacent sections.

Since speeds often increase when there is a new pavement surface and when geometric improvements are made, engineering judgement should be exercised in determining the reasonableness and applicability of the design speed obtained using the above methods. Scoping documents, design approval documents, etc. must contain a statement that the design speed is consistent with or greater than the anticipated off-peak 85th percentile speed once the proposed improvements have been completed.

If a design speed is selected which is below the speed limit, appropriate warning signs and speed advisory signs must be provided in accordance with the NYSDOT "Manual of Uniform Traffic Control Devices".

B. Lane Width:

Travel Lane Width - For undivided rural arterials determine from Table 2-2 except for routes designated as Qualifying Highways on the national network of Designated Truck Access Highways (1982 STAA highways), travel lanes = 3.6 m minimum.

For multi-lane, divided rural arterials the travel lane width = 3.6 m minimum. On reconstructed divided, multilane arterials it may be acceptable to retain 3.3 m lanes if the alignment and safety records are acceptable. However for routes designated as Qualifying Highways on the national network of Designated Truck Access Highways (1982 STAA highways), travel lanes = 3.6 m minimum.
For bridge projects determine the lane width from the NYSDOT "Geometric Design Policy for Bridges".

Turning lane width = 3.0 m minimum. Desirably the turning lane width should be the same as the travel lane width.

C. Shoulder Width

For undivided, rural arterials determine the minimum from Table 2-2.

For multilane, divided rural arterials the right side shoulder = 2.4 m minimum. The left side shoulder = 0.6 m minimum where the median is level (2% or flatter). Where the median is sloped, the left side shoulder = 1.2 m minimum.

For bridge projects determine the shoulder width from the NYSDOT "Geometric Design Policy for Bridges".

D. Bridge Roadway Width

Determine from NYSDOT "Geometric Design Policy for Bridges."

E. Grade

Determine maximum from Table 2-2.

F. Horizontal Curvature

Determine minimum radius from Table 2-2. For curves flatter than the minimum radius, the radius and superelevation on each horizontal curve shall be correlated with the design speed in accordance with the $e_{max} = 6\%$ table, Table 2-10.

G. Superelevation

6% maximum

H. Stopping Sight Distance (Horizontal and Vertical)

Determine minimum and desirable distances from Table 2-2.

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## Table 2-2 Rural Arterials

<table>
<thead>
<tr>
<th>Design speed, km/h</th>
<th>Travel Lane Width, m</th>
<th>Maximum % Grade</th>
<th>Stopping Sight Distance, m</th>
<th>Min. Radius Curve, m</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Terrain</td>
<td></td>
<td>e&lt;sub&gt;max&lt;/sub&gt; = 6%</td>
</tr>
<tr>
<td></td>
<td>Current AADT Under 400</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>60</td>
<td>3.3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>70</td>
<td>3.3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>80</td>
<td>3.3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>90</td>
<td>3.3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>100</td>
<td>3.6</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>110</td>
<td>3.6</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>All speeds</td>
<td>1.2</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Notes:

1. Width of travel lane may remain 3.3 m on reconstructed highways where accident history is satisfactory.

2. DHV = Future two way design hourly volume. If the current AADT exceeds 400 and the DHV exceeds 100, this column or the column to the right for the DHV applies.
I. Lateral Clearance

Minimum = Shoulder width but not less than 1.2 m, except for bridges on minor arterials where the NYSDOT "Geometric Design Policy for Bridges" allows less than 1.2 m.

J. Vertical Clearance

Determine minimum from NYSDOT "Geometric Design Policy for Bridges".

K. Pavement Cross Slope

1.5% minimum to 2% maximum.

L. Rollover

Between travel lanes = 4% maximum. At pavement edge = 8% maximum.

M. Structural Capacity

Determine from NYSDOT "Geometric Design Policy for Bridges".

N. Pedestrian Accommodation

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

O. Median Width

For multilane, divided rural arterials, median = 1.2 m minimum without left turn lanes. Where left turn lanes are provided the median = 3.6 m minimum (3.0 m left turn lane with 0.6 m median separation).

2.7.2.2 Urban Arterials

The design criteria for urban arterials are as follows:

7/11/94
A. Design Speed

Determine the design speed as described in Section 2.7.2.1A. With respect to the functional class, design speeds for urban arterials normally range from 60 km/h to 100 km/h and occasionally may be as low as 50 km/h in the central business district and immediate areas.

B. Lane Width

Travel Lane Width = 3.3 m minimum for most arterial streets. For higher speed (design speed of 80 km/h or above), free flowing principal arterials travel lane width = 3.6 m minimum. For highly restricted areas with no or little truck traffic (0 to 2%) travel lane width = 3.0 m minimum. However on routes designated as Qualifying Highways on the national network of Designated Truck Access Highways (1982 STAA highways), travel lane width = 3.6 m minimum.

For bridge projects determine lane width from the NYSDOT "Geometric Design Policy for Bridges."

Left and right turn lanes = 3.0 m minimum, 3.3 m desirable. For minor arterials 2.7 m minimum turn lanes may be used where an overall impact assessment concludes wider lanes would have unacceptable impacts such as taking property. Two-way left turn lanes = 3.3 m minimum, 4.8 m desirable. Parking lane width = 2.4 m minimum.

C. Shoulder Width

Normally no shoulder is required. However, if a shoulder is provided with a nonmountable curb at the back of shoulder, the shoulder = 1.8 m minimum.

For bridge projects determine shoulder width from NYSDOT "Geometric Design Policy for Bridges."

A curb offset is not a critical design element. However, with a nonmountable curb, a 0.3 m or 0.6 m curb offset from the travel lane is desirable. Curb offset is one of the design elements that, if not provided, should be explained in the design approval document.

D. Bridge Roadway Width

Determine from NYSDOT "Geometric Design Policy for Bridges."
E. Grade

Determine maximum from Table 2-3.

F. Horizontal Curvature

Determine minimum radius from Table 2-3. For curves flatter than the minimum radius, the radius of curve and superelevation on each horizontal curve shall be correlated with the design speed in accordance with the $e_{\text{max}} = 4\%$ table, Table 2-9.

For low speed (60 km/h and below) urban streets in heavily built-up residential, commercial or industrial areas sharper curves are allowed. The maximum horizontal curve shown below may be used:

<table>
<thead>
<tr>
<th>Design Speed, km/h</th>
<th>Minimum Curve Radius ($e_{\text{max}} = 4%$), m</th>
</tr>
</thead>
<tbody>
<tr>
<td>30</td>
<td>20</td>
</tr>
<tr>
<td>40</td>
<td>45</td>
</tr>
<tr>
<td>50</td>
<td>80</td>
</tr>
<tr>
<td>60</td>
<td>125</td>
</tr>
</tbody>
</table>

For curves on low speed urban streets flatter than the above minimum radius for $e_{\text{max}} = 4\%$ but sharper than the minimum radius shown below for normal crown, use 2% superelevation (i.e. remove adverse crown). Curves flatter than that shown below may use normal crown.

<table>
<thead>
<tr>
<th>Design Speed, km/h</th>
<th>Minimum Curve Radius, m (normal crown)</th>
</tr>
</thead>
<tbody>
<tr>
<td>30</td>
<td>25</td>
</tr>
<tr>
<td>40</td>
<td>55</td>
</tr>
<tr>
<td>50</td>
<td>100</td>
</tr>
<tr>
<td>60</td>
<td>175</td>
</tr>
</tbody>
</table>

G. Superelevation

4% maximum.

H. Stopping Sight Distance (Horizontal and Vertical)

Determine minimum and desirable from Table 2-3.

7/11/94
<table>
<thead>
<tr>
<th>Design Speed, km/h</th>
<th>Maximum Percent Grade</th>
<th>Stopping Sight Distance, m</th>
<th>Minimum Radius Curve, m</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Level 8</td>
<td>Rolling 9</td>
<td>Mountainous 11</td>
</tr>
<tr>
<td>50</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>60</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>70</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>80</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>90</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>100</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
I. Lateral Clearance

For curbed streets, 0.5 m minimum from face of curb to the vertical elements. For uncurbed streets, 1.2 m minimum, except on bridges where the NYSDOT "Geometric Design Policy for Bridges" allows less than 1.2 m.

J. Vertical Clearance

Determine minimum from NYSDOT "Geometric Design Policy for Bridges".

K. Pavement Cross Slope

Travel lanes 1.5% minimum to 2% maximum. Parking lanes = 1.5% minimum to 4% maximum.

L. Rollover

Between travel lanes = 4% maximum. At pavement edge = 8% maximum.

M. Structural Capacity

Determine from the NYSDOT "Geometric Design Policy for Bridges".

N. Pedestrian Accommodations

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

2.7.3 Collector Roads and Streets

2.7.3.1 Rural Collectors

The design criteria for rural collectors are as follows:

A. Design Speed

Determine design speed as described in Section 2.7.2.1A. With respect to the functional
class, for rural collectors the design speed must equal or exceed the design speeds listed below:

**Minimum Design Speeds (km/h)**

<table>
<thead>
<tr>
<th>Type of Terrain</th>
<th>Current AADT 0-400</th>
<th>Current AADT Over 400</th>
<th>DHV 100-200</th>
<th>DHV 200-400</th>
<th>DHV Over 400</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level</td>
<td>60</td>
<td>80</td>
<td>80</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>Rolling</td>
<td>50</td>
<td>60</td>
<td>60</td>
<td>80</td>
<td>80</td>
</tr>
<tr>
<td>Mountainous</td>
<td>30</td>
<td>50</td>
<td>50</td>
<td>60</td>
<td>60</td>
</tr>
</tbody>
</table>

1DHV = future two way design hourly volume. If the current AADT exceeds 400 and the DHV exceeds 100 this column or the appropriate column to the right based on DHV applies.

B. Lane Width

Travel Lane Width - Determine minimum from Table 2-4. However, for routes designated as Qualifying Highways on the national network of Designated Truck Access Highways (1982 STAA highways), travel lane width = 3.6 m minimum.

For bridge projects determine the lane width from the NYSDOT "Geometric Design Policy for Bridges".

Turning Lane Width - 3.0 m minimum, 3.3 m desirable.

C. Shoulder Width

Determine minimum from Table 2-4.

For bridge projects determine the shoulder width from the NYSDOT "Geometric Design Policy for Bridges".

D. Bridge Roadway Width

Determine minimum from NYSDOT "Geometric Design Policy for Bridges".

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E. Grade

Determine maximum from Table 2-4.

F. Horizontal Curvature

Determine minimum radius from Table 2-4. For curves flatter than the minimum radius, the radius and superelevation on each horizontal curve shall be correlated with the design speed in accordance with the $e_{\text{max}} = 6\%$ table, Table 2-10.

G. Superelevation

6% maximum

H. Stopping Sight Distance (Horizontal and Vertical)

Determine minimum and desirable distances from Table 2-4.

I. Lateral Clearance

Minimum = Shoulder width but never less than 1.2 m, except on bridges where the NYSDOT "Geometric Design Policy for Bridges" allows less than 1.2 m.

J. Vertical Clearance

Determine minimum from the NYSDOT "Geometric Design Policy for Bridges".

K. Pavement Cross Slope

Travel lanes = 1.5% minimum to 2% maximum.

L. Rollover

Between travel lanes = 4% maximum. At pavement edge = 8% maximum.

M. Structural Capacity

Determine from the NYSDOT "Geometric Design Policy for Bridges".

7/11/94
<table>
<thead>
<tr>
<th>Design Speed, km/h</th>
<th>Travel Lane Width, m</th>
<th>Maximum % Grade</th>
<th>Stopping Sight Distance, m</th>
<th>Min. Radius Curve, m $\theta_{max}$ 6%</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Current AADT Under 400</td>
<td>Current AADT 400 &amp; Over</td>
<td>DHV$^1$ 100 to 200</td>
<td>DHV 200 to 400</td>
</tr>
<tr>
<td>30</td>
<td>3.0</td>
<td>3.0</td>
<td>3.0</td>
<td>3.3</td>
</tr>
<tr>
<td>40</td>
<td>3.0</td>
<td>3.0</td>
<td>3.0</td>
<td>3.3</td>
</tr>
<tr>
<td>50</td>
<td>3.0</td>
<td>3.0</td>
<td>3.0</td>
<td>3.3</td>
</tr>
<tr>
<td>60</td>
<td>3.0</td>
<td>3.3</td>
<td>3.3</td>
<td>3.3</td>
</tr>
<tr>
<td>70</td>
<td>3.0</td>
<td>3.3</td>
<td>3.3</td>
<td>3.6</td>
</tr>
<tr>
<td>80</td>
<td>3.0</td>
<td>3.3</td>
<td>3.3</td>
<td>3.6</td>
</tr>
<tr>
<td>90</td>
<td>3.3</td>
<td>3.3</td>
<td>3.3</td>
<td>3.6</td>
</tr>
<tr>
<td>100</td>
<td>3.3</td>
<td>3.3</td>
<td>3.3</td>
<td>3.6</td>
</tr>
<tr>
<td>110</td>
<td>3.3</td>
<td>3.3</td>
<td>3.3</td>
<td>3.6</td>
</tr>
</tbody>
</table>

**Shoulder width, m**

| All Speeds | 0.6$^3$ | 1.2 | 1.8 | 2.4$^4$ | 2.4$^4$ |

1. DHV = future two way design hourly volume. If the current AADT exceeds 400 and the DHV exceeds 100 this column or the appropriate column to the right for the DHV applies.

2. Maximum grades of short lengths (less than 150 m), on one-way down grades and on low volume (<100 DHV) rural collectors may be 2% steeper.

3. Minimum width is 1.2 m if roadside barrier is utilized.

4. 1.8 m shoulders may be used in mountainous terrain.
N. Pedestrian Accommodations

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

2.7.3.2 Urban Collectors

The design criteria for urban collectors are as follows:

A. Design Speed

Determine design speed as described in Section 2.7.2.1A. With respect to functional class, for urban collectors the design speed must equal or exceed 50 km/h.

B. Lane Width

Travel lane width = 3.3 m minimum for most urban collectors with 3.6 m minimum for urban collectors in industrial areas. Where ROW imposes severe limitations, in residential areas travel lane width = 3.0 m minimum and in industrial areas = 3.3 m minimum. However, for routes designated as Qualifying Highways on the national network of Designated Truck Access Highways (1982 STAA highways), travel lane width = 3.6 m minimum.

For bridge projects determine the lane width from the NYSDOT "Geometric Design Policy for Bridges".

Turning Lane Widths - Left and right turn lanes = 3.0 m minimum, 3.3 m desirable, although 2.7 m minimum may be used where an overall impact assessment concludes wider lanes would have unacceptable impacts such as taking property. Two-way left turn lanes = 3.0 m minimum, 3.3 m desirable.

Parking Lane Width - Parking lanes = 2.1 m minimum in residential areas and = 2.7 m minimum in commercial and industrial areas.

C. Shoulder Width

No shoulder is required.

For bridge projects determine the shoulder width from the NYSDOT "Geometric Design Policy for Bridges".

7/11/94
A curb offset is not a critical design element. However, with a nonmountable curb, a 0.3 m or 0.6 m curb offset from the travel lane is desirable. Curb offset is one of the design elements that, if not provided, should be explained in the design approval document.

D. Bridge Roadway Width

Determine minimum from NYSDOT "Geometric Design Policy for Bridges".

E. Grade

Determine maximum from Table 2-5.

F. Horizontal Curvature

Determine minimum radius from Table 2-5. For curves flatter than the minimum radius, the radius and superelevation on each horizontal curve shall be correlated with the design speed in accordance with the $e_{\text{max}} = 4\%$ table, Table 2-9.

For low speed (60 km/h and below) urban streets in heavily built-up residential, commercial or industrial areas sharper curves are allowed. The maximum horizontal curve shown below may be used:

<table>
<thead>
<tr>
<th>Design Speed, km/h</th>
<th>Minimum Curve Radius ($e_{\text{max}} = 4%$), m</th>
</tr>
</thead>
<tbody>
<tr>
<td>30</td>
<td>20</td>
</tr>
<tr>
<td>40</td>
<td>45</td>
</tr>
<tr>
<td>50</td>
<td>80</td>
</tr>
<tr>
<td>60</td>
<td>125</td>
</tr>
</tbody>
</table>

For curves on low speed urban streets flatter than the above minimum radius for $e_{\text{max}} = 4\%$ but sharper than the minimum radius shown below for normal crown, use $2\%$ superelevation (i.e. remove adverse crown). Curves flatter than that shown below may use normal crown.

<table>
<thead>
<tr>
<th>Design Speed, km/h</th>
<th>Minimum Curve Radius, m (normal crown)</th>
</tr>
</thead>
<tbody>
<tr>
<td>30</td>
<td>25</td>
</tr>
<tr>
<td>40</td>
<td>55</td>
</tr>
<tr>
<td>50</td>
<td>100</td>
</tr>
<tr>
<td>60</td>
<td>175</td>
</tr>
</tbody>
</table>

7/11/94
G. Superelevation

4% maximum

H. Stopping Sight Distance (Horizontal and Vertical)

Determine minimum and desirable from Table 2-5.

I. Lateral Clearance

For curbed streets, 0.5 m minimum from face of curb to the vertical elements. For uncurbed streets, 1.2 m minimum, except on bridges where the NYSDOT "Geometric Design Policy for Bridges" allows less than 1.2 m.

J. Vertical Clearance

Determine minimum from the NYSDOT "Geometric Design Policy for Bridges".

K. Pavement Cross Slope

Travel lanes = 1.5% minimum to 2% maximum. Parking lanes = 1.5% minimum to 4% maximum.

L. Rollover

Between travel lanes = 4% maximum. At pavement edge = 8% maximum.

M. Structural Capacity

Determine from the NYSDOT "Geometric Design Policy for Bridges".

N. Pedestrian Accommodations

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

7/12/94
### Table 2-5 Urban Collectors

<table>
<thead>
<tr>
<th>Design Speed, km/h</th>
<th>Maximum Percent Grade(^1)</th>
<th>Stopping Sight Distance, m</th>
<th>Minimum Radius Curve, m e(_\text{max}) = 4%</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Terrain</td>
<td>Minimum</td>
<td>Desirable</td>
</tr>
<tr>
<td>Level</td>
<td>Rolling</td>
<td>Mount.</td>
<td></td>
</tr>
<tr>
<td>50</td>
<td>9</td>
<td>11</td>
<td>12</td>
</tr>
<tr>
<td>60</td>
<td>9</td>
<td>10</td>
<td>12</td>
</tr>
<tr>
<td>70</td>
<td>8</td>
<td>9</td>
<td>11</td>
</tr>
<tr>
<td>80</td>
<td>7</td>
<td>8</td>
<td>10</td>
</tr>
<tr>
<td>90</td>
<td>7</td>
<td>8</td>
<td>10</td>
</tr>
<tr>
<td>100</td>
<td>6</td>
<td>7</td>
<td>9</td>
</tr>
</tbody>
</table>

\(^1\) Maximum grades of short length (less than 150 m) and on one-way down grades may be 2% steeper.
2.7.4 Local Roads and Streets

2.7.4.1 Local Rural Roads

The design criteria for local rural roads are as follows:

A. Design Speed

Determine design speed as described in Section 2.7.2.1A. With respect to the functional class, for local rural roads, the design speed must equal or exceed the design speeds listed below:

| Type of Terrain | Current AADT Under 50 | Current AADT 50-250 | Current AADT 250-400 | Current AADT 400 and Over | DHV 100-200 | DHV 200-400 | DHV 400 and Over |
|-----------------|-----------------------|---------------------|----------------------|---------------------------|-------------|-------------|----------------|------------------|
| Level           | 50                    | 50                  | 60                   | 80                        | 80          | 80          | 80             | 80               |
| Rolling         | 30                    | 50                  | 50                   | 60                        | 60          | 60          | 60             | 60               |
| Mountainous     | 30                    | 30                  | 30                   | 50                        | 50          | 50          | 50             | 50               |

1DHV = future two way design hourly volume. If the current AADT exceeds 400 and the DHV exceeds 100 this column or the appropriate column to the right based on DHV applies.

B. Lane Width

Travel Lane Width - Determine minimum from Table 2-6.

For bridge projects determine the lane width from the NYSDOT "Geometric Design Policy for Bridges".

Turning Lane Width - 3.0 m minimum

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C. Shoulder Width

Determine minimum from Table 2-6.

For bridge projects determine the shoulder width from the NYSDOT "Geometric Design Policy for Bridges".

D. Bridge Roadway Width

Determine minimum from NYSDOT "Geometric Design Policy for Bridges".

E. Grade

Determine maximum from Table 2-6.

F. Horizontal Curvature

Determine minimum radius from Table 2-6. For curves flatter than the minimum radius, the radius and superelevation on each horizontal curve shall be correlated with the design speed in accordance with the $e_{\text{max}} = 6\%$ table, Table 2-10.

G. Superelevation

6% maximum.

H. Stopping Sight Distance (Horizontal and Vertical)

Determine minimum and desirable from Table 2-6.

I. Lateral Clearance

Minimum = Shoulder width but never less than 1.2 m, except on bridges where the NYSDOT "Geometric Design Policy for Bridges" allows less than 1.2 m.

J. Vertical Clearance

Determine minimum from the NYSDOT "Geometric Design Policy for Bridges."

7/11/94
<table>
<thead>
<tr>
<th>Design Speed km/h</th>
<th>Travel Lane Widths, m</th>
<th>Max. % Grade</th>
<th>Stopping Sight Distance, m</th>
<th>Minimum Radius Curve, m</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Current AADT under 250</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>30</td>
<td>2.72</td>
<td>3.0</td>
<td>3.0</td>
<td>3.0</td>
</tr>
<tr>
<td>40</td>
<td>2.72</td>
<td>3.0</td>
<td>3.0</td>
<td>3.0</td>
</tr>
<tr>
<td>50</td>
<td>2.72</td>
<td>3.0</td>
<td>3.0</td>
<td>3.0</td>
</tr>
<tr>
<td>60</td>
<td>3.0</td>
<td>3.0</td>
<td>3.0</td>
<td>3.0</td>
</tr>
<tr>
<td>70</td>
<td>3.0</td>
<td>3.0</td>
<td>3.0</td>
<td>3.0</td>
</tr>
<tr>
<td>80</td>
<td>3.0</td>
<td>3.0</td>
<td>3.0</td>
<td>3.0</td>
</tr>
<tr>
<td>90</td>
<td>3.0</td>
<td>3.0</td>
<td>3.0</td>
<td>3.0</td>
</tr>
<tr>
<td>100</td>
<td>3.0</td>
<td>3.3</td>
<td>3.3</td>
<td>3.6</td>
</tr>
</tbody>
</table>

Width of Shoulders, m

All Speeds | 0.6³ | 0.6³ | 1.2 | 1.8 | 1.8 | 2.4⁴

1. DHV = future two way design hourly volume. If the current AADT exceeds 400 and the DHV exceeds 100 this column or the appropriate column to the right for the DHV applies.

2. Minimum travel lane width is 3.0 m for routes designated as Access Highways and for routes within 1.6 km of Qualifying Highways on the national network of Designated Truck Access Highways.

3. Minimum width is 1.2 m if roadside barrier is used.

4. 1.8 m shoulders may be used in mountainous terrain.
K. Pavement Cross Slope

Travel lanes = 1.5% minimum to 2% maximum.

L. Rollover

Between travel lanes = 4% maximum. At pavement edge = 8% maximum.

M. Structural Capacity

Determine from the NYSDOT "Geometric Design Policy for Bridges".

N. Pedestrian Accommodations

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

2.7.4.2 Local Urban Streets

The design criteria for local urban streets are as follows:

A. Design Speed

Determine design speed as described in Section 2.7.2.1A. With respect to the functional class, the design speeds for local urban streets are normally 30 to 50 km/h.

B. Lane Width

Travel Lane Width = 3.0 m minimum for most local urban streets with 3.6 m minimum for local urban streets in industrial areas. Where ROW imposes severe limitations 2.7 m minimum can be used in residential areas and 3.3 m minimum in industrial areas.

For bridge projects determine the lane width from the NYSDOT "Geometric Design Policy for Bridges".

Left and right turn lane widths = 2.7 m minimum, 3.0 m desirable. Two-way left turn lane widths = 3.0 m minimum, 3.3 m desirable.
Parking lane width = 2.1 m minimum in residential areas with 2.7 m minimum in commercial and industrial areas.

C. Shoulder Width

Shoulders are not normally used on local urban streets.

For bridge projects determine the shoulder width from the NYSDOT "Geometric Design Policy for Bridges".

A curb offset is not a critical design element. However, with a nonmountable curb, a 0.3 m or 0.6 m offset from the travel lane is desirable. Curb offset is one of the design elements that, if not provided, should be explained in the design report.

D. Bridge Roadway Width

Determine minimum from NYSDOT "Geometric Design Policy for Bridges."

E. Grade

Grades for local streets = 15% maximum in residential areas and 8% maximum in commercial and industrial areas.

F. Horizontal Curvature

Determine minimum radius from Table 2-6. For curves flatter than the minimum radius, the radius and superelevation on each horizontal curve shall be correlated with the design speed in accordance with the $e_{\text{max}} = 4\%$ table, Table 2-9.

For low speed (60 km/h and below) urban streets in heavily built-up residential, commercial and industrial areas sharper curves are allowed. The maximum curve shown below may be used:

<table>
<thead>
<tr>
<th>Design Speed, km/h</th>
<th>Minimum Curve Radius ($e_{\text{max}} = 4%$), m</th>
</tr>
</thead>
<tbody>
<tr>
<td>30</td>
<td>20</td>
</tr>
<tr>
<td>40</td>
<td>45</td>
</tr>
<tr>
<td>50</td>
<td>80</td>
</tr>
<tr>
<td>60</td>
<td>125</td>
</tr>
</tbody>
</table>

7/11/94
For curves on low speed urban streets flatter than the above minimum radius for $e_{max} = 4\%$ but sharper than the minimum radius shown below for normal crown, use 2\% superelevation (i.e. remove adverse crown). Curves flatter than that shown below may use normal crown.

<table>
<thead>
<tr>
<th>Design Speed, km/h</th>
<th>Minimum Curve Radius, m (normal crown)</th>
</tr>
</thead>
<tbody>
<tr>
<td>30</td>
<td>25</td>
</tr>
<tr>
<td>40</td>
<td>55</td>
</tr>
<tr>
<td>50</td>
<td>100</td>
</tr>
<tr>
<td>60</td>
<td>175</td>
</tr>
</tbody>
</table>

G. Superelevation

4\% maximum.

H. Stopping Sight Distance (Horizontal and Vertical)

Determine minimum and desirable from Table 2-6.

I. Lateral Clearance

For curbed streets, 0.5 m minimum from the face of curb to the vertical elements. For uncurbed streets, 1.2 m minimum, except on bridges where the NYSDOT "Geometric Design Policy for Bridges" allows less than 1.2 m.

J. Vertical Clearance

Determine minimum from the "Geometric Design Policy for Bridges".

K. Pavement Cross Slope

Travel lane = 1.5\% minimum to 2\% maximum. Parking lane = 1.5\% minimum to 4\% maximum.

L. Rollover

Between travel lanes = 4\% maximum. At pavement edge = 8\% maximum.

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M. Structural Capacity

Determine from the NYSDOT "Geometric Design Policy for Bridges".

N. Pedestrian Accommodations

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

2.7.5 Other Roadways

2.7.5.1 Parkways

Parkways that are multilane, divided freeways or expressways with occasional at-grade intersections should follow the standards in Section 2.7.1.2 Other Freeways. Parkways that are two lane highways or multilane, divided highways with signalized intersections should follow the standards of the functional class of the parkway.

2.7.5.2 Ramps

The design criteria for ramps are as follows:

A. Design Speed

Ramp design speed should approximate the low volume running speed on the intersecting highways and is dependent on the ramp type. The ramp design speed to be listed in the design criteria applies to the sharpest or controlling ramp curve, usually on the ramp proper. The ramp design speed does not apply to the ramp terminals, which should be properly transitioned and provided with speed change facilities adequate for the design speeds of the highways and ramps involved.

The table below identifies the minimum ramp design speed as related to highway design speed. The highway design speed is the higher design speed of the interchanging roadways. Further guidance on minimum design speed for specific types of ramps is provided after this table.

<table>
<thead>
<tr>
<th>Highway Design Speed (km/h)</th>
<th>50 60 70 80 90 100 110 120</th>
</tr>
</thead>
<tbody>
<tr>
<td>Min. Ramp Design Speed</td>
<td>20 30 40 40 50 50 60 70</td>
</tr>
</tbody>
</table>

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For direct connections the minimum ramp design speed = 80 km/h except as noted in the following paragraph.

The minimum design speeds noted below may be used for resurfacing projects on interstates or other freeways on which the ramp accident history is satisfactory and for all types of projects on parkways:

1. Loop ramps - 40 km/h minimum for highways with design speeds of more than 80 km/h.
2. Semidirect connection ramps - 50 km/h minimum
3. Direct connection ramps - 60 km/h minimum

B. Lane Width

Determine minimum lane widths from Table 2-7. For one-lane, one-way ramps, Case II, which provides for passing a stalled vehicle, should normally be used.

C. Shoulder Width

Ramps shall have a 2.0 m right shoulder and a 1.0 m left shoulder except for direct connection ramps with design speeds over 60 km/h which shall have an 2.4 m right shoulder and a 1.0 m minimum left shoulder.

D. Bridge Roadway Width

The lane and shoulder widths should be carried across all ramp structures.

E. Grade

Determine maximum from Table 2-8.

F. Horizontal Curvature

Determine minimum radius from Table 2-8.
G. Superelevation

Maximum superelevation is based on the minimum radius curve and determined from Table 2-8. For ramps and turning roadways with design speeds of 40 km/h or less the maximum superelevation rate is selected from the range of maximum superelevation rates shown in Table 2-8.

Where other radii on a ramp are flatter than the minimum for the ramp design speed, they should be superelevated at less than the maximum rate to effect a balance in design.

H. Stopping Sight Distance (Horizontal and Vertical)

Determine minimum and desirable stopping sight distance from Table 2-8.

I. Lateral Clearance

Right side = shoulder width but never less than 1.8 m and left side = 1.0 m minimum. Where ramps pass under structures, there should be an additional 1.2 m lateral clearance beyond the outside of shoulders to bridge piers or abutments.

J. Vertical Clearance

Determine minimum from the NYSDOT "Geometric Design Policy for Bridges". Ramps should have the same vertical clearance as the higher functional classification of the interchanging roadways.

K. Pavement Cross Slope

1.5% minimum to 2% maximum.

L. Rollover

Between travel lanes = 4% max. At pavement edge 8% maximum.

M. Structural Capacity

Determine from the NYSDOT "Geometric Design Policy for Bridges".

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### Table 2-7 Lane Widths for Ramps and Turning Roadways

<table>
<thead>
<tr>
<th>Radius on Inner Edge of Pavement R (m)</th>
<th>Design Traffic Condition ¹</th>
<th>Case I One-lane, One-way Operation - No Provision for Passing a Stalled Vehicle</th>
<th>Case II One-lane, One-way Operation with Provision for Passing a Stalled Vehicle</th>
<th>Case III Two-Lane Operation - Either One-Way or Two-Way</th>
</tr>
</thead>
<tbody>
<tr>
<td>A B C D</td>
<td>A B C D</td>
<td>A B C D</td>
<td>A B C D</td>
<td>A B C D</td>
</tr>
<tr>
<td>15</td>
<td>5.4 5.4 6.9 8.7</td>
<td>6.9 7.5 8.7 14.7</td>
<td>9.3 10.5 12.6 16.8</td>
<td></td>
</tr>
<tr>
<td>25</td>
<td>4.8 5.1 5.7 7.8</td>
<td>6.3 6.9 8.1 13.5</td>
<td>8.7 9.9 11.1 15.3</td>
<td></td>
</tr>
<tr>
<td>30</td>
<td>4.5 4.8 5.4 7.8</td>
<td>6.0 6.6 7.5 12.6</td>
<td>8.4 9.3 10.5 14.4</td>
<td></td>
</tr>
<tr>
<td>50</td>
<td>4.2 4.8 5.1 7.1</td>
<td>5.7 6.3 7.2 11.1</td>
<td>8.1 9.0 9.9 12.9</td>
<td></td>
</tr>
<tr>
<td>75</td>
<td>3.9 4.8 4.8 6.3</td>
<td>5.7 6.3 6.9 10.5</td>
<td>8.1 8.7 9.3 12.0</td>
<td></td>
</tr>
<tr>
<td>100</td>
<td>3.9 4.5 4.8 5.7</td>
<td>5.4 6.0 6.6 9.3</td>
<td>7.8 8.4 9.0 11.1</td>
<td></td>
</tr>
<tr>
<td>125</td>
<td>3.9 4.5 4.8 5.4</td>
<td>5.4 6.0 6.6 8.7</td>
<td>7.8 8.4 8.7 10.5</td>
<td></td>
</tr>
<tr>
<td>150</td>
<td>3.6 4.5 4.5 5.4</td>
<td>5.4 6.0 6.6 8.1</td>
<td>7.8 8.4 8.7 9.9</td>
<td></td>
</tr>
<tr>
<td>Tangent</td>
<td>3.6 4.5 4.5 4.5</td>
<td>5.1 5.7 6.3 6.3</td>
<td>7.5 8.1 8.1 8.1</td>
<td></td>
</tr>
</tbody>
</table>

**Width Modification Regarding Edge of Pavement Treatment:**

<table>
<thead>
<tr>
<th>No Stabilized Shoulder</th>
<th>None</th>
<th>None</th>
<th>None</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mountable Curb</td>
<td>None</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>Barrier Curb:</td>
<td>Add 0.3 m</td>
<td>None</td>
<td>Add 0.3 m</td>
</tr>
<tr>
<td>One Side</td>
<td>Add 0.6 m</td>
<td>Add 0.3 m</td>
<td>Add 0.6 m</td>
</tr>
<tr>
<td>Two Sides</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stabilized Shoulder, One or Both sides</td>
<td>None</td>
<td>Deduct Shoulder width; minimum pavement width under Case I ²</td>
<td>Deduct 0.6 m where shoulder is 1.2 m or wider</td>
</tr>
</tbody>
</table>

1 A= predominantly P vehicles, but some consideration for SU trucks. 
B= sufficient SU vehicles to govern design, but some consideration for semitrailer vehicles, (Generally SU plus semitrailer vehicles =5 to 10% of the total traffic volume) 
C= sufficient bus and combination-types of vehicles to govern design, (over 10% of total traffic volume) 
D= for ramps and turning roadways connecting to Qualifying Highways on the national network of Designated Truck Access Highways (1982 STAA highways) 

2 For Design Traffic Condition D, only use minimum pavement width under Case I if the WB-19 and WB-20 vehicles are less than 10% of the total traffic volume.
### Table 2-8 Ramp and Turning Roadway Alignment

<table>
<thead>
<tr>
<th>Design Speed, km/h</th>
<th>Maximum % Grade</th>
<th>Minimum Radius, m</th>
<th>Maximum¹ Superelevation</th>
<th>Stopping Sight Distance, m</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Minimum</td>
</tr>
<tr>
<td>30</td>
<td>8</td>
<td>25</td>
<td>2% to 6%²</td>
<td>30</td>
</tr>
<tr>
<td>40</td>
<td>7</td>
<td>50</td>
<td>4% to 6%²</td>
<td>50</td>
</tr>
<tr>
<td>50</td>
<td>7</td>
<td>80</td>
<td>6%</td>
<td>60</td>
</tr>
<tr>
<td>60</td>
<td>6</td>
<td>125</td>
<td>6%</td>
<td>80</td>
</tr>
<tr>
<td>70</td>
<td>5</td>
<td>195</td>
<td>6%</td>
<td>100</td>
</tr>
<tr>
<td>80</td>
<td>5</td>
<td>250</td>
<td>6%</td>
<td>120</td>
</tr>
</tbody>
</table>

1. Maximum superelevation = 8% may be retained if currently used on ramps and turning roadways. For a maximum superelevation = 8% the minimum radii for 30, 40 and 50 km/h are as shown above and for higher design speeds are as follows:

<table>
<thead>
<tr>
<th>Design Speed, km/h</th>
<th>Minimum Radius, m</th>
</tr>
</thead>
<tbody>
<tr>
<td>60</td>
<td>115</td>
</tr>
<tr>
<td>70</td>
<td>175</td>
</tr>
<tr>
<td>80</td>
<td>230</td>
</tr>
</tbody>
</table>

2. Desirably use a maximum superelevation rate in the upper half or third of the indicated range.
2.7.5.3 Speed Change Lanes

Acceleration lanes, deceleration lanes and combination acceleration-deceleration lanes have the same lane width as the adjacent travel lanes. The minimum shoulder width = 1.8 m on interstates and other freeways and 1.2 m on other roadways. All other controlling design elements (grades, stopping sight distance, etc.) are the same as apply for the adjacent roadway.

The lengths of acceleration and deceleration lanes are not critical design elements. However the lengths, as determined from Chapter 10 in AASHTO’s, "A Policy on Geometric Design of Highways and Streets", 1990 should be provided. If these lengths are not provided an explanation must be included in the design report.

2.7.5.4 Turning Roadways

The design speed of turning roadways may range from 20 km/h to 60 km/h. Determine the widths from Table 2-7. The vertical and horizontal alignment elements are normally determined from Table 2-8. However for a 20 km/h design speed a radius of 10 m may be used with superelevation ranging from 2% minimum to 6% maximum. Also a lateral clearance = 0.6 m minimum shall be provided from the edge of pavement to vertical elements.

2.7.5.5 Collector-Distributor Roads

The design speed of a collector-distributor road should be no less than 20 km/h below the design speed of the adjacent mainline roadway. Lane and shoulder widths should be the same as apply for the adjacent mainline roadway. The other controlling design elements (horizontal curve, stopping sight distance, etc.) should be modified appropriately if a design speed less than the mainline design speed is used.

2.7.5.6 Frontage Roads

The design criteria for frontage roads or service roads should be consistent with the design criteria for the functional class of the frontage or service road.

2.7.5.7 Climbing Lanes

Climbing lanes should have the same lane width as the adjacent travel lanes. The minimum shoulder width for a climbing lane on interstates and other freeways is 1.8 m. The minimum shoulder width for a climbing lane on arterials, collectors and local roads is 1.2 m, or the shoulder width of the highway, whichever is less. All other controlling design elements (grades, stopping sight distances, etc.) are the same as applies for the adjacent roadway.

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### Table 2-9 Values for Design Elements Related to Design Speed and Horizontal Curve ($e_{\text{max}} = 4\%$)

<table>
<thead>
<tr>
<th>$V_r$ (kph)</th>
<th>$R$ (m)</th>
<th>$e$ (%)</th>
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**Legend:**
- **R** = radius of curve
- **V** = assumed design speed
- **e** = rate of superelevation (%)  
- **L** = minimum length of runoff (does not include tangent runoff)
- **NC** = normal cross slope
- **RC** = remove adverse cross slope, superelevate at normal cross slope
- **e_{max} = 4\%**
- **Note:** Lengths rounded in multiples of 10 m permit simpler calculations. In recognition of safety considerations use of $e_{\text{max}} = 4\%$ should be limited to urban conditions.

_Taken from "A Policy on Geometric Design of Highways and Streets", Unofficial Draft, Jan. 1994._
Table 2-10 Values for Design Elements Related to Design Speed and Horizontal Curve ($e_{\text{max}} = 6\%$)

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$R$ = radius of curve  
$V$ = assumed design speed  
$e$ = rate of superelevation (%)  
$L$ = minimum length of runoff (does not include tangent runoff)

Note: Lengths rounded in multiples of 10 m permit simpler calculations.

Table 2-11 Values for Design Elements Related to Design Speed and Horizontal Curve (e_max = 8%)

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<td>0</td>
<td>0</td>
<td>NC</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>NC</td>
</tr>
<tr>
<td>280</td>
<td>0</td>
<td>0</td>
<td>NC</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>NC</td>
</tr>
<tr>
<td>290</td>
<td>0</td>
<td>0</td>
<td>NC</td>
<td>0</td>
<td>0</td>
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<td>NC</td>
</tr>
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<td>300</td>
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<td>0</td>
<td>NC</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>NC</td>
</tr>
</tbody>
</table>

R = radius of curve
V = assumed design speed
e = rate of superelevation (%)
L = minimum length of runoff (does not include tangent runoff)

NC = normal cross slope
RC = remove adverse cross slope, superelevate at normal cross slope

Note: Lengths rounded in multiples of 10 m permit simpler calculations.
2.8 REQUIREMENTS FOR JUSTIFICATION OF NON-STANDARD FEATURES

In recognition of the fact that meeting established criteria for the critical design elements is not always feasible, cost effective or warranted based on project specific conditions, a procedure has been established by the Department to obtain approval of exceptions to these standards. This procedure, described in the Design Procedure Manual, includes documentation in the Design Approval Document of the rationale for not meeting applicable criteria. The extent of the documentation or justification is influenced by project conditions and not by the project type or the approving authority.

The data provided must include the rationale to support the designer's decision to include a non-standard critical design element. A separate discussion in support of retention or creation of each non-standard feature included must be provided. This information is only required for the design alternative for which design approval is sought. However, there may be situations when the same data should be included in earlier project reports for other alternatives. This would occur when the use of non-standard features are relevant to environmental determinations and/or when relevant to the advantages and disadvantages of feasible alternatives. In support of the designer's rationale the following information must either be provided, or an explanation given as to why the information was not considered to be applicable:

1. Typical Section(s) - Typical section(s) which show the proposed element in question in relation to both the existing roadway and other proposed elements.

2. Accident Analysis - An analysis of accident data related to the element in question.

3. Cost Estimates - An estimate of the cost of meeting the design criteria for the element in question, as well as incremental cost estimates for different levels of improvement between the condition proposed and fully meeting the applicable criteria. A benefit/cost analysis which weighs the cost of fully meeting the applicable criteria with the benefits which would be derived, may be considered when appropriate data is accessible.

4. Compatibility - A discussion of compatibility with the adjacent sections of roadway, and the future expectations of the route.

5. Other Factors - Information about any other factors, such as right-of-way or environmental constraints, which have a significant bearing on the ability to meet the design criteria for the element in question.

Strict application of each item in all instances may be inappropriate. These items should serve as a guide since the information outlined is generally applicable to the range of critical design elements. In addition, if a sidewalk, ramp, curb ramp, stairway, or other pedestrian facility cannot fully comply with accessibility standards found in the Americans with Disabilities Act Accessibility Guidelines, it must be made accessible to the maximum extent practicable. The reasons that full compliance with the standards are not feasible must be documented in the Design Approval Document and must be consistent with the reasons for infeasibilities found in
2.9 REFERENCES


6. Guidelines for Highways Within the Adirondack Park, New York State Department of Transportation, State Campus, Albany, NY 12232.


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2.7 STANDARDS

This section provides the standard values for the critical design elements.

The values are provided for each functional classification, with further division of arterials, collectors and local roads for rural and urban conditions, similar to the format of AASHTO's "A Policy on Geometric Design of Highways and Streets", 1990. In addition, values are provided for other roadways such as parkways, ramps, speed change lanes, turning roadways, climbing lanes, collector-distributor roadways and frontage roads. When these values are not met, concurrence with non-standard features must be obtained from FHWA or the Regional Director as described in Section 2.8 and in the Design Procedure Manual.

The values shown are the minimum or maximum values or other parameters as applicable. In some cases further refinement of the values, dependent on certain conditions, are provided.

Desirable values are also provided for a few of the critical design elements (horizontal and vertical stopping sight distance, wider shoulders on certain interstates and other freeways, curb offsets on urban streets and turning lanes). Whenever practicable, considering factors such as cost limitations and social, economic and environmental impacts, the designer should strive to achieve the desirable or other levels better than the minimum or maximum values shown. Stopping sight distance is a prime example. For a 60 mph design speed the minimum stopping sight distance is based on an assumed wet weather average running speed of 52 mph. AASHTO notes that studies show many operators drive just as fast on wet pavement as they do on dry pavement. Therefore the desirable values for stopping sight distance should be used for design whenever practicable, considering factors such as cost and impacts as noted above.

It is intended that the minimum widths be used for travel lane and shoulder widths, except for the desirable wider shoulders noted on certain interstates and other freeways.

The values for bridge widths are established by the NYSDOT "Geometric Design Policy for Bridges," July 1993. They are influenced by future plans for the adjacent highway and should be considered both the minimum acceptable and the desirable values.

2.7.1 Interstates and Other Freeways

2.7.1.1 Interstates

The design criteria for interstate highways are detailed in sections A to Q below.

Note - For interstate resurfacing, restoration and rehabilitation (I 3R) projects the standards used for horizontal and vertical alignment, and travel lane, shoulder and median widths may be the AASHTO interstate standards that were in effect at the time of original construction or
inclusion into the interstate system. However the design speed should be established in accordance with the guidance in this section.

A. Design Speed

The design speed selected should be consistent with any planned improvements for the facility or travel corridor and should be the higher speed of either:

1. a speed based on the functional class of the highway, the terrain (level, rolling or mountainous) and adjacent character of the area (rural or urban) which the highway traverses, or

2. a speed which fits the travel desires and habits of nearly all drivers (the 85th percentile) for the anticipated off-peak conditions.

In addition, the design speed selected should be consistent with the speed previously established on adjacent projects. However, significant changes in the highway environment or terrain may necessitate a different design speed for different highway segments within the project or between adjacent projects. The use of different design speeds for continuous segments of a facility should be kept to a minimum to better assure consistency of design features such as vertical and horizontal alignment.

With respect to the functional class, for interstates a design speed of 70 mph should be used for rural areas. Where terrain is mountainous, a design speed of 60 mph or 50 mph, which is consistent with driver expectancy, may be used. A design speed of 60 mph is acceptable for rolling terrain. In urban areas, the design speed shall be at least 50 mph. Design speed shall equal or exceed the posted speed in every case.

One or more of the following methods should be used to establish a value for the anticipated off-peak 85th percentile speed for the proposed improvements:

1. Use statewide speed studies for a similar interstate or other freeway facility. Statewide 85th percentile speeds are provided in the "Annual Report on Highway Speeds" published each year by the NYSDOT Planning Division. The Regional Traffic Engineering and Safety Group must verify that the use of the statewide speed study to determine the anticipated off-peak 85th percentile speed for the project is acceptable.

2. Conduct spot speed studies for the project using radar or, where feasible, automatic traffic recorders. The Regional Traffic Engineering and Safety Group may do the radar study or must be consulted on how to conduct these studies in order to obtain statistically reliable results.

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Since speeds often increase when there is a new pavement surface and when geometric improvements are made, engineering judgement should be exercised in determining the reasonableness and applicability of the design speed obtained using the above methods. Scoping documents, design approval documents, etc. must contain a statement that the design speed is consistent with or greater than the anticipated off-peak 85th percentile speed once the proposed improvements have been completed.

B. Lane Width

Travel lanes = 12 ft. minimum.

C. Shoulder Width

The right side shoulder = 10 ft. minimum. In mountainous terrain involving high cost for additional width, the right shoulder = 6 ft. minimum. The left side shoulder = 4 ft. minimum.

Where trucks exceed 250 DDHV (directional design hourly volume) the right side shoulder should desirably = 12 ft. For interstates of six or more lanes the left side shoulder should desirably = 10 ft. and, where trucks exceed 250 DDHV, = 12 ft.

D. Bridge Roadway Width

Determine from NYSDOT "Geometric Design Policy for Bridges."

E. Grade

Determine maximum from Table 2-1.

F. Horizontal Curvature

Determine maximum from Table 2-1. For curves flatter than the maximum, the degree of curve and superelevation on each horizontal curve shall be correlated with the design speed in accordance with the $e_{\text{max}} = 0.06$ table, Table III-9, in AASHTO's "A Policy on Geometric Design of Highways and Streets," 1990.

G. Superelevation

0.06 maximum

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H. Stopping Sight Distance (Horizontal and Vertical)

Determine minimum and desirable distances from Table 2-1.

I. Lateral Clearance

Minimum = Shoulder width but never less than 4 ft, except on bridges where the NYSDOT "Geometric Design Policy for Bridges" allows less than 4 ft.

J. Vertical Clearance

Determine minimum from NYSDOT "Geometric Design Policy for Bridges".

K. Pavement Cross Slope

Travel lanes = 1.5% minimum to 2% maximum.

L. Rollover

Between travel lanes = 4% maximum. At pavement edge = 8% maximum.

M. Structural Capacity

Determine from NYSDOT "Geometric Design Policy for Bridges".

N. Level of Service

A minimum of four traffic lanes shall be provided on the Interstate System. The number of lanes shall be sufficient to accommodate the selected DDHV (directional design hourly volume) at an acceptable level of service as listed below, and shall be determined on the basis of service volumes for the applicable conditions as given in AASHTO's "A Policy on Geometric Design of Highways and Streets," 1990. On ascending grades which exceed the critical design length, a climbing lane analysis shall be made in accordance with TRB Special Report 209 "Highway Capacity Manual", and AASHTO's "A Policy on Geometric Design of Highways and Streets," 1990, and climbing lanes added where warranted.
The following levels of service are the criteria for interstates:

- Rural, level terrain       LOS = B minimum
- Rural, rolling terrain    LOS = B minimum
- Rural, mountainous terrain LOS = C minimum
- Urban and suburban\(^1\)   LOS = C minimum

\(^1\)In heavily developed sections of metropolitan areas conditions may necessitate LOS = D minimum. Scoping closure and design approval documents should include documentation of the heavily developed metropolitan area conditions.

Some interstate projects, especially in urban areas, will provide levels of service below those above due to social, economic and environmental and/or policy/intergovernmental decisions during project scoping and design. Such decisions for lesser levels of service should be made in accordance with National Environmental Policy Act (NEPA) and/or State Environmental Quality Review Act (SEQRA) procedures and, where applicable, with the Major Metropolitan Transportation Investment process. These decisions should be supported and documented in the design approval documents.

O. Control of Access

Access to the interstate system shall be fully controlled.

Access is to be achieved by interchanges at selected public highways. 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.

Control for connections to the crossroad should be provided beyond the ramp terminals by purchasing access rights or providing frontage roads. Such control should extend beyond the ramp terminal at least 100 feet in urban areas and 300 feet in rural areas (see Chapter 6 of the Highway Design Manual for more specific details).

The interstate highway shall be grade separated at all railroad crossings and selected public crossroads. All at-grade intersections of public highways shall be eliminated. To accomplish this the connecting roads are to be terminated, rerouted, or intercepted by frontage roads.

P. Pedestrian Accommodation

To assure access for persons with disabilities, pedestrian facilities shall be located and constructed in accordance with Chapter 18 of the Highway Design Manual and the Americans with Disabilities Act Accessibility Guidelines for Buildings and Facilities.
### Table 2-1 Interstates and Freeways Other Than Interstates

<table>
<thead>
<tr>
<th>Design Speed, mph</th>
<th>Maximum Percent Grade&lt;sup&gt;1&lt;/sup&gt;</th>
<th>Stopping Sight Distance, Ft.</th>
<th>Maximum Degree Curve&lt;sup&gt;2&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Level</td>
<td>Rolling</td>
<td>Mount.</td>
</tr>
<tr>
<td>50</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>55</td>
<td>3.5</td>
<td>4.5</td>
<td>6</td>
</tr>
<tr>
<td>60</td>
<td>3</td>
<td>4</td>
<td>6</td>
</tr>
<tr>
<td>65</td>
<td>3</td>
<td>4</td>
<td>5.5</td>
</tr>
<tr>
<td>70</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

<sup>1</sup> Grades 1 percent steeper may be used for extreme cases in urban areas where development precludes the use of flatter grades and for one-way downgrades except in mountainous terrain.
Q. Median Width

Medians in rural areas in level or rolling terrain shall be at least 36 ft. wide. Medians in mountainous terrain or in urban areas shall be at least 10 ft. wide.

2.7.1.2 Other Freeways

The design criteria for freeways other than interstates is the same as Section 2.7.1.1 Interstates with the exception of Section 2.7.1.1N (Level of service is not a standard for other freeways).

2.7.2 Arterials

2.7.2.1 Rural Arterials

The design criteria for undivided and divided rural arterials are as follows:

A. Design Speed

The design speed selected should be consistent with any planned improvements for the facility or travel corridor and should be the higher speed of either;

1. a speed based on the functional class of the highway, the terrain (level, rolling or mountainous) and adjacent character of the area (rural or urban) which the highway traverses, or

2. a speed which fits the travel desires and habits of nearly all drivers (85th percentile) for the anticipated off-peak conditions.

In addition, the design speed selected should be consistent with the speed previously established on adjacent projects. However, significant changes in highway environment or terrain may necessitate a different design speed for different highway segments within the project (i.e. rural, urban, flat, mountainous, side roads, etc.). The use of different design speeds for continuous segments of a facility should be kept to a minimum to better assure consistency of design features such as vertical and horizontal alignment.

With respect to the functional class, for rural arterials design speeds should be at least 60 mph and normally 70 mph in level terrain, at least 50 mph and normally 60 mph in rolling terrain and at least 40 mph and normally 50 mph in mountainous terrain.

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One or more of the following methods should be used to establish a value for the anticipated off-peak 85th percentile speed for the proposed improvements:

1. Use statewide speed studies for a similar facility when the speed limit is 55 mph. Statewide 85th percentile speeds are provided in the "Annual Report on Highway Speeds" published each year by the NYSDOT Planning Division. The Regional Traffic Engineering and Safety Group must verify that the use of the statewide speed study to determine the anticipated off-peak 85th percentile speed for the project is acceptable.

2. Use the data that was obtained to establish any regulatory speed zone or zones within the project limits if such data is still representative of current and anticipated conditions. This method should only apply where there will not be improvements which create substantial vertical and/or horizontal alignment or other changes that will increase speeds. The Regional Traffic Engineering and Safety Group must verify the data is current and is suitable for use on the project.

3. Use the speed limit plus 5 mph to set the design speed. This method should be used only when there are known off-peak, 85th percentile speeds on comparable existing facilities that approximate the speed limit plus 5 mph. The Regional Traffic Engineering and Safety Group must verify the reasonableness of the anticipated off peak 85th percentile speed as part of their field investigation of the project.

4. Conduct spot speed studies for the project using radar or, where feasible, automatic traffic recorders where volumes are high or using test cars or following car techniques where volumes are low. The Regional Traffic Engineering and Safety Group may do the radar study or must be consulted on how to conduct these studies in order to obtain statistically reliable results.

For spot improvements (bridge replacements, intersection improvements, etc.), where there are no planned improvements to adjacent sections of the highway, the speed studies should be done on adjacent sections of the highway so that a design speed is established that is consistent with or greater than the adjacent sections.

Since speeds often increase when there is a new pavement surface and when geometric improvements are made, engineering judgement should be exercised in determining the reasonableness and applicability of the design speed obtained using the above methods. Scoping documents, design approval documents, etc. must contain a statement that the design speed is consistent with or greater than the anticipated off-peak 85th percentile speed once the proposed improvements have been completed.
If a design speed is selected which is below the speed limit, appropriate warning signs and speed advisory signs must be provided in accordance with the NYSDOT "Manual of Uniform Traffic Control Devices".

B. Lane Width

Travel Lane Width - For undivided rural arterials determine from Table 2-2 except on routes designated as Qualifying Highways on the national network of Designated Truck Access Highways (1982 STAA highways), travel lanes = 12 ft. minimum.

For multilane, divided rural arterials the travel lane width = 12 ft. minimum. On reconstructed divided, multilane arterials it may be acceptable to retain 11 ft. lanes if the alignment and safety records are acceptable. However for routes designated as Qualifying Highways on the national network of Designated Truck Access Highways (1982 STAA highways), travel lanes = 12 ft. minimum.

For bridge projects determine the lane width from the NYSDOT "Geometric Design Policy for Bridges".

Turning lane width = 10 ft. minimum. Desirably the turning lane width should be the same as the travel lane width.

C. Shoulder Width

For undivided, rural arterials determine the minimum from Table 2-2.

For multilane, divided rural arterials the right side shoulder = 8 ft. minimum. The left side shoulder = 2 ft. minimum where the median is level (2% or flatter). Where the median is sloped, the left side shoulder = 4 ft. minimum.

For bridge projects determine the shoulder width from the NYSDOT "Geometric Design Policy for Bridges".

D. Bridge Roadway Width

Determine from NYSDOT "Geometric Design Policy for Bridges."

E. Grade

Determine maximum from Table 2-2.
F. Horizontal Curvature

Determine maximum from Table 2-2. For curves flatter than the maximum, the degree of curve and superelevation on each horizontal curve shall be correlated with the design speed in accordance with the $e_{\text{max}}=0.06$ table, Table III-9, in AASHTO’s "A Policy on Geometric Design of Highways and Streets," 1990.

G. Superelevation

0.06 maximum

H. Stopping Sight Distance (Horizontal and Vertical)

Determine minimum and desirable distances from Table 2-2.

I. Lateral Clearance

Minimum = Shoulder width but not less than 4 ft., except for bridges on minor arterials where the NYSDOT "Geometric Design Policy for Bridges" allows less than 4 ft.

J. Vertical Clearance

Determine minimum from NYSDOT "Geometric Design Policy for Bridges".

K. Pavement Cross Slope

1.5% minimum to 2% maximum.

L. Rollover

Between travel lanes = 4% maximum. At pavement edge = 8% maximum.

M. Structural Capacity

Determine from NYSDOT "Geometric Design Policy for Bridges".

7/11/94
| Design speed, mph | Travel Lane Width, Ft. | Maximum % Grade | Stopping Sight Distance, Ft. | Max. Degree Curve, $e_{max}$
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Current AADT Under 400</td>
<td>Current AADT 400 &amp; Over</td>
<td>DHV$^2$ 100 to 200</td>
<td>DHV Over 200</td>
</tr>
<tr>
<td>40</td>
<td>11</td>
<td>11</td>
<td>11</td>
<td>12</td>
</tr>
<tr>
<td>45</td>
<td>11</td>
<td>12</td>
<td>12</td>
<td>12</td>
</tr>
<tr>
<td>50</td>
<td>11</td>
<td>12</td>
<td>12</td>
<td>12</td>
</tr>
<tr>
<td>55</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
</tr>
<tr>
<td>60</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
</tr>
<tr>
<td>65</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
</tr>
<tr>
<td>70</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
</tr>
<tr>
<td>Shoulder Width, Ft.</td>
<td>All Speeds</td>
<td>4</td>
<td>6</td>
<td>6</td>
</tr>
</tbody>
</table>

1 Width of travel lane may remain 11 ft. on reconstructed highways where accident history is satisfactory.

2 DHV = Future two way design hourly volume. If the current AADT exceeds 400 and the DHV exceeds 100, this column or the column to the right for the DHV applies.
N. Pedestrian Accommodation

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

O. Median Width

For multilane, divided rural arterials, median = 4 ft. minimum without left turn lanes. Where left turn lanes are provided the median = 12 ft. minimum (10 ft. left turn lane with 2 ft. median separation).

2.7.2.2 Urban Arterials

The design criteria for urban arterials are as follows:

A. Design Speed

Determine the design speed as described in Section 2.7.2.1A. With respect to the functional class, design speeds for urban arterials normally range from 40 mph to 60 mph and occasionally may be as low as 30 mph in the central business district and immediate areas.

B. Lane Width

Travel Lane Width = 11 ft. minimum for most arterial streets. For higher speed (design speed of 50 mph or above), free flowing principal arterials travel lane width = 12 ft. minimum. For highly restricted areas with no or little truck traffic (0 to 2%) travel lane width = 10 ft. minimum. However on routes designated as Qualifying Highways on the national network of Designated Truck Access Highways (1982 STAA highways), travel lane width = 12 ft. minimum.

For bridge projects determine lane width from the NYSDOT "Geometric Design Policy for Bridges."

Left and right turn lanes = 10 ft. minimum, 11 ft. desirable. For minor arterials 9 ft. minimum turn lanes may be used where an overall impact assessment concludes wider lanes would have unacceptable impacts such as taking property. Two-way left turn lanes = 11 ft. minimum, 16 ft. desirable. Parking lane width = 8 ft. minimum.

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C. Shoulder Width

Normally no shoulder is required. However, if a shoulder is provided with a nonmountable curb at the back of shoulder, the shoulder = 6 ft. minimum.

For bridge projects determine shoulder width from NYSDOT "Geometric Design Policy for Bridges".

A curb offset is not a critical design element. However, with a nonmountable curb, a 1 ft. or 2 ft. curb offset from the travel lane is desirable. Curb offset is one of the design elements that, if not provided, should be explained in the design approval document.

D. Bridge Roadway Width

Determine from NYSDOT "Geometric Design Policy for Bridges."

E. Grade

Determine maximum from Table 2-3.

F. Horizontal Curvature

Determine maximum from Table 2-3. For curves less than the maximum, the degree of curve and superelevation on each horizontal curve shall be correlated with the design speed in accordance with the $e_{\text{max}} = 0.04$ table, Table III-8, in AASHTO's "A Policy on Geometric Design of Highways and Streets," 1990.

For low speed (40 mph and below) urban streets in heavily built-up residential, commercial or industrial areas sharper curves are allowed. The maximum horizontal curve shown below may be used:

<table>
<thead>
<tr>
<th>Design Speed, mph</th>
<th>Maximum Degree Curve ($e_{\text{max}} = 0.04$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>30</td>
<td>25.00</td>
</tr>
<tr>
<td>35</td>
<td>16.50</td>
</tr>
<tr>
<td>40</td>
<td>11.75</td>
</tr>
</tbody>
</table>

For curves on low speed urban streets flatter than the maximum degree of curve above, for $e_{\text{max}} = 0.04$ but sharper than the maximum degree of curve shown below for normal crown, use 0.02 superelevation (i.e. remove adverse crown). Curves flatter than that shown below may use normal crown.
<table>
<thead>
<tr>
<th>Design Speed, mph</th>
<th>Maximum Degree Curve (normal crown)</th>
</tr>
</thead>
<tbody>
<tr>
<td>30</td>
<td>19.25</td>
</tr>
<tr>
<td>35</td>
<td>12.25</td>
</tr>
<tr>
<td>40</td>
<td>8.50</td>
</tr>
</tbody>
</table>

G. Superelevation

0.04 maximum.

H. Stopping Sight Distance (Horizontal and Vertical)

Determine minimum and desirable from Table 2-3.

I. Lateral Clearance

For curbed streets, 1.5 ft. minimum from face of curb to the vertical element. For uncurbed streets, 4 ft. minimum, except on bridges where the NYSDOT "Geometric Design Policy for Bridges" allows less than 4 ft.

J. Vertical Clearance

Determine minimum from NYSDOT "Geometric Design Policy for Bridges".

K. Pavement Cross Slope

Travel lanes 1.5% minimum to 2% maximum. Parking lanes = 1.5% minimum to 4% maximum.

L. Rollover

Between travel lanes = 4% maximum. At pavement edge = 8% maximum.

M. Structural Capacity

Determine from the NYSDOT "Geometric Design Policy for Bridges".

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### Table 2-3: Urban Arterials

<table>
<thead>
<tr>
<th>Design Speed, mph</th>
<th>Level</th>
<th>Rolling</th>
<th>Mountainous</th>
<th>Maximum Percent Grade</th>
<th>Maximum Degree Curve $\theta_{max} = 0.04$</th>
</tr>
</thead>
<tbody>
<tr>
<td>30</td>
<td>8</td>
<td>9</td>
<td>11</td>
<td>200</td>
<td>19.00</td>
</tr>
<tr>
<td>35</td>
<td>7.5</td>
<td>8.5</td>
<td>10.5</td>
<td>225</td>
<td>13.50</td>
</tr>
<tr>
<td>40</td>
<td>7</td>
<td>8</td>
<td>10</td>
<td>275</td>
<td>10.00</td>
</tr>
<tr>
<td>45</td>
<td>6.5</td>
<td>7.5</td>
<td>9.5</td>
<td>325</td>
<td>7.75</td>
</tr>
<tr>
<td>50</td>
<td>6</td>
<td>7</td>
<td>9</td>
<td>400</td>
<td>6.00</td>
</tr>
<tr>
<td>55</td>
<td>5.5</td>
<td>6.5</td>
<td>8.5</td>
<td>450</td>
<td>4.75</td>
</tr>
<tr>
<td>60</td>
<td>5</td>
<td>6</td>
<td>8</td>
<td>525</td>
<td>3.75</td>
</tr>
</tbody>
</table>

Stopping Sight Distance, Ft.:
- Desirable
- Minimum

### APPENDIX A - DESIGN CRITERIA

7/11/94
N. Pedestrian Accommodations

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

2.7.3 **Collector Roads and Streets**

2.7.3.1 Rural Collectors

The design criteria for rural collectors are as follows:

A. **Design Speed**

Determine design speed as described in Section 2.7.2.1A. With respect to the functional class, for rural collectors the design speed must equal or exceed the design speeds listed below:

<table>
<thead>
<tr>
<th>Type of Terrain</th>
<th>Current AADT 0-400</th>
<th>Current AADT Over 400</th>
<th>DHV(^1) 100-200</th>
<th>DHV 200-400</th>
<th>DHV Over 400</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level</td>
<td>40</td>
<td>50</td>
<td>50</td>
<td>60</td>
<td>60</td>
</tr>
<tr>
<td>Rolling</td>
<td>30</td>
<td>40</td>
<td>40</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>Mountainous</td>
<td>20</td>
<td>30</td>
<td>30</td>
<td>40</td>
<td>40</td>
</tr>
</tbody>
</table>

\(^1\)DHV = future two way design hourly volume. If the current AADT exceeds 400 and the DHV exceeds 100 this column or the appropriate column to the right based on DHV applies.

B. **Lane Width**

Travel Lane Width - Determine minimum from Table 2-4. However, for routes designated as Qualifying Highways on the national network of Designated Truck Access Highways (1982 STAA highways), travel lane width = 12 ft. minimum.

For bridge projects determine the lane width from the NYSDOT "Geometric Design Policy for Bridges".

7/11/94
Turning Lane Width - 10 ft. minimum, 11 ft. desirable.

C. Shoulder Width
Determine minimum from Table 2-4.

For bridge projects determine the shoulder width from the NYSDOT "Geometric Design Policy for Bridges".

D. Bridge Roadway Width
Determine minimum from NYSDOT "Geometric Design Policy for Bridges".

E. Grade
Determine maximum from Table 2-4.

F. Horizontal Curvature
Determine maximum from Table 2-4. For curves flatter than the maximum, the degree of curve and superelevation on each horizontal curve shall be correlated with the design speed in accordance with the \( e_{max} = 0.06 \) table, Table III-9, in AASHTO's "A Policy on Geometric Design of Highways and Streets," 1990.

G. Superelevation
0.06 maximum

H. Stopping Sight Distance (Horizontal and Vertical)
Determine minimum and desirable distances from Table 2-4.

I. Lateral Clearance
Minimum = shoulder width but never less than 4 ft., except on bridges where the NYSDOT "Geometric Design Policy for Bridges" allows less than 4 ft.
<table>
<thead>
<tr>
<th>Design Speed, mph</th>
<th>Travel Lane Width, Ft.</th>
<th>Maximum % Grade²</th>
<th>Stopping Sight Distance, Ft.</th>
<th>Max. Degree Curve eₘₐₓ= 0.06</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>DHV¹ 100 to 200</td>
<td>DHV 200 to 400</td>
<td>DHV Over 400</td>
<td>Min.</td>
</tr>
<tr>
<td></td>
<td>Current AADT Under 400 &amp; Over</td>
<td>Current AADT Over</td>
<td>Terrain</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>11</td>
</tr>
<tr>
<td>25</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>11</td>
</tr>
<tr>
<td>30</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>11</td>
</tr>
<tr>
<td>35</td>
<td>10</td>
<td>11</td>
<td>11</td>
<td>11</td>
</tr>
<tr>
<td>40</td>
<td>10</td>
<td>11</td>
<td>11</td>
<td>11</td>
</tr>
<tr>
<td>45</td>
<td>10</td>
<td>11</td>
<td>11</td>
<td>12</td>
</tr>
<tr>
<td>50</td>
<td>10</td>
<td>11</td>
<td>11</td>
<td>12</td>
</tr>
<tr>
<td>55</td>
<td>11</td>
<td>11</td>
<td>11</td>
<td>12</td>
</tr>
<tr>
<td>60</td>
<td>11</td>
<td>11</td>
<td>11</td>
<td>12</td>
</tr>
<tr>
<td>65</td>
<td>11</td>
<td>11</td>
<td>11</td>
<td>12</td>
</tr>
<tr>
<td>70</td>
<td>11</td>
<td>11</td>
<td>11</td>
<td>12</td>
</tr>
</tbody>
</table>

Shoulder Width, Ft.

1 DHV = future two way design hourly volume. If the current AADT exceeds 400 and the DHV exceeds 100 this column or the appropriate column to the right for the DHV applies.
2 Maximum grades of short lengths (less than 500 ft.), on one-way down grades and on low volume (<100 DHV) rural collectors may be 2% steeper.
3 Minimum width is 4 ft. if roadside barrier is utilized.
4 6 ft. shoulders may be used in mountainous terrain.
J. Vertical Clearance

Determine minimum from the NYSDOT "Geometric Design Policy for Bridges".

K. Pavement Cross Slope

Travel lanes = 1.5% minimum to 2% maximum.

L. Rollover

Between travel lanes = 4% maximum. At pavement edge = 8% maximum.

M. Structural Capacity

Determine from the NYSDOT "Geometric Design Policy for Bridges".

N. Pedestrian Accommodations

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

2.7.3.2 Urban Collectors

The design criteria for urban collectors are as follows:

A. Design Speed

Determine design speed as described in Section 2.7.2.1A. With respect to functional class, for urban collectors the design speed must equal or exceed 30 mph.

B. Lane Width

Travel lane width = 11 ft. minimum for most urban collectors with 12 ft. minimum for urban collectors in industrial areas. Where ROW imposes severe limitations, in residential areas travel lane width = 10 ft. minimum and in industrial areas = 11 ft. minimum. However, for routes designated as Qualifying Highways on the national network of Designated Truck Access Highways (1982 STAA highways), travel lane width = 12 ft. minimum.

7/11/94
For bridge projects determine the lane width from the NYSDOT "Geometric Design Policy for Bridges".

Turning Lane Widths - Left and right turn lanes = 10 ft. minimum, 11 ft. desirable, although 9 ft. minimum may be used where an overall impact assessment concludes wider lanes would have unacceptable impacts such as taking property. Two-way left turn lanes = 10 ft. minimum, 11 ft. desirable.

Parking Lane Width - Parking lanes = 7 ft. minimum in residential areas and = 9 ft. minimum in commercial and industrial areas.

C. Shoulder Width

No shoulder is required.

For bridge projects determine the shoulder width from the NYSDOT "Geometric Design Policy for Bridges".

A curb offset is not a critical design element. However, with a nonmountable curb, a 1 ft. or 2 ft. curb offset from the travel lane is desirable. Curb offset is one of the design elements that, if not provided, should be explained in the design approval document.

D. Bridge Roadway Width

Determine minimum from NYSDOT "Geometric Design Policy for Bridges".

E. Grade

Determine maximum from Table 2-5.

F. Horizontal Curvature

Determine maximum from Table 2-5. For curves less than the maximum, the degree of curve and superelevation on each horizontal curve shall be correlated with the design speed in accordance with the $e_{\text{max}} = 0.04$ table, Table III-8, in AASHTO's "A Policy on Geometric Design of Highways and Streets," 1990.

For low speed (40 mph and below) urban streets in heavily built-up residential, commercial or industrial areas sharper curves are allowed. The maximum horizontal curve shown below may be used:

7/11/94
Design Speed, mph | Maximum Degree Curve \((e_{\text{max}} = 0.04)\)
--- | ---
30 | 25.00
35 | 16.50
40 | 11.75

For curves on low speed urban streets flatter than the maximum degree of curve above for \(e_{\text{max}} = 0.04\) but sharper than the maximum degree of curve shown below for normal crown, use 0.02 superelevation (i.e. remove adverse crown). Curves flatter than that shown below may use normal crown.

Design Speed, mph | Maximum Degree Curve (normal crown)
--- | ---
30 | 19.25
35 | 12.25
40 | 8.50

G. Superelevation

0.04 maximum

H. Stopping Sight Distance (Horizontal and Vertical)

Determine minimum and desirable from Table 2-5.

I. Lateral Clearance

For curbed streets, 1.5 ft. minimum from face of curb to vertical element. For uncurbed streets, 4 ft. minimum, except on bridges where the NYSDOT "Geometric Design Policy for Bridges" allows less than 4 ft.

J. Vertical Clearance

Determine minimum from the NYSDOT "Geometric Design Policy for Bridges".

K. Pavement Cross Slope

Travel lanes = 1.5% minimum to 2% maximum. Parking lanes = 1.5% minimum to 4% maximum.

7/11/94
### Table 2-5 Urban Collectors

<table>
<thead>
<tr>
<th>Design Speed, mph</th>
<th>Maximum Percent Grade ¹</th>
<th>Stopping Sight Distance, Ft.</th>
<th>Maximum Degree Curve $e_{max} = 0.04$</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Terrain</td>
<td>Minimum</td>
<td>Desirable</td>
</tr>
<tr>
<td></td>
<td>Level</td>
<td>Rolling</td>
<td>Mount.</td>
</tr>
<tr>
<td>30</td>
<td>§</td>
<td>11</td>
<td>12</td>
</tr>
<tr>
<td>35</td>
<td>§</td>
<td>10.5</td>
<td>12</td>
</tr>
<tr>
<td>40</td>
<td>§</td>
<td>10</td>
<td>12</td>
</tr>
<tr>
<td>45</td>
<td>§</td>
<td>9</td>
<td>11</td>
</tr>
<tr>
<td>50</td>
<td>7</td>
<td>8</td>
<td>10</td>
</tr>
<tr>
<td>55</td>
<td>6.5</td>
<td>7.5</td>
<td>9.5</td>
</tr>
<tr>
<td>60</td>
<td>6</td>
<td>7</td>
<td>9</td>
</tr>
</tbody>
</table>

1 Maximum grades of short length (less than 500 ft.) and on one-way down grades may be 2% steeper.
L. Rollover

Between travel lanes = 4% maximum. At pavement edge = 8% maximum.

M. Structural Capacity

Determine from the NYSDOT "Geometric Design Policy for Bridges".

N. Pedestrian Accommodations

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

2.7.4 Local Roads and Streets

2.7.4.1 Local Rural Roads

The design criteria for local rural roads are as follows:

A. Design Speed

Determine design speed as described in Section 2.7.2.1A. With respect to the functional class, for local rural roads, the design speed must equal or exceed the design speeds listed below:

<table>
<thead>
<tr>
<th>Type of Terrain</th>
<th>Minimum Design Speeds (mph)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Current AADT</td>
</tr>
<tr>
<td></td>
<td>Under 50</td>
</tr>
<tr>
<td>Level</td>
<td>30</td>
</tr>
<tr>
<td>Rolling</td>
<td>20</td>
</tr>
<tr>
<td>Mountainous</td>
<td>20</td>
</tr>
</tbody>
</table>

<sup>1</sup>DHV = future two way design hourly volume. If the current AADT exceeds 400 and the DHV exceeds 100 this column or the appropriate column to the right based on DHV applies.
B. Lane Width

Travel Lane Width - Determine minimum from Table 2-6.

For bridge projects determine the lane width from the NYSDOT "Geometric Design Policy for Bridges".

Turning Lane Width - 10 ft. minimum

C. Shoulder Width

Determine minimum from Table 2-6.

For bridge projects determine the shoulder width from the NYSDOT "Geometric Design Policy for Bridges".

D. Bridge Roadway Width

Determine minimum from NYSDOT "Geometric Design Policy for bridges".

E. Grade

Determine maximum from Table 2-6.

F. Horizontal Curvature

Determine maximum from Table 2-6. For curves flatter than the maximum, the degree of curve and superelevation on each horizontal curve shall be correlated with the design speed in accordance with the $e_{\text{max}} = 0.06$ table, Table III-9, in AASHTO's "A Policy on Geometric Design of Highways and Streets," 1990.

G. Superelevation

0.06 maximum.

H. Stopping Sight Distance (Horizontal and Vertical)

Determine minimum and desirable from Table 2-6.

7/11/94
Table 2 - 6 Local Roads and Streets

<table>
<thead>
<tr>
<th>Design Speed mph</th>
<th>Current AADT under 250</th>
<th>Current AADT 250 to 400</th>
<th>Current AADT Over 400</th>
<th>DHV&lt;sup&gt;1&lt;/sup&gt; 100 to 200</th>
<th>DHV 200 to 400</th>
<th>DHV 400&amp; Over</th>
<th>Max. % Grade</th>
<th>Stopping Sight Distance, Ft.</th>
<th>Maximum Degree Curve</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Level</td>
<td>Terrain</td>
<td>Min.</td>
</tr>
<tr>
<td>20</td>
<td>g&lt;sup&gt;2&lt;/sup&gt;</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>11</td>
<td>12</td>
<td>-</td>
<td>11</td>
<td>16</td>
</tr>
<tr>
<td>25</td>
<td>g&lt;sup&gt;2&lt;/sup&gt;</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>11</td>
<td>12</td>
<td>7</td>
<td>10.5</td>
<td>15</td>
</tr>
<tr>
<td>30</td>
<td>g&lt;sup&gt;2&lt;/sup&gt;</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>11</td>
<td>12</td>
<td>7</td>
<td>10</td>
<td>14</td>
</tr>
<tr>
<td>35</td>
<td>10</td>
<td>10</td>
<td>11</td>
<td>11</td>
<td>11</td>
<td>12</td>
<td>7</td>
<td>9.5</td>
<td>13</td>
</tr>
<tr>
<td>40</td>
<td>10</td>
<td>10</td>
<td>11</td>
<td>11</td>
<td>11</td>
<td>12</td>
<td>7</td>
<td>9</td>
<td>12</td>
</tr>
<tr>
<td>45</td>
<td>10</td>
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<td>11</td>
<td>11</td>
<td>11</td>
<td>12</td>
<td>6.5</td>
<td>8.5</td>
<td>11</td>
</tr>
<tr>
<td>50</td>
<td>10</td>
<td>10</td>
<td>11</td>
<td>11</td>
<td>12</td>
<td>12</td>
<td>6</td>
<td>8</td>
<td>10</td>
</tr>
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<td>55</td>
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<td>11</td>
<td>11</td>
<td>11</td>
<td>12</td>
<td>12</td>
<td>5.5</td>
<td>7</td>
<td>10</td>
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<tr>
<td>60</td>
<td>10</td>
<td>11</td>
<td>11</td>
<td>11</td>
<td>12</td>
<td>12</td>
<td>5</td>
<td>6</td>
<td>-</td>
</tr>
</tbody>
</table>

Shoulder Width Ft.

<table>
<thead>
<tr>
<th>All Speeds</th>
<th>2&lt;sup&gt;3&lt;/sup&gt;</th>
<th>2&lt;sup&gt;3&lt;/sup&gt;</th>
<th>4</th>
<th>6</th>
<th>6</th>
<th>8&lt;sup&gt;4&lt;/sup&gt;</th>
</tr>
</thead>
</table>

1. DHV = future two way design hourly volume. If the current AADT exceeds 400 and the DHV exceeds 100 this column or the appropriate column to the right for the DHV applies.

2. Minimum travel lane width is 10 ft. for routes designated as Access Highways and for routes within one mile of Qualifying highways on the national network of Designated Truck Access Highways.

3. Minimum width is 4 ft. if roadside barrier is used.

4. 6 ft. shoulders may be used in mountainous terrain.
I. Lateral Clearance

Minimum = Shoulder width but never less than 4 ft., except on bridges where the NYSDOT "Geometric Design Policy for Bridges" allows less than 4 ft.

J. Vertical Clearance

Determine minimum from the NYSDOT "Geometric Design Policy for Bridges."

K. Pavement Cross Slope

Travel lanes = 1.5% minimum to 2% maximum.

L. Rollover

Between travel lanes = 4% maximum. At pavement edge = 8% maximum.

M. Structural Capacity

Determine from the NYSDOT "Geometric Design Policy for Bridges".

N. Pedestrian Accommodations

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

2.7.4.2 Local Urban Streets

The design criteria for local urban streets are as follows:

A. Design Speed

Determine design speed as described in Section 2.7.2.1A. With respect to the functional class, the design speeds for local urban streets are normally 20 to 30 mph.

7/11/94
B. Lane Width

Travel Lane Width = 10 ft. minimum for most local urban streets with 12 ft. minimum for local urban streets in industrial areas. Where ROW imposes severe limitations 9 ft. minimum can be used in residential areas and 11 ft. minimum in industrial areas.

For bridge projects determine the lane width from the NYSDOT "Geometric Design Policy for Bridges".

Left and right turn lane widths = 9 ft. minimum, 10 ft. desirable. Two-way left turn lane widths = 10 ft. minimum, 11 ft. desirable.

Parking lane width = 7 ft. minimum in residential areas with 9 ft. minimum in commercial and industrial areas.

C. Shoulder Width

Shoulders are not normally used on local urban streets.

For bridge projects determine the shoulder width from the NYSDOT "Geometric Design Policy for Bridges".

A curb offset is not a critical design element. However, with a nonmountable curb, a 1 ft. or 2 ft. offset from the travel lane is desirable. Curb offset is one of the design elements that, if not provided, should be explained in the design report.

D. Bridge Roadway Width

Determine minimum from NYSDOT "Geometric Design Policy for Bridges."

E. Grade

Grades for local streets = 15% maximum in residential areas and 8% maximum in commercial and industrial areas.

F. Horizontal Curvature

Determine maximum from Table 2-6. The degree of curve and superelevation on each horizontal curve shall be correlated with the design speed in accordance with the $e_{\text{max}} = 0.04$ table, Table III-8, in AASHTO's "A Policy on Geometric Design of Highways and Streets", 1990.

7/11/94
APPENDIX A - DESIGN CRITERIA

Local Urban Streets

For low speed (40 mph and below) urban streets in heavily built-up residential, commercial and industrial areas sharper curves are allowed. The maximum curve shown below may be used:

<table>
<thead>
<tr>
<th>Design Speed, mph</th>
<th>Maximum Degree Curve ($e_{max} = 0.04$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>30</td>
<td>25.00</td>
</tr>
<tr>
<td>35</td>
<td>16.50</td>
</tr>
<tr>
<td>40</td>
<td>11.75</td>
</tr>
</tbody>
</table>

For curves on low speed urban streets flatter than the maximum degree of curve above for $e_{max} = 0.04$ but sharper than the maximum degree of curve shown below for normal crown, use 0.02 superelevation (i.e. remove adverse crown). Curves flatter than that shown below may use normal crown.

<table>
<thead>
<tr>
<th>Design Speed, mph</th>
<th>Maximum Degree Curve (normal crown)</th>
</tr>
</thead>
<tbody>
<tr>
<td>30</td>
<td>19.25</td>
</tr>
<tr>
<td>35</td>
<td>12.25</td>
</tr>
<tr>
<td>40</td>
<td>8.50</td>
</tr>
</tbody>
</table>

G. Superelevation

0.04 maximum.

H. Stopping Sight Distance (Horizontal and Vertical)

Determine minimum and desirable from Table 2-6.

I. Lateral Clearance

For curbed streets, 1.5 ft. minimum from face of curb to vertical element. For uncurbed streets, 4 ft. minimum, except on bridges where the NYSDOT "Geometric Design Policy for Bridges" allows less than 4 ft.

J. Vertical Clearance

Determine minimum from the "Geometric Design Policy for Bridges".

7/11/94
K. Pavement Cross Slope

Travel lane = 1.5% minimum to 2% maximum. Parking lane = 1.5% minimum to 4% maximum.

L. Rollover

Between travel lanes = 4% maximum. At pavement edge = 8% maximum.

M. Structural Capacity

Determine from the NYSDOT "Geometric Design Policy for Bridges".

N. Pedestrian Accommodations

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

2.7.5 Other Roadways

2.7.5.1 Parkways

Parkways that are multilane, divided freeways or expressways with occasional at-grade intersections should follow the standards in Section 2.7.1.2 Other Freeways. Parkways that are two lane highways or multilane, divided highways with signalized intersections should follow the standards of the functional class of the parkway.

2.7.5.2 Ramps

The design criteria for ramps are as follows:

A. Design Speed

Ramp design speed should approximate the low volume running speed on the intersecting highways and is dependent on the ramp type. The ramp design speed to be listed in the design criteria applies to the sharpest or controlling ramp curve, usually on the ramp proper. The ramp design speed does not apply to the ramp terminals, which should be
properly transitioned and provided with speed change facilities adequate for the design speeds of the highways and ramps involved.

The table below identifies the minimum ramp design speed as related to highway design speed. The highway design speed is the higher design speed of the interchanging roadways. Further guidance on minimum design speed for specific types of ramps is provided after this table.

<table>
<thead>
<tr>
<th>Highway Design Speed (mph)</th>
<th>30</th>
<th>40</th>
<th>50</th>
<th>60</th>
<th>65</th>
<th>70</th>
</tr>
</thead>
<tbody>
<tr>
<td>Min. Ramp Design Speed (mph)</td>
<td>15</td>
<td>20</td>
<td>25</td>
<td>30</td>
<td>30</td>
<td>35</td>
</tr>
</tbody>
</table>

For direct connections the minimum ramp design speed = 50 mph except as noted in the following paragraph.

The minimum design speeds noted below may be used for resurfacing projects on interstates or other freeways on which the ramp accident history is satisfactory and for all types of projects on parkways:

1. Loop ramps - 25 mph minimum for highways with design speeds of more than 50 mph.
2. Semidirect connection ramps - 30 mph minimum
3. Direct connection ramps - 35 mph minimum

B. Lane Width

Determine minimum lane widths from Table 2-7. For one-lane, one-way ramps, Case II, which provides for passing a stalled vehicle, should normally be used.

C. Shoulder Width

Ramps shall have a 6 ft. - 6 in. right shoulder and a 3 ft.-6 in. left shoulder except for direct connection ramps with design speeds over 40 mph which shall have an 8 ft. right shoulder and a 3 ft. - 6 in. minimum left shoulder.

D. Bridge Roadway Width

The lane and shoulder widths should be carried across all ramp structures.

7/11/94
E. Grade

Determine maximum from Table 2-8.

F. Horizontal Curvature

Determine minimum radius from Table 2-8.

G. Superelevation

Maximum superelevation is based on the minimum radius curve and determined from Table 2-8. For ramps and turning roadways with design speeds of 25 mph or less the maximum superelevation rate is selected from the range of maximum superelevation rates shown in Table 2-8.

Where other radii on a ramp are flatter than the minimum for the ramp design speed they should be superelevated at less than the maximum rate to effect a balance in design.

H. Stopping Sight Distance (Horizontal and Vertical)

Determine minimum and desirable stopping sight distance from Table 2-8.

I. Lateral Clearance

Right side = shoulder width but never less than 6 ft. and left side = 3 ft. 6 in. minimum. Where ramps pass under structures, there should be an additional 4 ft. lateral clearance beyond the outside of shoulders to bridge piers or abutments.

J. Vertical Clearance

Determine minimum from the NYSDOT "Geometric Design Policy for Bridges". Ramps should have the same vertical clearance as the higher functional classification of the interchanging roadways.

K. Pavement Cross Slope

1.5% minimum to 2% maximum.
## Table 2 - Lane Widths for Ramps and Turning Roadways

<table>
<thead>
<tr>
<th>Case</th>
<th>One-lane, One-way Operation</th>
<th>Design Traffic Condition 1</th>
<th>Edge of Pavement R (ft)</th>
<th>No Stabilized Shoulder</th>
<th>Mountable Shoulder</th>
<th>Stabilized Shoulder, One or Both Sides</th>
<th>Barrier Curb: One Side</th>
<th>Barrier Curb: Two Sides</th>
</tr>
</thead>
<tbody>
<tr>
<td>Case I</td>
<td>None</td>
<td>None</td>
<td>50</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>Case II</td>
<td>Add 1 ft.</td>
<td>None</td>
<td>18 18 23 29</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>Case III</td>
<td>Add 2 ft.</td>
<td>None</td>
<td>12 15 15 15</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
</tr>
</tbody>
</table>

1. A predominant P vehicles, but some consideration for SU trucks. 
2. Sufficient traffic to support at least SU trucks. 

For Design Traffic Condition D, only use minimum pavement widths under Case I if the WB-62 and WB-67 vehicles are less than 10% of the total traffic volume.
Table 2 - 8 Ramp and Turning Roadway Alignment

<table>
<thead>
<tr>
<th>Design Speed, mph</th>
<th>Maximum % Grade</th>
<th>Minimum Radius, Ft.</th>
<th>Maximum Superelevation</th>
<th>Stopping Sight Distance, Ft.</th>
<th>Minimum</th>
<th>Desirable</th>
</tr>
</thead>
<tbody>
<tr>
<td>20</td>
<td>8</td>
<td>90</td>
<td>.02 to .06²</td>
<td>125</td>
<td>125</td>
<td></td>
</tr>
<tr>
<td>25</td>
<td>7</td>
<td>150</td>
<td>.04 to .06²</td>
<td>150</td>
<td>150</td>
<td></td>
</tr>
<tr>
<td>30</td>
<td>7</td>
<td>230</td>
<td>.06</td>
<td>200</td>
<td>200</td>
<td></td>
</tr>
<tr>
<td>35</td>
<td>6</td>
<td>340</td>
<td>.06</td>
<td>225</td>
<td>250</td>
<td></td>
</tr>
<tr>
<td>40</td>
<td>6</td>
<td>480</td>
<td>.06</td>
<td>275</td>
<td>325</td>
<td></td>
</tr>
<tr>
<td>45</td>
<td>5</td>
<td>674</td>
<td>.06</td>
<td>325</td>
<td>400</td>
<td></td>
</tr>
<tr>
<td>50</td>
<td>5</td>
<td>849</td>
<td>.06</td>
<td>400</td>
<td>475</td>
<td></td>
</tr>
</tbody>
</table>

1 Maximum superelevation = 0.08 may be retained if currently used on ramps and turning roadways. For a maximum superelevation =0.08 the minimum radii for 20, 25 and 30 MPH are as shown above and for higher design speeds are as follows:

<table>
<thead>
<tr>
<th>Design Speed MPH</th>
<th>Minimum Radius, Ft.</th>
</tr>
</thead>
<tbody>
<tr>
<td>35</td>
<td>310</td>
</tr>
<tr>
<td>40</td>
<td>440</td>
</tr>
<tr>
<td>45</td>
<td>603</td>
</tr>
<tr>
<td>50</td>
<td>764</td>
</tr>
</tbody>
</table>

2 Desirably use a maximum superelevation rate in the upper half or third of the indicated range.
L. Rollover

Between travel lanes = 4% max. At pavement edge 8% maximum.

M. Structural Capacity

Determine from the NYSDOT "Geometric Design Policy for Bridges".

2.7.5.3 Speed Change Lanes

Acceleration lanes, deceleration lanes and combination acceleration-deceleration lanes have the same lane width as the adjacent travel lanes. The minimum shoulder width = 6 ft. on interstates and other freeways and 4 ft. on other roadways. All other controlling design elements (grades, stopping sight distance, etc.) are the same as apply for the adjacent roadway.

The lengths of acceleration and deceleration lanes are not critical design elements. However the lengths, as determined from Tables X-4, 5 and 6 in AASHTO’s, "A Policy on Geometric Design of Highways and Streets", 1990 should be provided. If these lengths are not provided an explanation must be included in the design report.

2.7.5.4 Turning Roadways

The design speed of turning roadways may range from 15 mph to 40 mph. Determine the widths from Table 2-7. The vertical and horizontal alignment elements are normally determined from Table 2-8. However for a 15 mph design speed a radius of 50 ft. may be used with superelevation ranging from 0.02 minimum to 0.06 maximum. Also a lateral clearance = 2 ft. minimum shall be provided from the edge of pavement to vertical elements.

2.7.5.5 Collector-Distributor Roads

The design speed of a collector-distributor road should be no less than 10 mph below the design speed of the adjacent mainline roadway. Lane and shoulder widths should be the same as apply for the adjacent mainline roadway. The other controlling design elements (horizontal curve, stopping sight distance, etc.) should be modified appropriately if a design speed less than the mainline design speed is used.

7/11/94
2.7.5.6 Frontage Roads

The design criteria for frontage roads or service roads should be consistent with the design criteria for the functional class of the frontage or service road.

2.7.5.7 Climbing Lanes

Climbing lanes should have the same lane width as the adjacent travel lanes. The minimum shoulder width for a climbing lane on interstates and other freeways is 6 ft. The minimum shoulder width for a climbing lane on arterials, collectors and local roads is 4 ft., or the shoulder width of the highway, whichever is less. All other controlling design elements (grades, stopping sight distances, etc.) are the same as applies for the adjacent roadway.