CHAPTER 5
LOCAL ROADS AND STREETS

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5.0 INTRODUCTION

The following guidelines apply to those roads functionally classified as local roads and local urban streets in accordance with the discussion in Chapter 1 and Chapter 5 of the *PGDHS* **(1)**. In a jurisdictional highway classification, these guidelines apply generally to village or city streets and township and county roads, but not to State Highways.

A local road or residential street primarily serves as access to a farm, residence, business, or other abutting property. Some such roads properly include geometric design and traffic control features more typical of collectors and arterials to encourage the safe movement of through traffic. On these roads, the through traffic is local in nature and extent rather than regional, intrastate, or interstate.

Criteria for use on local roads and streets are presented in the *PGDHS* **(1)**. See Chapter 13 for guidance on low-volume roadways. Other low-volume applications include, but are not limited to, access, forest, recreational, and resource development roads. See Chapter 5 in the *PGDHS* **(1)** for these applications, and check with local agencies for their standards and requirements. Consult Chapter 3 and Chapter 4 of this Guide for details on the basic design elements applicable to this classification of roadway.

5.1 LOCAL RURAL ROADS

5.1.1 General Design Considerations

5.1.1.1 Design Speed

It is necessary for designers to recognize conditions where actual operating speeds typically may exceed the design speed; for example, terrain conditions may limit the overall design speed of a roadway section to a select speed but several long tangents may encourage higher speeds. An older facility may occasionally have a highway curve that has a design speed below the general operating speed of the highway. When this occurs, the common practice is to use an advisory speed sign to warn drivers of the lower safe operating speed on the curve. On new and reconstructed facilities, the curve should be designed to appropriate standards. See Table 5-1, Minimum Design Speeds for Local Rural Roads in the *PGDHS* **(1)** to determine appropriate design speeds as a function of volume and terrain.

5.1.1.2 Grades

Suggested maximum grades for local rural roads are a function of terrain and design speed, see Table 5-2 in the *PGDHS* **(1).**

5.1.1.3 Vertical Curves

Design control for vertical sag and crest curves are provided in Table 5-3 and Table 5-4 of the *PGDHS* **(1).** Criteria for measuring stopping sight distance includes an eye height of 3.5 feet and an object height of 2.0 feet. Passing sight distance includes an eye height of 3.5 feet and the object height is also 3.5 feet.

5.1.2 Intersection Design

Rural intersections may need special design consideration. Accidents may be infrequent, but severity is usually high. Minor improvements can provide major safety benefits. Intersections should avoid steep profile grades and should not be situated just beyond a short-crest vertical curve. Intersections should also be avoided at sharp horizontal curves. Intersections should be designed with adequate corner radii and intersection sight distance. Intersection legs under stop control should intersect at right angles.

5.2 LOCAL URBAN STREETS

5.2.1 General Design Considerations

The design criteria presented in other chapters of this Guide are most applicable to rural and high speed roadways. This section attempts to identify lower design criteria applicable to the lesser functional classes of urban streets that operate at lower speeds.

An urban street is characterized by restricted right of way, stop-and-go traffic, residential, commercial and industrial traffic, pedestrian and bus traffic, bikeways and the special demands and needs these conditions generate. An urban street includes the entire area within the right of way and usually is the product of a comprehensive community development plan. The design values should be those for the ultimately planned development. Typical types of improvements through the urban program include:

- Channelization of intersections.
- Modification of traffic lanes.
- Additional traffic lanes.
- Addition and upgrading of traffic control signs, pavement markings, and signals. Grade separations for pedestrians.
- Major reconstruction or resurfacing.
- New construction.
- Bicycle lanes.

Local agencies desiring to use Federal funds must utilize project designs that meet or exceed these design standards or the minimums also presented in the *PGDHS* **(1)**. The use of Federal funds also requires that the National Environmental Policy Act (NEPA) process be followed because the project design is viewed as a Federal action. Historic districts require special consideration.

The criteria presented in this section are applicable to urban and urbanized area streets with design speeds at or below 40 mph. Local streets have relatively low traffic volumes and the design standards are of a comparatively low order as a matter of practicality.

5.2.2 Design Traffic Volume

The DHV projected to some future design year should be the basis of design. It usually is difficult and costly to modify the geometric design of an existing street unless provision is made at the time of initial construction. Design traffic in these areas should be that estimated for at least 10 years, and preferably 20 years, from the date of completion of construction.

On local residential streets, traffic volume is not usually a major criterion in determining geometric values. Two travel lanes plus additional width for shoulders and parking are usually sufficient.

5.2.3 Design Speed

Design speed is not a major factor for local streets. For consistency in design elements, design speeds ranging from 20 to 30 mph may be used, depending on available right of way, terrain, adjacent development, and other area controls.

In the typical street grid, the closely spaced intersections usually limit vehicular speeds, making the effect of design speed of little significance. Design speeds exceeding 30 mph in residential areas may require longer sight distances and increased curve radii, which would be contrary to the basic function of a local street.

The design speed selected should be a logical choice with respect to the topography, adjacent land use, and type of facility. Once selected, all the pertinent features of the street should be related to that design speed. A street carrying a large volume of traffic may justify a high design speed but a low volume of traffic does not necessarily justify a low design speed. Drivers do not adjust their speeds to the importance of the highway but rather to the physical limitations.

The designer may use the running speed and/or posted speed as logical governing design criteria.

5.2.4 Sight Distance

Minimum stopping sight distance for local streets should range from 115 to 200 feet depending on the design speed (see Table 3-1). Design for passing sight distance seldom is applicable on local streets.

5.2.5 Grades

The grade for residential streets should be as flat as is consistent with the surrounding terrain. When grades are 4 percent or steeper, drainage design may become critical. For streets in industrial areas (with truck traffic) grades should be less than 8 percent and desirably less than 5 percent. See Table 3-4 for maximum grades

To provide for drainage, the minimum preferred grade used for streets with curbs is 0.30 percent but as flat as 0.20 percent may be used when sufficient drainage can be provided. Where bikeways are present, grades may be affected by their separate requirements.

5.2.6 Alignment

Alignment in residential areas should fit closely with the existing topography to minimize the need for cuts or fills. The alignment should not reduce safety but may serve a special purpose if desired by the local planning officials. Street alignment in commercial and industrial areas should be commensurate with the topography but should be as direct as possible. The avoidance or minimizing of involvement with adjacent property associated with hazardous waste or petroleum product contamination may influence the choice of alignment, cross section, and right of way width.

Street curves should be designed with as large a radius as feasible, the minimum radius being 100 feet. Where curves are superelevated, lower values may apply, but the radius should never be less than 75 feet for a 20 mph design speed.

5.2.7 Cross Slope

Pavement cross slope should be adequate to provide proper drainage. Cross slope normally should be as shown in Table 5-1 where there are flush shoulders adjacent to the traveled way.

Surface Type	Range in Cross Slope (%) Local Roads
High	1.5 to 2.0
Intermediate	1.5 to 3.0
Low	2.0 to 6.0
Surface Types High = Hard pavements with good retention of properties and support Intermediate = Surface treatments to slightly less strict than high type Low = Surface treated to loose materials	

Table 5-1 Normal Traveled Way Cross Slopes

The center section of the pavement crown may be parabolic to permit smooth transition of cross slope.

5.2.8 Superelevation

Although superelevation is advantageous for traffic operations, various factors such as wide pavements, abutting properties, drainage, intersections, and access points may make it impractical in built-up areas. Therefore, superelevation is not usually provided on low-speed urban streets in residential and commercial areas. It should be considered in industrial areas or streets where operating speeds are above 40 mph. A maximum superelevation of 0.04 or 0.06 is commonly used. A detailed discussion of superelevation is found in Chapter 3.

5.2.9 Width of Roadway

Street lanes for moving traffic preferably should be at least 10-feet wide. Where feasible, they should be 11-feet wide, and in industrial areas they should be 12-feet wide. Where available or attainable width of right of way imposes severe limitations, 11-foot lanes can be used in industrial areas. Added turning lanes where used at intersections should be 10 to 12 feet wide, depending on the percentage of trucks.

Where local streets carry bicycles, the roadway width should be designed to accommodate the bicycles. Local streets usually provide for two traveled lanes plus parking. Where curb and gutter sections are used, the gutter pan width may be included as a part of the parking lane width. The gutter pan should not be included as part of the travel lane width.

When bicycle facilities are included as part of the design, refer to the AASHTO *Guide for the Development of Bicycle Facilities* **(2)**.

5.2.10 Medians

Medians on low-speed streets are either raised or painted. Local streets rarely have medians and should have justification if the median is a continuous type. Median widths should be designed to accommodate required signing. For the purpose of discussion herein, median areas of 1 to 3 feet in width are considered" separators" or "dividers" and not medians, and may not accommodate required signs.

Openings should be situated only where there is adequate sight distance. The shape and length of the median openings depend on the width of median and the vehicle types to be accommodated. A discussion of the various median types appears in section 4.10.

5.2.11 Drainage

Drainage is an important consideration in urban areas because of high runoff and the flooding potential. Highway drainage facilities are designed to carry water across the right of way and to remove storm water from the roadway itself. These facilities include bridges, culverts, channels, curbs, gutter, and storm sewer systems.

Where drains are available under or near the roadway, the flow is transferred at frequent intervals from the street cross section by grating or curb opening inlets to basins and from there by connectors to drainage channels or underground drains. Properly oriented pedestrian and bicycle-safe inlet grates should be used, where appropriate.

The principal objective in urban drainage design is to control the presence and flow of water on the street surface such that pedestrians, bicyclists, and vehicles are not placed in an unsafe situation.

Economic considerations usually dictate that maximum practical use be made of the street sections for surface drainage. A minimum curb flowline grade for the usual case is 0.30 percent, but a grade of 0.20 percent may be used where there is a high type pavement accurately crowned and supported on firm subgrade.

To provide for proper drainage on local streets, it is desirable to use a minimum crown slope of 2.0 percent (0.02 ft/ft), particularly where the surrounding terrain is relatively flat. This will reduce ponding areas that can contribute to deterioration of pavements and create safety problems. For additional information, see the *CDOT Drainage Design Manual* **(3).**

5.2.12 Cul-De-Sacs and Turnarounds

Check with local agencies for applicable standards and requirements, and see Chapter 5 of the *PGDHS* **(1)**.

5.2.13 Sidewalks

Sidewalks used for pedestrian access to schools, parks, shopping areas, and transit stops and placed along all streets in commercial areas should be provided along both sides of the street. In residential areas, sidewalks are desirable on both sides of the street but need to be provided on at least one side of all local streets. The preferred cross slope is toward the roadway.

Where practical, the sidewalk should be separated from the curb. The three principal reasons for doing this are:

- Greater separation of pedestrians from moving traffic.
- An area for placement of street hardware and traffic signs which will not interfere with pedestrian traffic.
- A location for landscaping.
- A location for placing removed snow.

Maintenance of the area between curb and sidewalk can be difficult and some jurisdictions may desire to eliminate the area in favor of additional sidewalk width. Coordinate with local agencies for maintenance outside of the back of curb.

Clear sidewalk width should be an absolute minimum of 4 feet; 5 feet is desirable. If a continuous sidewalk has a width of 4 feet, a minimum 5-foot by 5-foot passing space needs to be provided at 200-foot intervals. Sidewalk widths of 8 feet or greater may be needed in commercial areas. If roadside appurtenances are situated on the sidewalk adjacent to the curb, additional width is required to secure the clear width.

Pedestrian facilities must be compliant with *PROWAG* **(4)**. Also see Chapter 12 of this Guide.

5.2.14 Sidewalk Curb Ramps

See section 4.16.2.~~Curb-cut ramps shall be provided at crosswalks to accommodate persons with disabilities. Refer to the *CDOT Standard Plans - M & S Standards* **(5)**. Also see Chapter 12 of this Guide.~~

5.2.15 Border Area

Border area or width is commonly defined as the space from the face of curb to the property line. In many cities, the border width is 10 to 12 feet wide, with at least 1 foot between the outer edge of sidewalk and property line. Border areas should be wider in areas with available right of way or locations where future widening is anticipated.

Consider the following:

- Clear zone
- Street appurtenances
- Sidewalk width
- Utilities
- Landscaping
- Snow storage
- Buffer space between pedestrians and vehicles
- Outer slopes

REFERENCES

1. AASHTO. *A Policy on Geometric Design of Highways and Streets.* American Association of State Highway and Transportation Officials, Washington, D.C.: 2011.
2. AASHTO. *Guide for the Development of Bicycle Facilities*, Washington, D.C.: American Association of State Highway and Transportation Officials, 2012.
3. CDOT. *Drainage Design Manual*. Colorado Department of Transportation, 2017.
4. ADA. *Public Rights of Way Accessibility Guidelines (PROWAG),* The Access Board, Washington D.C. 2011
5. CDOT. *CDOT Standard Plans – M & S Standards,* Colorado Department of Transportation. 2012