CHAPTER 6
PART 1

ROADWAY DESIGN AND TECHNICAL CRITERIA

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CHAPTER 6 - ROADWAY DESIGN AND TECHNICAL CRITERIA

6.1 GENERAL

This section sets forth the minimum design and technical criteria and specifications to be used in the preparation of all roadway plans. See Section 1.8.3 (AASHTO "Green Book").

6.2 ROADWAY DESIGN AND TECHNICAL CRITERIA

Teller County has adopted a classification of roads (See Section 1.12 "Definitions") based on traffic volumes, land use and expected growth. This classification designates roads as local, collector, or arterial (major and minor). Within each of these classifications, the road type is further subdivided into either urban or rural depending on its location. Those areas within the of either Section 1.7.1 of these Roadway Standards are classified as Urban. All other areas are classified as Rural. The following criteria apply to each classification. Standard roadway cross sections are presented in Appendix A. Private roads are subject to these Roadway Standards -- see Chapter 14 for definition of "private road".

6.2.1 Planning Principles for Local Circulation Systems

Basic considerations in the design of local circulation systems must recognize the following factors:

Safety - for both vehicular and pedestrian traffic
Efficiency of Service - for all users
Livability - especially as affected by traffic elements in the circulation system
Economy - of both construction and use of land

Each of the following principles is an elaboration on one of more of these four factors. The principles are not intended as absolute criteria, since instances may appear where certain principles conflict. The principles should, therefore, be used as guides to proper systems layout.

a. **Ensure Vehicular and Pedestrian Access**
The primary function of local roads is to serve abutting properties. Road widths, placement of sidewalks, patterns of roads and number of intersections are related to safe and efficient access to abutting lands.

b. **Minimize Through Trips**
Through traffic on local and collector roads increases the average speed and volume and thus the accident potential, thereby reducing residential amenities. Through traffic can be discouraged by creating a circuitous route between neighborhoods and higher volume roads and by channelizing or controlling median crossings along peripheral routes.

c. **Control Access to Arterials**
Local circulation systems and land development patterns should not detract from the efficiency of peripheral arterial facilities. Ideally, land development should occur so that no local roads require direct access to arterial routes. The number of access points between the local circulation system and the arterial system should be minimized. Intersections along arterial routes should be properly spaced for efficient signalization and traffic flow. The roads that

do intersect the arterial system will tend to have high volumes since they are the only exit points.

d. **Discourage Speeding**
Residential roads should be designed to discourage fast movement (more than 25 m.p.h.), through the use of curvilinear alignments and circuitous routes in the road system.

e. **Minimize Pedestrian - Vehicular Conflicts**
Pedestrian travel from within the area to points outside should require a minimum of road crossings. Sometimes this may be achieved through proper design of road patterns, land use arrangements and pedestrian routes. Typical methods includes use of cul-de-sacs and loop roads , special pedestrian routes or walkways and the proper placement of high pedestrian traffic generators. In general, while vehicular flow must be outward oriented to the peripheral arterials, pedestrian travel should be inward-oriented to avoid these heavier vehicular flows.

f. **Minimize Space Devoted to Road Use**
It is desirable to minimize local road mileage to reduce construction and maintenance costs as well as to permit the most economic land use. Roads should also have an appearance commensurate with their function. They should be in keeping with the character of the adjoining land.

g. **Relate Road to Topography**
Local roads will be more attractive and economical if they are constructed to closely adhere to topography. The important role that roads play in the overall storm drainage system can be enhanced by using the topography of the area.

h. **Layout Roads to Achieve Optimum Subdivision of Land**
The arrangements of roads should permit economical and practical patterns, shapes and sizes of development parcels. Roads as a function of land use must not unduly hinder the development of land. Distances between roads, number of roads, and related elements all have a bearing on efficient subdivision of an area. Access to adjoining properties should also be encouraged.

6.2.1.1 Urban Local

a. **POSTED SPEED LIMIT** - 25 mph
Posted or prima facie speeds for the various road classifications shall be 5 miles per hour less than the design speed of that road .

b. **TRAFFIC VOLUMES**
Generally less than 1000 vehicles per day.

c. **LIMITED CONTINUITY**

d. **SAFETY**

Designed for the safety of pedestrians and bicyclists, and the ease of access to adjacent parcels of land.

e. **TRAFFIC CONTROL**
Stop signs, yield signs, or right-of-way rules for uncontrolled intersections.

f. **FUNCTION**
Local roads provide direct access to adjacent property. Traffic carried by local roads should have an origin or a destination within the neighborhood. Utility line easements should be available.

g. **RIGHT-OF-WAY AND EASEMENTS**
In single-family residential areas: 60 feet minimum. In multiple-family residential areas: 60 feet minimum. Any change in R.O.W. and easement width due to a change in road classification shall be made at intersections only. Easements are required for any construction, maintenance, or sight triangle areas not accommodated within the ROW.

h. **NUMBER OF MOVING LANES** - Two

I. **ACCESS CONDITIONS**
Intersections at grade with direct access to abutting property permitted.

j. **PLANNING CHARACTERISTICS**
Local roads should be designed to discourage through traffic from moving through the neighborhood. Local roads should not intersect major collectors or arterial roads . See Section 13.2 for intersection spacing criteria.

k. **TYPE OF CURB AND GUTTER**
Vertical and mountable type permissible with attached sidewalk.

l. **CUL-DE-SACS**
Shall have a minimum flowline radius of forty-five (45) feet (See Exhibit SP-22 & SP-23.) Cul-de-sacs may have a maximum length of 1200 feet, or a maximum of 40 dwelling units (if approved by the fire district), whichever is more restrictive.

m. **SIDEWALK**
1. Single-family residential median lot size at least 2 acres: No sidewalks required.
2. Single-residential median lot size at least 3/4 acre: 4' wide sidewalk combination w/curb on one side. Trail outside of ROW is an approved alternate where the trail (a) serves all lots (b) connects to trails and sidewalks in adjacent developments and (c) for trails on rear side of lots, connections between trails and roadways, shall be spaced no more than 1,000'.
3. Single-family residential: 4' wide combination w/curb.
4. Multi-family residential: 4' wide combination w/curb.

n. **ROAD WIDTHS**
1. Single-family residential where median lot size is at least 3/4 acre: 26' paved width plus 2-2' gutter pans (30' flowline - flowline). Parking restricted to sidewalk side only.
2. Single-family residential: 32' paved width plus 2-2' gutter pans. (36' flowline - flowline)
3. Multi-family residential: 40' paved width plus 2-2' gutter pans. (44' flowline - flowline)

o. **MINIMUM RADIUS OF CURVATURE ON CENTERLINE (HORIZONTAL)**
See Table 6.2.

p. **MINIMUM LENGTH OF VERTICAL CURVES**
See Table 6.6.

q. **ROAD GRADES**
A minimum longitudinal flowline grade of 1.0% shall be required on all local roads except at curb returns where the minimum flowline grade shall be 2.0%. Maximum grade 8.0% . (See Table 6.1, and Table 6.6. See Section 6.4.2. Inlets.)

r. **CURB RETURN RADII**
See Table 6.3.

6.2.1.2 **Rural Local**

a. **POSTED SPEED LIMIT** - 25 mph
Posted or prima facie speeds for the various road classifications shall be 5 miles per hour less than the design speed of that road .

b. **TRAFFIC VOLUMES**
Generally less than 1000 vehicles per day.

c. **LIMITED CONTINUITY**

d. **SAFETY**
Designed for the safety of pedestrians and bicyclists, and the ease of access to adjacent parcels of land.

e. **TRAFFIC CONTROL**
Stop signs, yield signs, or right-of-way rules for uncontrolled intersections.

f. **FUNCTION**
Local roads provide direct access to adjacent property. Traffic carried by local roads should have an origin or a destination within the neighborhood. Utility line easements should be available.

g. **RIGHT-OF-WAY** - 60 feet minimum.

h. **NUMBER OF MOVING LANES** - Two

i. **ACCESS CONDITIONS**
Intersections at grade with direct access to abutting property permitted.

j. **PLANNING CHARACTERISTICS**
Local roads should be designed to discourage through traffic from moving through the neighborhood. Local roads should not intersect arterial roads. (See Section 13.3 for intersection spacing criteria.) Parking shall be restricted to one side of the road.

k. **TYPE OF CURB AND GUTTER**
Not required.

l. **CUL-DE-SACS**
Shall all have a minimum flowline radius of forty-five (45) feet (See Exhibit SP-22 & SP-23). Cul-de-sacs may have a maximum length of 1200 feet, or a maximum of 40 dwelling units (whichever is most restrictive).

m. **SIDEWALK**
Trail required. See note 5 in Table 6.1.

n. **STREET WIDTHS**
1. 26' paved width plus 2-3' gravel shoulders for roads with projected or actual ADT greater than 350. (with parking restricted on one side.)

2. 24' paved width plus 2-4' gravel shoulders for roads with projected ADT less than 350 (with parking restricted on one side).

o. **MINIMUM RADIUS OF CURVATURE ON CENTERLINE (HORIZONTAL)**
See Table 6.2.

p. **MINIMUM LENGTH OF VERTICAL CURVES**
See Table 6.6.

q. **ROAD GRADES**
A minimum longitudinal centerline grade of 1.0% shall be required on all Local roads . Maximum grade 10%. See Table 6.1, and Table 6.6.

r. **INTERSECTION RADII**
See Table 6.3.

6.2.2 **Collector**
A collector is a general term denoting a roadway designed or operating with the following characteristics:

6.2.2.1 Urban Collector

a. **POSTED SPEED LIMIT** - 30 MPH
Posted or prima facie speeds for the various road classifications shall be 5 miles per hour less than the design speed of that road.

b. **TRAFFIC VOLUMES**
Generally less than 7000 vehicles per day.

c. **CONTINUITY**
Continuous for less than two miles.

d. **SAFETY**
Designed to handle traffic volumes loading from and onto local, other collector, and arterial roadways.

e. **TRAFFIC CONTROL**
Regulation of traffic accomplished through the use of stop signs and channelization. Traffic signals are normally used only at intersections with other collector and arterial roads. Parking is prohibited.

f. **FUNCTION**
Collector roads collect and distribute traffic between arterial and local roads and serve as main connectors within communities, linking one neighborhood with another. Traffic carried by collector roads should have an origin or a destination within the community. Utility line easements should be available.

g. **RIGHT-OF-WAY** - 60 feet minimum

h. **NUMBER OF MOVING LANES** - Two

I. **ACCESS CONDITIONS**
Intersections at grade with no direct access to abutting property permitted unless no other access is reasonably available.

j. **PLANNING CHARACTERISTICS**
Collector roads should have continuity throughout a neighborhood but need not extend beyond the neighborhood. (See Section 13.3 for intersection spacing criteria.)

k. **TYPE OF CURB AND GUTTER**
6" vertical curb & gutter.

l. **SIDEWALK**
5' wide attached or detached.

m. **ROAD WIDTHS**
34' paved width plus 2-2' gutter pans. (38' flowline - flowline). Additional lanes may be required at intersections.

n. **MINIMUM RADIUS OF CURVATURE ON CENTERLINE (HORIZONTAL)**
See Table 6.2.

o. **MINIMUM LENGTH OF VERTICAL CURVES**
See Table 6.6.

p. **MINIMUM LENGTH OF TANGENTS BETWEEN ALL CURVES**
50 feet.

q. **ROAD GRADES**
A minimum longitudinal grade of 2.0% shall be required along the centerline of all collector and arterial roads . Maximum grade 6.0%. See Tables 6.1 & 6.6. (See section 6.4.2. Inlets.)

r. **CURB RETURN RADII**
See Table 6.3.

6.2.2.2 **Rural Collector**

a. **POSTED SPEED LIMIT** - 30 MPH
Posted or prima facie speeds for the various road classifications shall be 5 miles per hour less than the design speed of that road.

b. **TRAFFIC VOLUMES**
Generally less than 4000 vehicles per day.

c. **CONTINUITY**
Continuous for less than two miles.

d. **SAFETY**
Designed to handle traffic volumes loading from and onto rural local, other rural collector and arterial roadways.

e. **TRAFFIC CONTROL**
Regulation of traffic accomplished through the use of stop signs and channelization. Traffic signals normally used only at intersections with collector and arterial roads. Parking is prohibited.

f. **FUNCTION**
Collector roads collect and distribute traffic between arterial and local roads and serve as main connectors within communities, linking one neighborhood with another. Traffic carried by collector roads should have an origin or a destination within the community. Utility line easements should be available.

g. **RIGHT-OF-WAY** - 60 feet minimum

h. **NUMBER OF MOVING LANES** - Two

l. **ACCESS CONDITIONS**
Intersections at grade with no direct access to abutting property permitted unless no other access is reasonably available.

j. **PLANNING CHARACTERISTICS**
Collector roads should have continuity throughout a neighborhood but need not extend beyond the neighborhood. (See Section 13.3 for intersection spacing criteria.)

k. **TYPE OF CURB AND GUTTER**
Not required.

l. **SIDEWALK**
4' wide detached. Not required for developments with average lot size in excess of one-half acre

m. **ROAD WIDTHS**
30' paved surface width plus 2-3' gravel shoulders. Additional lanes may be required at intersections.

n. **MINIMUM RADIUS OF CURVATURE ON CENTERLINE (HORIZONTAL)**
See Table 6.2

o. **MINIMUM LENGTH OF VERTICAL CURVES**
See Table 6.6

p. **MINIMUM LENGTH OF TANGENTS BETWEEN ALL CURVES**
50 feet.

q. **ROAD GRADES**
A minimum longitudinal grade of 2.0% shall be required along the centerline of all collector and arterial roads . Maximum grade 9.0%. See Tables 6.1 & 6.6. (See section 6.4.2. Inlets.)

r. **INTERSECTION RADII**
See Table 6.3.

6.2.3 Arterial

An arterial road is a general term denoting a roadway designated or operating with the following characteristics:

6.2.3.1 Minor Arterial

a. POSTED SPEED LIMIT - Greater than or equal to 35 MPH
Actual posted speed to be determined by the County Engineer prior to submittal of construction plans. Posted or prima facie speeds for the various road classifications shall be 10 miles per hour less than the design speed of that road.

b. **TRAFFIC VOLUMES**
Generally less than 12,000 vehicles per day when the property which the arterial serves is fully developed.

c. **CONTINUITY**
Continuous for several miles, generally connecting with intercity routes.

d. **SAFETY**
Designed to handle traffic volumes loading from and onto collector and arterial roadways.

e. **TRAFFIC CONTROL**
1. Regulation of traffic accomplished through the use of traffic signs, signals and channelization.
2. Parking is prohibited.
3. Traffic signals will normally be required.

f. **FUNCTION**
Arterial routes permit relatively unimpeded traffic movement and are intended for use on these routes where two to four moving lanes are required but where a major arterial cross section would not be warranted.

g. **RIGHT-OF-WAY** - 100 feet (min)
Additional R.O.W. may be required based on future transit needs as identified by the Planning Director.

h. **NUMBER OF MOVING LANES - 2 - 4**

I. **ACCESS CONDITIONS**
1. Intersections at grade.
2. Access from road of lower classification will be permitted but in all cases will be controlled by traffic control devices.
3. Direct access to abutting property is not permitted unless no other access is reasonably available.
4. Intersection spacing shall be 1/4 mile.

j. **PLANNING CHARACTERISTICS**
Arterials should be spaced from one half (½) to one (1) mile apart and should, where possible, be continuous. (See Section 13.3 for intersection spacing criteria.) Arterials should act as boundaries between neighborhood areas.

k. **TYPE OF CURB AND GUTTER**
6" vertical curb & gutter (urban areas only).

l. **SIDEWALK WIDTH**
5' wide detached. (See Note 5 in Table 6.1.)

m. **STREET WIDTHS**
2 - 12' travel lanes (minimum); 1-12' left turn lane/striped or raised median, as may be required to control access; 2-2' gutter pans plus acceleration/deceleration lanes at intersections (40'-70' flowline - flowline).

n. **MINIMUM RADIUS OF CURVATURE ON CENTERLINE (HORIZONTAL)**
650'. See Table 6.2.

o. **MINIMUM LENGTH OF VERTICAL CURVES**
See Table 6.6.

p. **MINIMUM LENGTH OF TANGENTS BETWEEN ALL CURVES**
One hundred feet.

q. **ROAD GRADES**
A minimum longitudinal grade of 2.0% shall be required along the centerline of all collector and arterial roads. Maximum grade 6.0% Urban (7% in Rural Areas). (See Tables 6.1 & 6.6. See Section 6.4.2. Inlets.)

r. **CURB RETURN RADII**
See Table 6.3.

6.2.3.2 **Major Arterial** (4 Lane)

a. **POSTED SPEED LIMIT** - Greater than or equal to 35 MPH
Actual posted speed to be determined by County Engineer prior to submittal of construction plans. Posted or prima facie speeds for the various road classifications shall be 10 miles per hour less than the design speed of that road.

b. **TRAFFIC VOLUMES**
Generally greater than 12,000 vehicles per day when the property which the collector serves is fully developed.

c. **CONTINUITY**
Continuous for several miles, generally connecting with inter-county and intra-county routes.

d. **SAFETY**
Major arterial roads permit rapid and relatively unimpeded traffic movement throughout the county, connecting major land use elements as well as communities with one another. Designed to handle traffic volumes loading from and onto collector and arterial roadways.

e. **TRAFFIC CONTROL**
1. Regulation of traffic accomplished through the use of traffic signals and channelization.
2. Parking shall be prohibited.
3. Roadways should have a median strip between them.

f. **FUNCTION**
Major arterial routes permit rapid and relatively unimpeded traffic movement throughout the county, connecting major land use elements as well as communities with one another.

g. **RIGHT-OF-WAY** - 100 feet (min)
Additional R.O.W. may be required based on future transit needs as identified by the Planning Director.

h. **NUMBER OF MOVING LANES** - 2 - 4

I. **ACCESS CONDITIONS**
1. Intersections at grade.
2. Intersections will normally be located at 1/4 mile intervals.
3. Access from collector and arterial roads shall be controlled by traffic control devices.
4. Normally, direct access to abutting property is not permitted.
5. Abutting properties should not face on the roadway unless separated from it by a frontage road.

j. **PLANNING CHARACTERISTICS**
Major arterials should be spaced approximately one (1) mile apart and should traverse an entire city and/or county. (See Section 13.3 for intersection spacing criteria). Major arterial roads should not bisect neighborhoods but should act as boundaries between them.

k. **TYPE OF CURB AND GUTTER**
6" vertical curb & gutter (urban areas only).

l. **SIDEWALK WIDTH**
5' wide detached. (See Note 5 in Table 6.1.)

m. **ROAD WIDTHS**
2 - 12' travel lanes (minimum); 4 - 12' travel lanes shall have 4' to 26' medians, striped or raised, as may be required to control access or 1 - 12' left turn lane; 2-1' median gutter pans plus necessary left turn and acceleration/deceleration lanes and 4' median at intersections plus 2-2' gutter pans on 4 travel lanes (80'-102' flowline - flowline).

n. **MINIMUM RADIUS OF CURVATURE ON CENTERLINE (HORIZONTAL)**
650'. See Table 6.2.

o. **MINIMUM LENGTH OF VERTICAL CURVES**
See Table 6.6.

p. **MINIMUM LENGTH OF TANGENTS BETWEEN ALL CURVES**
One hundred feet.

q. **ROAD GRADES**
A minimum longitudinal grade of 2.0% shall be required along the centerline of all collector and arterial roads. Maximum grade 6.0%. See Tables 6.1 & 6.6. (See section 4.4.2. Inlets.)

r. **CURB RETURN RADII**
See Table 6.3.

6.2.4 Roadway Specifications

Table 6.1 shows a summary of the minimum roadway construction requirements and other related information.

TABLE 6.1
ROADWAY CONSTRUCTION STANDARDS

TYPE	LOCAL[4]		COLLECTOR[4]		ARTERIAL	
CLASSIFICATION	URBAN	RURAL	URBAN	RURAL	MINOR	MAJOR
Posted Speed[1]	25	25	30	30	35 Min.	35 Min.
Driving Lanes	2	2	2	2	2-4	2-4
Min. ROW (ft.)	60'	60'	60'	60'	100' Min.	100' - 140'
Roadway Width	30' - 36' - S.F. 44' - M.F.	32'	38'	36'	40' -70'	40'-88'
Curb, Gutter & Walk (Curb & gutter required in urban areas only)[5]	Vert. or Mountable Walk - 4'	Gravel Shoulder Walk - 4'	Vertical Walk - 5'	Gravel Shoulder Walk - 4'[2]	Vertical Walk - 5'	Vertical Walk - 5'
Intersection Radii Arterial Collector Local	 30 25 20	 30 25 20	 30 25 25	 30 25 25	 50 30 25	 50 30 25
Min. Curve Radius	225'	175'	See Table 6.2	See Table 6.2	650' See Table 6.2	650' See Table 6.2
Min. Tangent Length	25'	25'	50'	50'	100'	100'
Max. Grade @ Intersection	4%	4%	4%	4%	3%	3%
Road Grade	1% - 8%	1% - 10%	2% - 6%	2% - 9%	2% - 6% Urban 2% - 7% Rural	2% - 6%
Vertical Alignment	See Table 6.3					
Min. Pavement Sections[3]	See Table 7.4					

1. Design speeds are normally 5-10 MPH higher than posted speeds
2. Walks are not required when average single family lot size is in excess of one-half acre.
3. Pavement designs must be submitted for all roads. The pavement section shall not be less than that listed. (For pavement design and alternate materials see Chapter 7.)
4. See Section 6.14
5. Outside of urban areas, trails, consistent with the Teller County Master Plan, shall be used instead of sidewalks. Design shall be comparable with the Rural character of the surrounding area.

6.3 SIDEWALKS, CURBS AND GUTTER

6.3.1 Roadway typical sections shall be as specified by these Roadway Standards. (Appendix A)

6.3.2 All sidewalks used in conjunction with vertical curb and gutter shall have a minimum width as indicated in Table 6-1.

6.3.3 Combination curb, gutter and walk is approved for use on local roadways only. Vertical curb, gutter and detached walk shall be used on all other roadways, except collectors on which either attached or detached sidewalks are permitted.

6.3.4 CRS requires that handicap ramps be installed at all intersections and at certain mid-block locations for all new construction or reconstruction of curb and sidewalk (CRS 43-2-107[2]). Handicap ramps shall be constructed in accordance with standard plates. (Appendix A) Handicap ramps may be shown at all curb returns or called out by a general note on the development plans, but must be shown (located) at all "T" intersections directly opposite either curb return. Whenever referencing a handicap ramp, call out the specific Roadway Standards standard plate to be used to construct that ramp. On local roads only, mid-block handicap ramps may be constructed per CDOT M-Standard M-608-1 "TYPE 3A - MID-BLOCK" (6' from flowline to back-of-ramp). See STANDARD PLATE SP.9B.

6.3.5 In general, when the number of parking spaces serviced by the driveway exceeds ten (10), radius returns are required (See Table 6.3 for curb return radii).

6.3.6 Where curb cuts are allowed based on traffic considerations, concentrated storm water runoff must not be discharged across the sidewalk. These flows must be directed to a sidewalk chase section (See Section 6.4.5). If this is not possible due to grading restraints, radius returns and a crosspan must be used.

6.3.7 Curb cuts and driveways shall be constructed in accordance with the Teller County Standard Drawing SP.4 (Appendix A)

6.4 DRAINAGE

Storm drainage systems shall be designed in accordance with the Drainage Criteria (Appendix G). Because safe and efficient conveyance of traffic is the primary function of roadways, the storm drainage function of the roadway (such as allowable gutter capacity and road overtopping) will be designed to the limits set forth in the Drainage Criteria.

6.4.1 Crosspans

Crosspans shall be constructed in accordance with the Teller County Standard plate, SP.6, (Appendix A.) Crosspans are not permitted across entry, collector and arterial roadways.

On a case-by-case basis, if an excessive length of storm sewer must be constructed to comply with this requirement, causing undue financial hardship, a variance may be requested to use a 10-foot wide crosspan (see SP-6) across a local road, an entry road, or a minor collector roadway. If there is storm sewer in the road, and within a

reasonable distance, no crosspans shall be allowed.

No mid-block crosspans will be allowed.

6.4.2 **Inlets**

Inlets shall be located to intercept the curb flow at the point curb flow capacity is exceeded by the storm runoff. Inlets shall also be installed to intercept cross-pavement flows at points of transition in superelevation. Inlets are not allowed in the curb return, but will be located at or behind the tangent points of the curb returns. Minimum inlet length for type R inlets shall be 5 feet.

6.4.3 **Cross Slope**

Except at intersections, or where superelevation is required, roadways shall be level from top of curb to top of curb (or flowline to flowline) and shall have a two (2) percent crown. At or within the "L" distance shown in Figure 6.4, the maximum elevation difference between flowlines is that dictated by the allowable intersection grade (See Figure 6.4) and the actual distance between flowlines.

6.4.3.1 Parabolic or curved crowns are not allowed. In no case shall the pavement cross slope at warped intersections exceed the grade of the through road.

6.4.3.2 The rate of change in pavement cross slope, when warping side roads at intersections, shall not exceed one (1) percent every twenty-five (25) feet horizontally on a local roadway, one (1) percent every thirty-seven and one-half (37.5) feet horizontally on a collector roadway, or one (1) percent every fifty-six and one-half (56.5) feet horizontally on arterial roadways. (See Section 6.7.)

6.4.4 **Temporary Erosion Control**

Temporary erosion control is required along and at the ends of all roadways that are not completed due to project phasing, subdivision boundaries, etc., in accordance with the Drainage Criteria.

6.4.5 **Sidewalk Chases**

Storm water from concentrated points of discharge shall not be allowed to flow over sidewalks, but shall drain to the roadway by use of chase sections. Sidewalk chase sections shall not be located within the curb cut or driveway. Hydraulic design shall be in accordance with the Drainage Criteria . Sidewalk chases will only be allowed in special situations, on a case-by-case basis, as determined by the County Engineer. Sidewalk chases, when permitted, are to be used to allow surface drainage to enter into the road gutter rather than being used to avoid the use of a standard inlet.

Sidewalk chase sections are to be constructed in accordance with the standard plates. (Appendix A)

6.5 HORIZONTAL ALIGNMENT

6.5.1 Horizontal Curves

See Table 6.2.

TABLE 6.2
HORIZONTAL CURVES

DESIGN SPEED (MPH)	MAXIMUM CURVE (DEGREES)	MINIMUM CURVE RADIUS (FEET)
25	32.7	175
30	22.9	225
35	14.3	400
40	10.4	600
45	8.0	720
50**	6.7	850
55**	5.7	1000

** Superelevation may be allowed. (See Section 6.5.5.)

6.5.2 Curb Return Radii

Minimum and maximum curb return radii shall be as shown in Table 6.3.

TABLE 6.3
CURB RETURN RADII
MINIMUM AND MAXIMUM
(Measured Along Flowline)

THROUGH STREET	ARTERIAL	COLLECTOR	LOCAL SERVICE
ARTERIAL	50'	30'	25'
COLLECTOR	30'	25'	25'
LOCAL	30'	25'	20'.

6.5.3 **Design Speed**

Horizontal alignment design speed shall be consistent with the requirement for vertical alignment design speed.

If no superelevation is required and a normal crown section exists, the horizontal curve data as shown in Table 6.2 shall be used.

6.5.4 **Barricades**

Whenever roadways terminate due to project phasing, subdivision boundaries, etc., barricades are required. Design and construction shall comply with the requirements of the MUTCD most recent edition. Details shall be shown on the construction drawings, and installation shall be provided by the developer.

6.5.5 **Superelevation**

Superelevation may be required for curves on arterial roadways and selected collector roadways. Horizontal curve radii and superelevation shall be in accordance with the recommendations of the AASHTO "Green Book" (Horizontal Alignment).

Superelevation shall not be used on local or other roadway classifications with a design speed of less than 50 mph. Superelevation shall not be used without prior approval by the County Engineer.

The following procedure is an outline for the correct application of superelevation on roadways within Teller County.

6.5.5.1 **Definitions Regarding Superelevation**

Superelevation Runoff - That length of roadway needed to accomplish the change in cross slope from a section with the adverse crown removed (flat) to the fully superelevated section, or vice versa.

Transition Points - Beginning or ending of tangent runout, superelevation runoff or full superelevation.

Tangent Runout - That length of roadway needed to accomplish the change in cross slope from a normal (2.0%) crown section to a section with the adverse crown removed (flat), or vice versa.

6.5.5.2 **General**

One of the most important factors to consider in highway safety is the centrifugal force generated when a vehicle traverses a curve. Centrifugal force increases as the velocity of the vehicle and/or the degree of curvature increases.

It is impossible to balance centrifugal force by superelevation alone, because for any given curve radius a certain superelevation rate is exactly correct for only one driving speed. At all other speeds there will be a side thrust either outward or inward, relative to the curve center, which must be offset by side friction.

6.5.5.3 Standards for Superelevation

The Division "M" Standards (CDOT) on Superelevation give the required rate of superelevation for the various degrees of curvature.

Maximum superelevation rates of 0.04 to 0.06 foot per foot are commonly used on major roads. The lower value should be used where snow and ice are significant factors.

6.5.5.4 Urban Road Conditions

Every effort should be made to maintain standard rates of superelevation. However, in urban areas, road intersections, established road grades, curbs and drainage conditions may require a reduction in the rate of superelevation, or different rates for each half of the roadbed. In warping areas for drainage, adverse superelevations should be avoided.

6.5.5.5 Effect of Grade

Drivers tend to travel somewhat faster in the downgrade than in the upgrade direction. This should be recognized in the designs for divided highways and ramps on steep grades.

Where practical, the designer should use a higher design speed for the downgrade and a lower design speed for the upgrade. The variation of design speed will depend upon the rate and length of grade and the degree of curvature compared with other curves on the highway section.

6.5.6 Spiral Curves

Spiral curves are prohibited.

6.5.7 Railroad Crossings

All railroad crossings on arterial roads shall be steel reinforced rubber for the full width of the roadway. A timber pedestrian walk and vehicle recovery area shall be provided on both sides of the steel reinforced rubber.

Timber crossings may be used in place of steel reinforced rubber on local roads only. Minimum crossing width shall be the full width of the right-of-way to provide for pedestrians and vehicle recovery area.

All railroad crossing must be approved by the affected railroad company.

6.5.8 Cul-de-sacs

Criteria for cul-de-sacs shall follow the requirements of Section 6.2.

6.5.9 Sight Distances

6.5.9.1 General

The major considerations in alignment design are safety, grade, profile, road area, design speed, sight distance, topography, drainage and performance of heavy duty vehicles. Alignment should provide for safe and continuous operation at a uniform design speed. Road layout shall bear a logical relationship to existing or platted roads in adjacent properties.

6.5.9.2 **Horizontal Alignment**

a. **Sight Distance.** Horizontal alignment must provide at least the minimum stopping distance for the design speed at all points. This includes visibility at intersections as well as around curves and roadside encroachments.

b. **Stopping Sight Distance.** The minimum stopping sight distance is the distance required by the driver of a vehicle traveling at the design speed to bring the vehicle to a stop after an object on the road becomes visible. Stopping sight distance is calculated in accordance with the AASHTO "Green Book". Object height is 6" above road surface and viewers height is 3.50 ft. above road surface.

Where an object off the pavement restricts sight distance, the minimum radius of curvature is determined by the stopping sight distance (See Figures 6.1a and 6.1b). In no case shall the stopping sight distance be less than as specified in Table 6.4. A likely obstruction may be a bridge abutment or line of columns, wall, cut sideslope, or a side or corner of a building. The sight distance design procedure shall assume a 6'-0" fence (as measured from actual finished grade) exists at all property lines except in the sight-distance triangles required at all intersections.

The lateral clearance, inner edge of pavement to sight obstruction, for various radii of inner edge of pavement and design speeds, is shown graphically in Figure 6.1a and 6.1b. The position of the driver's eye and the object sighted are assumed to be 6 ft. from the inner edge of pavement, with the sight distance being measured along this arc.

TABLE 6.4
STOPPING AND PASSING SIGHT DISTANCE

DESIGN SPEED (MPH)	STOPPING SIGHT DISTANCE	PASSING SIGHT DISTANCE
15	100	500
20	125	800
25	150	1000
30	200	1100
35	250	1300
40	275	1500
45	325	1650
50	400	1800
55	450	1950

From AASHTO "Green Book"
Table III-1, Table III-5 and Table VII-3
(For Intersection & Driveway Sight-Distance, see Figure 6.2)

c. **Passing Sight Distance.** Passing sight distance is the minimum sight distance that must be available to enable the driver of one vehicle to pass another safely and comfortably without interfering with oncoming traffic traveling at the design speed. Two-lane roads should provide adequate passing zones. Required passing sight distance for given design speeds is given in Table 6.4.

d. **Coefficient of Friction.** The coefficient of friction (f) shall conform to the values shown in Table 6.5 for snowpacked conditions rather than as stated in Figure III-1 of the AASHTO "Green Book".

TABLE 6.5
COEFFICIENT OF FRICTION
(Design Criteria Snowpacked)

DESIGN SPEED	f
30-40	.24
40-50	.22
50-60	.21
60-70	.20

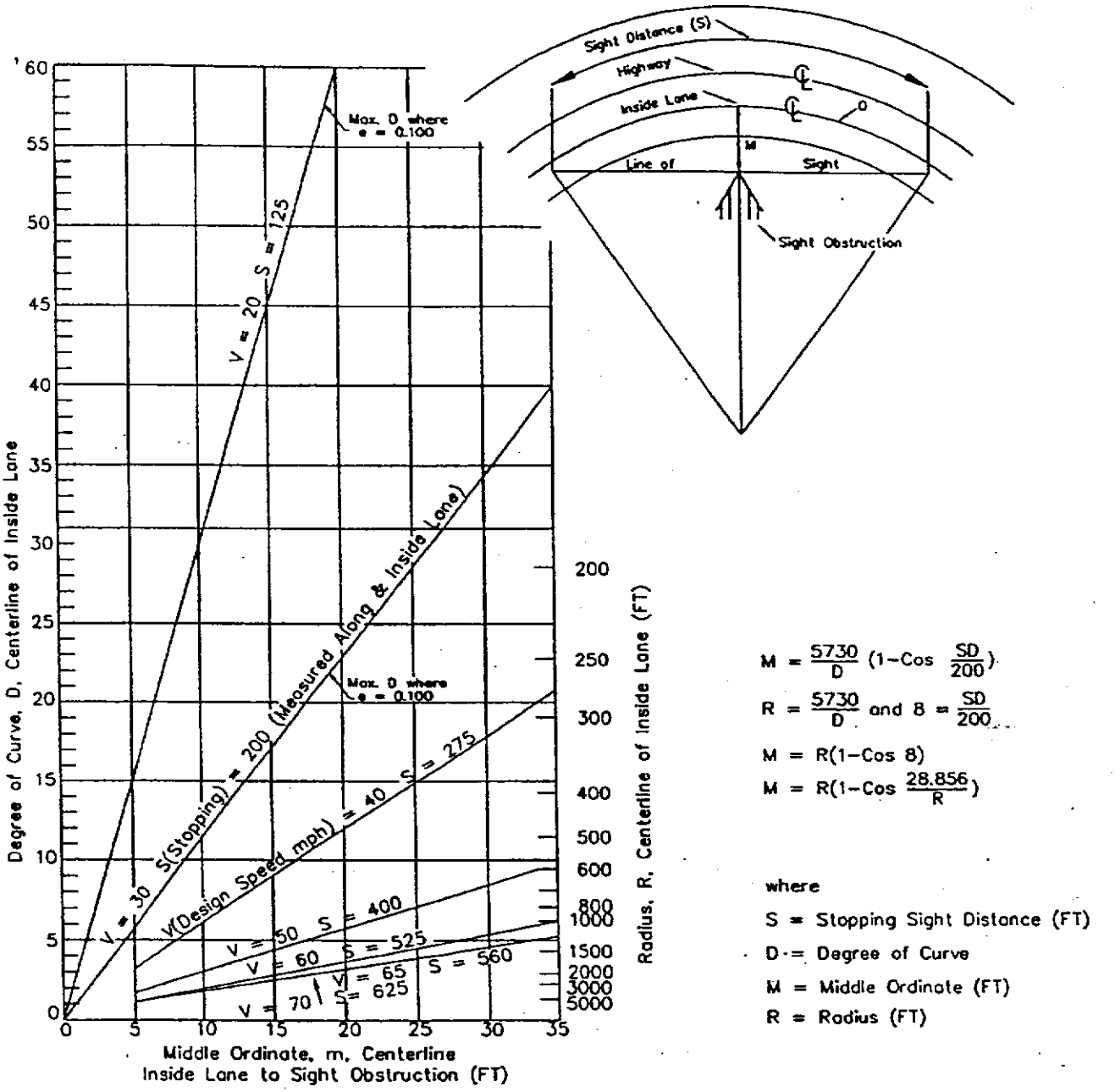


Figure III-25A. Range of lower values—relation between degree of curve and value of middle ordinate necessary to provide stopping sight distance on horizontal curves under open road conditions.

FIGURE 6.1a
LATERAL CLEARANCE TO SIGHT OBSTRUCTION INSIDE OF HORIZONTAL CURVES PROVIDING STOPPING DISTANCE FOR TURNING ROADWAYS

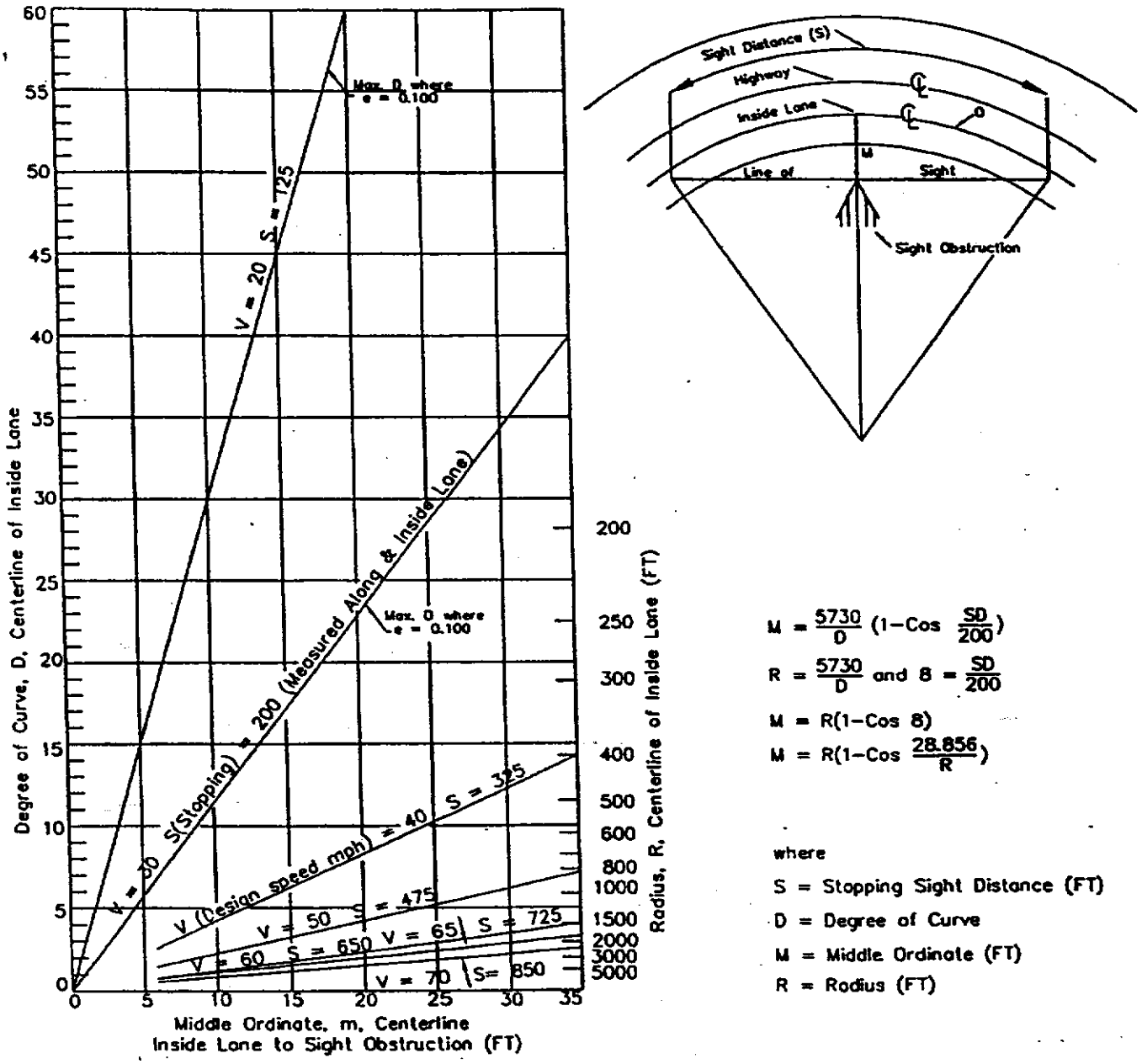
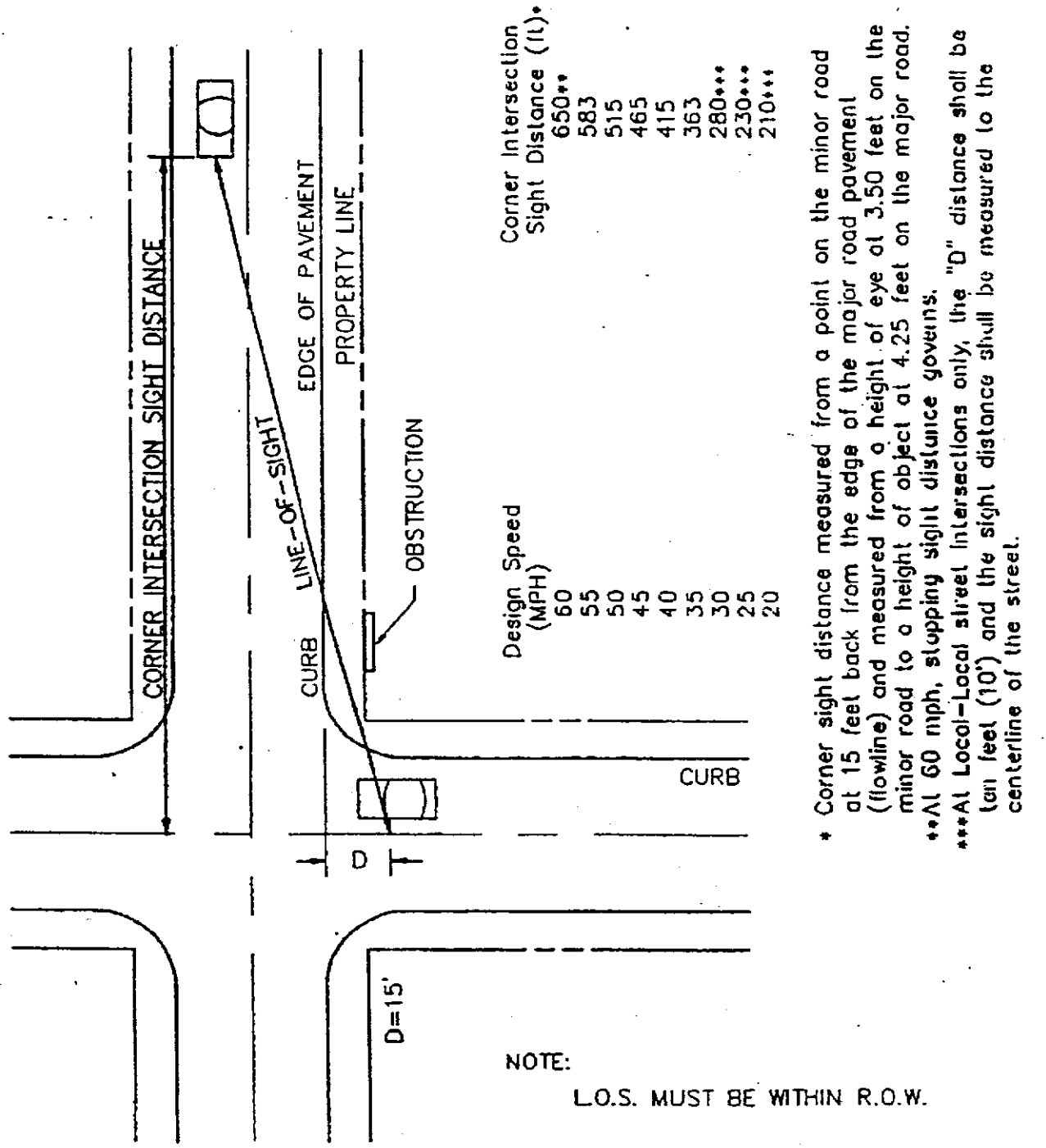


Figure III-25B. Range of upper values-relation between degree of curve and value of middle ordinate necessary to provide stopping sight distance on horizontal curves under open road conditions.

Figure 6.1b
LATERAL CLEARANCE TO SIGHT OBSTRUCTION INSIDE OF HORIZONTAL CURVES PROVIDING STOPPING DISTANCE FOR TURNING ROADWAYS

SIGHT DISTANCE AT INTERSECTIONS



SIGHT DISTANCE DEVELOPED FROM AASHTO "GREEN BOOK"

Figure 6.2
INTERSECTION SIGHT DISTANCE - SIGHT TRIANGLE

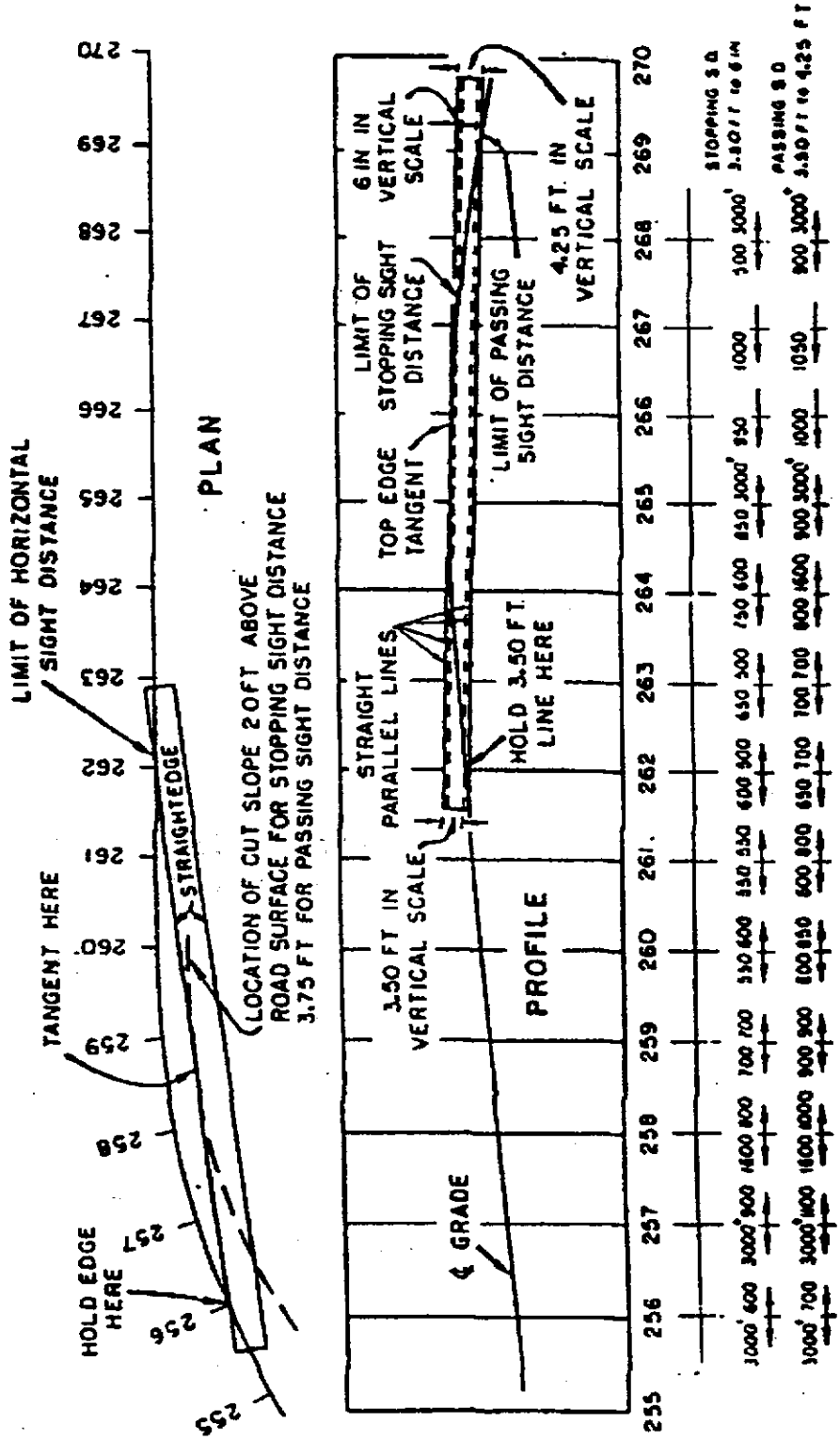


Figure III-3. Scaling and recording sight distances on plans.

Figure 6.3
SCALING AND RECORDING SIGHT DISTANCES ON PLANS

e. **Intersection and Driveway Sight Distance.** There shall be an unobstructed sight distance along both approaches of both sides at an intersection within the R.O.W. for distances sufficient to allow the operators of vehicles, approaching simultaneously, to see each other in time to prevent collisions at the intersection. The sight triangle relationship developed for use in Teller County is based upon the dimensions shown in Figure 6.2.

Any object within the sight triangle more than thirty-six (36) inches above the flowline elevation of the adjacent road shall constitute a sight obstruction and shall be removed or lowered. Such objects include: buildings, cut slopes, hedges, trees, bushes, utility cabinets or tall crops. This design criteria also requires the elimination of parking (except on local roads) within the sight triangle and applies whether the intersecting roads are level or on grades. The sight distance shall be measured to the centerline of the closest through lane in both directions.

All sight-distance triangles must be shown on the road plan/profile plans. All sight distances must be within the public right-of-way. In order to obtain the required sight distance within the ROW, the ROW cannot be widened more than 5.0 feet. On local roads only, if the L.O.S. (Line Of Sight) crosses the front yards of the lots, a "SIGHT DISTANCE EASEMENT" may be dedicated on the plat to meet the required sight distance.

In no case shall any permanent object encroach into the line-of-sight of any part of the sight-distance triangle.

6.5.9.3 **Vertical Alignment**

Both the horizontal and vertical sight distance should be checked to insure that the sight distance along the major highway is sufficient to allow a vehicle to cross or turn left, whichever is required.

a. By determining, graphically, the sight distances on the plans and recording them at frequent intervals, the designer can appraise the overall layout and effect a more balanced design by minor adjustments in the plan or profile. Methods for scaling sight distances are demonstrated in Figure 6.3. The figure also shows a typical sight distance record that would be shown on the final plans.

Because the view of the highway ahead may change rapidly in a short distance, it is desirable to measure and record sight distance for both directions of travel at each station. Both horizontal and vertical sight distances should be measured and the shorter lengths recorded. In the case of two-lane roads passing sight distance, in addition to stopping sight distance, should be measured and recorded.

Once the horizontal and vertical alignments are tentatively established, the practical means of examining sight distances along the proposed road is by direct scaling on the plans. (See Figure 6.3.)

b. Horizontal sight distance on the inside of a curve is limited by obstructions such as buildings, hedges, wooded areas, high ground, or other topographical features. These generally are plotted on the plans. Horizontal sight is measured with a straightedge, as indicated at the upper left in Figure 6.3. The cut slope obstruction is shown on the worksheets by a line representing the proposed excavation slope at a point 2.0 ft. (average of 3.50 and 0.5 ft) above the road surface for stopping sight distance and at a point about 3.75 ft. above the road surface for passing sight distance. The position of this line, with respect to the centerline, may be scaled from the plotted roadway cross sections. The stopping sight distance should be measured between points on the one traffic lane and passing sight distance from the middle of one lane to the middle of the other lane as outlined in Figures 6.1a and 6.1b.

c. Vertical sight distance may be scaled from a plotted profile by the method illustrated at the right center of Figure 6.3. A transparent strip with parallel edges 4.25 ft. apart and with scratched lines 6 in. and 3.50 ft. from the upper edge, in accordance with the vertical scale, is a useful tool. The 3.50 ft. line is placed on the station from which the vertical sight distance is desired and the strip is pivoted about this point until the upper edge is tangent to the profile. The distance between the initial station and the station on the profile intersected by the 6 in. line is the stopping sight distance. The distance between the initial station and the station on the profile intersected by the lower edge of the strip is the passing sight distance.

d. A simple sight distance record is shown in the lower part of Figure 6.3. Sight distances in both directions are indicated by arrows and figures at each station on the plan and profile sheet of the proposed highway. To avoid the extra work of measuring unusually long sight distances that may occasionally be found, a selected maximum value may be recorded. In the example shown, all sight distances of more than 3,000 ft. are recorded as 3,000+, and where this occurs for several consecutive stations, the intermediate values are omitted. Sight distances less than 1,000 ft. may be scaled to the nearest 50 ft. and those greater than 1,000 ft. to the nearest 100 ft.

e. The methodology of graphically determining sight distances may well require longer stopping sight distances than noted in Table 6.4 or Figures 6.1a and 6.1b. However, in urban design, the combination of horizontal curves, vertical curves and intersections occurring at the same time is very real. The graphic solution then is a simple means to determine the controlling sight distances.

6.6 VERTICAL ALIGNMENT

Design controls for vertical alignment are shown on Table 6.6 below.

TABLE 6.6
VERTICAL ALIGNMENT CONTROLS

DESCRIPTION	DESIGN SPEED*	MAX. GRADE**	K-VALUE RANGES CREST	K-VALUE RANGES SAG	MIN V.C.L. CREST	MIN V.C.L. SAG
URBAN LOCAL	30	8%	25-30	25-30	50	50
RURAL LOCAL	30	10%	25-30	25-30	50	50
URBAN COLL.	35	6%	35-50	40-50	50	50
RURAL COLL.	35	9%	35-50	40-50	50	50
MINOR ARTERIAL	45	6% Urban (7% Rural)	70-105	65-85	70	60
MAJOR ARTERIAL	45	6.0%	115-220	90-125	110	90

*The design speed is a minimum of five (5) mph over the posted speed for each classification, except arterials. Arterials are ten (10) mph over posted and design speeds are minimum for arterials.

**The maximum grades indicated should only be used in extreme topographic conditions, e.g., mountains. The designer should strive to minimize the use of these grades for considerable lengths and on north facing slopes.

6.6.1 **Permissible Roadway Grades**
A minimum longitudinal flowline grade of 1.0% shall be required on all local roads.

A minimum longitudinal grade of 2.0% shall be required along the centerline of all collector and arterial roads.

The maximum allowable grade for any roadway is shown on Tables 6.1 and 6.6 of these Roadway Standards.

6.6.2 **Permissible Intersection Grades** (Public Rights-of Way)
The maximum permissible grade at intersections will be as shown in Figure 6.4. These grades are maximum instantaneous flowline grades for the stated distances (each side of the road) for the minor (intersecting) road. Desirable intersection grades should be in the range of two (2.0) to four (4.0) percent for all intersecting roads with the limit of three (3.0) percent for arterials.

Then, intersection grade of the "through" road at the intersection may be dictated by design considerations for that road. However, if the "through" road intersection grade exceeds 3%, the type of access and access control will be dictated by the County Engineer.

All private commercial driveways with curb return radii shall follow the standard set forth for a local road. The length of the maximum grade for the commercial driveway shall be a minimum of 50 feet measured from the flowline intersection of the public

roadway.

6.6.3 Changing Grades

The use of grade breaks in lieu of vertical curves is discouraged. However, if a grade break is necessary and the algebraic difference in grade (A) does not exceed five tenths (0.5 ft./ft.) of a percent along the roadway, the grade break will be permitted.

The maximum grade break allowed at the point of tangency at a curb return for local and collector roads shall be two (2.0) percent and for arterial roadways a maximum of one (1.0) percent.

6.6.4 Cross Fall

Except at intersections, or where superelevation is required, roadways shall be level from top of curb to top of curb (or flowline to flowline). The distance from intersections with which 'cross-fall' will be permitted shall be determined by criteria in Section 6.4.3 "Cross-Slope".

6.6.5 Vertical Curves

When the algebraic difference in grade (A) is at or exceeds five-tenths (0.5 ft./ft.) of a percent, a vertical curve is to be used. Design criteria for vertical curves is found in Table 6.6 of these Roadway Standards. The minimum gradients into and out of a sag (sump) vertical curve is five-tenths (0.5 ft./ft.) of a percent. Minimum length of a vertical curve is shown in Table 6.6. All vertical curves shall be labeled, in the profile, with length of curve (L) and K= (L/A) values.

6.7 INTERSECTIONS

The following criteria shall apply at intersections:

6.7.1.1 The grade of the "through" road shall take precedence at intersections. At intersections of roadways with the same classification, the more important roadway, as determined by the County Engineer, shall have this precedence. The design should warp side roads to match through roads with as short a transition as possible.

6.7.1.2 The key criteria for determining the elevation of the curb return on the side road and the amount of warp needed on a side road transitioning to a through road are:

a. Permissible grade in the stop/start lane. (See Section 6.6.2).

b. Pavement cross slope at the P.C.R.'s on the side road and permissible warp in pavement cross slope. (See Section 6.4.3).

c. Normal vertical curve criteria. (See Section 6.6.5).

d. Vertical controls within the curb return itself. (See Section 6.7.3).

6.7.1.3 The elevation at the P.C.R. of the curb return on the "through" road is always set by the grade of the "through" road in conjunction with normal pavement cross slope (2.0%).

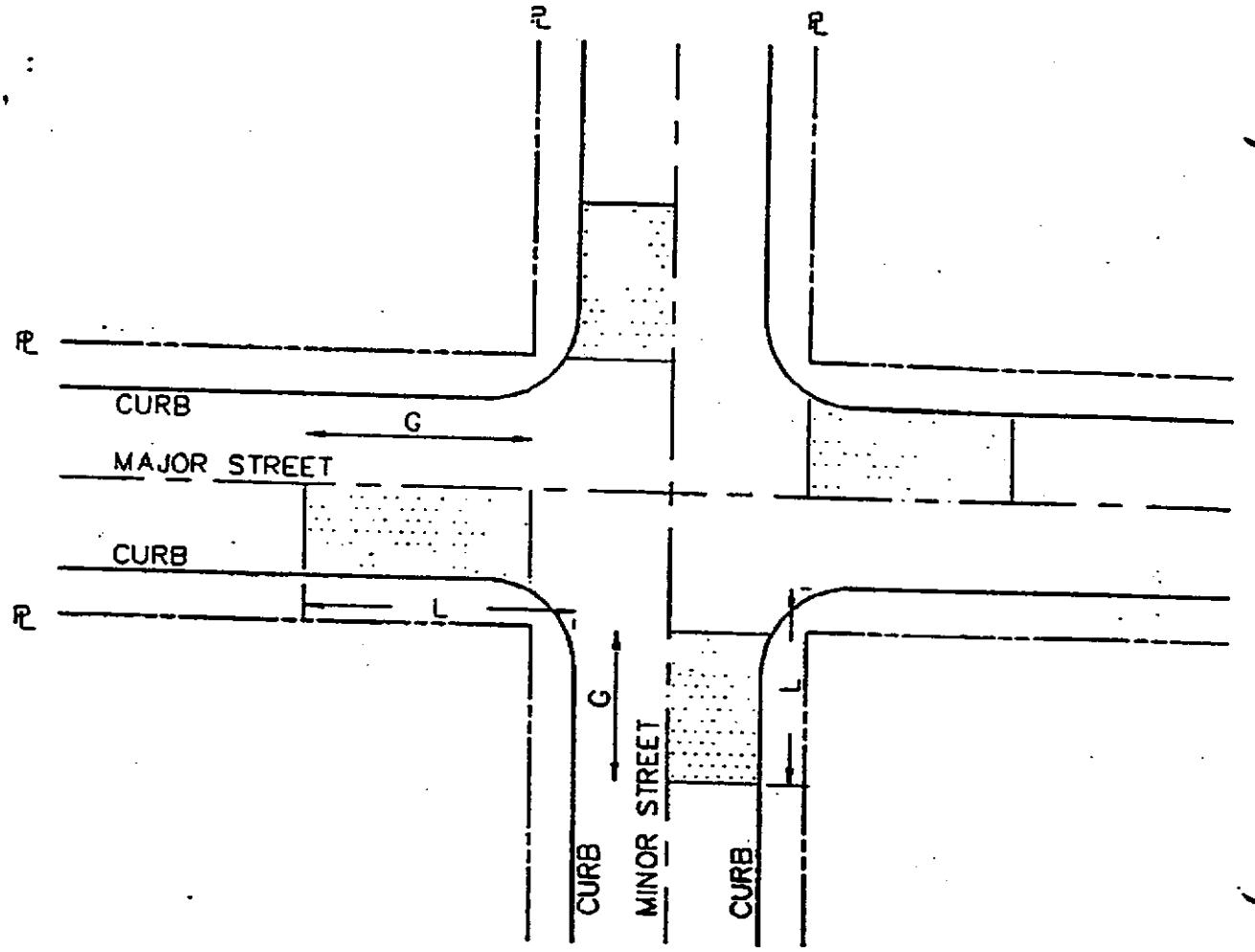
6.7.1.4 Carrying the crown at a side road into the through road is permitted only when drainage considerations warrant such a design. (See Section 6.4.3.2 for road cross slope allowances.)

6.7.1.5 Dipping the flowline to the extent that the lip of gutter is dipped is not permitted. Dipping the flowline is only permitted as specified by Teller County Standard Details concerning curb opening inlets. Tipping an inlet for the benefit of drainage is also not permitted.

6.7.1.6 A more detailed review shall be performed for arterial-arterial intersections to maximize driveability. Few arterial intersections will have a uniform 2% cross slope, the majority of them having one or more sides warped. (See Sections 6.4.3 and 6.7.1.2 of these Roadway Standards for rates of pavement warp allowed.)

6.7.1.7 Whenever possible, intersections shall be made at right angles or radial to a curve. No intersecting angle of less than eighty (80°) degrees will be allowed. (See Figure 6.5.)

6.7.1.8 Intersection sight distances shall conform to the requirements of Section 6.5.9.2.e and Figure 6.2 of these Roadway Standards which have been taken from Table V-11 (page 468) and the formula on page 781 of AASHTO "Green Book".



* The longitudinal slope of the major street shall continue through the intersection and may be greater than the max "G" shown in the table except at major collectors and arterials.

MINOR STREET / MAJOR STREET	LOCAL	MINOR COLLECTOR	MAJOR COLLECTOR	MINOR ARTERIAL	MAJOR ARTERIAL
LOCAL	L .95' G 4%	100' 4%	100' 4%	125' 4%	125' 4%
MINOR COLLECTOR	L – G –	100' 4%	120' 3%	150' 3%	150' 3%
MAJOR COLLECTOR	L – G –	– –	120' 3%	150' * 3%	200' * 3%
MINOR ARTERIAL	L – G –	– –	– –	200' * 2%	200' * 2%
MAJOR ARTERIAL	L – G –	– –	– –	– –	200' * 2%

Figure 6.4
PERMISSIBLE INTERSECTION GRADES

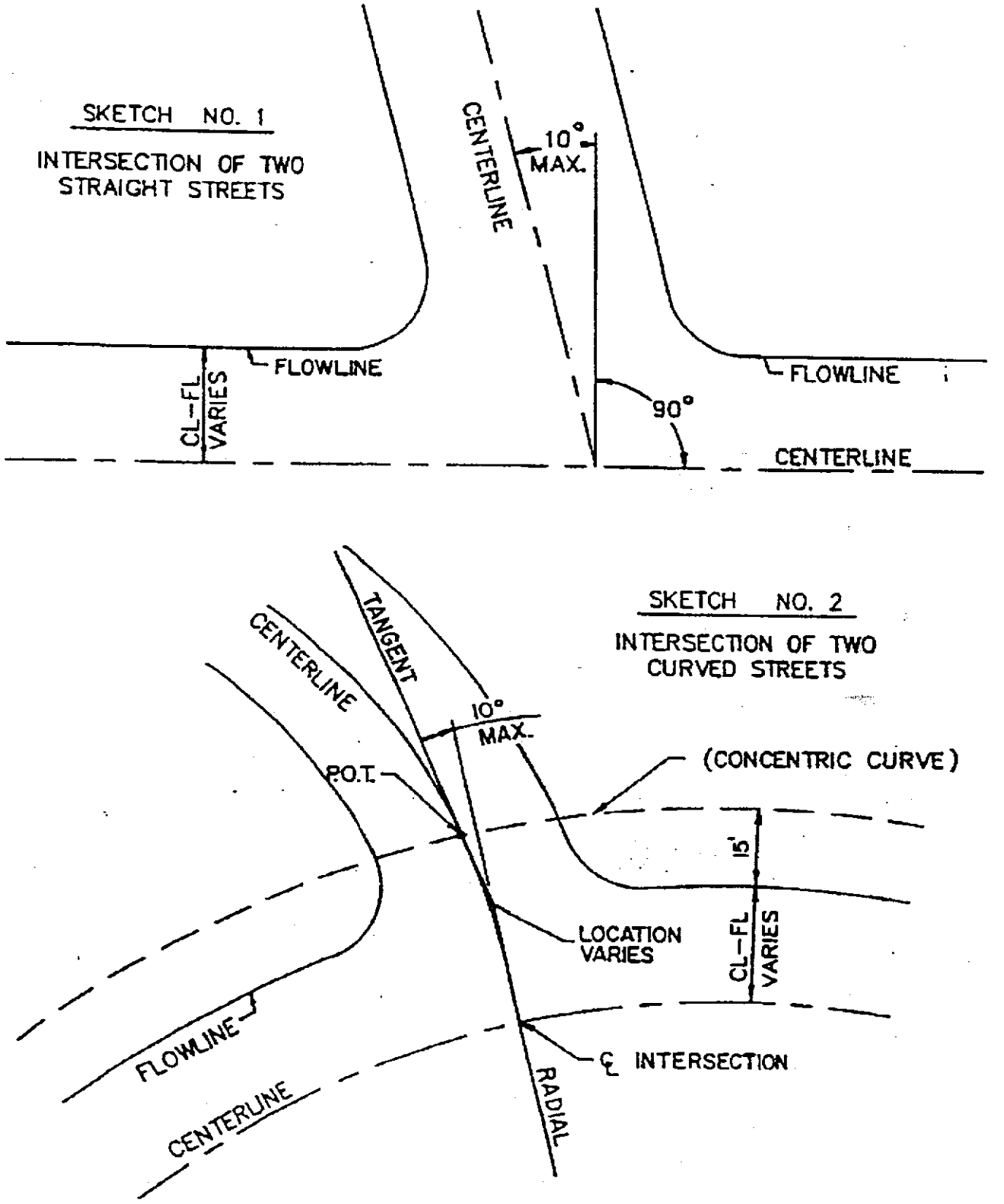


Figure 6.5
PERMISSIBLE INTERSECTION ANGLES

6.7.2 Curb Returns

Minimum fall around curb returns along the flowline shall be as follows:

TABLE 6.7
CURB RETURNS

RADIUS	MINIMUM FALL
All	2.0% around the curb return

6.7.3 Curb Return Profiles

Curb return profiles are required for radii equal to or greater than thirty (30) feet within the public right-of-way. A midpoint elevation along the arc length of the curb return shall be shown in plan view for radii equal to or greater than twenty five (25) feet. Curb return design shall be set in accordance with the following design procedure. General standards for flowline control and profiles within the curb returns shall be as follows:

6.7.3.1 The point of tangency at each curb return shall be determined by the projected tangent grade beginning at the point of intersection (P.I.) of the flowlines.

6.7.3.2 The arc length and external distance of the curb return shall be computed and indicated on the drawing.

6.7.3.3 Show the corresponding flowline (or top of curb) grade for each roadway beyond the P.C.R.

6.7.3.4 Design the flowline of the curb return such that the maximum slope along the flowline does not exceed +8 percent. Grade breaks at the PCR's will not exceed two (2) percent for local and collector roads and one (1) percent for arterials. Maximum vertical curves will equal the arc length of the curb return. The elevation and location of the high or low point within the return, if applicable, is to be called out in the profile. Warp of the side roads shall match across the road within the "L" distance shown on Figure 6.4. No more than 1' vertical difference in elevation across the road at the PCR is allowed.

6.7.3.5 Scale for the curb return profile is 1" = 10' horizontally and 1" = 1' vertically.

6.7.3.6 Curb return radii, existing and proposed, shall be shown.

6.7.4 Connection With Existing Roadways

6.7.4.1 Connection with existing roadways shall be smooth transitions conforming to normal vertical curve criteria (See Section 6.6) if the algebraic difference in grade (A) between the existing and proposed grade exceeds five-tenths (0.005 ft./ft/) percent. When a vertical curve is used to make this

transition, it shall be fully accomplished prior to the connection with the existing improvement, and also comply with the grade requirements at intersection approaches.

6.7.4.2 Existing grade shall be shown for at least three-hundred (300) feet with field verified as-builts showing stations and elevations at twenty-five (25) foot intervals. In the case of connection with an existing intersection, these as-builts are to be shown within a three-hundred (300) foot radius of the intersection. This information will be included in the plan and profile that shows that proposed roadway.

Limits and characteristics of the existing improvement are the primary concern in the plan view. Such characteristics include horizontal alignment, off-site intersections, limits of the improvement, etc.

6.7.4.3 Previously approved designs for the existing improvement are not an acceptable means of establishing existing grades, however, they are to be referenced on the construction plan where they occur.

6.7.4.4 The basis of the as-built elevations shall be the same as the design elevations (both flowlines or both top or curbs, etc,) when possible.

6.8 OFF-SITE DESIGN

The design grade, and existing ground at that design grade, of all roadways that dead end due to project phasing, subdivision boundaries, etc., shall be continued, in the same plan and profile as the proposed design, for at least five hundred (500) feet or to its intersection with an arterial roadway. This limit shall be extended to one thousand (1,000) feet when arterial roadways are being designed.

6.8.1 If the off-site roadway, adjacent to the proposed development, is not fully improved, the developer is responsible for the design and construction of a transition for the safe conveyance of traffic from his improved section to the existing roadway. The following formula shall be applied to the taper of lane change necessary for this transition:

$$L = WS^2/60$$

where

L = Length of transition in feet
W = Width of offset in feet
S = Speed limit or 85th percentile speed.

6.8.2 The County Engineer should be contacted to approve unusual transition criteria. This contact is the responsibility of the Applicant.

6.9 ACCELERATION/DECELERATION LANES

The design of the arterial road system depends upon the proper control of access to developments. The location and design of access points must minimize traffic hazards and interference to through traffic movements. Acceleration/Deceleration lanes shall be designed using Section 400 and 500 of the CDOT Road Design Manual. The need for acceleration or deceleration lanes shall be established by the approved traffic impact study for the final plat or development plan.

6.10 BUS PULLOUT LANES

If recommended by the adopted Teller County Master Plan, bus pullout lanes shall be designed and constructed by the Applicant.

6.10.1 The design of the pullout lanes will be governed by dimensions shown in Table 6.8 and shall be reviewed and approved according to procedures set forth in these Roadway Standards.

TABLE 6.8
BUS PULLOUT LANES

SPEED LIMIT	LEAD-IN LENGTH	LEAD-OUT LENGTH
35 MPH & UNDER	60'	60'
40 MPH	100'	70'
45 MPH	150'	80'
50 MPH	200'	90'
55 MPH	250'	100'

6.10.2 The Pavement Design Soil Report (See Chapter 5) shall consider the requirements of the pullout lane separately from the adjacent roadway.

6.10.3 Bus pullouts shall be constructed with no less than 50 feet between an intersection curb return curve (P.C.) and the beginning of the lead-in taper.

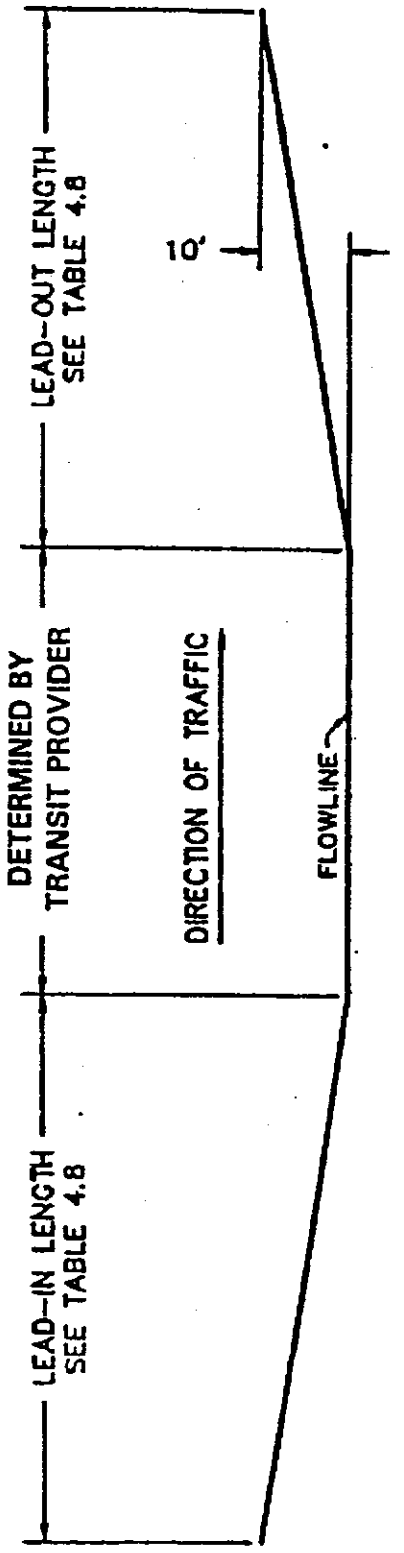


Figure 6.6
BUS TURNOUT STANDARD

6.11 CONSTRUCTION TRAFFIC CONTROL

6.11.1 Pedestrian Traffic

6.11.1.1 Every precaution shall be taken to ensure that construction work does not interfere with the movement of pedestrian traffic, which shall be maintained on the sidewalk at all times. Certified flaggers shall be provided for guidance as necessary.

6.11.1.2 Where an excavation interrupts the continuity of the sidewalk, the contractor shall provide suitable bridge or deck facilities to be supplemented by the use of such proper devices and measures as prescribed in the MUTCD most recent edition for the safe and uninterrupted movement of pedestrian traffic. The edges or ends of the pedestrian bridge or decking shall be beveled or chamfered to a thin edge to prevent tripping.

6.11.1.3 Unless otherwise authorized by the Road and Bridge Director (if maintained by the County) or the County Engineer, pedestrians shall not be channeled to walk on the traveled portion of a roadway.

6.11.1.4 Under certain conditions it may be necessary to divert pedestrians to the sidewalk on the opposite side of the road. Such crossings shall only be made at intersections or marked pedestrian crossovers.

6.11.1.5 Facilities satisfactory to the Road and Bridge Director (if maintained by the County) or the County Engineer shall be provided for pedestrians crossing at corners, pedestrian crossovers and public transportation stops.

6.11.2 Vehicular Traffic

6.11.2.1 Construction work zone traffic shall be controlled by signs, barricades, detours, etc., which are designed and installed in accordance with the MUTCD most recent edition. A Traffic control plan shall be submitted and accepted by the Road and Bridge Director or his designated representative prior to start of any construction (if maintained by the County) otherwise the plan shall be submitted to the County Engineer.

6.11.2.2 During construction of new facilities traffic control should strive to keep the motorist from entering the facility. The primary means to accomplish this are by use of temporary barricades located in advance of the point where new construction joins existing and by appropriate signing. New construction shall not be opened to traffic, and thus the construction traffic control removed, without the approval of the Road and Bridge Director (if maintained by the County) or County Engineer.

6.11.2.3 In general terms, a construction traffic control plan must be drawn on a map. For minor projects or local roadways, a neat sketch of the roadways and the proposed control devices will suffice. For major projects or major roadways, the traffic control plan should be superimposed on as-builts, construction plan drawings, or other detailed maps.

6.11.2.4 The MUTCD most recent addition PART VI shall be the basis upon which the construction traffic control plan is designed, in concert with proper, prudent, and safe engineering practice. All necessary signing, striping, channelization devices, barricading, flagging, etc., shall be shown on the plan.

6.11.2.5 In concept, County roads shall not be closed overnight, and work shall not force road or lane closures before 8:30 a.m. or after 3:30 p.m. If exceptions to this are required, this shall be so noted on the construction traffic control plan and must be specifically approved by the County Engineer and (if maintained by the County) by the Road & Bridge Department Director.

6.11.2.6 Directional access on roadways may be restricted (minimum travel lane width in construction area is 10 feet), but proper controls including flagging must be indicated. Removal of on-road parking should be considered, and noted where applicable.

6.12 MEDIAN ISLANDS

6.12.1 Median islands shall be designed per the AASHTO "Green Book".

6.12.2 No permanent structures (trees, poles, large rocks, etc.) shall be placed within 10 feet of the traveled lane (unless median is constructed per SP-25 of these Roadway Standards) or in any location that would obstruct sight distance. Alternatives may be approved as part of an approved development plan.

6.12.3 The nose of the median island shall not extend past the curb return at the intersection.

6.12.4 Landscaping on median islands shall have a mature height of 24 inches or less above the traveled way in areas around intersections to facilitate adequate sight distance and will preferably be dry land or native vegetation. If irrigation is planned for a median island, mitigation will be provided to protect the subgrade under the pavement from being saturated by using the median island detailed in Appendix A, Drawings SP.24 and SP.25.

6.12.5 A minimum flowline-flowline dimension of 20.00 feet must be maintained on both sides of all median islands.

6.13 SIGNAGE AND STRIPING CRITERIA

All traffic control devices and striping shall be fabricated and installed in accordance with MUTCD.

Permanent signage and striping shall be completely in place before any new roadway is opened to the public.

Traffic signal installation and equipment shall conform to the CDOT standards and specifications. The MUTCD Signal Warrants shall be met for signal installation.

6.13.1 Reflectivity

All traffic control devices and all regulatory signs must have reflective materials. All reflective materials must qualify at 70 candlepower Energy Grade (E.G.) or above (High Intensity). All signs, or traffic control devices, must have a seven-year materials warranty. Regulatory signs must be High Intensity grade reflectivity or greater; in particular, all STOP, YIELD, or DO NOT ENTER signs.

6.13.2 Design and Size

Sign specifications and diagrams are detailed in the Federal "Standard Highways Sign." (Publication available from the U.S. Department of Transportation, Federal Highway Administration 1979.) Acceptable sign sizes are listed in the standard column of the table printed with each diagram. Construction signs will be a minimum 36 inches. STOP signs used at major roadway intersections shall be a minimum 30 inches.

6.13.3 Backing Plates

Aluminum blanks of .080 gauge is standard, except for signs larger than 36 x 36 inches, which shall be .100 or .125 gauge aluminum.

6.13.4 Posts and Boots

6.13.4.1 All regulatory and warning signs shall be mounted on standard one and three quarter inch by one and three quarter inch by (1¾" x 1¾") galvanized steel tubing, all four sides punched with 3/8" holes at one inch (1") centers. Posts must be of appropriate length to pass the MUTCD specifications for the location, must conform to CDOT specification Section 614, and must meet the Federal break-away standards. Installation boots are to be two inches by three feet (2"x3') four (4) punch tubing, driven down to within four inches above ground level.

6.13.4.2 Sign boots are to be driven a minimum of thirty two inches (32") into the ground, and longer boots may be required because of soil composition and compaction.

6.13.4.3 Road signs shall be installed on standard one and three-quarter inch (1-3/4") four (4) punch square steel tubing, (3/8" diameter holes on 1" centers galvanized).

6.13.4.4 When road name sign assemblies are posted with the traffic control, posts must be standard one and three quarter inch (1¾" x 1¾") tubing, using two inch by three foot (2" x 3') boots driven into ground until within four inches above ground.

6.13.4.5 The height to the bottom of the sign assembly shall be at least eight feet (8') above the adjacent roadway crown, when installed exclusively for road name posting. When combined with traffic control (STOP or YIELD) signs, the road name sign assembly shall be at least nine feet (9') above the adjacent roadway crown.

6.13.4.6 Post caps and crosses shall have five inch by one-fourth inch (5"x¼") slots for plates.

6.13.4.7 Road name assembly should be located at point of curvature of corner radius and should be placed according to the requirements as stated in 6.13.5 (Road Name Signs) of these Roadway Standards. When road name assembly is combined with regulatory signs, sign placement for the regulatory sign shall govern.

6.13.5 Road Name Signs

6.13.5.1 Road names and 100-block (where applicable) designations should be obtained from the Teller County Planning Department.

6.13.5.2 Six inch plates, up to 42 inches long, may be used at all minor intersections, minimum two plates per road sign assembly. Six inch by 48-inch plates will be installed, two for each road, minimum four plates per road sign assembly and shall be installed with end bolts on all plates. In the instance where a road changes names, such name changes should be designated on the road name assembly by using directional arrows and will require two additional plates.

6.13.5.3 Road name assembly should be located at the point of curvature of the corner radius and should be placed according to the following, as measured from the edge of the sign. When the road name assembly is combined with regulatory signs, sign placement for the regulatory sign shall govern.

Curb, Gutter and Sidewalk Combination:
Two feet behind sidewalk

Curb with no Sidewalk or Detached Sidewalk:
Two to five feet behind curb on local roads. On collector roads, 4 to 6 feet behind curb, and on arterials, 6 to 8 feet behind curb.

No Curb or Gutter:
Twelve feet min. from edge of pavement.

Gravel Road:
Twelve feet min. from edge of travel lane.

6.13.5.4 The height to the bottom of the sign assembly shall be at least eight feet above the adjacent roadway crown, when installed exclusively for road name posting. When combined with traffic control (STOP or YIELD) signs, the road name sign assembly shall be at least nine feet above the adjacent roadway crown.

6.13.5.5 Sign assemblies shall be installed on standard 1-3/4", four (4) punch square tubing, (3/8" diameter holes on one inch centers, galvanized).

6.13.5.6 When road name sign assemblies are posted with the traffic control, posts must be standard 1¾-inch tubing, using 2"x3' boots driven until flush within four inches above ground level.

6.13.5.7 Sign boots are to be driven a minimum of thirty two inches into the ground. Longer boots may be required because of soil composition and compaction.

6.13.5.8 Post caps and crosses shall be 5"x¼" slots for plates.

6.13.5.9 All road signs will be engineering grade or above (high intensity) white on engineering grade or above reflectorized green. Lettering shall be Series C. per MUT CD

6.13.6 **Criteria on Special Allowances for Road Name Sign Variations**

6.13.6.1 Plans for any variances must be submitted to and reviewed by the County Engineer. List all specific variances from County Roadway Standards in the special footnote box on the first page of the plans.

6.13.6.2 Only Special Districts may apply for variances. The Special District must submit a draft of a "save harmless" letter to be reviewed by the Road & Bridge Department, County Engineer and the County Attorney.

6.13.6.3 This letter is to be addressed to the Road and Bridge Director. It must identify that the Special District's responsibility for maintenance and supply in perpetuity of their specific signs and materials. It must stipulate the Special District will respond within 24 hours after notification by the Road and Bridge Department to maintain or repair.

6.13.6.4 This agreement will be recorded, and notification of the book and page number will be returned to the Special District.

6.13.6.5 All road name signage size and reflectivity (red may not be used as background color) shall meet or exceed Roadway Standards.

6.13.7 **Designer's Responsibility**
These plans are intended for typical applications of signage and striping for standard conditions. These standards do not alleviate the responsibility of the designer from

sound engineering judgment or to exceed minimum standards in specific cases where conditions warrant.

6.14 ENTRY ROADS

"Entry Roads" are generally short (160' minimum, one block or first intersection max.) roads with no driveway access, that are designed to allow a reduction in the separation between an arterial road and the first local road intersection, or to allow more than 40 dwelling-units with a single access. An "Entry Road" off of an arterial shall have a minimum 40' flowline-flowline dimension (if median island, 20' min. FL-FL both sides). An "Entry Road" off of a collector shall have a minimum 38' flowline-flowline dimension (if median island, 20' min. FL-FL both sides). If an "Entry Road" off of a collector has a FL-FL dimension of 40', driveways may be allowed on one side of the "Entry Road." Entry road shall be posted "No Parking." An "Entry Road" is considered a lower classification road than a collector, but greater than a local road, therefore, for example, "Entry Road" criteria for separation between intersections along a collector cannot be used to place a collector road within 160 feet of another intersection. See Section 13.3.5.2.

6.15 NUMBER OF DWELLING UNITS WITH A SINGLE ACCESS

The number of D.U.'s with a single access shall generally be as described under Sections 6.2.1.1(l) and 6.2.1.2(l). If an Entry Road is the single access to a group of homes, depending on the internal road alignments, up to 100 D.U.'s may be allowed with written approval of the Fire District. Factors that effect the allowable D.U.'s with a single access are: the length of the roads from a through collector or arterial; and if, after entering the development, there is a circle drive so there is more than one way to get to a particular D.U., topography, vegetation (trees, scrub oak, etc.), and other considerations deemed important by the Fire District for emergency access.