

Public Street Facilities Design and Planning Standards
Table of Contents
Chapter 3

3.1 General

- (3.1.1) Master Transportation Plan
- (3.1.2) Street Systems in General
- (3.1.3) Classification
- (3.1.4) Right of Way Widths
- (3.1.5) Half Streets
- (3.1.6) One Way Streets
- (3.1.7) General Access
- (3.1.8) Access Management
- (3.1.9) Temporary Termination
- (3.1.10) Permanent Termination
- (3.1.11) Reserved Strips
- (3.1.12) Corridors
- (3.1.13) Common and Shared Driveways
- (3.1.14) Street Lights

3.2 Traffic Impact Analysis (TIA)

- (3.2.1) Applicability
- (3.2.2) Administration

3.3 Street Improvements Along Frontage of Developing Properties

- (3.3.1) General
- (3.3.2) Curb and Gutter
- (3.3.3) Sidewalks
- (3.3.4) Bicycle Facilities on Public Streets
- (3.3.5) Public Transit Accommodations

3.4 Shared Use Paths

- (3.4.1) General
- (3.4.2) Safety Considerations
- (3.4.3) Gradient and Drainage
- (3.4.4) Bridges

3.5 Paper and Substandard Streets

- (3.5.1) Paper Streets
- (3.5.2) Substandard Streets
- (3.5.3) Turnarounds

3.6 Street Design

- (3.6.1) General
- (3.6.2) Curves
- (3.6.3) Design Requirements for Designated Street Classifications
- (3.6.4) Typical Cross Sections

3.7 Geotechnical Report

- (3.7.1) General
- (3.7.2) Special Conditions

3.8 Handicap Ramps

3.9 Adjacent Existing Streets/Subdivisions

3.10 Miscellaneous Design Criteria

- (3.10.1) Street Grades
- (3.10.2) Entrances, Curb Cuts and Intersections
- (3.10.3) Underdrains
- (3.10.4) Guard Rail
- (3.10.5) Conduits and Sleeves
- (3.10.6) Street Signs and Markings
- (3.10.7) Traffic Signals
- (3.10.8) Utility Easements

Chapter 3

Public Facilities Street Design and Planning Standards

3.1 General

(3.1.1) Master Transportation Plan

Any street(s) that is/are designated as a new street or improved street on the Master Transportation Plan and associated plans, shall be coordinated with adjoining links in said system and constructed at consistent widths. Where streets are not indicated on the Master Transportation Plan or associated plans, the arrangement of streets shall provide for the continuation of or appropriate projection of existing and proposed streets in surrounding areas.

Widening of existing streets and construction of sidewalks and bike facilities along property frontage(s) shall be accomplished as necessary to provide widths called for in this manual, the Master Transportation Plan, and associated plans. Where not shown in the Plan, widening shall extend to meet the standard typical section for the classification of the existing street.

Developers and consultants are encouraged to contact the City Engineer and Public Works Director early in the development process in order to confirm specific street improvement needs.

(3.1.2) Street Systems in General

The provisions of this section shall apply to all street design and construction in the City. Where no specific roadway construction, design standard, or specification is set forth in this provision, the provisions of the Virginia Department of Transportation Road and Bridge Standards, Minimum Standards for Entrances to State Highways, Road Design Manual, and the Virginia supplement to the Manual of Uniform Traffic Control Devices shall be used.

(3.1.3) Classification

(3.1.3.1) All streets shall be classified as one of the following:

- Major Arterial Street: Purpose is to provide linkages between localities and towns. Traffic volumes generally exceed 10,000 vehicles per day.
- Minor Arterial Street: Purpose is to support inter-neighborhood linkages and carry traffic to and from the arterial system. Traffic volumes are similar to Collector Street Classification Streets.

- Collector Street: Purpose is to provide direct access to a group of residential local streets, and connect with the arterial system. It is not intended to handle heavy through traffic. Generally traffic volumes should range between 1,001 vehicles per day and 2,500 vehicles per day.
- Residential Local Street: The lowest category of functional classification. The purpose of local streets is to provide access to individual parcels that abut one another. The traffic type is local in nature rather than regional. Generally, traffic volumes should not exceed 800 vehicles per day. Residential streets carrying more than that will be classified as Collectors.
- Private Street: Streets that have not been dedicated to public use or that require the permission or invitation of a resident or owner to use the street. Such streets are not intended to be included in the system of streets maintained by the City of Harrisonburg. Perpendicular or angled parking is not permitted on a private street.

(3.1.3.2) Streets of a proposed subdivision that have not been classified by the Master Transportation Plan, shall be classified during the review of the preliminary plat, at which time the required street cross-section will also be determined. All streets in Business/Commercial Zones shall be considered to be Collector or Arterial Streets.

(3.1.3.3) Typical Street Cross Sections are located in Appendix F.

(3.1.4) Right-of-Way Widths

Street right-of-way widths shall be as shown in the Master Transportation Plan and where not shown thereon such widths shall be as shown on the Typical Cross Sections.

(3.1.5) Half Streets

Half Streets are prohibited.

(3.1.6) One-Way Streets

One-way public streets shall not be accepted unless constructed for full width in accordance with the design requirements for the appropriate street classifications.

(3.1.7) General Access

(3.1.7.1) Unless proffered otherwise during a rezoning application, or unless the Director of Public Works determines that traffic in adjoining developments will be increased in a manner threatening the safety of existing residents, the

arrangement of major streets in a development shall provide for their proper continuation from developed adjoining parcels, and for their proper extension into undeveloped adjoining properties.

(3.1.7.2) Residential local streets shall be laid out to discourage cut-through movements of vehicles. Cut-through movements are defined as any trip that does not originate or terminate in a given location such as a shopping center or residential area.

(3.1.8) Access Management

(3.1.8.1) Virginia Department of Transportation's Road Design Manual, Appendix F: "Access Management Design Standards for Entrances and Intersections" shall be used as the guideline for access management on arterials.

(3.1.8.2) In accordance with VDOT's classification system, access management may be regulated with increasing levels of stringency as classification becomes more intense.

Local streets emphasize property access rather than traffic movement. Arterial and collector streets must serve a combination of property access and traffic movement. Direct property access will be restricted along arterials and collectors, whenever reasonable access can be provided to a lower class roadway. Should reasonable alternative access not be available, commercial entrances onto collector streets will be allowed based on length of street frontage per the following:

55-160 ft. frontage – one entrance

161-600 ft. frontage – two entrances

601-1000 ft. frontage – three entrances

>1000 ft. frontage – one additional entrance per every 400 ft. of frontage (or fraction thereof)

Notes: 55 ft. is the minimum frontage needed for a two-way commercial entrance. Frontage for corner lots will be measured for both frontages combined, not individually. The number of allowed entrances may be constricted by other criteria such as, but not necessarily limited to, separation from intersections, alignment with opposite entrances or intersections, sight distance or Traffic Impact Analysis (TIA) recommendations.

(3.1.8.3) Signalized access points shall fit into the overall signal coordination plan for traffic progression.

(3.1.8.4) Developers, builders and contractors are encouraged to minimize entrances from private development directly onto a public street or road, and to consider safety impacts of placing drive entrances near intersections. Where medians exist, it shall be disallowed to permit any breach of the median any distance shorter than six-hundred (600) feet.

(3.1.9) Temporary Termination

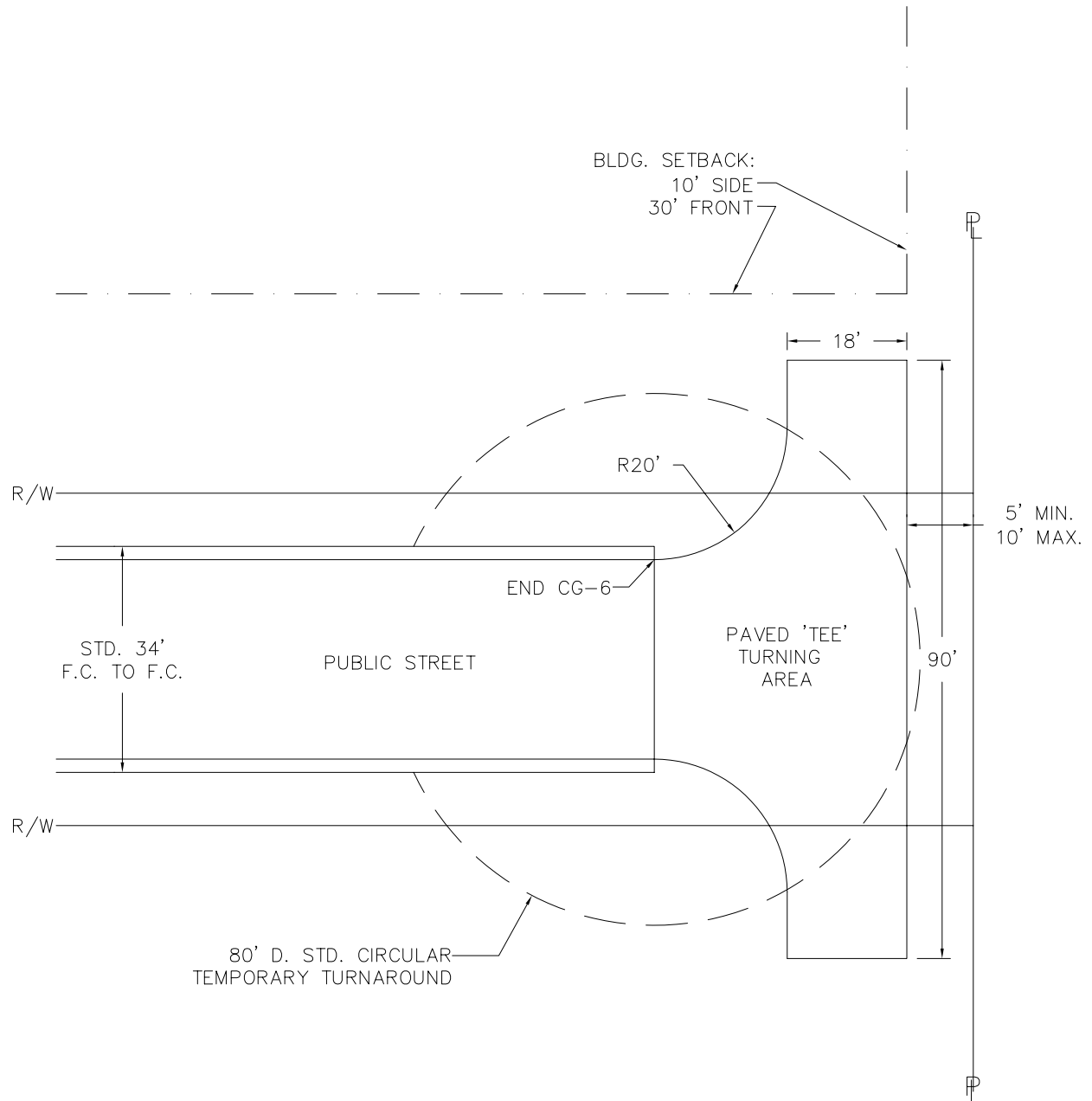
(3.1.9.1) Streets that terminate temporarily, appearing in character as a dead-end street, shall be provided with a temporary terminal turn-around having a diameter of not less than eighty (80) feet of traffic-capable surfaced area to be a minimum of eight (8) inches compacted 21-A aggregate plus two (2) inches base asphalt. Future street grades shall be accommodated as much as possible in constructing the temporary turnaround. Subgrade elevation shall be no higher than that needed for future street extension. Additional stone base and/or pavement thickness may be required to reach adequate temporary grade.

(3.1.9.2) An alternate, paved “tee” turnaround may be acceptable on a case-by-case basis, where topography, lot constraints, entrances, etc. make it difficult to install a circular turnaround. Paving section to match street. Refer to standard detail.

(3.1.9.3) The developer has the option of escrowing funds to the City for surfacing the turnaround if it is expected that the street will be continued within one year thereby removing the temporary turnaround. This will be allowed where the street continuation is shown on an approved preliminary plat, or where the same developer owns the adjacent property (must be in the City). At any time during the year period, and upon issuance of a Public Access Permit, the developer can dress up and surface the turnaround and have the escrow subsequently returned. Upon passing of the year, the City will dress up and surface the turnaround using the escrowed funds. Such escrowed funds shall be in cash or in a bank letter of credit with the City named as beneficiary.

(3.1.9.3) The developer shall provide on-site temporary construction easements of sufficient width to accommodate the future completion of the street when the adjacent area is developed.

(3.1.9.4) Where future street construction/connections are planned, developers shall place pre-approved signage indicating “Future Street Connection” at end of temporary termination point.



ALTERNATE TO CIRCULAR TEMPORARY TURNAROUND
ACCEPTED ON CASE-BY-CASE BASIS ONLY

SCALE: 1" = 25'

REVISIONS				DWG. NO. 3.1.9
NO.	DATE	DESCRIPTION	INIT.	
				PAGE

TEE TURNAROUND

(3.1.9.5) Plans shall include extension of street profile into adjacent property for a minimum distance of three hundred (300) feet, to show feasibility for future extension without excessive cuts or fills.

(3.1.10) Permanent Termination

(3.1.10.1) A permanent dead-end street (cul-de-sac) may be permitted in the event that previous development, physical features such as floodplains and highways or extraordinarily restrictive topography of an adjacent property make future street extension unlikely. Other locations may be approved on a case-by-case basis to meet the needs of individual developments upon staff review and recommendation.

(3.1.10.2) A cul-de-sac serving a residential development shall be designed to a length that will carry a maximum of two hundred fifty vehicles per day, not to exceed eight hundred (800) feet in length, measured along the centerline from its intersection with the centerline of the through street to the center of the turnaround, and the minimum length shall be one hundred fifty (150) feet measured from the centerline of the intersecting street to the center of the turnaround.

(3.1.10.3) The minimum radius of the residential cul-de-sac shall be forty-five (45) feet to the face of the curb, with a fifty-five (55) foot radius on the right-of-way.

(3.1.10.4) A cul-de-sac serving a commercial or industrial development shall not exceed a maximum length of one thousand (1,000) feet, measured along the centerline from its intersection with the centerline of the through street to the center of the turnaround.

(3.1.10.5) The minimum radius of a commercial/industrial cul-de-sac shall be fifty (50) feet to the face of curb, with a sixty (60) foot. radius on the right-of-way.

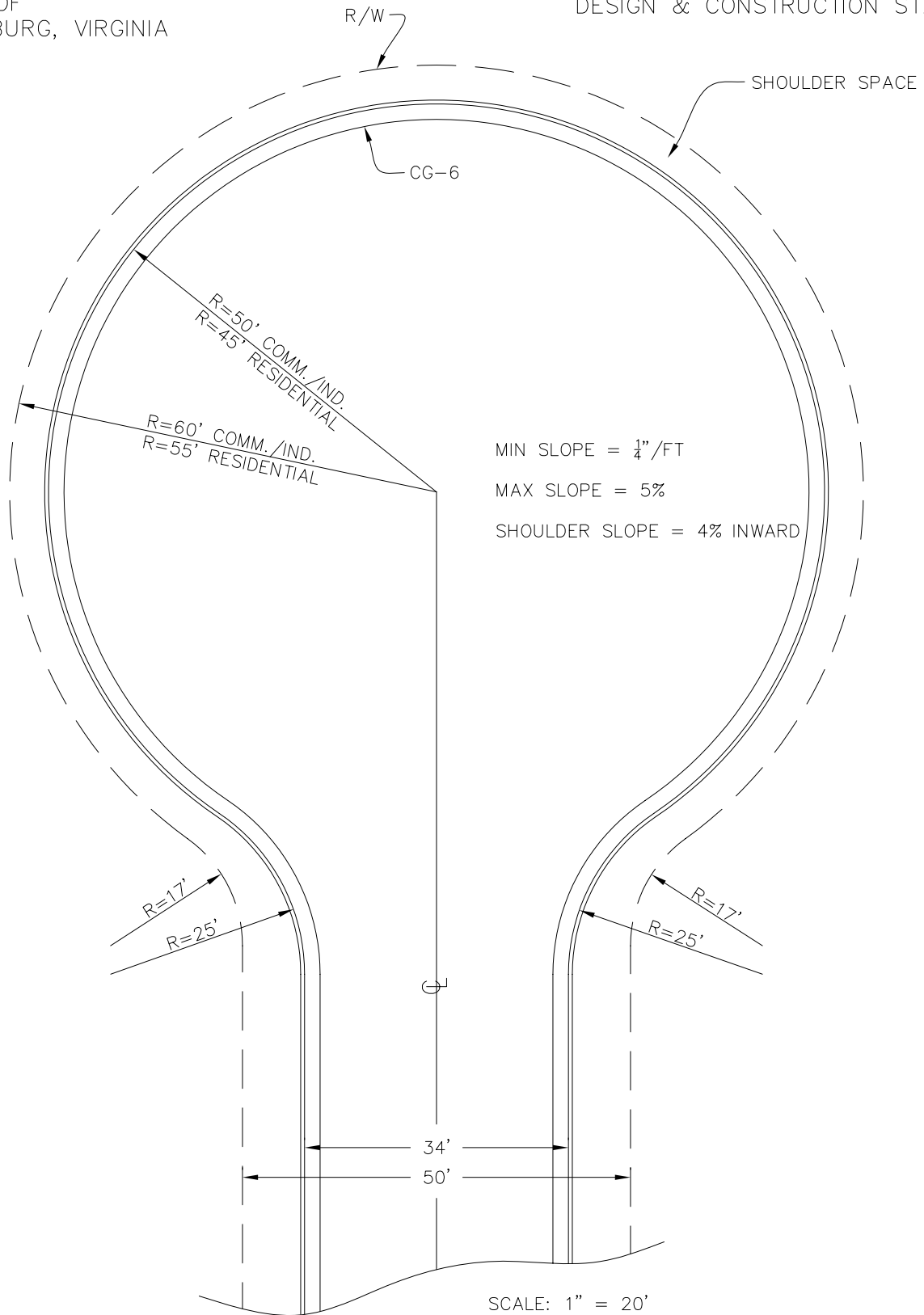
(3.1.10.6) Any commercial, industrial or multi-family entrance onto a cul-de-sac shall be provided with a stop sign for outgoing traffic.

(3.1.11) Reserved Strips

Reserved strips restricting access to streets, alleys, public ways and easements shall be prohibited.

(3.1.12) Corridors

In locations where the City has designated either in the Master Transportation Plan, or by Council endorsement, a corridor for street construction to link two



REVISIONS			
NO.	DATE	DESCRIPTION	INIT.
1	9/04	DCSM UPDATE	
2	9/09	DCSM UPDATE	

**STANDARD
CUL-DE-SAC**

DWG. NO.

3.1.10

PAGE

or more major City streets or to make substantial improvements along a particular corridor or segment thereof, the subdivider shall be required to provide the designated street or street improvements within that corridor where it crosses the development.

(3.1.13) Common and Shared Driveways

(3.1.13.1) Interparcel connections, common or shared driveways are required along collectors and arterials to minimize the number of entrances. Developer shall coordinate with adjacent property owner(s) to configure suitable connections.

(3.1.13.2) Where more than one lot is served by a common driveway, a shared maintenance agreement must accompany the shared access easement agreement. The shared maintenance agreement must be approved by the Director of Community Development in conjunction with final subdivision plat approval. A similar agreement is encouraged for interparcel connections.

(3.1.13.3) Common driveways shall be served by an adequate access easement.

(3.1.13.4) Suitable turnarounds shall be provided at the end of a pipestem driveway serving two or more lots.

(3.1.14) Street Lights

(3.1.14.1) Street lights shall be shown on plans for all new public streets. Locations of poles, conduits, transformers, wires and easements shall be determined by the Harrisonburg Electric Commission (HEC) in coordination with the developer and the design engineer and shall be shown on the development plans.

(3.1.14.2) Costs for street lights and appurtenances shall be borne by HEC and/or the developer in accordance with HEC policy.

(3.1.14.3) Utility easements shall be provided on the utility plats along the frontage of all lots in a residential development. The developer will be responsible for granting utility easements and ensuring that all bonded roadway luminaires are installed.

(3.1.14.4) Roadway luminaire poles must be either breakaway type or be located outside the right-of-way or the minimum required clear zone, whichever is greater. Roadway luminaires may have arm brackets that mount the luminaire two feet over the edge of the pavement.

(3.1.14.5) Intersection luminaires must overhang the approach lanes of the street carrying the larger volume of traffic. The overhang should be at 90 degrees from the edge of the pavement.

3.2 Traffic Impact Analysis (TIA)

(3.2.1) Applicability

(3.2.1.1) A traffic impact analysis is a study that provides information on the impacts of vehicle trips generated from the proposed land uses on traffic safety and operation within a designated area and provides recommended solutions to mitigate the impacts. These standards and guidelines are to provide applicants the requirements for a comprehensive and acceptable traffic study for development proposals in the City of Harrisonburg.

(3.2.1.2) The Director of Public Works or his designee may require that a TIA be conducted for any planned development expected to generate 100 peak hour vehicle trips. Confer with the Institute of Transportation Engineer's "Trip Generation Handbook," most recent edition.

(3.2.1.3) Planned developments that will substantially affect transportation on state controlled highways must also be reviewed by VDOT. Per 24 VAC 30-155 this includes

- Residential site plans that generated more than 100 vehicle trips per peak hour and has an entrance that is within 3,000 feet, measured along public roads or streets, of a connection to a state-controlled highway.
- Other site plans that generate more than 250 vehicle trips per peak hour or 2,500 vehicle trips per day and has an entrance that is within 3,000 feet, measured along public roads or streets, of a connection to a state-controlled highway.

Applicant fees for TIA review can be found in the City's Subdivision Ordinance.

(3.2.1.4) As required in VDOT's Traffic Impact Analysis Regulations, 24 VAC 30-155-40, the city shall submit a package to VDOT within 10 business days of receipt of complete application for a rezoning proposal if the proposal substantially affects transportation on –state controlled highways. Criteria for determining affect on transportation on state controlled highways can be found in the Traffic Impact Analysis Regulations and Administrative Guidelines.

(3.2.2) Administration

(3.2.2.1) A TIA shall conform to all provisions described in VDOT's Traffic Impact Analysis Regulations, and Administrative Guidelines unless the requirements of specific subsections are modified or deemed unnecessary by the Director of Public Works or the City Engineer.

(3.2.2.2) The applicant shall provide two (2) copies of the TIA to the Department of Community Development for review by City Staff. The applicant shall provide three (3) additional copies of the TIA to the Department of Community Development if VDOT review is needed. The TIA shall be prepared by a qualified transportation engineer with experience and expertise in preparing similar studies.

3.3 Street Improvements Along Frontage of Developing Properties

(3.3.1) General

Any required improvement to existing city maintained street(s) necessitated by development shall provide necessary street improvements along the development's street frontage. At a minimum, curb and gutter, street widening and sidewalk construction per Section 3.1.1 will be required. Where master city plans or council approved plans indicate further improvements, the developer may be responsible for bicycle facility construction, shared use path construction, or land dedication for such improvements.

(3.3.2) Curb and Gutter

(3.3.2.1) Curb and gutter shall be provided on both sides of all new public streets.

(3.3.2.2) Rolltop curb & gutter may be accepted on a case-by-case basis on local streets carrying less than 400 vehicles per day. Rolltop curb & gutter shall be three feet wide and dimensioned per VDOT Subdivision Street Standards. Rolltop curb may prompt the need for additional storm inlets.

(3.3.3) Sidewalks

(3.3.3.1) Sidewalks shall be required on both sides of all new public streets.

(3.3.3.2) Sidewalks shall be constructed along the street frontage of all developing and redeveloped properties. In cases where insufficient right of way exists for sidewalk construction, appropriate right of way shall be dedicated and sidewalks constructed.

(3.3.3.3) Please confer with typical cross-section, Appendix F, for specifications.

(3.3.3.4) Sidewalks shall be dowelled into storm drain structures to prevent differential settlement.

(3.3.4) Bicycle Facilities on Public Streets

Any property being developed fronting on a public street that abuts a designated bicycle route in the adopted Bicycle Plan, shall dedicate additional right of way to satisfy the appropriate width for bicycle lanes and the developer may be responsible for bicycle facility construction.

Design and construction of facilities on public streets shall be in general conformance with AASHTO's Guide for the Development of Bicycle Facilities as referenced in Appendix F.

(3.3.5) Public Transit Accommodations

(3.3.5.1) Transit accommodations may be required in the following circumstances:

- For all significant residential development, particularly related to high-density multifamily uses
- For developments located near or along a designated public transit bus route
- For developments located on major collectors or arterials, the applicant may be required to construct a dedicated bus pull-off in order to minimize impact to traffic flow
- For large commercial developments

(3.3.5.2) Transit accommodations may include:

1. Bus shelter
2. Bench
3. Bus stop pole and sign
4. Bus stop information display case
5. Trash receptacle
6. Concrete boarding pad
7. Bicycle rack
8. Lighting
9. Bus pull-off

(3.3.5.3) Transit accommodations will be reviewed by City staff based on the following criteria during the site plan process:

1. Acceptable location
2. Safe Pedestrian Access
3. Visibility for vehicles and waiting pedestrians
4. Access for those with mobility impairments
5. Bus pull offs along public streets shall be provided with adequate right-of-way dedicated to serve the needs of bus maneuvering and pedestrian accommodations.
6. Number of average peak hour traffic trips. The number of anticipated peak hour traffic trips is important in gauging the possible demand for public transit services at a development. While not applicable in all cases, the following categories are provided as a guide to possible transit accommodations at various types of developments:
 - a. Residential Developments.
 - i. That generate between 25 and 49 peak hour trips: concrete boarding pad, lighting, and bench
 - ii. That generate between 50 and 99 peak hour trips: concrete boarding pad, bus shelter, lighting, trash receptacle, and bus stop information display case
 - iii. That generates 100 or more peak hour trips: concrete boarding pad, bus shelter, lighting, trash receptacle, bus stop information display case, and bus pull-off.
 - b. Commercial/Industrial/Public Facility Developments:
 - i. That generate between 25 and 49 peak hour trips: concrete boarding pad, lighting, and bench.
 - ii. That generate between 50 and 149 peak hour trips: concrete boarding pad, bus shelter, lighting, trash receptacle, and bus stop information display case.
 - iii. That generates 150 or more peak hour trips: concrete boarding pad, bus shelter, lighting, trash receptacle, bus stop information display case, and bus pull-off.

(3.3.5.4) For commercial/industrial/public facility developments, there shall be one central stop where placement of a bus shelter shall be required. Depending on the characteristics of the development additional bus stop locations may be necessary. The necessity of additional stops will be evaluated on a case-by-case basis.

(3.3.5.5) Maintenance agreements and final ownership shall be determined prior to installation. Typically, transit accommodations will be owned and maintained by the property owner(s).

(3.3.5.6) All shelters and transit accommodations shall conform to standards adopted by Harrisonburg Transit as established by the Federal Transit Administration and Virginia Department of Rail and Public Transportation. All transit accommodations shall be constructed in compliance with guidance set forth in Section 10 of the ADA Accessibility Guidelines for Buildings and Facilities (ADAAG).

(3.3.5.7) All transit accommodations shall be detailed on the plans and adequately dimensioned.

3.4 Shared Use Path

(3.4.1) General

(3.4.1.1) Where a shared use path bisects a property as indicated in any City-adopted plans, the applicant-owner shall create a public access easement maintaining connectivity with adjoining properties in order to facilitate planning for and construction of shared use path facilities.

(3.4.1.2) Pedestrian/shared use paths may be located outside the street right-of-way, and may displace sidewalk requirements at the discretion of the Director of Community Development or Director of Public Works. This substitution shall only be considered where shared use paths are designed to be continuous and connect to a public street. Maintenance for such shared use paths must be addressed as a part of the plan approval process.

(3.4.1.3) Maintenance of any private shared use paths and sidewalks within a development shall be the responsibility of the owner or homeowners association and shall be so noted on the plans and on appropriate homeowner association documents.

(3.4.1.4) Design and construction of shared use paths intended for public use shall be in general conformance with AASHTO's Guide for the Development of Bicycle Facilities.

(3.4.2) Safety Considerations:

(3.4.2.1) The safety of pedestrians and bicyclists shall be a prime consideration in shared use path design.

(3.4.2.2) Standard signing and markings shall be in conformity with the Manual Uniform Traffic Control Devices.

(3.4.2.3) The design engineer shall address stopping and intersection sight distances at all shared use path intersections, curves and particularly where steep grades are proposed at shared use path/street intersections.

(3.4.2.4) Standard curb ramps for persons with mobility impairments shall be provided at all shared use path curb crossings to allow continuity of shared use path use by handicapped persons and bicyclists. Curb depressions shall be equal to the shared use path slope and shall not be steeper than twelve-to-one (12:1).

(3.4.2.5) Barricades shall be provided at all shared use path access locations to prevent unauthorized vehicular access. The barricades shall have locking/unlocking devices to permit access by authorized maintenance and/or emergency vehicles. Barricade designs are subject to approval by the Director of Public Works.

(3.4.3) Gradient and Drainage:

(3.4.3.1) A minimum grade of 1 percent shall be required for all shared use paths, except in sags where proper drainage is provided by the cross slope. A slope of one percent to six percent is generally required for all shared use paths. If, due to topography, this requirement cannot be satisfied, then a slope of six percent to ten percent may be granted with approval of the City Engineer and Director of Public Works.

(3.4.3.2) Cross slope shall be a minimum of one-quarter inch per foot width of shared use path with a maximum of a half-inch per foot width of shared use path. Where slopes exceed these standards, the design engineer shall submit a special design including use and safety considerations, for review and approval by the City Engineer and Director of Public Works

(3.4.4) Bridges

(3.4.4.1) Where a crossing of a watercourse is required, a pedestrian bridge or a fair weather crossing shall be required.

(3.4.4.2) Pedestrian bridges shall be designed for specific site conditions and structurally sound for projected pedestrian volumes. Any publicly maintained bridge shall be approved by the City Engineer.

3.5 Paper and Substandard Streets

(3.5.1) Paper Streets

Paper streets are streets that have been platted and recorded, yet remain unbuilt or not maintained by the City. If an owner, developer, etc. wishes to develop any parcel of land abutting a paper street, and the parcel abuts no other publicly maintained city street, it shall be the sole responsibility of the developer to construct the street to current standards until it accesses a

publicly maintained street. If there is not a minimum width of fifty (50) feet of public street right-of-way or other width as determined by the City, then it must be dedicated to the City. Design of such improvement must be adequate to ensure extension of the remainder of the street in the future.

(3.5.2) Substandard Streets

(3.5.2.1) If a street is existing, but substandard and maintained by the city, in order for development of more than a single dwelling unit fronting the street, or on a new street feeding into the substandard street, it shall be the sole responsibility of the developer to upgrade the street to an adequate standard, as determined by the City, for a distance adequate to serve the development as determined by the City. If there is not a minimum width of fifty (50) feet of public street right-of-way or other width as determined by the City, then it must be dedicated to the City. Design of such improvement must be adequate to ensure extension or further improvement of the remainder of the street in the future.

(3.5.2.2) If a street is existing, but substandard and maintained by the City, a single dwelling unit (i.e. detached single family home, conversion of an existing detached single family home to a duplex, etc.) may be constructed, provided the developer ensures the street has at least twenty (20) feet of pavement width, exclusive of any existing gutter, along the property's entire public street frontage. If so, no street improvements are required. If not, it shall be the sole responsibility of the developer to improve the street so that twenty (20) feet of pavement exists across the property's entire public street frontage or the property owner shall make other street improvements, as determined by the City, to achieve an equivalent improvement to better the functionality of the street. If there is not a minimum width of fifty (50) feet of public street right-of-way or other width as determined by the City, then it must be dedicated to the City. Design of such improvement must be adequate to ensure extension or further improvement of the remainder of the street in the future.

(3.5.3) Turnarounds

Provisions for turnarounds may be required on a case-by-case basis.

3.6 Street Design

(3.6.1) General

(3.6.1.1) Street jogs with centerline offsets of less than 125 feet shall be prohibited.

(3.6.1.2) No Street shall intersect another street at an angle less than eighty (80) degrees.

(3.6.1.3) Street centerlines shall align at intersections.

(3.6.1.4) Right-of-way lines at street intersections shall be rounded with a minimum radius equal to the street intersection curb radius less ten (10) feet and shall be concentric with the curb line where possible. Intersection curb radii shall be twenty-five (25) feet minimum for local streets and thirty-five (35) feet minimum for all other classifications. The City Engineer may require increased radii for intersections based on classification of street, street geometrics and intensity of use.

(3.6.2) Curves

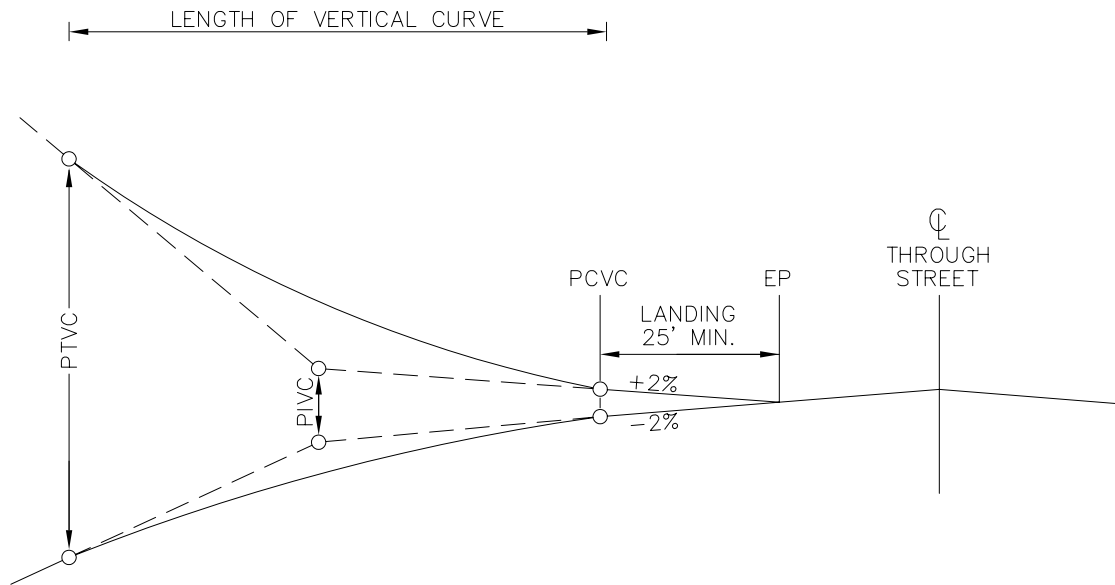
(3.6.2.1) Horizontal curves shall be required where a deflection angle of more than one (1) degree in alignment of a street occurs. Length of tangent, combined with length of curve, both measured along the centerline, shall be sufficient to meet full transitions length for curve superelevation. Length of tangent for non-superelevated curves shall be 100 feet minimum.

(3.6.2.2) Curve superelevation is required on all major subdivision streets classified as Local/Sub-Class D, by an amount equal to the standard pavement crown. Horizontal curves on streets classified as collector or above shall be superelevated in accordance with VDOT Standard TC-5 (urban) of the VDOT Road and Bridge Standards.

(3.6.2.3) Vertical curves shall be required at all changes in grade except at street approaches to intersections with through streets. Grade design at intersections shall be in accordance with Drawing 3.6.2.3 "Intersection Landing Requirements". Unsymmetrical vertical curves are not allowed.

(3.6.2.4) Minimum length of crest and sag vertical curves shall be computed by multiplying the algebraic differences (A.D.) of the tangent grades by the appropriate K value. The absolute minimum length of vertical curve shall be 50 feet. K values for various applications are as follows:

	<u>Sag Curve</u>	<u>Crest Curve</u>	<u>Crest curve at landing*</u>
Local Street	20	20	20
Collector/Industrial	50	50	44
Minor Arterial	90	90	90
Major Arterial	90	90	90



NOTES:

1. STREET LANDING TO HAVE A MIN. 25' LENGTH WITH MAX. GRADE OF $\pm 2\%$.
2. LENGTH OF VERTICAL CURVE BASED ON SECTION 3.6.2.4
3. DRAINAGE PROVISIONS MAY NOT ALLOW FOR IMMEDIATE PLUS GRADE FROM EP. THIS MUST BE STUDIED CAREFULLY

REVISIONS

NO.	DATE	DESCRIPTION	INIT.
1	12/06	REV. REFERENCE	DR

**INTERSECTION
LANDING
REQUIREMENTS**

DWG. NO.
3.6.2.3

PAGE

*"Crest curve at landing" refers to the first vertical curve beyond an intersection landing. K value for this curve shall only be used when the curve begins within 35 feet of the edge of the pavement of the through street.

(3.6.3) Design Requirements for Designated Street Classifications

Design speeds are used to determine the geometric design of streets accommodating safe operation of vehicles and considering sight distance considerations for all streets, access points, and commercial entrances.

Classification	Design Speed	Maximum Horizontal Curve	Minimum Stopping Sight Distance	Maximum Grade	Minimum Grade
Principal Arterial	50mph	6 degrees	400 feet	7%	0.50%
Minor Arterial	50 mph	6 degrees	400 feet	7%	0.50%
Collector Streets	40 mph	10.5 degrees	275 feet	10%	0.50%
Industrial Street	40 mph	10.5 degrees	275 feet	7%	0.50%
Local Streets	30 mph	23 degrees	200 feet	10%	0.50%
Cul-de-sacs	30 mph	32 degrees	200 feet	10%	0.50%

(3.6.4) Typical Street Sections

(3.6.4.1) Typical street sections are included in Appendix F for various street classifications and types.

(3.6.4.2) Number of lanes will be established during review of the preliminary plat.

(3.6.4.3) Reduction in street width to 26 feet of pavement, exclusive of gutter, shall be allowed for Local Streets carrying less than 200 vehicles per day if requested by the applicant during review of the preliminary plat. Such reduction, however, must be accompanied by the restriction of on street parking to one side of the street only. Plans shall show required "No Parking This Side" signage where appropriate and in accordance with MUTCD and City Standards. The developer shall install such signage.

3.7 Geotechnical Report

(3.7.1) General

(3.7.1.1) A geotechnical report is recommended, but not required, for all proposed public streets or publicly maintained roadways. The report shall be

based upon the preliminary plan and profile design for the proposed street(s). The report should be submitted for review prior to or with the submission of final design plans.

(3.7.1.2) The scope and purpose of the geotechnical study are to address the following aspects of the site conditions and site suitability:

1. Brief description of the terrain
2. Recommendations for preparation of road subgrade, including removal of topsoil and other unsuitable materials, additional stabilization, etc.
3. Recommendations for pavement design based on City Standards
4. Evidence of unsound rock strata or sinkholes
5. Evidence of ground water and provisions for dewatering
6. Recommendations for use of excavated rock

(3.7.2) Special Conditions

The City Engineer may require that a Geotechnical Report be provided where conditions are warranted, particularly where undocumented earthwork has occurred.

3.8 Handicap Ramps

Handicap ramps (Std. CG-12-A, B or C as appropriate) shall be installed in all intersection curb returns regardless of the existence of sidewalk. Such ramps shall also be installed upon the development of an existing corner lot extension of a street from an existing intersection. Ramps are required for commercial entrances where sidewalk exists or is planned. All ramps shall be seven (7) inches thick to withstand weight of errant vehicles.

3.9 Adjacent Existing Streets / Subdivisions

Existing streets adjacent to proposed subdivision development shall be provided with right-of-way as set forth herein. Such adjacent streets shall be widened as necessary, from right-of-way centerline, to provide one-half of the ultimate street cross section required for the street classification. Such widening shall extend the full width of the subdivision property frontage on said adjacent streets. Pavement taper sections at the ends of the lanes shall be three times the distance between the constructed face of curb and the existing street pavement, with a minimum of 30 feet. Sidewalk construction will be mandatory.

3.10 Miscellaneous Design Criteria

(3.10.1) Street Grades

(3.10.1.1) Length of maximum grade on any street shall not exceed 400 feet of tangent grade between vertical curves.

(3.10.1.2) Subject to approval by City's technical staff, street grades may be increased above the maximum grades by not more than 2.00% and not to exceed 200 feet in length. Average (positive or negative) tangent grade of the entire street segment shall not exceed the maximum stated requirements.

(3.10.1.3) Maximum grade within a permanent or temporary cul-de-sac turnaround shall not exceed 5.00% in any direction.

(3.10.2) Entrances, Curb Cuts and Intersections

(3.10.2.1) The need for right lane tapers, turn lanes, left turn lanes, etc. shall be determined based on VDOT Entrance Standards. Calculations shall be provided if requested during plan review. Extension of acceleration and deceleration lanes beyond the limit of the development property will be required where determined by City staff. The developer shall be responsible for coordination with adjoining landowner(s) to secure additional right-of-way and easements necessary for construction.

(3.10.2.2) Entrances and curb cuts shall comply with the requirements of the Virginia Department of Transportation "Minimum Standards of Entrances to State Highways," and this manual. Throat widths shall be measured at point of tangency of curb radii. Entrance must extend to this point before any turnouts are allowed.

(3.10.2.3) Minimum distances, at street intersections, measured from end of curb radius at street intersection along face of curb to beginning of curb radius for proposed entrance shall be as follows:

Collector Streets	50 feet
	(100 feet where traffic signal exists or is planned)
Local Streets	50 feet

Minimum distance shall be 125 feet if cross street is classified as an Arterial Street.

(3.10.2.4) Width of entrance, measured perpendicularly to parallel sides shall be as follows:

(3.10.2.4.1) Commercial and Multi-family Residential – Minimum 30 feet for two-way traffic, 14 feet for one-way traffic. Maximum 50 feet/20 feet respectively. Appropriate signage shall be shown for all one-way entries and exits. Minimum width of a curb median dividing a two-way entrance into one-way entry and exit lanes shall be 4 feet.

(3.10.2.4.2) Single Family Residential –12 feet minimum, 24 feet maximum.

(3.10.2.5) Minimum curb radii for entrances shall be:

(3.10.2.5.1) Industrial – 25 feet (50 feet when high volume of tractor-trailer trucks is anticipated).

(3.10.2.5.2) Commercial and Multi-family Residential is 12.5 feet

(3.10.2.5.3) Single Family Residential 2 feet

(3.10.2.5.4) Curb returns shall not extend along street beyond side property line extended.

(3.10.2.6) Curb cuts shall comply with the requirements of the following VDOT Standard Drawings:

(3.10.2.6.1) Street Intersections – CG-11

(3.10.2.6.2) Industrial Entrances – CG-10A (must be designed to contain ten-year storm in street) or CG-11 (must be designed to intersection standards)

(3.10.2.6.3) Commercial and Multi-Family Residential Entrances – CG-9D; CG-10A or CG-11 may be considered if designed with uphill grade from the street such that a six-inch rise in the pavement is provided from the center of the valley gutter and the entrance curbing extends to that rise. For CG-11 entrance, plans must detail curb spillout and flow line locations and elevations. Additionally, use of CG-11 requires a street grade of 2% minimum to allow for curb spillout and drainage across the entrance, unless drainage design provides for street water to enter site. Existing elevations at edge of pavement, flow line, and top of curb for both sides of the proposed entrance tie-in shall be provided on the plans to confirm suitability for CG-11.

(3.10.2.6.4) Single Family Residential – CG-9B modified per the following:

1. 5 ft. distance from flow line to end/grade break is reduced to 4 feet for curb & gutter only installations.
2. Extend full depth entrance to back of sidewalk where sidewalk exists or is proposed.

(3.10.2.7) All entrances shall be designed and constructed to contain gutter drainage within street for a minimum 10-year storm flow.

(3.10.2.8) No driveway shall intersect a public street at an angle less than 80 degrees.

(3.10.2.9) Adequate sight distance must be available at all entrances in accordance with the standard entrance sight distance detail. Sight distance profiles shall be required when requested by the City Engineer. Sight distance easements are required when the line of sight encroaches into private property behind the entrance radius curbing. Such easement shall be recorded prior to the start of construction.

(3.10.2.10) Upon development, any existing entrances not being used shall be removed and replaced with standard curb and gutter.

(3.10.2.11) Entrance locations and interior areas shall be selected and designed such that public streets or alleys are not depended upon for vehicles maneuvering in and out of loading areas.

(3.10.3) Underdrains

(3.10.3.1) Standard underdrains type UD-1 shall be shown and installed in those locations where recommended in the Geotechnical Report or determined during plan review or where determined necessary in the field by City Inspectors. Plans shall contain a note stating that final UD-1 installations will be determined in the field by City Inspectors. Generally, this will be along curb lines that are in cut areas where there is an upslope behind the curb.

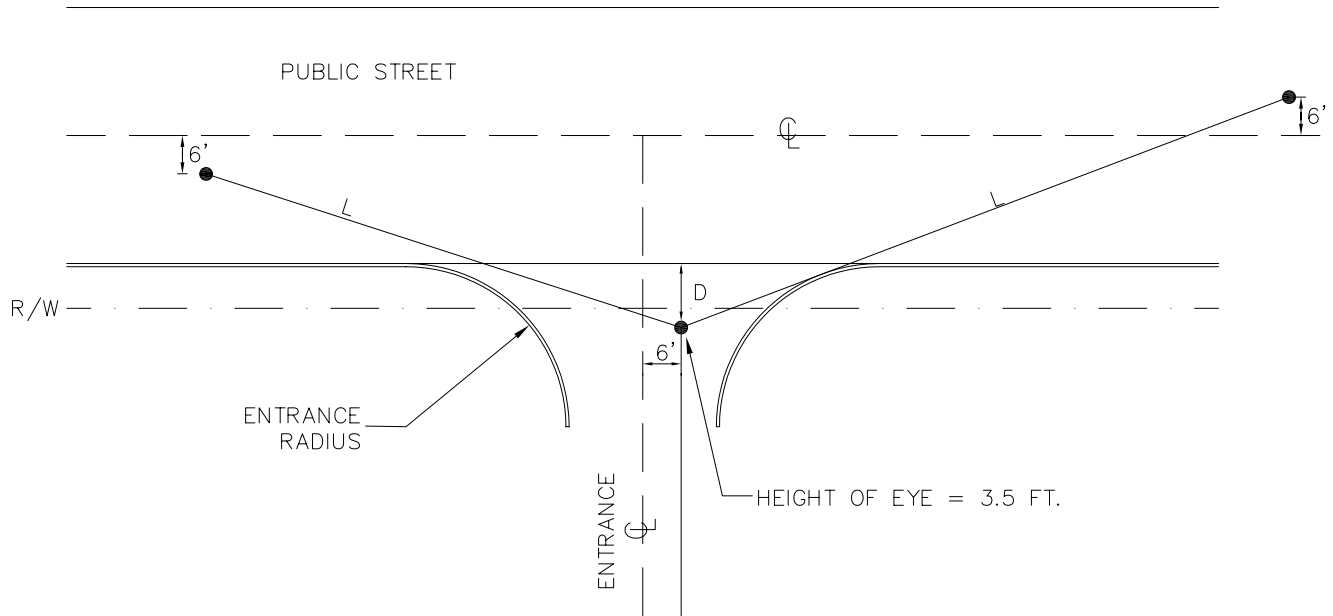
(3.10.3.2) Combination underdrains type CD-1 shall be shown and installed at the lower end of cut sections. Underdrains type CD-2 shall be shown and installed at the low point of all vertical curves.

(3.10.3.3) Sidewalk underdrains type UD-3 shall be shown and installed in those locations where recommended in the Geotechnical Report and where determined necessary in the field by City Inspectors. Plans shall contain a note stating that final UD-3 installations will be determined in the field by City Inspectors.

(3.10.4) Guard Rail

(3.10.4.1) Guard rail shall be provided at such locations required by VDOT Safety Standards or as set out by City Staff during the review process. Guard rail, posts and hardware shall comply with VDOT Standard Drawings GR-2. End sections shall comply with VDOT Standard Drawings GR-7 or GR-9.

HEIGHT OF OBJECT
= 3.5' (TYP.)



L = 10 FT. PER MPH SPEED LIMIT OF INTERSECTING STREET OR THROUGH STREET AS APPROPRIATE. SIGHT DISTANCE EASEMENT REQ. WHERE LINE OF SIGHT ENCROACHES INTO PRIVATE PROPERTY BEHIND ENTRANCE RADIUS CURBING. EASEMENT SHALL EXTEND A MINIMUM OF FIVE FEET BEHIND AND PARALLEL TO THE LINE OF SIGHT.

D = 10 FT. FOR LOCAL STREETS AND 12 FT. FOR ALL OTHER STREETS.

NOT TO SCALE

REVISIONS

NO.	DATE	DESCRIPTION	INIT.
	9/04	DCSM UPDATE	

**ENTRANCE
SIGHT DISTANCE**

DWG. NO.

3.10.2.9

PAGE

(3.10.4.2) Unless a variance is granted, the face of the guard rail shall be shown set behind the face of curb in accordance with VDOT Standards.

(3.10.5) Conduits and Sleeves

At least three(3) conduits and/or sleeves shall be shown to be installed at all approaches under the pavement at all intersections for future street lighting or traffic signals. Such conduits and/or sleeves shall be schedule 80 PVC, 3 inches in diameter and shall be located by station, distance left and right and depth. Such locations shall be coordinated with the Public Works Department and shown on the construction drawings.

(3.10.6) Street Signs and Markings

(3.10.6.1) Traffic regulatory signs shall be shown to be installed by and at the sole cost of the developer and shall comply with the applicable provisions of the Manual on Uniform Traffic Control Devices (MUTCD) and its Virginia Supplement.

(3.10.6.2) Street name signs shall comply with the MUTCD and its Supplements. It shall be the sole responsibility of the developer, owner, contractor, etc. to install all required traffic control signs.

(3.10.6.3) Any street within a development that is not incorporated into the City street system shall be identified by street signs that maintain a white background with green lettering.

(3.10.6.4) Approximate location of all signs shall be shown on the plans. Exact location shall be coordinated, at the time of erection, with the Public Works Department.

(3.10.7) Traffic Signals

(3.10.7.1) Traffic Signals shall be required for development projects where warranted by MUTCD standards and VDOT guidelines. Designer shall provide ITE trip generation figures for the development project when requested by the City for evaluation of signal warrants.

The City will determine the need for traffic signals. The City will provide specifications for traffic signal and device installation requirements and will determine the cost-sharing responsibility of the developer. Cost-sharing agreements shall be finalized prior to plan approval and start of construction of any portion of the project.

(3.10.7.2) The City shall disallow any traffic signal installation at a private entrance, regardless of warrants, that is less than 700' feet from any public

intersection, and/or decreases the level of service (LOS) of the public street by a grade level. It will be the responsibility of the applicant to determine the existing and projected LOS.

(3.10.8) Utility Easements

Utility easements, parallel and contiguous to streets, as required by the Subdivision Ordinance, shall be graded at a maximum ten (10) percent cross-slope.