Street Design

SELECTED LINKS TO SECTIONS WITHIN THIS DOCUMENT

SECTION 1
INTRODUCTION – STREETS

(Last revised 6/23/05)

The following division has been established to assist developers and engineers with the design of streets (private and public) within the jurisdiction of the City of Fairfax. The methods, procedures, design factors, formulas, graphs, and tables presented in this division are intended to establish minimal guidelines for residential and commercial pavement design. The City of Fairfax believes that the following design criteria are sufficient to insure the welfare and safety of the general public and to protect the economic investment of the citizens of the City.

Alternative design methods may be considered by the Engineer/Designer on a case-by-case basis; however, there should not be extensive variations from the criteria and procedures within this division without the expressed approval of the Director of Public Works.

1.1 CITY OF FAIRFAX DIRECTOR OF PUBLIC WORKS

The Director of Public Works shall be responsible for interpretation and implementation of the pavement design criteria for the City of Fairfax. Approval from other applicable agencies may be required.

1.2 CITY OF FAIRFAX PAVEMENT POLICY

It is the policy of the City of Fairfax that all developed land within the City Limits have adequate streets and parking lots. The City may accept roadway systems for maintenance that have been dedicated to the public if the system provides pavement sections that have been accepted for maintenance by the City and have been designed and constructed in accordance with the provisions of the City and this division.

1.3 ACKNOWLEDGEMENTS

This section has been prepared by Appian Consulting Engineers, P.A. of Rocky Mount, NC, in cooperation with the City of Fairfax, Virginia. However, the content of this division is largely derived from the *AASHTO Guide for Design of Pavement Structures* [AASHTO, 1986]. The AASHTO method looks at total volume of traffic over the life span of the pavement, not just daily which helps in cases where traffic is very seasonal or does not occur on weekends etc. The AASHTO method also allows for acceptance of

pavement deterioration as an economic decision. When correctly used, especially in conjunction with a good model of traffic numbers and wheel loads, the method provides reasonable results. These manuals were particularly important because of their format, quality, completeness, and because they represent generally accepted criteria.

SECTION 2
STREET/SUBDIVISION DESIGN

The purpose of this section is to define the policy of the City of Fairfax with respect to the design, construction, and maintenance of public streets within the City.

The following shall be considered the *minimum* standards of design for streets within the City of Fairfax.

Streets shall be improved for the entire width of the right-of-way. When a subdivision abuts an existing street, these requirements shall apply only to the approximate centerline of that existing street.

2.1 SUBDIVISION STREETS

Table 2.01 Required Improvements

Public Improvement	Required
Underground Drainage	X
BMP's	When applicable
Curb and Gutter	X
Public Water and Hydrants	X
Public Sewer	X
Paved Streets	X
Sidewalks	Both sides of Residential, Collectors, Alleys, Service Drives, & Arterials.
Street lights	X
Street trees	Not required but recommended
Underground Power	Not required by recommended

Streets in every new subdivision or development shall be designed and located in proper relation to existing and proposed streets, topography, natural features, tree growth, public convenience, public safety, and the proposed use of land to be served by such streets. All proposed streets shall provide for the appropriate protection of principal streets in surrounding areas and provide reasonable access for surrounding acreage tracts.

In the case that a subdivision borders along an existing or proposed arterial street, no direct driveway access will be permitted to the arterial street. When subdividing residential properties adjacent to a arterial street, all lots shall have frontage on another public road or approved private street. When subdividing commercially zoned property, the developer may be required to create an access street adjacent to the major thoroughfare right-of-way or shall provide some other form of access, which does not entail direct driveway access onto the arterial street.

2.1.1 Street Functional Classifications

1. **Alley**: Alley means a road providing a secondary means of access to abutting property and not for general traffic circulation or public dedication.

2. **Arterial street**: Arterial street means a divided roadway with a minimum of four lanes with or without service roads, principally serving through traffic movements. This type of street carries major portions of the traffic entering and leaving the City.

3. **Collector**: Collector street means a street to collect and carry traffic from local streets of a commercial or residential area to an arterial or other collector street or arterial streets. Average daily trips typically exceed 5,000 and often provide access to abutting property.

4. **Cul-De-Sac**: A short street designed to have one end permanently closed; the closed end terminated by vehicular turn around.

5. **Local Street:** Local street means a street which provides direct access to residential, business, or other abutting properties. This type of street does not carry through-traffic.

6. **Private Street**: Private street means a local or collector road, not a component of the City street system, which is owned, regulated, and guaranteed to be maintained by a private entity.

2.1.2 Widening of Existing Streets

New subdivisions or developments along existing streets of inadequate right-of-way shall provide additional right-of-way and street paving improvements to meet the minimum widths specified. The entire right-of-way shall be provided where any part of a new subdivision is on both sides of an existing street. Minimum pavement section shall be as required by a Traffic Impact Analysis or 2 lanes minimum. One-half the required right-of-way and required street improvement measured from the centerline of the existing street shall be provided where a new subdivision or development is located only on one side of an existing street.

Widening of streets in existing neighborhoods will be considered on a case-by-case, taking into consideration the effects on the neighborhood and the traffic and parking requirements.

2.1.3 Paving

In all cases, the subdivider shall be responsible for the cost and installation of the street foundation and paving of all streets on the approval of the final plat in accordance with the City of Fairfax Public Facilities Manual, latest revision, and VDOT, as may be applicable.

2.2 DESIGN

2.2.1 Pavement Design

1. Pavement sections/thicknesses shall conform to the minimum cross-sectional thicknesses shown on **Standard Detail 401.01** and **401.02**.

2. If, in the opinion of the Public Works Director or his/her representative, soils appear to be weak or have inherent problems, such as a high mica content or a seasonal high or perched groundwater condition, the Geotechnical Engineer either confirm or alter the minimum section with improvements such as subsurface drainage, subgrade stabilization with a Geotextile fabric, lime or cement, increased pavement thickness, etc.

2.2.2 Geometric Design

The geometric design criteria provided below shall be used in the design of streets within the jurisdiction of the City of Fairfax. Where design elements are not specifically covered below, the designer shall utilize first the VDOT R*oad Design Manual*, *Vol. 1*. Where not covered in this book, refer to AASHTO's *Highway Policy on Geometric Design of Highways and Streets*, latest edition.

2.3 VERTICAL ALIGNMENT

2.3.1 Grades

Unless necessitated by exceptional topography and subject to the approval of the Public Works Director, street grades shall not exceed 10% percent unless approved by the Public Works Director. In all cases, street grades shall not be less than 0.5% percent.

Grades approaching intersections shall not exceed 5% percent for a distance of at least 100 feet from the centerline of the intersection.

2.3.2 Vertical Curves

All changes in street grade shall be connected by vertical curves. The following formula shall be used for determining the length of vertical curve required to provide minimum sight distance:

$L = KA$

L = Length of vertical curve in feet

K = Rate of vertical curvature in feet per percent of A (Table 2.01)

A = Algebraic difference in grades in percent

Table 2.01 Minimum K Values

Street Type	K	
	Sag	Crest
Arterials	100	140
Collectors	35	35
Residential	30	35
Cul-de-sacs, Private Accessways, Service Drives, Alleys	15	20

2.3.3 Superelevation

Superelevation shall only be utilized on arterial streets except when widening VDOT streets. Superelevation for shoulder sections shall not exceed 0.08 feet/foot of width. For curb and gutter sections, superelevation shall not be less than 0.02 feet/foot of width or more than 0.06 feet/foot of width.

2.3.4 Grading

Grading and filling shall be undertaken to insure that:

1. The street is centered in the right-of-way.

2. Adequate shoulders and space for future sidewalks are provided.

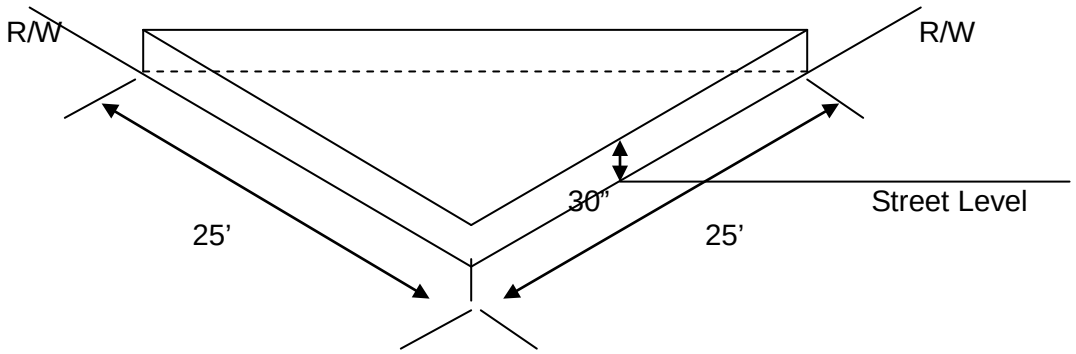
3. Allowance is made for roadside ditches, curbs and gutters, and storm sewers for street drainage.

4. Street grades shall be established wherever practicable in such a manner as to avoid excessive grading, the promiscuous removal of ground cover, tree growth and the general leveling of the topography.

2.3.5 Sight Distance

1. General: Conform to the requirements of AASHTO *Highway Policy on Geometric Design of Highways and Street*s, latest revision.

2. Corner Lots: On any corner lot in any district except RT, R-T6, and CPD, there shall be no planting, structure, retaining wall, fence, shrubbery, or other visual obstruction greater than a height of 30 inches above the street level within the imaginary prism formed at said corner by the intersecting right-of-way lines and a line connecting 2 points each 25 feet from their intersection within a height measured along such right-of-way lines as illustrated below. The designer shall also ensure that final grades outside the right-of-way and within the sight distance triangle are contoured to remove any visual obstruction above the 30-inch plane above street level. The Public Works Director may request that the designer provide a profile along the hypotenuse of the sight-distance triangle for verification of sight-distance visibility.



SCHEMATIC OF SIGHT DISTANCE TRIANGLE
NTS

2.4 HORIZONTAL ALIGNMENT

2.4.1 Curves

Where a street centerline deflection of 10 or more degrees occurs a curve of not less than 250 feet radius shall be introduced, except on alleys and minor streets, a curve of

not less than 175 feet radius may be used, measured along the centerline of the street. For other street classifications

Table 2.02 Minimum Horizontal Curve Radii

Classification	Minimum Radii
Arterials	600
Collectors	250
Residential	175
Cul-de-Sacs, Private Accessways, Service Drives, Alleys	175

A tangent of not less than 100 feet shall be provided between reverse curves on all streets.

2.4.2 Intersections

Street intersections shall be designed in the following manner:

1. No more than two streets shall intersect at one point.

2. Streets shall intersect as nearly as possible at right angles, and no street shall intersect any other street at an angle of less than 60 degrees.

3. Intersections with arterial streets shall be at least 600 feet apart, measured from centerline to centerline. The Planning Board may waive this requirement if such requirement would prevent a property owner fronting on a major thoroughfare from having access to such a facility.

4. Street jogs with centerline offsets of less than 125 feet on arterial streets are prohibited.

5. Property lines at street intersections shall be rounded with a minimum radius of 20 feet.

6. All proposed connections to VDOT roads shall meet the applicable criteria of the VDOT *Road and Bridge standards, Volumes I and II,* latest revision and AASHTO *Highway Policy on Geometric Design of Highways and streets, 2001*, latest revision.

7. **Handicap Ramps**: All curbs constructed or replaced shall include not less than 2 ramps per lineal block leading to the crosswalks at intersections for the use of handicapped persons. Such ramps shall be at least 36 inches wide and have a gradient not greater than 5%, unless the difference between the sidewalk and the paved right-of-way is such as to make a 5% grade impractical, in which case the ramp shall be installed so as to adjust to the grade of the street and sidewalk.

2.4.3 Cul-de-Sacs

Dead-end streets (cul-de-sacs) shall be designed so that turnabout or the closed ends shall have a minimum radius for the vertical curb face of at least 40 feet and shall not be over 600 feet in length.

2.4.4 Alleys

Alleys may be required in the rear of lots to be used for businesses purposes and in residential lots where the subdivider shows evidence of the need for alleys.

2.4.5 Blocks

1. **Proposed Use:** Blocks shall be laid out with special consideration given to the type of land use proposed within the block.

2. The proposed street system shall be so arranged as to discourage through vehicular traffic; but where feasible, shall provide more than one entrance and exit the subdivision.

3. **Length:** Blocks shall not exceed 1,200 feet in length nor shall they be less than 300 feet in length.

4. **Width:** Blocks shall have sufficient width to provide for 2 tiers of lots of appropriate depth except where otherwise required to separate residential development, prevented by topographical conditions, or size of property.

2.4.6 Lots

1. Arrangement of lots shall generally be at right angles to street lines if possible or radial to curved street lines.

2. Pipestem lots are prohibited (*Pipestem lot* means a lot which has street or private road frontage which when measured along the right-of-way line does not equal or exceed 75 percent of the minimum lot width at the building restriction line for the appropriate zoning district in chapter 110 of the City Code).

3. Corner lots shall be increased in size whenever necessary in order to provide that any structure to be placed thereon shall conform to the building and setback lines of both streets. In addition to the minimum widths of rights-of-way required by **Standard Detail 401.01**, additional right-of-way or easements may be require to provide safe sight distances or for traffic control.

4. In the R-1, R-2, and R-3 zoning districts, each lot shall front on a public street.

5. Lots shall be appropriately shaped for the type of building development contemplated and shall conform to the zoning provisions of chapter 110, *Zoning* of City Code.

2.5 DRAINAGE

Streets shall be designed such that storm runoff will cross only the stop approach of intersections and not across the through street. Storm drainage structures should be used to avoid storm runoff crossing through street intersections. Directional arrows must

be shown on plans to reflect surface drainage flow. This is particularly important around curb returns. Valley gutters are not to be constructed unless approved by the Public Works Director.

Unless otherwise permitted by the Public Works Director, pipe penetration or cutting down the back of the curb and gutter for drainage purposes will not be permitted.

Inlets shall be located to limit the spread of water in the gutter to 10 feet. The hydraulic grade line of the system shall rise no higher than 1 foot below the grade of the gutter.

2.6 STREET SECTION TYPES

2.6.1 Curb and Gutter

Concrete curb and gutter shall be provided on both sides of all streets and shall conform to the current VDOT specifications.

2.7 SIDEWALKS AND DRIVEWAYS

2.7.1 Sidewalks – General

Concrete sidewalks shall be provided on both sides of all streets and shall have a minimum thickness of 4 inches, a minimum width of 4 feet, constructed of class A-3 concrete, and shall be placed as described in **Standard Detail 404.01**. Sidewalks shall be constructed on the street right-of-way.

Sidewalks should generally link residential areas with employment, commercial and public areas and should interconnect with the Trails when possible.

Multi-family and planned developments shall provide sidewalks for interior movement of pedestrians and for interior to connect to public sidewalk system.

The subdivider shall bear the expense of all sidewalk construction.

Sidewalk construction shall meet the applicable ADA provisions.

2.7.2 Brick Sidewalks

1. **Allowable Locations and Installation**: Installation and maintenance of brick sidewalks shall be permitted only:

   a. Where an existing sidewalk is brick and is being replaced or repaired; or

   b. In an area designated as a historic district; or

   c. Adjacent to an historic property; or

   d. Where proposed for an entire block and all property owners agree to brick installation; or

e. Where a streetscape plan has been approved by City specifying brick sidewalk. In such areas, brick sidewalk may be installed on a lot-by-lot basis.

2. **Construction Methods for Brick Sidewalks**

For brick layout and schematic, see **Standard Detail 406.01**.

2.7.3 Driveways

1. All driveways for houses to be built in a subdivision shall be cut and graded to provide a minimum of 12-foot wide driveways. See **Standard Details 404.03, 404.04, and 404.05**. Commercial driveways shall be cut and graded to provide a minimum width of 30 feet in accordance with **Standard Details 404.04 and 404.06**

2.8 PEDESTRIAN PATH EASEMENTS

Pedestrian path easements may be provided through the interior of blocks. Pedestrian path easements shall be at least 10 feet wide and shall be laid out along front, side or rear property lines.

2.9 BIKEWAYS & TRIALS

When required, bikeways and trails shall be provided with an easement. 8 feet is the minimum width for bikeways and 6 feet is the minimum width for walkways. Wider sections up to 10 feet may be required in areas where travel is expected to be heavy. See **Standard Details 401.04 and 401.05,** as applicable.

2.10 SERVICE ALLEYS

Service alleys shall conform to the requirements of **Standard Details 401.01 and 401.03**. The minimum width shall be 19 feet. Service alleys shall a minimum horizontal curve of 35 feet where the centerline deflects more than 10 degrees with a pavement radius of 20 feet and a property line radius of 20 feet at intersecting streets.

2.11 STREET NAMES

New names shall not duplicate or be similar to existing street names. Names of new streets shall be proposed by the subdivider and approved by the Director. Proposed streets that are in alignment with existing streets already named shall bear their names.

Street signs shall conform to City Standards and shall be installed at all street intersection in a location to be determined by the Public Works Director.

2.12 STREET LIGHTING

1. **General**: The Designer shall make provisions for adequate street lighting to provide safety and security for both pedestrian and vehicular traffic. No lighting fixture within or immediately adjacent to any residential district shall exceed 12 feet in height. Lighting poles or structures shall not be located within any required planting island. Levels of illumination shall be consistent with the foot-candles and uniformity values

specified in the latest edition of the Illuminating Engineering Society Lighting Handbook.

2. **Street Lighting Luminaires and Poles:** Street Lighting Luminaires and Poles shall conform to the **Standard Details 407.01, 407.02, and 407.03**, as applicable.

SECTION 3
SECTION DELETED

3.1 RESERVED SPACE

SECTION 4
STREET POLICY

4.1 GENERAL REQUIREMENTS:

1. Prior to commencing construction, all approvals including plan approval and all permits and encroachments shall be obtained. Site grading only may be performed upon issuance of an Sedimentation and Erosion Control permit. All other construction must await the issuance of all remaining permits.

2. Prior to the issuance of a certificate of occupancy for any dwelling, an Engineer's certification must be received by the City for both water and sewer extensions. Additionally, as-built drawings must be in hand and the gravity sewer lines confirmed to be within the permitted tolerances.

3. The developer is responsible for the maintenance and repair of streets for 12 months after acceptance by the City for warranty. At the end of 12 months the City of Fairfax will accept permanent responsibility. If a significant failure occurs, requiring extensive maintenance during the first year of service, the Public Works Director shall suspend the 12-month warranty until the failure is repaired to an acceptable condition.

4. The developer is responsible for the maintenance and repair of all paved areas other than streets.

5. No Contractor shall permit mud or construction debris to accumulate in any paved street, which is maintained or is proposed to be maintained by the City of Fairfax.

4.2 INSPECTIONS

1. Upon completion of construction, the developer shall request a final inspection. Upon completion of all punch list items, the provision of a set of acceptable record drawings, and the submission of Engineer's certifications, a 12-month warranty period shall commence.

2. During the 12-month warranty period the developer shall repair any latent defects that occur. At the end of the 12-month warranty period, the developer shall request a warranty inspection. Upon successful completion of all warranty items the developer shall be released from maintenance responsibilities for the warranted construction.

3. All inspections must be scheduled the day prior to when needed. Inspections will be performed in the order received. Every effort will be made to accommodate the time of request; however, this cannot be guaranteed.

4. **All inspections, which fail and deficient items are not corrected upon re-inspection, are subject to a re-inspection fee**.

4.3 MAINTENANCE

4.3.1 Existing Streets

The City will assume all maintenance responsibility on all existing paved streets.

SECTION 5
BIBLIOGRAPHY

1. American Association of State Highway and Transportation Officials (AASHTO), *AASHTO Guide for Design of Pavement Structures*, Washington, DC, 1986.

2. AASHTO *Highway Policy on Geometric Design of Highways and Street*s, latest revision.

3. AASHTO 2000X *Design Method for Asphalt Pavements*, Y. Richard Kim, PH.D., PE, Professor of Civil Engineering, NCSU,

3. Haung, Yang H., *Pavement Analysis and Design*, Prentice-Hall, Inc., Englewood Cliffs, NJ, 1993.

4. Holtz, Robert D. and William Kovacs, *An Introduction to Geotechnical Engineering*, Prentice-Hall, Inc., Englewood Cliffs, NJ, 1981.

5. Institute for Transportation Engineers, *Traffic Engineer's Handbook.*

6. Transportation Research Board, National Cooperative Highway research Program (NCHRP)

7. VDOT *Road and Bridge Specifications.*

8. VDOT *Road & Bridge Standards, Volume I and II*.

9. VDOT *Pavement Design Guide for Subdivision and Secondary Roads in Virginia* prepared by Materials Division and Virginia Transportation Research Council.

10. VDOT *Road Design Manual, Vol 1*, latest revision.

bj.City of Fairfax.DesignSection.Street-Design.doc