

PUBLIC WORKS DESIGN MANUAL

V4.2024.01

March 28, 2024



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1.01 Purpose

Standard

This Manual has been prepared to promote uniform design procedures for designers and technicians in the development of property and roads in the County of Henrico, Virginia. The Manual is intended to serve as a procedural design guide which is to be used in conjunction with specifications, standards and policy directives from other County agencies as well as design manuals published by the American Association of State Highway and Transportation Officials (AASHTO), and the Virginia Department of Transportation (VDOT).

Public roadways within the County are either maintained by VDOT or Henrico County. Roadways which are designated as Interstate Routes (I-64, I-95, I-295), U.S. Highways (U.S. 250, W. Broad Street; U.S. 60, Williamsburg Road; etc.) and Virginia Primary Routes (Rt. 6, Patterson Avenue; Rt. 5, New Market Road, Rt. 895 Pocahontas Parkway; etc.) are maintained by VDOT. The Ashland Residency Office of VDOT should be contacted regarding issues relating to these roads. All other public roads within the County are maintained by Henrico County.

The design and construction of all public roads intended to be included in the Henrico County System of Maintained Roadways shall conform to the details included in this Manual and to the VDOT requirements where this Manual is silent.

Roads that are intended to be included in the VDOT system of maintained roadways must meet the standards and specifications prescribed by VDOT.

Applicability of the Standard

This standard applies to all types of development, including residential subdivisions, PODs, and CIP projects.

Design Requirements

N/A

1.02 Definitions and Acronyms

Standard

The following terms, definitions and acronyms are utilized in this Manual. See Chapters 18 and 19 of the Henrico County Code for additional definitions of terms described herein.

“AASHTO” means American Association of State Highway and Transportation Officials.

“ADAAG” means ADA Accessibility Guidelines. This document contains scoping and technical requirements for accessibility to buildings and facilities by individuals with disabilities under the Americans with Disabilities Act (ADA) of 1990.

“ADT” means Average Daily Traffic.

“Arterial Road” is a road that connects major activity centers, carries high volumes of traffic longer distances and has access to abutting development/land as a small part of its function. The concept of service to abutting land is secondary to the provision of mobility for major traffic movements on arterial roads. Normally, arterial roads carry significantly higher traffic volumes and a variety of traffic types at higher speeds than collector roads or residential roads.

“ASTM” means American Society of Testing Materials.

“BFE” means Base Flood Elevation, which is the water surface elevation during the 1 percent annual chance (100-year) storm event.

“BMP” means Best Management Practice. A BMP is a practice or combination of practices that is determined to be the most practicable means of preventing or reducing the amount of pollution generated by non-point sources to a level compatible with water quality goals.

“Board of Supervisors” means the Henrico County, Virginia, Board of Supervisors.

“CBLAD” means Chesapeake Bay Local Assistance Department.

“CBR” means California Bearing Ratio. This is a testing procedure to determine the load bearing capacity of the soil.

“CIP” means Capitol Improvement Project

“Clerk” means the Clerk of the Henrico County Circuit Court.

“Collector Road” is a road that provides both access and service for local traffic movements within a neighborhood, commercial or industrial area. Access and traffic service are of approximate equal importance on collector roads. Normally, collector roads carry higher volumes of traffic at higher speeds than residential roads.

“County Code” means the Henrico County Code.

“County Engineer” means the Henrico County Director of Public Works.

“Cul-de-sac” means a road with only one outlet that connects to the balance of the public road system at only one point. At the end opposite this outlet is an appropriate turnaround for the safe and convenient reversal of traffic movement.

“DBIZ” means Dam Break Inundation Zone, which is the area which would be inundated when a dam fails during a specified storm.

“DCR” means Virginia Department of Conservation and Recreation.

“DEQ” means Virginia Department of Environmental Quality

“Dam” means an embankment or structure intended or used to impound, retain, or store water either as a permanent pond or as a temporary storage facility.

“Dead End Road” means a road that connects to the balance of the public road system at only one point and has no turnaround at the end.

“Design Speed” means a speed selected for purposes of design and correlation of those features of a road such as curvature, superelevation, and sight distance, upon which the safe operation of vehicles is dependent.

“Easement” means a grant of a right to use property of an owner for a defined specific limited use or purpose.

“Expressway” means a public way designed to handle heavy volumes of vehicular traffic with limited access. An expressway is a divided highway for through traffic, with full or partial control of access.

“Extrinsic Structure” means any structure whose primary mission is not essential for the operation of a public road (i.e. subdivision identification signing, landscaping, wall, etc.).

“FEMA” means Federal Emergency Management Agency.

“FHWA” means Federal Highway Administration.

“Functional Classification” means the process by which roads and streets are grouped into classes, or systems according to the character of service they provide or are intended to provide.

“GCN” means the Henrico County Geodetic Control Network.

“GIS” means Geographic Information System.

“ITE” means Institute of Transportation Engineers.

“ITE Trip Generation” means the current edition of Trip Generation, an informational report of the Institute of Transportation Engineers.

“Intersection” means the juncture of two or more roads or streets at which point there are three or more legs.

“Level of Service” means a qualitative measure describing operational conditions within a traffic stream. The latest edition of the Highway Capacity Manual shall serve as the basis for determining “level of service”.

“Major Street” means a street which typically falls within the functional classification range of major collector road to arterial. The street will normally carry a large percentage of through trips while, at the same time, providing for a certain amount of access to abutting property.

“Major Thoroughfare Plan” is the transportation element of the County’s Comprehensive Plan. The Major Thoroughfare Plan identifies the existing roadways and future roadway corridors (controlled access roads, arterial roads, collector roads and major access roads) that are planned to serve the County.

“Manual” means the Department of Public Works Design Manual.

“May” means that the condition is permissive. The design or condition is optional when “may” is referenced.

“Minor Street” means a street which typically falls within the functional classification range of local street to minor collector road. A minor street provides access to abutting property without large volumes of through traffic. The street normally carries a large percentage of local, short distance trips.

“MUTCD” means the Manual on Uniform Traffic Control Devices (published by Federal Highway Administration).

“NEC” means National Electrical Code.

“NPDES” means National Pollution Discharge Elimination System.

“Offsite Drainage Easement” is a drainage easement located outside of the development parcel that allows drainage improvements to be utilized and/or constructed. The easement may be public or private.

“Private Road” means a road or street that has not been accepted into the Henrico County or the VDOT system of maintained roadways.

“POD” means Plan of Development as defined by Section 24-3 of the Henrico County Code.

“Professional Engineer” means an engineer registered and licensed to practice in the Commonwealth of Virginia.

“PROWAG” means Public Right-of Way Accessibility Guidelines. The proposed guidelines ensure that the following facilities for pedestrian circulation and use located in the public right-of-way are readily accessible to and usable by pedestrians with disabilities.

“Public Road” means a road or street that has been formally accepted into the Henrico County or the VDOT system of maintained roadways.

“Residential Road” is a road whose primary purpose is to serve abutting development/land and carry low traffic volumes over short distances.

“R/W” means right-of-way, which is land, property or interest therein, usually in a strip, acquired for or devoted to a public road designated to become part of the County system of maintained roadways or the VDOT system of maintained roadways.

“Shall” means that the specified criteria is mandatory.

“SFHA” means Special Flood Hazard Area, which is the land area covered by the floodwaters during the 1 percent annual chance (100-year) storm event.

“Should” means that the condition is advisory or recommended.

“Through Street” means a street or road which connects to and provides access between at least two other public streets or roads.

“Unmaintained Right-of-Way” is land, or property, usually in a strip, acquired for or devoted to a public street designated to become part of the County system of maintained roadways or the VDOT system of maintained roadways but is not currently maintained in any way by the County or VDOT.

“VDOT” means the Virginia Department of Transportation.

“VPD” means Vehicles Per Day

Applicability of the Standard

This standard applies to all types of development, including residential subdivisions, PODs, and CIP projects.

1.03 Effect of Legislation

Standard

If subsequent legislation is enacted that conflicts with any provision of this Manual, the legislation provisions shall govern. As of its effective date, such legislation shall take precedence over any conflicting interpretations or decisions rendered by the Department of Public Works personnel prior to the enactment of the legislation. However, such action shall not affect the validity of these requirements as a whole, or any part thereof, other than the specific provision involved.

Applicability of the Standard

This standard applies to all types of development, including residential subdivisions, PODs, and CIP projects.

Design Requirements

N/A

1.04 Discretionary Authority and Appeal Procedure

Standard

The Director of Public Works may utilize discretionary authority, as it relates to the provisions of this Manual. Such judgments will take into consideration the individual situation, but safety features or structural integrity prescribed by these standards shall not be sacrificed.

The Director of Public Works will consider and render a ruling on unresolved differences of opinion between a developer and a Public Works staff member that pertain to the interpretation and application of the requirements specified herein.

To obtain this review, the developer shall submit a written waiver request to the Director identifying the conflict and describing the unresolved issue. After reviewing all pertinent information, the Director will advise the developer of his decision in writing relative to the appeal.

The request for an exception or more liberal interpretation, may be considered provided that the request is not based exclusively on financial considerations. The exception must also not be detrimental to public safety or injurious to surrounding property.

Applicability of the Standard

This standard applies to all types of development, including residential subdivisions, PODs, and CIP projects.

Design Requirements

N/A

1.05 Design Manual Updates

Section	Description	Version
1.05	<ul style="list-style-type: none"> Added revision table 	V4.2023.01
1.06	<ul style="list-style-type: none"> Updated dates 	V4.2023.01
2.35	<ul style="list-style-type: none"> Added “Parking in Private Developments - Maintenance” Section 	V4.2023.01
2.36	<ul style="list-style-type: none"> Revised the Reference to Henrico County Code 	V4.2023.01
2.32	<ul style="list-style-type: none"> Revised name of Traffic Calming Program to “Henrico County Neighborhood Traffic Management Program” Added Note regarding Developers may install Speed Humps/Cushions in new subdivisions, and shall coordinate the work with Traffic Engineering during the Plan of Development Process 	V4.2023.01
3.14	<ul style="list-style-type: none"> Added ability to use Polypropylene (PP) Pipe 	V4.2023.01
Appendix C	<ul style="list-style-type: none"> Added Backfill for Polypropylene Pipe (Page C-30) 	V4.2023.01
Appendix C	<ul style="list-style-type: none"> New Right of Way Monument Detail (Page C-31) 	V4.2023.01
1.06	<ul style="list-style-type: none"> Updated effective date and grandfathering language removed due to being past current date. 	V4.2023.02
General	<ul style="list-style-type: none"> Page numbers updated. 	V4.2023.02
Appendix C	<ul style="list-style-type: none"> Added Emergency Gate Access detail (Page C-36) 	V4.2023.02
2.04	<ul style="list-style-type: none"> Correction to language regarding single lot road improvements. 	V4.2023.02
2.50	<ul style="list-style-type: none"> Added Temporary or Emergency Gate Access language. 	V4.2023.02
2.32	<ul style="list-style-type: none"> Revised name of “Henrico County Neighborhood Traffic Management Program” back to “Traffic Calming Program”. 	V4.2024.01
2.36	<ul style="list-style-type: none"> Added minimum distance a single-family driveway can be to a public or private travel lane 	V4.2024.01
2.37	<ul style="list-style-type: none"> Added language that prior to a new traffic signal design or modification to an existing traffic signal design, a Roundabout design shall be investigated. 	V4.2024.01
2.43	<ul style="list-style-type: none"> Added language that Roundabouts have demonstrated safety and operational benefits and are the primary design for intersection improvement projects, and the advantages Roundabouts provide. 	V4.2024.01
General	<ul style="list-style-type: none"> Page numbers updated. 	V4.2024.01

1.06 Design Manual Effective Date/Grandfathering

Standard

This version of the Design Manual is effective on January 26, 2024.

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2.01 Continuity of the Public Road System

Standard

A road or street may only be accepted for maintenance into the system if it is the continuation of the network of public streets whose maintenance has been officially accepted by the County or, if appropriate, the Virginia Department of Transportation. The County shall determine if such road or street renders sufficient public service to justify the expenditure of public funds for its subsequent maintenance.

For the purpose of these requirements, public service may include, but is not limited to, one or more of the following situations:

- Provides an extension of a road to the subdivision boundary or parcel to facilitate the continuity of possible adjacent development.
- Serves as access to a public school, a County owned public recreational facility or other similar facility open to public use.
- Provides access to single family lots in a platted subdivision.
- Is identified on the County's Major Thoroughfare Plan.

Applicability of the Standard

This standard applies to all types of development, including subdivisions and PODs.

Design Requirements

N/A

2.02 Establishing a Public Right-of-Way

Standard

Public roadways that are constructed for acceptance into the County road system shall be established through one of two methods:

- Hearing of Necessity before the Board of Supervisors
- Dedication of Right-of-Way with a Subdivision or Plan of Development

Hearing of Necessity before the Board of Supervisors

The establishment of a roadway with the Hearing of Necessity process is one that is normally utilized by the County in the furtherance of its Capital Improvement Program.

The Board of Supervisors initiates the process by requesting the Director of Public Works to prepare a report (i.e. Letter) describing the need (Necessity) for a specific project. This “Letter of Necessity” is filed with the Board who then holds a public hearing on the Letter and the project. Following this public hearing the Board of Supervisors makes a decision based on the merits of the project (See Code of Virginia 33.1-230 *et seq.* for additional details).

While the above indicates the normal process when non-federal funds are used for the construction of roadways in the County, it should be noted that as allowed under 33.1-216 of the Code of Virginia, the County is permitted to fully comply with rules and regulations which may be in conflict with the Letter of Necessity process, when federal-aid funds and contracts are involved. Use of such funds requires a process for public involvement much greater than that provided by the Letter of Necessity.

Dedication of Right-of-Way with a Subdivision or Plan of Development

The establishment of a roadway through right-of-way dedication with a subdivision plat is the process that is used by developers. The development of the plat shall be in accordance with Chapter 19-Subdivisions of the County Code.

Construction plans for the proposed roadway shall be developed in accordance with this Manual and Chapter 19, Article II of the County Code.

The construction plans will be reviewed by the Department of Public Works. If the plans are determined to be in compliance with the standards, the Director of Public Works will authorize the construction of the road through the approval of the plans. After the plans are approved by the Planning Department and the Department of Public Utilities, a pre-construction meeting must be scheduled with the Environmental Division prior to the beginning of any construction.

The Department of Public Works will periodically inspect the roads throughout the construction process. The developer shall request a final inspection at such time that the road construction is complete. See Section 4 of this Manual for additional information concerning the inspection process and the acceptance of the roads into the County System.

Applicability of the Standard

This standard applies to all types of development, including subdivisions and PODs.

Design Requirements

N/A

2.03 Road Functional Classification

Standard

Roadway functional classification is one of the tools used to determine the road design for a County road or road project. The function of a road is determined by the volume of traffic, length of vehicle trips using the road, and whether the road provides service primarily for vehicular movement or access to abutting land uses.

Normally the arterial roadways will carry significantly higher traffic volumes and a variety of traffic types at higher speeds than collector roads. Similarly, collector roads will normally carry higher traffic volumes at higher speeds than local roads.

All roadways within the County are classified as to their function. The Department of Public Works utilizes roadway functional classification, along with the existing and projected traffic volumes, to determine the design features and requirements of the road.

The functional classification for all of the County roadways classified as either a major arterial, minor arterial, major collector, minor collector, or major access road are shown on the County's Major Thoroughfare Plan. Local streets are not included on this plan.

Applicability of the Standard

This standard applies to all types of development, including subdivisions and PODs.

Design Requirements

N/A

2.04 Road Improvements

Standard

For any proposed development, including one single-family house, the developer shall dedicate the right-of-way for the entire cross section of the planned ultimate road width or the portion of the proposed right-of-way that is located within the development.

The developer shall build one half of the proposed roadway cross section, including one half of the median, if applicable, and any related drainage facilities for the ultimate road section if the proposed road is required to provide access to the development on one side of the roadway. If projected traffic volumes warrant additional travel lanes beyond those indicated previously, the additional lanes will be required to be constructed.

The developer (of anything besides on single-family house) shall build the entire ultimate roadway cross section, including the median if applicable, and any related drainage facilities if the road is required to provide access to the development on both sides of the roadway.

If a development, including one single-family house, is proposed that has direct access to a county roadway that is not constructed to current county standards, the developer shall dedicate the right-of-way and improve the roadway to current county standards along the parcel's frontage. This may include the widening of the roadway to its ultimate width. At a minimum, a one single-family residence development shall be required to widen the roadway to create the minimum AASHTO standard of a ten (10) foot travel lane along the parcel where no curb/gutter exists. If curb/gutter exists on an adjacent parcel, then the subject parcel shall widen the road along the parcel to match the existing adjacent cross section, including any drainage facilities. The developer of one single-family residence may be required to improve a direct accessed road from the closest intersection to the parcel being developed and install a turnaround, if required by the Fire Department. If the development is on both sides of an existing roadway, the developer will be required to dedicate the ultimate right-of-way on both sides of the roadway and construct the roadway to its ultimate width.

For any proposed development in which a new roadway, where an ultimate cross section of less than four lanes is planned, the developer shall dedicate the right-of-way and construct the entire roadway and any related drainage facilities.

For any proposed subdivision (defined in Section 19-2 of the County Code) that fronts and/or has direct access to a county roadway that is not constructed to current county standards, the developer shall dedicate the right-of-way and improve the roadway to county standards along the parcel's frontage as outlined in Sections 19-134 and 19-161 of the County Code.

Roads intersecting with unimproved right-of-way shall include the ultimate drainage, pavement design, grade, and traffic control considerations in the design.

The unimproved right-of-way shall be cleared, grubbed, rough graded and seeded as a part of the development. Construction plans for the road shall be prepared for the above grading, to allow the lot layout, dwelling location and orientation of the development to take the ultimate road into consideration and to determine if slope easements need to be dedicated as a part of the development.

Right-of-way dedication, based on the ultimate road right-of-way width, shall be provided along those sides of the lots where road improvements are not required as a part of the development. Construction or Maintenance easements may also be required.

Road improvements, drainage improvements, and/or sidewalk improvements cannot be escrowed.

Applicability of the Standard

This standard applies to all types of development, including subdivisions and PODs.

Design Requirements

N/A

2.05 Road Improvements for Double-Frontage Lots

Standard

Road improvements and right-of-way dedication are required for all double-frontage lots. The County Code defines a double-frontage lot as “a lot, other than a corner lot, which has a frontage on two more or less parallel streets”. Section 19-135 of the Code does not allow lots to front more than one street except to:

- separate a lot from an expressway, toll road, or major street, or;
- make practical use of the land.

Applicability of the Standard

This standard applies to all types of single family development.

Design Requirements

These requirements are applicable to all double-frontage lots.

- Road improvements are required on all sides of the lot where access is permitted.
- Road improvements are not required where there is an easement preventing access if the adjacent roadway is an expressway, toll road, or major street, except for the lot(s) on either side of an entrance road. If the adjacent roadway does not fall into this category, road improvements are required.
- The Developer is responsible for completing all required road improvements adjacent to the lot.
- Right-of-way must be dedicated on all sides of lots that abut at County or State right-of-way (even if no road improvements will be made), based on the ultimate right-of-way width.

2.06 Survey Requirements

Standard

All horizontal and vertical control will be the latest found in the GIS Monumentation Network

All topography surveys will meet the minimum standard from VA Code 18VAC10-20-382.

Plans with topography will include the following:

- Source of the topography
- Date of the survey
- Name of the Surveyor that performed or oversaw the site survey work
- Name of the firm that performed the site survey work

All plans that have improvements, excluding single family driveway culverts and curb cuts, in the existing ROW shall have the following:

A minimum of two benchmarks must be established and shown on the construction plans in areas that will not be disturbed during construction. For linear projects such as road widening, benchmarks must be placed no farther apart than 500 feet and tied into the survey base line.

Horizontal and vertical control must clearly be shown on the plans

Baseline with stations clearly shown.

Geometry of the baseline to include Point of Curvature (PC) and Point of Tangent (PT) must be on the plan.

Baseline must be tied to a minimum of two known points in the field.

If a proposed curb or edge of pavement is not parallel to the baseline, the proposed geometry must be shown. Drainage structures must have stations and offsets to the middle of the chamber. Provide cross-sections, at a minimum of 25 feet intervals, showing the existing and proposed pavement elevations throughout the limits of all road improvements

For roads without curb and gutter, the EP survey point should be taken at the white line or at the point which represents the consistent cross slope of the road.

Applicability of the Standard

This standard applies to all types of development, including subdivisions, and PODs.

Applies to CIP projects as above unless project contract requests different requirements.

Any waivers from the above requirements must be approved by the County Surveyor.

Subdivision Plats are covered by minimum standards and procedures for land boundary surveying practices, VA Code 18VAC10-20-370.

Design Requirements

N/A

2.07 Right-of-Way

Standard

A clear and unencumbered right-of-way shall be dedicated for public use for all proposed roadway additions to the County roadway system. Related easements for drainage, water quality, traffic devices and all others necessary to support the proposed roadway are required to be dedicated for public use in a form acceptable to the County Attorney and the Department of Public Works.

Right-of-Way Radius

Right-of-way radii are required at the beginning of all roadway curves and shall end at the tangent point on all roadways.

Property/Right-of-Way Lines at Street Intersections

Property/right-of-way lines at roadway intersections shall be a tangent, a radius is not allowed. The beginning and ending points of the right-of-way tangent are determined by measuring back from the right-of-way extended PI (point of intersection) along each individual right-of-way tangent no less than 25 feet in residential areas, and 30 feet in non-residential areas. A typical detail of this relationship is identified in Appendix C on Drawings C-14 and C-15. Additional chord length may be required by the Traffic Engineer.

Standard Cul-de-Sac

Cul-de-sacs are required at the end of all dead end streets. Cul-de-sac streets shall terminate in a circular right-of-way. The size of the cul-de-sac is based on the road classification and width of the road that is terminated. Details regarding size of cul-de-sac that is to be used are identified in Section 2.22 and in Appendix C, Drawing C-23.

Widths of Right-of-Way

The minimum right-of-way for streets to be accepted into the County Road System is based on functional classification.

Typical Roadway Sections for these right-of-way are shown on the Typical Section Details, in Appendix B.

Applicability of the Standard

This standard applies to all types of development, including subdivisions, PODs and CIPs.

Design Requirements

Typical Section Details, in Appendix B.

2.08 Right-of-Way Monuments / Property Pins

Standard

Right-of-way monuments shall be installed in conformance with Section 19-160 of the County Code. Monuments must be installed at all breaks in the right-of-way line including angle points, radial points and at the beginning (PC) and end (PT) of curves. In addition, monuments must be installed at intervals on tangents so as to be visible from each monument, but not more than 2,400 feet apart.

Applicability of the Standard

This standard applies to all types of development, including subdivisions, PODs, and CIPs.

Design Requirements

Monuments are to be set in accordance with the County standard detail located in Appendix C, with an accuracy of 1: 20,000 (2nd order, class 2).

The replacement of any monuments removed or destroyed during the development of the subdivision shall be the responsibility of the subdivider.

The replacement of any monuments removed or destroyed during the development of any development shall be the responsibility of the developer.

2.09 GIS Requirements

Standard

All plans and plats, excluding single family building permits, which are submitted for review and approval must include four coordinate points derived from the County Geodetic Control Network (GCN). The plan or plat must identify the location of any GCN monuments that are located on the site. All measurements on the plan must be tied to the four coordinate reference points.

Monuments shall conform to the County standard detail located in Appendix C in this Manual. Specifications for installation and accuracy required for the placement of GPS monuments can be found in the latest edition of the Henrico County GPS Control Network Book.

Applicability of the Standard

This standard applies to all types of development, including subdivisions, CIPs and PODs.

Design Requirements

N/A

2.10 Encroachments and Extrinsic Structures on the Right-of-Way

Standard

Posts, Walls, Signs, Structures

Posts, walls, and signs as permitted in Chapter 24, Section 104 of the Henrico County Code or similar ornamental structures that do not interfere with roadway capacity, traffic safety or sight distance may be permitted within the right-of-way.

Specific authorization by a permit, issued by the Department of Public Works, is a requisite for these devices or any other encroachment to be located within the right-of-way. A Right-of-Way Maintenance Agreement, found in Appendix D, Page D-23, must be entered into with the Department of Public Works before work takes place on the right-of-way.

No permanent or semi-permanent structure will be permitted to be constructed over or directly adjacent to a storm water drainage pipe or structure.

An approved sign permit for the specific sign in question will satisfy authorization for placement of a sign on the right-of-way. A Right-of-Way Maintenance Agreement must accompany all approved sign permits. A written request, providing all necessary details, must be made to the Director of Public Works for all other planned or proposed encroachments.

The maintenance of an approved sign, structure or facility shall be the responsibility of the developer or the permit applicant. The sign or structure will be removed from the right-of-way if it is not maintained in a manner that is satisfactory to the Director of Public Works.

Landscaping, Lighting, and Irrigation

Landscaping on the right-of-way may be permitted provided the landscaping does not interfere with sight distance requirements, introduce safety hazards, and does not introduce potential damage to the road and drainage system infrastructure. Plantings which bear fruit, nuts or seeds that, when dropped, will interfere with or impede storm water drainage flow shall not be permitted.

Irrigation systems may be permitted to be installed on the right-of-way provided that underdrains are installed to keep water from ponding or becoming trapped near or under the roadway.

Plans and specific details outlining proposed landscaping, landscape lighting, irrigation systems and/or private underdrains that are to be installed shall be approved by the Department of Public Works. Specific written authorization by the Director of Public Works shall be obtained and a Right-of-Way Maintenance Agreement must be entered into with the Department of Public Works before work takes place on the right-of-way.

The review and approval of landscaping plans that are part of an overall landscape plan for a development shall be coordinated with the Planning Department.

The County will not be held responsible for damages to irrigation systems, signs, landscaping, and other items placed within the County right-of-way. Such items, within the County right-of-way, shall be the responsibility of the owner, developer, home owners association (HOA) or other entity to maintain or repair.

The owner shall be responsible for removal and/or relocation of encroachments, should it become necessary to relocate for future road improvements or maintenance activities.

Applicability of the Standard

N/A

Design Requirements

N/A

2.11 Spite Strips

Standard

Plans shall not include a reserved strip, or “spite strip” that would prohibit otherwise lawful vehicular access to a public road or right-of-way from an adjacent property.

Applicability of the Standard

This standard applies to all types of development, including subdivisions, PODs, and CIPs.

Design Requirements

Planting strip easements that are required as a part of a development to control access to any street shall not be considered spite strips provided that alternate access is permitted to the parcel or lot in question (see also Section 19-124 of the County Code).

2.12 Typical Road Section Requirements

Standard

All construction will be in accordance with the most recent edition of: (1) VDOT Road and Bridge Specifications and (2) VDOT Road and Bridge Standards, except as noted in this Manual.

Applicability of the Standard

This standard applies to all types of development, including subdivisions, PODs, and CIPs.

Design Requirements

See Appendix B of this Manual for typical road section requirements.

Completion of road widenings to existing road sections will be determined by the County Engineer.

2.13 Design Speed

Standard

Design Speed is the maximum safe speed that can be maintained over a specified section of roadway.

For all roads with a posted speed limit of 35 miles per hour (mph) or less, the design speed shall be equal to or greater than the posted speed.

For roads with a posted speed of 40 mph or greater, the design speed shall be a minimum of 5 mph greater than the posted speed.

Applicability of the Standard

This standard applies to all types of development, including linear projects, CIPs, subdivisions and PODs.

Design Requirements

The vertical and horizontal curves are to be designed using the design speed.

2.14 Sight Distance

Standard

Two types of sight distance exist for the design of roads:

- Stopping Sight Distance
- Intersection Sight Distance

Stopping Sight Distance

Stopping sight distance is the sum of two distances: the brake reaction distance and the braking distance. The brake reaction distance is the distance a vehicle travels from the time a driver sees an object requiring a stop to the moment the brakes are applied. The braking distance is the distance a vehicle travels from the moment the brakes are applied, until it comes to a stop condition. In computing and measuring the stopping sight distance, the 3.5-foot eye height and 2.0-foot object height criteria are used. The following table shows the stopping sight distance for various posted speed limits.

Stopping Sight Distance

	POSTED SPEED LIMIT							
	20 mph	25 mph	30 mph	35 mph	40 mph	45 mph	50 mph	55 mph
Stopping Sight Distance	115'	155'	200'	250'	305'	360'	425'	495'

From – *A Policy On Geometric Design Of Highways And Streets*, 2018, Table 3-1, page 3-4, Stopping Sight Distance on Level Roadways

Note: Assumes wet pavement and level roadway. Roadways with a grade of 3 % or more should use equation 3-3 from *A Policy On Geometric Design Of Highways And Streets*.

Applicability of the Standard

This standard applies to all types of development, including subdivisions, PODs, and CIPs.

Design Requirements

- Needs to be measured from a height of 3.5 feet to an object at 2.0 feet
- Needed at all vertical and horizontal curves on public roads

Intersection Sight Distance

Intersection sight distance allows for the safe maneuver of a vehicle from the stopped position at an intersection even though an approaching vehicle comes into view on the intersecting road as the stopped vehicle begins its departure. In computing and measuring the intersection sight distance, the 3.5-foot eye height and 3.5-foot object height criteria are used. The following table shows the minimum intersection sight distance for various speed limits. All obstructions within this line must be no higher than 30 inches above the ground level where the sight distance originates. This line shall remain free of all structures, trees, and light poles. No landscape plantings which obstruct visions between a height of 30 inches and eight feet above the ground level where the sight distance originates shall be permitted within the Sight Distance Line nor within 5 feet of the sight distance line. If a Sight Distance Line is determined to be outside the county right-of-way, a Sight Distance Easement must be provided.

Intersection Sight Distance

ROAD WIDTH (FEET)*	POSTED SPEED LIMIT (mph)							
	20	25	30	35	40	45	50	55
22/24	220'	275'	330'	385'	440'	495'	550'	605'
28/30	225'	280'	335'	390'	450'	505'	560'	615'
34/36	230'	285'	340'	400'	455'	515'	570'	625'
40/41	230'	290'	345'	405'	460'	520'	575'	635'
47	235'	295'	350'	410'	470'	530'	585'	645'
52/53/54	240'	300'	360'	420'	480'	535'	595'	655'
64/67	245'	310'	370'	430'	495'	555'	615'	680'
78/81	255'	320'	385'	445'	510'	575'	640'	700'
86/91	260'	325'	390'	460'	525'	590'	655'	720'
From - <i>A Policy on Geometric Design of Highways and Streets</i> , 2018, Table 9-7, page 9-46, Design Intersection Sight Distance, Case B1, Left Turn From Stop								

Values are rounded. For all road widths greater than 24 feet, the formula from Table 9-5, Page 9-37 of *A Policy on Geometric Design of Highways and Streets*, 2018 was used.

*Road width is measured between face of curbs of the thru lanes or, in absence of curbing, between edge of pavements of thru lanes.

If an intersection is configured for only a right turn in and right turn out of a minor street or access driveway, the sight distances in the following table may be used for looking left only from the stopped vehicle. In computing and measuring the intersection sight distance, the 3.5 foot eye height and 3.5 foot object height criteria are used. No obstructions blocking vision between a height of 30 inches and eight feet above the ground level where the sight distance originates shall be permitted within the sight distance line nor within 5 feet of the Sight Distance Line. This line shall remain free of all structures, trees, and light poles. If a Sight Distance Line is determined to be outside the county right-of-way, a Sight Distance Easement must be provided.

Intersection Sight Distance (use for right in/right out locations only)

NUMBER OF LANES FROM LEFT	POSTED SPEED LIMIT (mph)							
	20	25	30	35	40	45	50	55
1	200'	240'	290'	340'	390'	430'	480'	530'
2	210'	260'	310'	370'	420'	470'	520'	570'
3	230'	280'	340'	390'	450'	500'	560'	610'

From - *A Policy on Geometric Design of Highways and Streets*, 2018, Table 9-9, page 9-48, Design Intersection Sight Distance, **Case B2, Right Turn From Stop**

Values are rounded up. For road widths greater than one lane, Table 9-8, Page 9-47 of *A Policy on Geometric Design of Highways and Streets, 2018* was used.

Applicability of the Standard

This standard applies to all types of development, including subdivisions, PODs, and CIPs.

Design Requirements

- Should be measured at 14.5 feet from edge of the major roadway through travel lane
- Needs to be measured from a height of 3.5 feet to an object height of 3.5 feet
- Needs to be measured looking left and right
- Needed at all public roads, private roads, and non-single family resident access points that intersect a public road
- Sight Distance Easements will be required when the line of sight is determined to be outside the county right-of-way. This includes offsite easements if necessary. Any obstructions located within a Sight Distance Easement shall not obstruct visions between a height of 30 inches and eight feet above the ground where the sight distance originates.
- Plan and profile details for sight distance lines will be required on all plans.

2.15 Horizontal Curves

Standard

When tangent centerlines deflect from each other more than one degree (1°) and are not forming an intersection, they shall be connected by a curve with a minimum centerline radius of 154 feet and a minimum centerline length of curve of 100 feet for residential roads. Residential roads are not required to have superelevation, but it is required on all Major Thoroughfare roads unless minimum normal crown radii are met. Residential roads intersecting any road shall have a tangent section of centerline at least 60 feet in length measured from the near edge of pavement/face of curb of the thru lane of the intersecting road.

When tangent centerlines on arterial and collector streets deflect from each other more than one degree (1°) and are not forming an intersection, they shall be connected by a curve with a minimum centerline radius of curve based on the data in the following curve table on the next page.

Prior to initiating the design of a road, the engineer should contact the Department of Public Works regarding the degree of superelevation that will be permitted on the specific road. The determination as to whether superelevation will be permitted will be based on the functional classification of the road as well as drainage characteristics and considerations. The maximum superelevation allowable is 0.04 foot/foot.

Degree of Curve and Minimum Radius for Roads

Normal Crown Section

	DESIGN SPEED							
	25	30	35	40	45	50	55	60 mph
	mph	mph	mph	mph	mph	mph	mph	
Radius	2050	2,830'	3730'	4770'	5930'	7220'	8650'	8650'

From – *A Policy On Geometric Design Of Highways And Streets* , 2018, Table 3-8, Page 3-42, Minimum Radii for Design Superelevation Rates, Design Speeds, and $e_{max} = 4\%$.

At Maximum Superelevation ($e_{max} = 0.04$)

	DESIGN SPEED							
	25	30	35	40	45	50	55	60
	mph	mph	mph	mph	mph	mph	mph	mph
Radius	154'	250'	371'	533'	711'	926	1,190'	1,500'

From – *A Policy On Geometric Design Of Highways And Streets* , 2018, Table 3-7, Page 3-34, Minimum Radius Using Limiting Values e and f .

A tangent is not required between reverse curves on residential streets. On all roads with superelevation, a minimum tangent of 200 feet will be required.

A curve with a minimum centerline radius of 154 feet is allowed for a residential street with normal crown.

Applicability of the Standard

This standard applies to all types of development, including subdivisions and PODs.

Design Requirements

N/A

2.16 Vertical Curves

Standard

Vertical curves may be either crest or sag. The maximum vertical grade permitted on a designated arterial or major collector road is 5 percent. On all other roads the maximum grade is 8 percent. The minimum grade for all streets shall be 0.50%. See section 2.24 of this Manual for minimum grades on curb and gutter within cul-de-sacs. The following table provides vertical curve data for each design speed.

DESIGN CONTROLS FOR VERTICAL CURVES

Sag Vertical Curves	DESIGN SPEED							
	25 mph	30 mph	35 mph	40 mph	45 mph	50 mph	55 mph	60 mph
K	26	37	49	64	79	96	115	136

From – *A Policy On Geometric Design Of Highways And Streets*, 2018, Table 3-37, Page 3-176, Design Controls for Sag Vertical Curves.

Crest Vertical Curves	DESIGN SPEED							
	25 mph	30 mph	35 mph	40 mph	45 mph	50 mph	55 mph	60 mph
K	12	19	29	44	61	84	114	151

From – *A Policy On Geometric Design Of Highways And Streets*, 2018, Table 3-35, Page 3-170, Design Controls for Crest Vertical Curves Based on Stopping Sight Distance.

Notes: K = Rate of Vertical Curvature

K factor based on minimum sight distance

Sag Vertical Curves sight distance based on headlight sight distance.

Applicability of the Standard

This standard applies to all types of development, including subdivisions, CIP's and PODs.

Design Requirements

N/A

2.17 Tapers

Standard

A taper is required to move traffic into a different travel path, such as when a lane ends and traffic must merge into the adjacent travel lane, or when lanes shift due to road geometrics. The following table specifies minimum taper lengths required on a roadway where a lane drop is proposed.

MINIMUM TAPER LENGTHS (L)							
POSTED SPEED LIMIT (MPH)	WIDTH OF OFFSET						
	6 FT	7 FT	8 FT	9 FT	10 FT	11 FT	12 FT
25	65'	75'	85'	95'	105'	115'	125'
30	90'	105'	120'	135'	150'	165'	180'
35	125'	145'	165'	185'	205'	225'	250'
40	160'	190'	215'	240'	270'	295'	320'
45	270'	315'	360'	405'	450'	500'	540'
50	300'	350'	400'	450'	500'	550'	600'
55	330'	385'	440'	495'	550'	605'	660'

Values are rounded up and are from formulas located in MUTCD (2009 Edition), Table 6C-4, page 557.

Values for Shifting Tapers shall be a minimum of $1/2(L)$. A Shifting Taper is used when a lateral shift is needed.

Tapers located at the end of a road widening section that is not open to traffic shall have a minimum of a 2:1 taper from edge of pavement back to the travel lane, unless otherwise approved by the Traffic Engineer. One foot beyond the end of pavement for these tapers, two OM-3R (black/white) signs shall be placed and mounted on 7' posts located three feet and eight feet from edge of the through travel lane.

Tapers for right and left turn lanes shall be 100 feet and are discussed in Section 2.20.

Applicability of the Standard

This standard applies to all types of development, including subdivisions, PODs, and CIPs.

Design Requirements

N/A

2.18 Points of Access

Standard

Any new subdivision with more than 50 single family lots shall have a minimum of two separate permanent points of access onto public roads. If construction of a subdivision is to be phased, the second point of access must be open to traffic before the total number of issued building permits in the subdivision exceeds 50.

In addition, any new POD consisting of:

1. multi-family development (apartments/town homes) with more than 82 multi-family units, or
2. 200,000 square feet of retail, or
3. 300,000 square feet of office, or
4. 500,000 square feet of industrial/warehousing, or
5. other large PODs as determined by the Traffic Engineer

shall have a minimum of two separate permanent points of access onto public roads.

If construction of a multi-family development is to be phased, the second point of access must be open to traffic before the total number of Certificate of Occupancies in the development exceeds 82.

There shall be no vehicular entrance or exit within 200 feet, along the same side of the street and in the same block, of the premises of any school, public playground, place of worship, hospital, public library, or institution for children or dependents, except where the parking lot is on the same premises (Sect. 24-98 Henrico County Code).

Applicability of the Standard

This standard applies to all types of development, including subdivisions and PODs.

Design Requirements

The second point of access needs to be a full point of access that handles two-way traffic that is a typical road section for subdivisions or a minimum of 24 feet wide for PODs.

Access points need to meet access management standards as detailed in Section 2.19.

2.19 Intersection Design

Standard

All roads intersecting another road shall do so at an angle of 90 degrees for a minimum distance of 60 feet measured from the near edge of pavement/face of curb of the thru lane of the intersecting road in all directions. In this section, "Road" shall mean public road, private road, multifamily access, alley, and commercial access.

The minimum offset between intersecting roads shall be not less than 150 feet (measured from the near edge of pavement of existing road to centerline of new road) on residential and minor collector roads. For major collector and arterial roads, offsets shall not be less than 250 feet (measured from the near edge of pavement of existing road to centerline of new road). The measurements listed above are to be met if adjacent intersecting roads are either on the same side of the main road or on the opposite side if the road is undivided.

On local roads, a vertical curve equivalent to the superelevation or crown of the intersecting road shall be provided for a distance of 50 feet. For residential roads internal to a subdivision, a vertical curve equivalent to the crown of the intersecting road shall be provided for a distance of 25 feet for a road with curb and gutter, and 35 feet for a road without curb and gutter

The curb radius or radius on the edge of pavement on all public roads intersecting other public roads designated as collector or arterial roads shall be a minimum of 35 feet. The curb radius or radius on the edge of pavement at all intersections of two public roads designated as residential roads shall be a minimum of 30 feet. The minimum curb radius at the intersection of a public road and a private road, multifamily access, or commercial access shall be 15 feet.

If a Sight Distance Line is determined to be outside the county right-of-way, a Sight Distance Easement must be provided. Sight Distance Easements shall be identified and shown for all road intersections and noted on the subdivision plat, plans of developments, and roadway projects. These easements shall remain free of all structures, trees, and light poles. No landscape plantings which obstruct visions between a height of 30 inches and eight feet above the ground level where the sight distance originates shall be permitted within the Sight Distance Line nor within 5 feet of the Sight Distance Line. See Section 2.14 for more information.

The distance between median breaks shall be a minimum of 800 feet. Spacing between signalized intersections shall not be less than 1,320 feet.

Applicability of the Standard

This standard applies to all types of development, including subdivisions, PODs, and CIPs.

Design Requirements

N/A

2.20 Turn Lanes

Standard

Left and right turn lanes shall be required at all entrances and public roads on four or more lane roadways. Turn lanes may be required on all other roads as determined on a case-by-case basis by the Traffic Engineer. This will be based on type of development, anticipated volume of traffic, location, classification of roads, and other factors.

Pavement design of the turn lane shall be the same as the through lanes of the roadway. Left-turn lanes shall have a minimum width of 10 feet if constructed in the median of a divided roadway, and 12 feet at all other locations. Right-turn lanes shall have a width of 12 feet. See Appendix C for additional information concerning turn lane design.

The minimum turn lane size is as follows:

Left turn lane: 200 feet of full storage; 100 feet of taper
Dual left turn lane: 200 feet of full storage; 200 feet of taper
Right turn lane: 200 feet of full storage; 100 feet of taper

Variations in full storage and taper lengths may be approved by the Traffic Engineer.

Applicability of the Standard

This standard applies to all types of development, including subdivisions, PODs, and CIPs.

Design Requirements

N/A

2.21 Raised Median Design

Standard

Raised medians may be placed at subdivision entrances or can be used to create a divided roadway through a subdivision. All medians greater than or equal to six (6) feet in width shall have a raised grass median with pavement edge drains along each side of raised grass median curbs. Additional landscaping may be added to the raised grass median if approved by the Department of Public Works, and a Right-of-Way Maintenance Agreement (see Page D-23) from a homeowner's association or other group is provided. Any median less than 6 feet shall be constructed in accordance with the latest edition of the VDOT Road and Bridge Standards for MS-1 Median. VDOT Standard MS-1A or variations of the same will not be permitted. All sight lines must meet the minimum criteria as stated in Section 2.14 of this Manual.

Raised medians at subdivision entrances designed for the expressed purpose of identifying and/or beautifying a subdivision entrance will be permitted only on a leg of the intersection that is/will be controlled by a stop condition.

See Pavement Edgedrain for Raised Grass Medians and Islands, Appendix C, Drawing C-33

The minimum crossover spacing on a road with a continuous median is 800 feet.

Applicability of the Standard

This standard applies to all types of development, including subdivisions, PODs, and CIPs.

Design Requirements

UD-4 underdrains are required below each raised median or island curb. Solid concrete medians and islands are exempt.

2.22 Cul-de-sac

Standard

Cul-de-sacs are required at the end of all dead end streets.

The size of the cul-de-sac is based on the road classification and width of the road that is being terminated. Details regarding the right-of-way and pavement radius that are to be used are identified in Appendix C.

A shoulder width of 6 feet shall be provided around the cul-de-sac to insure that the roadside ditch remains within the right-of-way where the right-of-way of the cul-de-sac has a 50-foot radius and a roadway with no curb and gutter is proposed.

A modified cul-de-sac may be used if desired on residential streets with a road section identified as classification IV or less. Any deviation from the standard cul-de-sac as stated above must meet the minimum design criteria of the modified design cul-de-sac as shown in Appendix C. Other alternative cul-de-sac designs will be considered on a case-by-case basis. A Right-of-Way Maintenance Agreement, Appendix D, Page D-23, acceptable to the Department of Public Works must be provided between the developer or the homeowner's association and the Department of Public Works for landscaping and maintenance of the island within the modified cul-de-sacs.

If adjacent property is undeveloped and the future continuation of the proposed street is necessary for convenient movement of traffic representing the best overall traffic pattern, then a temporary cul-de-sac shall be provided.

Temporary Turnaround Easements

Construction of a temporary turnaround area is required whenever a stub street extends more than one lot from a corner or more than one lot fronts on the stub street on either side of the road. All temporary turnarounds or temporary cul-de-sacs shall include a temporary turnaround easement. When a temporary cul-de-sac is no longer required because of a road extension, the developer of the road being extended shall be responsible for removing the temporary cul-de-sac and extending the road and property components (curb and gutter, driveways, sidewalks, mailboxes, etc.) to the new road section and re-grading areas to finished contours with acceptable drainage. The developer shall be responsible for providing all necessary documents to vacate the Temporary Cul-de-sac Easement, unless language is provided on the subdivision plat to extinguish the easement upon extension of the road.

When curb and gutter is required on a street, curb and gutter shall also be provided around the perimeter of any temporary cul-de-sacs, unless a subdivision plan has been submitted and approved to extend the street within the next twelve months after completion of the temporary cul-de-sac.

Applicability of the Standard

This standard applies to all types of development, including subdivisions and PODs.

Design Requirements

See Permanent Cul-De-Sac Criteria chart, Appendix C, Drawing C-23.

2.23 Roadway Shoulder Design

Standard

Shoulder slopes and widths shall be in accordance with roadway typical cross-section details for the road classification contained in this Manual. See Appendix B for additional details relating to road shoulders.

Grassed Shoulders

Topsoil shall be provided on grassed shoulders to a minimum depth of 2 inches. Shoulders shall be seeded and fertilized in accordance with VDOT Road & Bridge Specifications and VDOT Road and Bridge Standards.

Applicability of the Standard

This standard applies to all types of development, including subdivisions and PODs.

Design Requirements

- Shoulders shall be widened for guardrail in accordance with Henrico County Design Manual.

2.24 Curb and Gutter

Standard

General

All curb and gutter shall be constructed in accordance with the County of Henrico standard details located in Appendix C in this Manual.

Accessibility Requirements

All roadway construction shall incorporate a means of access for persons with mobility impairments. See Section 2.47 Curb Ramps in this manual.

New Development

Curb and gutter shall be installed on both sides of each road in a new subdivision in accordance with Section 19-162 of the County Code and with County design standards and specifications. Curb and gutter shall be installed on both sides of each street in a subdivision if any of the following conditions apply:

- any block of any street is constructed with a grade of 0.5% or less within the block
- 25% of the streets within a subdivision have a grade of 1.0% or less
- 25% of the lots in the subdivision have a street frontage of less than 80 feet.

Either standard curb and gutter or roll face curb and gutter may be used on residential roadways (Typical Road Sections I, II, III, IV). The type of curb and gutter that is used must remain the same for the entire length of the street. Standard curb and gutter shall be installed on collector and arterial roadways where curb and gutter is required.

Construction Staking

Curb and gutter, storm sewer and related drainage structures installed on existing County maintained roads will not be staked by the County. The developer shall be responsible for all staking in the public right-of-way. POD's started before September 1, 2021 can be staked by the Department of Public Works upon request. Curb and gutter shall not be staked until all conflicts are resolved within the right-of-way. If the developer requests staking by the Department of Public Works, the developer shall provide, alignment data and pertinent information sufficient to facilitate the construction staking of curb and gutter, storm sewer, and related drainage structures to the County Surveyor. Utility poles must not be located in conflict with existing or future sidewalk shelf areas or sidewalk locations.

Curb and gutter and related drainage facilities on new subdivision roads will not be staked by the County. The developer shall be responsible for staking the curb and gutter for the new road in conformance with the approved plans. The Department of Public Works will

perform inspections of the curb and gutter and road construction as the staking and construction proceeds.

The minimum allowable grade for County roadways is 0.5 % on continuous grade. The minimum allowable grade on curb and gutter within a cul-de-sac is 1.0%. Curb and gutter, storm sewer and related improvements installed on VDOT maintained roads will not be staked by the County.

An as built survey is required on all POD's and Subdivision. See **Appendix A** for right-of-way survey "As-Built" requirements.

Pavement Widening with Curb and Gutter Installation on Existing Roadways

If a property owner wishes to install curb and gutter along the road frontage, the installation location must be approved based on the road functional classification. The County will provide the necessary pavement widening to tie the new curb and gutter to the existing roadway. The County will not provide pavement widening to the new curb and gutter for Plans of Development, subdivisions or building permits.

The minimum pavement design shall be based on the classification of that roadway as defined by the Department of Public Works and the County Code. The new pavement structure depth shall be equal to or greater than the existing pavement.

Concrete Driveway Apron Requirements with Curb and Gutter

Concrete driveway aprons are required with curb and gutter where the following conditions apply:

- Within 25 feet of a drainage inlet.
- When the driveway is lower than the crown of the road.
- In the sag of a vertical curve.

Applicability of the Standard

This standard applies to all types of development, including subdivisions, PODs, and CIPs.

Design Requirements

N/A

2.25 Sidewalk

Standard

A sidewalk shall be installed on both sides of all major thoroughfare roads.

All other roads (including Class I – IV roads and cul-de-sac roads) shall have sidewalk installed on one side of the road at a minimum. The sidewalk will be placed on the side of the road which is most beneficial to pedestrians. This will be determined by the Department of Public Works.

All sidewalks shall be constructed of concrete and have a minimum width of 5 feet. A 4-foot grass utility strip shall be provided between the back of curb and the sidewalk. Appendix B and C provide additional details regarding sidewalk design.

For all pedestrian facilities in the Right-of-Way, Henrico follows these Federal guidelines: **Proposed Guidelines for Pedestrian Facilities in the Public Right-of-Way** (PROWAG). See this guideline for standards for public right of way accessibility.

Additional right-of-way shall be dedicated to incorporate the entire sidewalk plus a minimum one-foot shelf outside of the sidewalk should insufficient right-of-way exist. For road classes I-IV, a permanent easement will be needed in addition to the proposed right-of-way to incorporate the entire sidewalk, plus a minimum one-foot shelf outside of the sidewalk. Additional right-of-way can be dedicated in lieu of a permanent easement.

See Section 2.47 of this Manual for information regarding accessibility requirements for pedestrians at intersections.

Applicability of the Standard

This standard applies to all types of development, including subdivision, PODs and CIPs.

Design Requirements

See Sidewalk, Appendix C, Drawing C-11

2.26 Pavement Design

Standard

The pavement design for all streets and commercial / industrial access roads shall be in accordance with the appropriate road classifications shown in the Typical Sections. Pavement Design Standards are included in Appendix B of this Manual. The pavement designs are based on a minimum CBR value of 10 and set forth the minimum pavement design requirements for each road classification. The pavement designs shall be considered preliminary designs and are **not approved for construction** until substantiated by acceptable test results of the actual subgrade soil. Approval of the final pavement design shall be obtained prior to the construction of the pavement.

Field sampling of the subgrade soil shall be required to determine the actual CBR value, resiliency factor and other characteristics to verify the adequacy of the pavement design in relationship to the existing soil. If the test results reveal that the pavement design is less than adequate, adjustments to the pavement design shall be required.

Adjustments to the minimum required pavement designs shall be made in accordance with the latest edition of the VDOT Manual Pavement Design Guide for Subdivision and Secondary Roads in Virginia. The maximum vehicles per day, as shown for the appropriate road classification, shall be used as the Design ADT in the nomograph to determine the Thickness Index for the pavement and for any adjustments to the minimum pavement design requirements. Reductions to the minimum required pavement designs will not be considered. All CBR values are to be determined in accordance with "The Virginia Test Method for Conducting California Bearing Ratio Tests" (Designation VTM-8).

The developer needs to obtain the services of an independent testing firm to perform the tests and submit certified results and pavement recommendations to the County for review. Soil samples should be taken when the earthwork is within 0.1' from finished subgrade.

The pavement design determination process assumes that the properly compacted subgrade soil will produce a stable platform for pavement construction. If an unsuitable subgrade (wet, soft, unstable or unsuitable material) is encountered, it must be undercut to a firm foundation and replaced with adequately compacted material of suitable quality. Prior to the placement of the subbase / base layer, the subgrade must be inspected by the Department of Public Works, or it's representative, for grade and compaction and then proof-rolled. Additional inspections shall be required on each subsequent pavement course.

The use of soil stabilization fabrics in County roadways must be approved by the Construction Engineer. The soil stabilization fabric will not be considered as a substitute for undercut needs, nor will it be considered as added structural value in the pavement design.

In the preliminary design phase of development, the engineer shall take into consideration all possible road extensions, "Growth Rates," where applicable, and the percent of, "Heavy Commercial Vehicles," to determine appropriate adjustments in the design ADT to calculate the road design as required in the VDOT Manual.

In addition to the underdrains that are required in the road construction as detailed in Section 3.11 of this Manual, Standard UD-4 pavement edgedrains with outlets are required along each raised grass median and island curb line to prevent water infiltration through or under the pavement structure. See "Pavement Edgedrain for Raised Grass Medians and Islands", Appendix C, Drawing C-33. Longitudinal pavement edgedrains, Standard UD-4 with outlets to provide for lateral drainage, are also required in all road classifications.

Note: Changes have been made in the pavement designs for road classifications I through IV to provide two (2) asphalt layers of pavement. See Typical Sections - Pavement Design Standards included in Appendix B of this Manual.

Applicability of the Standard

This standard applies to all types of development, including subdivisions, PODs, and CIPs.

Design Requirements

County Road Classifications for each roadway shall be clearly identified on plan typical sections

Changes in Pavement Structure Depth

Changes in pavement structure depth shall only take place at intersecting roadways. The pavement structure depth of the larger ADT volume shall control and be extended around the intersection return before changing to a lesser approved ADT pavement structure design depth. The pavement structure depth change location shall be perpendicular to the roadway. At no time shall a change in pavement structure depth be allowed between intersecting roadways or cul-de-sacs.

Location of changes in pavement structure depth shall be investigated to ensure that differences in subgrade elevation will not create a trapped water scenario. UD-4 underdrain will be required at all such locations to ensure any trapped water will be removed from subgrade. UD-4 shall be outfalled to a drainage structure or roadside ditch and an EW-12 outfall structure.

2.27 Vertical Clearances

Standard

All overhead lines within the public right-of-way must be in accordance with the latest edition of the National Electrical Code.

Applicability of the Standard

This standard applies to all types of development, including subdivisions, PODs, and CIPs

Design Requirements

All roadways must have at least 15 feet of vertical clearance over the entire roadway width and clearances must be clearly marked on plan sheets.

2.28 Guardrail

Standard

Guardrail shall be provided and installed by the developer where necessary for the safety of the traveling public, as well as protection for adjacent properties. The need for guardrail should be determined at the early stages of design to ensure that road sections are designed with enough width to facilitate the guardrail installation and that drainage pipes have sufficient cover for the installation of posts and are extended to accommodate the necessary adjustments in the embankments and slopes. Right-of-way adjustments or guardrail easements may be necessary to accommodate the installation and maintenance of guardrail. All new guardrail installed after September 12, 2017 must meet Manual for Assessing Safety Hardware (MASH) testing criteria.

Warrants

A traversable recovery area for vehicles should be provided beyond the traveled way (edge of pavement) whenever possible. Ideally, this recovery area or “clear zone” should be free of obstacles such as non-traversable drainage structures, steep slopes, and unyielding fixed objects that can cause accidents and result in injuries to motorists. In locations where it is not feasible to remove these obstacles from the clear zone, guardrail may be required to adequately protect motorists.

The following minimum guidelines for guardrail installation are based on AASHTO Roadside Design Guide, VDOT Road Design Manual, and VDOT Guardrail Installation Training Manual. However, it should be noted that guardrail may be required in some locations that do not necessarily meet these criteria based on the judgment of the Traffic Engineer. Such factors as traffic volumes, speed of traffic, crash history, road curvature, slopes of recovery area, presence of curb and gutter, location of trees, utility poles, etc. must all be taken into consideration when determining if guardrail is warranted in a particular location.

Guardrail is typically required on sections of roadway when any of the following conditions exist within the clear zone:

- A roadside parallel embankment (fill slope) of 3:1 or steeper and a depth of 4 feet or more.
- A water hazard with a depth of 2 feet or more.
- A ditch section with a depth of 3 feet or more (as measured from the near edge of pavement).
- A fixed object (such as a culvert, pipe, headwall, retaining wall, bridge pier, or abutment).
- Other hazards as determined by the Traffic Engineer.

The clear zone is measured from either the face of curb or the near edge of pavement (on a road with no curb). For public roads with a design speed of 30 miles per hour or less, private roads, or parking lots, the minimum clear zone is 7.5 feet. When there is a water hazard with a depth of 2 feet or more, the minimum clear zone is increased to 10.0 feet. The width of the clear zone increases as the design speed of the road increases and can be found in the following table.

DESIGN SPEED OF ROADWAY (MPH)	30 or less	35 - 40	45 - 50	55
CLEAR ZONE WIDTH (FEET)	7.5	14	20	24

These dimensions are based on the clear zone having an average slope of 6:1 or flatter. If the average slope is steeper than 6:1 or a water hazard is present, the Traffic Engineer will determine the adequate clear zone requirement.

The Traffic Engineer shall make the final determination as to whether guardrail is warranted along a section of roadway based on a review of the plans, a field inspection after rough grading has been completed and/or prior to final acceptance. To avoid untimely adjustments to roadway features to facilitate guardrail, it shall be the responsibility of the developer to notify the Traffic Engineer of potential guardrail needs at the earliest possible stage of construction and prior to the installation of guardrail to ensure that the limits of the potential hazards are adequately protected.

Acceptable Types

Except as noted herein, all guardrail materials, types and installation requirements shall be in accordance with the latest edition of the VDOT Road and Bridge Specifications, VDOT Road and Bridge Standards and the VDOT Guardrail Installation Training Manual. Non-standard guardrail will not be permitted in the County right-of-way but may be acceptable along privately maintained roadways and within parking areas. All new guardrail installed after September 12, 2017 must meet Manual for Assessing Safety Hardware (MASH) testing criteria. NCHRP Guardrail Standards shall only be used for maintenance and repair work. When repair work requires an entire length of guardrail to be replaced, the new guardrail must meet MASH standards.

Guardrail shall be the galvanized strong post system, standard GR-MGS1. GR-2 shall only be used for Maintenance and Repair. Guardrail terminal treatments are required on both the run-on and run-off ends of guardrail. The standard run-on terminal treatment shall be the GR-MGS2. Run-off end terminal treatments shall be the GR-

MGS2. GR-MGS3 terminal treatment is restricted to runoff conditions on divided highways only.

The standard GR-7 or GR-9 Terminal Treatment are no longer approved for use or repair, unless a design waiver is issued.

Guardrail should be installed flush with the face of curb or a minimum of 6 feet behind the curb for roadways with a Design or Posted Speed of 45 mph or less as shown in the table below. The minimum offsets from the edge of pavement or face of curb to the face of the guardrail are shown in the following table. Additional information is shown on the typical road section details in Appendix B.

Guardrail Offsets

Road Classification		Minimum Offset (In Feet) from Edge of Pavement or Face of Curb to Face of Rail
Class I – IV	Shoulders	6.0
	Curb & Gutter without Sidewalk	6.5
	Curb & Gutter with Sidewalk	10.0
Class V – VIII	Shoulders	6.0
	Curb & Gutter without Sidewalk	6.5
	Curb & Gutter with Sidewalk	10.0

Guardrail installed on roadways with a Design or Posted Speed greater than 45 mph shall be constructed so that the face of rail is flush with the face of curb.

In addition, it may be necessary to dedicate additional right-of-way or dedicate permanent guardrail easements to encompass the guardrail installation, if sufficient right-of-way does not exist for the placement and maintenance of the facility.

Applicability of the Standard

This standard applies to all types of development, including subdivisions, PODs, and CIPs.

Design Requirements

N/A

2.29 Alleys

Standard

Public alleys, as part of developments or subdivisions, are discouraged and shall be minimized as much as possible. The construction of public alleys will only be allowed when the Director of Public Works has determined that no other practical alternatives are available for the proposed development.

Applicability of the Standard

This standard applies to all types of development, including subdivisions, PODs, and CIPs.

Design Requirements

The Director of Public Works will stipulate the alley design at the time the approval for alley use is granted.

Alleys shall not be constructed with the intent of meeting public road standards.

Henrico County will not maintain any alley.

A maintenance agreement (that is acceptable to the Director of Public Works and the County Attorney) is required for any improvements made to existing alleys.

Improvements (clearing, grading, and/or paving) to existing alleys may be completed by an adjacent property owner or other interested party.

Any alley improvements must be approved and authorized by the Director of Public Works.

Improvements will not be authorized on an existing alley without written agreement from all adjacent property owners.

2.30 Bicycle Lanes and Shared Use Paths

Standard

Bicycle lanes and shared use paths shall be designed per the latest version of AASHTO's Guide for the Development of Bicycle Facilities and/or the VDOT Road & Bridge Standards. All signs shall be in accordance with the MUTCD. Appendix B of this Manual provides details of typical road sections that include these facilities within the county's right-of-way.

The developer, or subsequent legal entity responsible for the maintenance within a development (i.e., homeowners association, community association, etc.), shall be responsible for maintaining any shared use paths constructed outside of the right-of-way and within the development. A written acknowledgement of this requirement, satisfactory in form and substance to the county attorney shall be submitted to the Director of Public Works.

Applicability of the Standard

This standard applies to all types of development, including subdivisions, PODs and CIPs.

Design Requirements

AASHTO's Guide for the Development of Bicycle Facilities and/or the VDOT Road & Bridge Standards. All signs shall be in accordance with the MUTCD

2.31 Street Lighting

Standard

Street lighting is not required to be provided on County public roads except as a part of the installation of a new traffic signal, a roundabout, or a UMU District. See Section 2.37 Traffic Signals or Section 2.43 Roundabouts of this Manual for additional information.

Street lighting will be considered as part of the development of new neighborhoods or subdivisions. A comprehensive plan for the entire area or subdivision shall be developed and submitted as a part of the development plans for review by both the Department of Public Works and the Planning Department. Any proposed street lighting shall be included with the road construction plan package for approval consideration. Landscaping plan approval does not constitute approval of the placement of street lighting on the right-of-way.

On existing roadways, street lighting is installed by the County upon request within some existing sanitary districts. Street light installation requests within sanitary districts should be directed to and coordinated with the Department of Public Utilities.

A permit must be obtained from the Department of Public Works for any proposed lighting which will be on or overhanging the right-of-way prior to the installation of the lighting. The lighting shall be designed in a manner that is acceptable to the Director of Public Works and the Director of Planning (if in a UMU District) and be compatible with the surrounding environment and intended use. Any street lighting, poles or fixtures which create a hazard to pedestrian or motor vehicle traffic using the right-of-way will not be permitted. Street lighting shall only be installed in accordance with an approved Permit to Work in the Right-of-Way, Appendix E, Page E-2.

Applications for street lighting permits shall include plans and/or a sketch indicating the exact location of poles with reference to the right-of-way and the edge of pavement, spacing of poles, width of right-of-way, width of pavement, all photometric data, location of electric service, existing facilities (drainage structures, utilities, etc.) in the right-of-way and any other pertinent data.

The permit applicant should provide a written acknowledgement from the adjacent property owners that indicate they have no objection or are in favor of the street lighting proposal as a part of the application information provided.

Street lighting will only be considered for approval if all costs associated with the street lighting, including energy costs, are not borne by the County. A Right-of-Way Maintenance Agreement acceptable to the Director of Public Works and the County Attorney for the street lighting will be required prior to the approval of the street lighting plan.

Street lighting that is proposed along the outside of a roadway shall be placed either behind the curb and gutter and sidewalk shelf area or behind the roadway shoulder and roadside ditch. Street lighting that is proposed to be placed in a roadway median or island will be reviewed and considered on a case by case basis considering the type of lighting proposed, pole locations, the median or island dimensions, traffic safety, and lighting needs.

Installation of the street lighting shall be in conformance with the approved plans, the National Electrical Code, and all other applicable standards.

Applicability of the Standard

This standard applies to all types of development, including subdivisions and PODs.

Design Requirements

- Lighting Plans shall be prepared, sealed, and signed by an appropriately licensed professional in the Commonwealth of Virginia, except plans in a UMU District as dictated by the Planning Department.

2.32 Speed Bumps/ Speed Humps / Speed Cushions / Bump Outs

Standard

The installation of speed bumps in a public road to attempt to control vehicle speeds, the volume of vehicles using the road, drainage, or for any other purpose shall not be permitted.

Speed humps/cushions are installed as part of traffic calming measures implemented in conjunction with the Henrico County Traffic Calming Program. Speed humps/cushions may also be installed by developers in new subdivisions to discourage higher speeds. The developer/engineer shall work with Traffic Engineering on the location of the speed humps/cushions during the Plan of Development process.

In new subdivision designs, bump outs shall be installed on all main roads to reduce the travel lane widths at intersections and serve as a traffic calming device. Bump outs may also be installed at other key intersections within subdivisions. The developer/engineer shall work with Traffic Engineering on the location of the bump outs. Bump outs are predominantly located at intersections to reduce pedestrian crossing distances but may be installed at a midblock section of roadway. An example of bump outs can be found in Appendix B, Pages B-4 and B-5.

Speed humps, speed cushions, or bump outs shall not be permitted on any roadway shown as a Minor Collector, Major Collector or Arterial on the Henrico County Major Thoroughfare Plan. Speed humps, speed cushions, and bump outs shall only be installed on roadways with a speed limit of 25 mph or less.

Any proposed installation of; speed humps, speed cushions, or bump outs on private roadways shall be coordinated with the Fire Marshall's office.

Applicability of the Standard

This standard applies to all types of development, including subdivisions and PODs.

Design Requirements

N/A

2.33 Railroad Crossings

Standard

Full grade crossing protection with flashing signals shall be provided at all new public highway-railroad grade crossings. Design of the grade crossing shall be in accordance with the latest edition of the Railroad Highway Grade Crossing Handbook published by the Federal Highway Administration.

Pedestrian and bicycle crossing safety should be considered as a part of all new highway-railroad grade crossings.

The developer is responsible for obtaining all permits as well as the cost of the installation of the grade crossing and grade crossing protection, including maintenance of rail traffic and vehicular traffic during the construction. The cost of future maintenance of the grade crossing and grade crossing protection shall be borne by the County and the railroad as specified in the Maintenance Agreement between the County and the railroad.

Applicability of the Standard

This standard applies to all types of development, including subdivisions, PODs and CIPs.

Design Requirements

N/A

2.34 Pavement Markings

Standard

The developer of subdivisions, plans of development, and roadway projects is responsible for the installation of pavement markings for the proposed road improvements. The developer is also responsible for any necessary pavement marking changes, including eradication, to existing conditions as a result of his project. Any existing pavement markings disturbed during construction shall be replaced by the developer. If one line of a double yellow centerline is disturbed, both lines shall be reinstalled.

The pavement marking material used for new installations or the replacement of disturbed markings shall be Thermoplastic and shall have a minimum thickness of 90 mil. The thermoplastic shall be reflectorized with glass beads at a rate outlined in the manufacturer's installation manual.

All pavement markings shall be in accordance with the latest edition of the Manual on Uniform Traffic Control Devices (MUTCD).

Installation shall be in accordance with County or VDOT specifications.

Applicability of the Standard

This standard applies to all types of development, including subdivisions, PODs, and CIPs.

Design Requirements

N/A

2.35 Parking

Parking on the Public Right-of-Way

Standard

The availability of on street parking shall not be considered or counted as a part of meeting the minimum parking space requirements of any development, except in a UMU District. Parking may be permitted to take place on the right-of-way. Such on street parking shall be in accordance with Chapter 22, Article IV of the Henrico County Code.

Parking may be removed from the right-of-way at any time, by the Traffic Engineer, if it is determined that such parking is creating a traffic safety problem, is impeding normal traffic flow or if the area that is used for parking is needed for another purpose.

Private parking lots shall not encroach into the public right-of-way.

Parking in Private Developments

Standard

Parking shall be perpendicular (90 degrees) or parallel to a two-way drive aisle. When a one-way drive aisle is proposed, parking shall be at a 60-degree angle with the drive aisle. When a two-way drive aisle is proposed with angled parking, a minimum four (4) foot raised median separating traffic is required and parking shall be at a 60 degree angle with the drive aisle. Parking stalls perpendicular with the drive aisle shall be 9' wide by 18' long. These dimensions shall be used to design the angled parking spaces. Parking stalls parallel with the drive aisle shall be 8' wide by 22' long.

Drive aisles shall be between 18 feet and 20 feet in width for one-way traffic and a minimum of 24 feet wide for two-way traffic. Where the one-way drive aisle is adjacent to parking stalls, the width of the drive aisle may be reduced to 15 feet depending on the length of the drive aisle and the surrounding development.

The minimum curb radii adjacent to 90 degree parking stalls shall be 4.5 feet. Raised islands with a minimum width of 9 feet shall be installed at the end of all rows of parking.

Buildings without a loading dock that will have deliveries shall have designated Loading/Unloading stalls near the building access point. These stalls shall allow for the safe loading and unloading of vehicles without conflicting with vehicles within the drive aisles. Delivery points and dumpster placement shall be designed so that trucks shall not have to back out for longer than five (5) parking stalls.

A turn around space (9' x 18') shall be installed at the dead end of drive aisles greater than five (5) spaces deep. This space shall be on the left side of the dead end (as you approach the dead end) and shall be striped and signed to indicate No Parking. At the dead end of the drive aisle, there shall be a backing area five (5) feet deep.

Wheel stops or bollards shall be placed within handicap parking stalls and any regular stall adjacent to ADA ramps. Wheel stops shall also be placed within 90 degree parking with a sidewalk running along the end of the space unless the sidewalk is a minimum of 5 feet in width. The bollards shall be placed so that they do not interfere with the minimum parking space requirements. Bollards shall be placed between parking stalls and buildings where there is no raised sidewalk or curb. Bollards shall also be placed adjacent to and three (3) feet from any door that opens into a drive aisle to protect pedestrians using the door.

Parking In Private Developments - Maintenance

Asphalt Pavement requires periodic inspection and evaluation to determine when maintenance is necessary.

The County's Planning Office Zoning Ordinance Sec. 24-5101 Off-Street Parking and Marking – Paragraph A. Surfacing: requires “...*all off-street vehicular parking and loading areas must be surfaced in accordance with one of the following methods: A hard, durable, and bonded surface material such as asphalt, concrete, brick, cobblestone, pavers, or recycled glass, rubber, asphalt, or other materials, maintained in a smooth, well-graded, clean, and orderly condition that meets County specifications*”.

To facilitate when maintenance is required on asphalt pavement the **PASER** (Pavement Surface Evaluation and Rating) system, [<https://www.apa-mi.org/docs/Asphalt-PASERManual.pdf>], developed by the Transportation Information Center/University of Wisconsin-Madison, or an approved equivalent, shall be used.

Using the **PASER** system, a Score of 1-4 shall require appropriate maintenance/rehabilitation of the pavement to be performed. A PASER score of 5-6 may also require appropriate maintenance/rehabilitation of the pavement to be performed.

Applicability of the Standard

This standard applies to all types of development, including subdivisions, PODs, and CIPs.

Design Requirements

N/A

2.36 Private Access Design at the Intersection of a Public Road

Standard

The connection of a private driveway or private road to a public road must provide a safe and efficient intersection for motorists and pedestrians and must comply with applicable standards.

The following criteria shall be used as a general guide for private access design at the intersection of a County public road.

Nonresidential and Multi-Family Dwelling Access

All access points shall intersect with the public road at 90 degrees for a minimum distance of 60 feet as measured from the near edge of pavement/face of curb of the thru lane of the intersecting road.

For Minor Collectors and Major Access Roads, no access point shall be located closer than 150 feet from another access point or road (as measured from the near edge of pavement of the existing access point or road to the centerline of the new access point).

For Major Collectors and Arterials, no access point should be located closer than 250 feet from another access point or road (as measured from the near edge of pavement of the existing access point or road to the centerline of the new access point).

No access point should be located within 12.5 feet of a property line (as measured along the right-of-way line between the property line and the near edge of pavement of the driveway apron). Reference: Henrico County Code Sec. 24-5104.

On undivided roadways, the centerline of an access point shall align with the centerline of an access point or road located across the street if the driveways are planned to be within 150 feet of each other (as measured from the near edge of pavement of the existing access point or road to the centerline of the new access point) on Minor Collectors and Major Access Roads or 250 feet on Major Collectors or Arterials.

Access points intended for two-way traffic flow shall have a minimum width of 24 feet. A wider driveway may be required to accommodate proper lane alignment, truck access, a raised median is provided to separate opposing traffic flows, or if additional lanes are needed to satisfy recommendations of the Traffic Engineer. Truck turning movements shall be provided with each Plan of Development. The size of the truck used for the turning movements shall be the largest truck that will have access to the development.

A median may be permitted to separate opposing traffic flows on two-way access points. Medians which are provided should have a minimum width of 4 feet and a maximum width of 16 feet. The minimum length of the median shall be 50 feet.

Access points intended for a single one-way travel lane shall have a minimum width of 18 feet and a maximum width of 20 feet.

A minimum radius of 15 feet shall be provided at the intersection of the access point and the public roadway. Larger radii may be permitted depending on the use, design and location of the access point.

Along the private access drive, the first conflict point shall be a minimum of 150 feet from the public roadway for developments with more than one business, or more than one office building, or greater than 82 housing units and 30 feet for developments with a single business, single office building, or less than or equal to 82 housing units. This point shall be measured from the near edge of pavement of the thru travel lane of the public road. These distances may be adjusted by the Traffic Engineer based on the type of development proposed.

Adequate sight distance, as specified in Section 2.14 of this Manual, shall be provided at all access points. Left turn and/or right turn lanes on the public road at the access point may be required. Refer to Section 2.20 of this Manual for additional information about turn lanes.

Access to properties that are considered out parcels to other developments (such as shopping centers, office complexes, etc.) shall be internal to the overall development. Separate and/or exclusive access points will not be permitted for the out parcels.

Single Family Dwelling Driveways

The width of the driveway at the right-of-way line shall be 12 feet. Wider driveways will be considered on a case-by-case basis considering need, physical conditions of the area and safety. On roadways with speed limits of 35 mph or greater, the driveway at the right-of-way line shall be 16 feet.

No driveway shall be permitted to be placed within the radius of a public road intersection and shall be a minimum of 50 feet from an adjacent public or private street travel lane.

All driveways shall intersect with the public road at 90 degrees. The maximum slope of driveways shall be 12%.

Applicability of the Standard

This standard applies to all types of development, including subdivisions, PODs, and CIPs.

Design Requirements

N/A

2.37 Traffic Signals

Standard

The developer shall pay for the design and installation of any new traffic signal or modification to an existing traffic signal, if warranted by their development. Prior to a new traffic signal design or modifications to an existing traffic signal being designed, a new roundabout design at the subject intersection shall be investigated. **Roundabouts are the preferred intersection traffic control.** New traffic signal installations shall be determined by the warrants outlined in the MUTCD. The traffic signal design shall be reviewed and approved by the Traffic Engineer before any construction shall take place. If no traffic signal exists, but one is anticipated in the future, the developer shall install all underground infrastructure (i.e. junction boxes, conduit, and pole and cabinet foundations), as determined by the Traffic Engineer, at the time of construction of the new subdivision street or plan of development entrance. Pole foundations require soil testing and shall be designed by a Professional Engineer licensed in the Commonwealth of Virginia.

LED Street lighting (250W equivalent) shall be on all mast arm poles unless there is an overhead utility conflict. The proposed LED lighting shall match existing street lighting in the area.

The need for pedestrian accommodations, including pedestrian heads and push buttons, shall be determined by the Traffic Engineer during the design stage. Poles should be located to meet ADA requirements. If mast arm poles cannot be placed with the maximum reach for ADA requirements, auxiliary poles designed to accommodate pedestrian heads and push buttons shall be installed adjacent to ADA ramps.

Street name signs for public streets shall be fabricated and installed on the appropriate mast arms between the pole and the first signal head. The cost of these signs shall be paid for by the developer and included in the design of the traffic signal. See Section 2.38 for information about street name signs on traffic signals.

Applicability of the Standard

This standard applies to all types of development, including subdivisions, PODs, and CIPs

Design Requirements

N/A

2.38 Street Name Signs and Posts

Standard

Roads within the Public Rights-of-Way

Street name signs for all roads located within public rights-of-way shall be fabricated using #086054 extruded aluminum with a minimum height of 9 inches. The signs shall be fully reflective, double faced and covered with prismatic lens sheeting (3M product #4090 or approved equivalent). The signs shall display a green background (3M product #1177C) with white upper and lower case FHWA Series C-stroke letters. The name of the street shall consist of an initial 5.25-inch upper case letter with corresponding lower case letters. The suffix shall be 2.5-inch upper case letters and top aligned with the street name.

Street name signs located within public right-of-way should be installed on 2" x 2" x 10' Brown powder coated metal posts and anchored in the ground by a 2.25" x 2.25" x 30" anchor. The street name blades shall be attached to the post in a cantilever fashion using aluminum brackets and shall be offset so that the top of the lower sign is equal in height to the bottom of the upper sign and at 90 degrees to each other pointing away from the intersection. The minimum mounting height of the street name signs shall be 8 feet as measured from the surrounding finished grade to the bottom of the lowest blade.

The cost of all street name signs shall be bonded by the developer, as a part of the subdivision performance bond. All street name signs for roads located within public rights-of-way shall be installed by Henrico County, unless otherwise approved by the Traffic Engineer.

Roads within Non-Maintained Rights-of-Way

Street name signs for all roads located along a non-maintained right of way shall follow the same standards listed above, except for color. The signs for non-maintained rights-of-way shall have a blue background (3M product #1175C or approved equivalent) with white letters (#4090 or approved equivalent).

Private Roads

Street name signs for all private roads shall follow the same standards listed above, except for color. The signs for private roads shall have a white background (3M product #4090 or approved equivalent) with black letters (#1178C or approved equivalent).

The developer shall install street name signs for private roads internal to a development.

Traffic Signals

Public streets located at signalized intersections shall have overhead street name signs made with a minimum of .100-inch aluminum with a height of 18” for a single street name and 30” for dual street names. The signs shall be fully reflective, single faced and fabricated with Diamond Grade sheeting (3M product #4090 or approved equivalent). The signs shall display a green background (3M product #1177C) with white upper and lower case FHWA Series C-stroke letters (T2000HWYC or equivalent). The name of the street shall consist of an initial 8.5-inch upper case letter with corresponding lower case letters. The suffix shall be 4-inch upper case letters and top aligned with the street name. Street block numbers shall be located at the bottom of the sign and shall be 3.5 inches in height.

The signs shall be installed on the appropriate mast arms between the pole and first traffic signal. If the sign cannot be placed between the pole and first traffic signal, it shall be placed on the pole at its highest point below the mast arm. The design of the overhead street name signs shall be submitted to the County for approval prior to fabrication.

Overhead street name signs shall not be installed for private roads nor for roads in an unmaintained right-of-way. Overhead street name signs shall not face private roads, private access points, nor roads in an unmaintained right-of-way.

Installation of Signs in New Subdivisions

Street name signs will be installed by Henrico County in a new subdivision after either of the following criteria is met:

- The developer has paid for the street name signs and the roads have formally been accepted into the County road system by the Board of Supervisors **or**;
- The developer has paid for the street name signs and the developer provides the Department of Public Works with a letter indicating that he will bear the cost of any maintenance which is needed for the street name signs until such time the roads in the subdivision have formally been accepted into the County road system by the Board of Supervisors.

Street name signs may be installed by the developer at his expense as approved by the Traffic Engineer. In this case, the developer will be responsible for the maintenance of the signs and posts until the roads are accepted into the County road system.

Decorative Street Name Sign Posts

Developers may, at their expense, install decorative street name sign posts instead of the County's standard posts. The decorative posts shall hold the standard County street name sign without the use of special tools. The mounting heights of the signs shall be the same as described above. All decorative posts shall be breakaway and shall be approved by the Traffic Engineer. The developer assumes responsibility for the posts and shall maintain them until the roads are accepted into the County system, at which time the maintenance shall be handled by the HOA or Community Association responsible for the neighborhood. A Right-of-Way Maintenance Agreement must be submitted to the County prior to the installation of the private street name sign posts or prior to the acceptance of the roads into the County system. The County will not maintain decorative street name sign posts.

Applicability of the Standard

This standard applies to all types of development, including subdivisions, PODs, and CIPs.

Design Requirements

N/A

2.39 Traffic Control Signs

Standard

Public Right-of-Way

The developer shall be responsible for providing, installing, and maintaining all Stop, Yield, Speed Limit, Keep Right and Object Marker signs within the subdivision or project limits prior to final acceptance into the County road system. These signs shall be installed on 2" x 2" square Telespar (or equivalent) galvanized posts, with the length dependent on the sign. All signs and posts shall be turned over to the County for maintenance after the roadway has been accepted. All signs installed shall be made in accordance with the Manual on Uniform Traffic Control Devices (MUTCD) and the Standard Highway Signs and Markings manual and shall be constructed using .080-inch aluminum with 3M Product #4090 white or #4081 yellow (or approved equivalent) background sheeting as specified in the MUTCD.

The developer shall coordinate the installation of the traffic control signs with the Traffic Engineer to insure correct and proper signing will be used in terms of sign type, post type, and location. All signs installed by the developer will be turned over for maintenance by the County when the roads are accepted in the County road system.

Private Roads

Traffic control signs installed on private roads open to public travel shall meet the same requirements as public roads as outlined in the MUTCD, Chapter 2.

Applicability of the Standard

This standard applies to all types of development, including subdivisions and PODs.

Design Requirements

N/A

2.40 Road Extension Sign

Standard

Signs indicating that a stub roadway, within a subdivision, will be extended in the future shall be installed by the developer at the end of stub roads as a part of the subdivision development. The sign shall have a message that indicates the following:

“This Road is to be Extended with Future Development. For More Information, Contact the County of Henrico Planning Department at 501-4602”.

A detail for the design of the road extension sign is identified in Appendix C. The sign is to be provided and installed by the developer and fabricated using a 0.080-inch gauge aluminum sign blank and fully reflective (minimum Type 1 material) sheeting. The sign shall be mounted on an End of Road Barricade, as shown in Appendix C, Drawing C-27, if it is a stub road, or on a 2” x 2” x 10’ Telespar (or equivalent) galvanized post with associated anchor if the sign is located in a temporary cul-de-sac.

The cost of all road extension signs shall be bonded by the developer, as a part of the subdivision performance bond. Road extension signs shall be installed prior to the issuance of the first building permit in the subdivision.

The developer shall bear the cost of the Road Extension signs and either the End of Road Barricade or post, whichever is used, and shall maintain the Road Extension signs and supports until such time the roads in the subdivision have formally been accepted into County road system by the Board of Supervisors.

Applicability of the Standard

This standard applies to all types of development, including subdivisions and PODs.

Design Requirements

N/A

2.41 End of Road Barricade

Standard

A developer shall provide a wooden barricade at the end of all stub streets, unless otherwise determined by the Traffic Engineer. End of Road Markers (OM4-2) shall be provided by and installed on the barricade by the developer. A description of the sign and barricade can be found in Appendix C, Drawing C-27. If access to the adjacent property is needed from the end of the stub street, an alternative design may be approved by the Traffic Engineer.

The developer or HOA (if common area where sign is located has been turned over to the HOA) shall maintain the End of Road Barricade and Markers until such time the roads in the subdivision have formally been accepted into County road system by the Board of Supervisors.

The cost of all End of Road Barricades and End of Road Markers shall be bonded by the developer as a part of the subdivision performance bond.

Applicability of the Standard

This standard applies to all types of development, including subdivisions and PODs.

Design Requirements

N/A

2.42 Unmaintained Road Sign

Standard

When roadways are constructed as part of a subdivision or other development, it sometimes becomes necessary to permit public traffic to use the road prior to the acceptance of the road into the County road system. In such instances, or when determined by the Traffic Engineer, signs with the following message shall be installed:

“This Roadway Not Maintained by the County”

The above sign shall be installed at locations determined by the Traffic Engineer.

A detail for the design of the unmaintained road sign is identified in Appendix C, Drawing C-26. The sign shall be mounted on a 2” x 2” x 10’ Telespar (or equivalent) galvanized post with associated anchor.

The cost of all “Unmaintained Road” signs and posts shall be bonded by the developer, as a part of the subdivision performance bond.

The developer shall bear the cost of initial installation and shall maintain the Unmaintained Road signs and posts until such time the road has formally been accepted into the County road system by the Board of Supervisors and the sign has been removed. The developer shall remove and take possession of the signs and posts after the roads have been accepted into the County system.

Applicability of the Standard

This standard applies to all types of development, including subdivisions and PODs.

Design Requirements

N/A

2.43 Roundabouts

Standard

Roundabouts are an acceptable form of intersection design. Roundabouts may be designed to be a single-lane roundabout or double-lane roundabout. The design of roundabouts, to include landscaping and lighting, shall be in accordance with the latest edition of the Federal Highway Administration publication Roundabouts: An Informational Guide.

Modern roundabouts have demonstrated safety and operational benefits and are the **primary design** for intersection improvement projects. They can offer several advantages over signalized and stop controlled alternatives, including better overall safety performance, shorter delays, and shorter queues (particularly during off-peak periods), better management of speeds, and opportunities for community enhancement or aesthetic features.

Parallel or perpendicular parking shall not be allowed within the circulatory roadway of the roundabout, whether the roundabout is public or private. On any roadway extending from the roundabout, parking shall not be allowed on either side within 75 feet of the circulatory roadway.

Lighting shall be incorporated into the design of the roundabout and consist of the recommendations found in the latest edition of the Roundabouts: An Informational Guide, IES Design Guide for Roundabout Lighting, and Section 2.31 of this Manual. Lighting shall be incorporated in the roundabout even if the approach lanes are not illuminated.

In determining the Intersection Sight Distance, the length of the approach leg of the sight triangle shall be 50 feet from the circulatory roadway. The sight distance shall assume a driver's height of 3.5 feet and an object height of 3.5 feet above ground.

The maintenance costs associated with the landscaping and the illumination shall be borne by the developer or HOA, as applicable.

Applicability of the Standard

This standard applies to all types of development, including subdivisions, PODs, and CIPs.

Design Requirements

Must use the Roundabouts: An Informational Guide to design the roundabout.

2.44 Urban Mixed Use/Traditional Neighborhood Design Developments

Standard

Urban Mixed Use (UMU) or Traditional Neighborhood Design (TND) Developments are multi-use, walkable communities with moderate to high residential densities and a mixed-use core. They are designed to be a more pedestrian and bike friendly community with slower speeds. These developments typically have a dense network of roadways, tighter centerline radii, and more narrow street widths. Streets are designed to only be as wide as needed to accommodate the usual vehicular mix for that street while providing adequate access for moving vans, garbage trucks, emergency vehicles, and school buses.

The actual road widths will need to be worked out with Fire, Public Works and Planning at the time of development review and approval based on the actual design of the development in regard to road network, height of buildings, and types of buildings.

The maintenance costs associated with any landscaping, irrigation, and lighting in the county right-of-way shall be borne by the developer or HOA, as applicable.

Applicability of the Standard

This standard applies to UMU and TND type developments

Design Requirements for Public Streets

- Minimum posted speed limit - 20 MPH
- Minimum centerline radius - 107 feet
- The minimum offset between centerlines of intersecting roads, alleys or commercial entrances shall be 100 feet.
- Minimum required sight distance of streets that are posted at 20 MPH shall be 230 feet.
- The installation of all-way stops shall not be permitted.

2.45 Queue Lengths and Drive Thru Lanes

Standard

Drive thru lanes allow customers to do business without leaving their vehicles. Proper queue lengths for drive up windows are an important part of plans of development. The parking lots shall be designed to provide the minimum queue lengths outlined below without blocking access points, dumpster enclosures, crosswalks, or parking stalls. Below are the minimum queue lengths for different types of developments:

75' queue length

- Standalone ATM

100' queue length

- Pharmacy
- Car wash at a gas station
- Call Box/Access Box – Gated Community, Mini-Storage, etc.

150' queue length

- Dry Cleaners

250' queue length

- Drive thru oil change facility
- Drive thru restaurant
- Coffee shop
- Donut Shop
- Banks, to include ATM lanes

300' queue length

- Standalone car wash

All queue lengths shall be measured from the center of the last window for the drive thru service. For car washes, the length shall be measured from the stop line prior to the car wash building. For ATMs, and Access Boxes, the length shall be measured from the actual ATM or Access Box. The queue length of an Oil Change Facility shall include the work bay. The queue lengths can be divided among multiple drive thru lanes.

Drive thru lanes shall have a minimum width of 10 feet. In addition, a bypass lane with a minimum width of 12' shall be provided to allow motorists an opportunity to exit the drive thru lane and re-enter the parking lot.

Applicability of the Standard

This standard applies to all Plans of Development.

Design Requirements

- Needs to be measured from the center of the last window in the drive thru lane

2.46 Bus Pads

Standard

Bus pads shall be provided adjacent to all existing and proposed public transit stops. The pad shall be constructed of concrete and built to the same standards as sidewalk. The location and dimensions of the pad shall be determined by the Department of Public Works in consultation with GRTC. Such factors as the width and location of the adjacent sidewalk, anticipated number of passenger boardings and disembarkings, anticipated amenities to be installed (benches, shelters) are considered when determining the minimum size of the concrete pad.

Additional right-of-way shall be dedicated to incorporate the entire bus pad should insufficient right-of-way exist.

Applicability of the Standard

This standard applies to all types of development, including subdivisions, PODs and CIPs.

Design Requirements

N/A

2.47 Curb Ramps

Standard

General

All curb ramps and detectable warnings within County Right of Way shall be constructed in accordance with CG-12 details shown in the VDOT Road and Bridge Standard.

All curb ramps and adjacent concrete sidewalks subject to traffic shall be 7" in depth.

All detectable warnings shall be from the VDOT materials approved list for detectable warning surfaces.

Accessibility Requirements

All roadway construction shall incorporate a means of access for persons with mobility impairments as outlined in Sections 6D.01 and 6D.02 in the Virginia Work Area Protection Manual.

Curb ramps shall be provided at all locations where an existing or proposed pedestrian access route intersects a curb. The pedestrian access route is not required to be improved (i.e.: concrete sidewalk or paved path) for a curb ramp to be required.

When curb ramps are required, a ramp is to be provided for each intended direction of travel, at each pedestrian crossing of the intersection. Curb ramps are to be installed as depicted in the guidance documents listed below or as approved by the Director of Public Works, where conditions do not reflect standard configurations. The bottom of the ramp run, exclusive of the flared sides, shall be aligned with the existing or planned crosswalk or at the point where pedestrian crossings are expected to occur. Color for detectable warnings shall be, 'Federal Yellow.' Federal color No. 33538.

In general, the following design constraints apply:

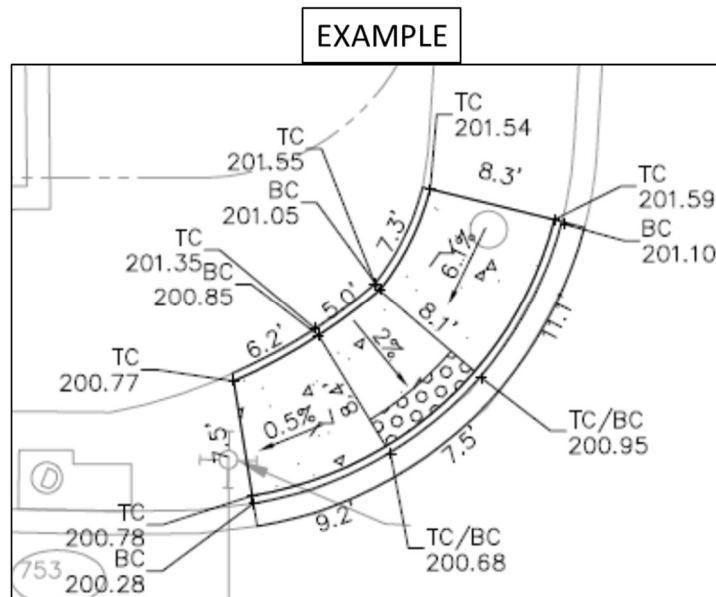
- Diagonal curb ramps are only to be used when certain conditions apply and are generally not permitted for new construction.
- Curb ramps are to be provided where accessible pedestrian routes are present, regardless of whether or not the route is an improved route (i.e.: sidewalk present).
- Curb ramps shall be provided for each intended direction of pedestrian travel.
- Detectable warnings are required at all entrances and intersections with the exception of private residential entrances.
- Detectable warning surfaces shall be truncated domes.
- Vehicle stop bar shall be located prior to the curb ramp.
- Curb wipe downs without ramps are not permitted.

- Acceptable cross slope of improved pedestrian facilities (sidewalk, path) must be maintained across all entrances.
- Where pedestrian facilities constructed of asphalt concrete (i.e.: shared use path) intersect a curb, the CG-12 curb ramp shall be constructed of hydraulic cement concrete and shall be the same width as the shared use path.

Curb ramps shall be designed and constructed in accordance VDOT Road and Bridge Standard CG-12 and Section 502 and 504 of the VDOT Road and Bridge Specifications. In addition, the most recent edition of the following guiding documents shall apply to the design of curb ramps:

- VDOT Location and Design IIM-LD-55.16
- VDOT Road Design Manual, Appendix A, Sect. 5
- Title II of the Americans with Disabilities Act (ADA) – 2010 ADA Standards for Accessible Design
- Public Rights-of-Way Accessibility Guidelines (PROWAG) – proposed version

Each CG-12 shall be designed to ensure proposed CG-12 geometrics will work with adjacent roadway design elements to meet current ADA requirements as published by VDOT. See example detail below:



Alterations:

Alteration of existing roadways and intersections is defined in The Department of Justice/Department of Transportation Joint Technical Assistance document.

In general:

- Curb ramps are required to be provided wherever an improved pedestrian access route intersects a curb.
- Where diagonal ramps are allowed, the required 48"x48" landing area shall be located entirely outside of the travel way.
- Existing, non-compliant curb ramps that are adjacent to improved pedestrian corridors will need to be considered on a case by case basis.*

*Note: It may be possible to remove a detectable warning that is no longer acceptable (i.e., exposed aggregate replaced with truncated domes); however, other elements such as ramp width and grade may also be out of compliance under the current design guidelines.

Applicability of the Standard

This standard applies to all types of development, including subdivisions, PODs, CIPs and eligible maintenance activities.

Design Requirements

N/A

2.48 Compaction Testing

General

Where open cutting of existing roadways is allowed or installation of infrastructure within roads intended to be accepted into the County system is completed via open trench excavation following grading of the roadway subgrade course, the material required for backfill of the excavated trench area shall be No. 21B aggregate stone, or an approved equal.

Restoration of utility trenches within existing roadways shall be performed in accordance with Henrico standard detail C-28, "Pavement replacement, bedding and backfill for pipe trench" and C-30, "Pipe bedding & backfill." (Appendix C)

Compaction testing for backfill material shall be performed in accordance with Virginia Test Methods, VTM-1 and VTM-10. All testing shall be completed by a licensed geotechnical engineer or by authorized personnel certified by VDOT to perform testing of the respective material.

The following conditions shall apply to aggregate backfill material placed above a bedded utility installation:

- Contractor shall achieve at least 95% of maximum density within optimum moisture range for the approved material. This compactive effort shall be achieved in all areas of trench backfill within the roadway prism, including shoulders.
- Target density of material (maximum density at theoretical optimum moisture) shall be provided by producer of aggregate material approved for backfill.
- Contractor shall provide for compaction testing within areas of backfill in order to provide evidence that required level of compactive effort has been met.
- Test results shall be provided to the Department of Public Works within 3 working days of material placement and completion of testing.
- Any failing material shall be addressed immediately under the guidance of the geotechnical engineer in consultation with the Construction Division of DPW.

The following frequencies are based on the use of No. 21B aggregate backfill as required by the Department of Public Works:

- One test location shall be taken for every 400 linear feet of trench. A minimum of one test location shall be taken per day. Additional tests are required upon any change in compaction methods, source of material, or compaction equipment.
- For each test location, density testing shall be performed at a minimum rate of one test per 12 inches of compacted backfill and taken on alternating sides of the excavated trench.

Applicability of the Standard

This standard applies to all types of development, including subdivisions, PODs, and CIPs.

Design Requirements

N/A

2.49 Pavement Depth Verification

General

The depth of surface course asphalt concrete shall be verified for all newly constructed streets prior to acceptance by the County into the maintenance inventory. Verification that depth meeting or exceeding the plan specified thickness shall be confirmed as outlined below.

Testing Requirements

The location of the core samples shall be determined by a randomization procedure similar to the suggested randomization procedure shown in VTM-32, Depth Test of Bituminous Concrete Base Course.

A) General

Acceptance testing of asphalt concrete pavement depth shall be completed by the contractor for all roadways consisting of a singular layer of bituminous asphalt concrete.

B) Frequency of Depth Tests

For the purpose of determining depth, the project shall be divided into lots, with each lot stratified, and the location of each test within the stratified section determined randomly. Lot sizes will be generated for each individual street proposed for acceptance. A lot of material is defined as the quantity being tested for acceptance, except that the maximum lot size will be one mile of 24 ft. width surface course. The randomization procedure used will be at the discretion of the Engineer. (See VTM-32(B) for example.) Samples will be taken from the lot at the following rate:

<u>Lot Size (per roadway)</u>	<u>No. of Samples Required</u>
0 - 1/2 Mile	2
1/2 - 3/4 Mile	3
3/4 - 1 Mile	4

A separate boring will be taken from each intersection, entrance, crossover, storage lane, or ramp having an area of 50 yds² or more. This boring will not be taken at random; however, care is to be taken not to set up a uniform pattern of testing. The tolerance for an individual test result shall apply for these miscellaneous borings.

The same frequency of testing as used on the mainline will be used for asphalt concrete shoulders requiring specific plan depths, except that the tests will be alternated from one shoulder to the other.

It is not the intent of the test procedure to prohibit sampling and testing of the material at any location which is visually determined to be out of specification tolerance for an individual test.

C) Reports

Results of depth testing shall be submitted to DPW prior to posting of defect bond and recommendation by DPW for road acceptance. The data should be submitted in the form of a worksheet including all relevant core data as well as stationing and offset for each respective test location. Those depth tests that fail to meet plan specification requirements shall be identified in the submittal and include a plan of resolution submitted by the developer to DPW.

Applicability of the Standard

This standard applies to all types of development, including subdivisions, PODs, and CIPs.

Design Requirements

N/A

2.50 Temporary Ingress/Egress Gate and Emergency Access Gate

Standard

When a point of temporary ingress / egress is to be gated, or an emergency point of ingress / egress is required, the developer shall provide an access gate at the location determined by the Traffic Engineer, or by the Division of Fire. A description of the gate can be found in Appendix C, Drawing C-36.

The developer or HOA (if the common area where the gate is located has been turned over to the HOA) shall maintain the gate until such time the roads in the subdivision have formally been accepted into County road system by the Board of Supervisors.

The cost of all gates shall be bonded by the developer as a part of the subdivision performance bond.

Applicability of the Standard

This standard applies to all types of development, including subdivisions and PODs.

Design Requirements

- Gate components shall be maintained in an operative condition at all times and replaced or repaired when damaged or defective.
- The gate(s) shall be located a minimum of 30-feet off the return on the roadway to be gated, (or as determined by the Traffic Engineer), to allow for a vehicle to be parked while the gate(s) is being opened or closed.
- If the gate is to be opened or closed with a Call Box / Key Swiping Device, it shall be located a minimum of 100-feet off the return on the roadway to be gated to allow for a vehicle to be parked while the gate(s) is being opened or closed.
- Electric gates shall be equipped with a means of opening the gate by fire department personnel for emergency access. Emergency opening devices shall be approved by the Division of Fire.
- Method of locking shall be submitted for approval to the Division of Fire.
- Emergency Access gates shall be signed, "Emergency Access Only", or "Emergency Access Do Not Block", as appropriate.
- Gates shall have STOP signs, (R1-1, 30"x30" min. size), mounted to the gate arms on both sides where vehicles approach the gate, (single gate shall have two STOP signs, double gates shall have four STOP signs).
- When a gate is to be provided on a "single" lane access road, the minimum width of the gate shall be 20-feet.
- Gates shall be painted a safety yellow color.
- When the gate arm is in the open position, the closest part of the gate arm and support shall have a lateral offset at least 2-foot from the edge of pavement or the face of curb.

- When a gate arm is in the opened position, it shall be restrained, tied, chained, or locked by some mechanical means to keep the gate arm in the opened position.
- If a pedestrian route is present, (and it is not intended for the gate to control the pedestrian traffic), there shall be a minimum of 2-foot between the gate post and the edge of the pedestrian route.
- The gate(s) and posts shall be constructed out of Schedule 40 steel pipe.
- The gate rails shall be 2.5-inches minimum in diameter.
- The gate posts shall be 4-inches minimum in diameter and filled with concrete, and shall be crashworthy, (the post must be designed to not cause injury/death to occupants of a vehicle that may strike it).
- The concrete footing for the gate posts shall be 2-foot in diameter, 3.5-foot in depth, with the post set 3-foot into the concrete, with a 3000-psi mix.

Section 3 – Drainage

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3.01 General

Standard

All drainage plans for proposed development shall be prepared by a Professional Engineer registered in Virginia, except as noted below. Their seal and dated signature shall be placed on the plans.

A Land Surveyor or Landscape Architect, registered under Section 54.1-408 or Section 54.1-409 of the Code of Virginia, may prepare construction plans for surface drainage, sanitary sewer, water lines, and detailed site grading, for subdivisions only, provided such work does not involve design of closed storm drainage systems, bridges, or other structures requiring detailed stress analysis, or design of sewage or water treatment plants, pump stations, or other work requiring mechanical or electrical equipment. Their seal and dated signature shall be placed on the plans.

Applicability of the Standard

This standard applies to all types of development, including subdivisions, PODs, and CIPs.

Design Requirements

3.02 Drainage Ordinances and Legal Requirements

Standard

All design and construction of site grading and drainage, both surface and subsurface systems, shall comply with all applicable drainage laws, ordinances, and standards.

All storm sewers that will carry drainage from adjacent properties through the property to be developed must be installed in private drainage easements. All storm sewers that will carry drainage from public facilities and/or public rights-of-way must be installed in an easement(s) dedicated to the County of Henrico.

A Stormwater Management (SWM) Facility Maintenance Agreement (Declaration of Covenants – Inspection and Maintenance of Stormwater Management Facilities as found in Appendix B of the Henrico County Environmental Compliance Manual) is required for all SWM facilities and must be submitted to the Department of Public Works prior to plan approval.

Drainage easements must be recorded through all SWM facilities and shown on the construction plans.

Offsite drainage easements must be recorded prior to plan approval. The Deed Book/Page Number for each off-site drainage easement must be included on the construction plans. All easement plats must be prepared by the developer and submitted to the Permit Center for approval. This is then forwarded to Real Property for routing and review of the other departments. The approved plat shall be forwarded to the Real Property Agent for preparation of the Deed of Easement and for processing of the documentation to the Clerk of the Circuit Court.

Applicability of the Standard

This standard applies to all types of development, including subdivisions, PODs, and Capital Improvement Projects.

Design Requirements

All proposed drainage easements must have a minimum width of sixteen (16) feet.

3.03 Offsite Drainage

Standard

The Department of Public Works reviews all subdivision plans, PODs, and building permits to ensure there are provisions by the developer to adequately handle drainage.

All storm sewers that will carry drainage from adjacent private properties through the property to be developed shall be installed in private drainage easements. All storm sewers that will carry drainage from public facilities and public rights-of-way through private property must be installed in an easement(s) dedicated to the County of Henrico.

Offsite drainage easements must be recorded prior to plan approval. The Deed Book/Page Number for each off-site drainage easement must be included on the construction plans. All easement plats must be prepared by the developer and submitted to the Permit Center for approval. This is then forwarded to Real Property for routing and review of the other departments. The approved plat shall be forwarded to the Real Property Agent for preparation of the Deed of Easement and for processing of the documentation to the Clerk of the Circuit Court.

Applicability of the Standard

This standard applies to all types of development, including subdivisions, PODs, and CIPs.

Design Requirements

All drainage improvements shall be adequate for the 10-year storm.

Drainage improvements that will serve off-site, upstream drainage areas shall be sized based on ultimate build-out for the upstream area based on the current Land Use Plan.

3.04 50/10 Detention

Standard

Stormwater detention facility needs were initially identified during the late 1970's as a part of a comprehensive county-wide stormwater drainage study. Stormwater detention facilities are required to be provided as a part of plans of development in those watersheds where downstream flooding problems are known to occur or if existing homes are located within the 50-year flood plain.

Storm water detention basins should be designed for future ease of maintenance. The developer shall be responsible for all required maintenance of the storm water detention facility.

A Stormwater Management (SWM) Facility Maintenance Agreement (Declaration of Covenants – Inspection and Maintenance of Stormwater Management Facilities as found in Appendix B of the Henrico County Environmental Compliance Manual) is required for all SWM facilities and must be submitted to the Department of Public Works prior to plan approval.

Applicability of the Standard

These standards apply to all regulated land-disturbing activities in the watersheds identified on Map 9-1 in the Henrico County Environmental Compliance Manual. However, the standards do not apply to (i) subdivisions or plans of development for single-family, detached residential structures, (ii) where it is demonstrated that there are no existing homes located within the 50-year floodplain downstream of the proposed development, or (iii) linear development projects.

Application of 50/10 detention requirements will be deferred if the proposed project meets either of the following conditions:

1. The proposed project results in an increase in impervious area of **½ acre** or less for the site, or
2. The post-developed 50-year peak rate of runoff (proposed runoff) for the site is an increase of **5 cfs or less** compared to the pre-developed 50-year peak rate of runoff for the site (existing runoff).

The 50/10 detention requirements can also be deferred for subsequent projects as long as one of the preceding conditions is met (considering the cumulative effects of all exceptions in comparison to the original existing conditions of the initial exception.)

Once a proposed project results in conditions when neither of the preceding conditions can be met for deferral, 50/10 detention requirements must be satisfied for the proposed project and all previously-deferred projects.

Even if the “insignificant” project conditions are met, we may deny the request based on known downstream flooding complaints/problems.

Design Requirements

These detention facilities must be designed so that the post-developed peak flow from the site for the 50-year storm does not exceed the pre-developed peak flow rate for the 10-year event. These requirements are to be calculated using the Rational Method.

A summary of the pre and post developed peak flow rates shall be shown on the construction plan.

3.05 Adequate Outfall

Standard

The outfall adequacy requirements for regulated land-disturbing activities vary, depending on whether a project is considered “grandfathered”, “previously permitted”, or if it falls under the Virginia Stormwater Management Program regulations that went into effect on July 1, 2014. For help determining which category a project falls under, please refer to Chapter 4 of the Henrico County Environmental Compliance Manual.

Projects that qualify as “grandfathered” or “previously permitted” must meet the requirements of Minimum Standard 19 of the Virginia Erosion and Sediment Control Regulations. These requirements are outlined in Section 14.3.1 of the Henrico County Environmental Compliance Manual.

All other projects must meet the Channel Protection Criteria and the Flood Protection Criteria that are outlined in Sections 9.3.4 and 9.3.5 of the Henrico County Environmental Compliance Manual.

Applicability of the Standard

This standard applies to all types of development, including subdivisions, PODs, and CIPs.

Design Requirements

Unless otherwise specified, the prescribed design storms are the 1-year, 2-year, and 10-year 24-hour storms using the site specific rainfall precipitation frequency data recommended by the U.S. National Oceanic and Atmospheric Administration (NOAA) Atlas 14. Partial duration time series shall be used for the precipitation data.

The U.S. Department of Agriculture's Natural Resources Conservation Service (NRCS) synthetic 24-hour rainfall distribution and models must be used to conduct the hydrologic analyses. These include, but are not limited to TR-55 and TR-20, hydrologic and hydraulic methods developed by the U.S. Army Corps of Engineers, or other standard hydrologic and hydraulic methods.

The Rational Method may be used to evaluate peak discharges for drainage areas of 200 acres or less.

The Modified Rational Method may be used for evaluating volumetric flows to stormwater conveyances for drainage areas of 200 acres or less.

All supporting information for outfalls (inverts, sizes, profiles, cross-sections, etc.) must be based on field-run elevations and surveys.

All storm sewer systems must be evaluated for both hydraulic grade line and pipe capacity during a 10-year storm event.

3.06 Open Channels

Standard

Open channels are not permitted with development except in the following cases:

1. Open channels with (i) drainage areas of 100 acres or more or (ii) regulated floodplain;
2. Open channels along roadsides (roadside ditches) when site characteristics or other conditions do not require the use of curb and gutter;
3. Yard swales; and
4. Existing open channels where the permitting agencies (the USCOE and/or DEQ) have claimed jurisdiction and have refused to issue the permits to authorizing the impacts necessary to eliminate them.

Applicability of the Standard

This standard applies to all types of development, including subdivisions, PODs, and CIP projects.

Design Requirements

1. Newly constructed channels must be designed such that the capacity of the channel is greater than or equal to the peak discharge to the channel associated with the 10-year storm event ($Q_{\text{capacity}} \geq Q_{10\text{-year}}$).
2. Newly constructed channels must be designed such that the velocity in the channel associated with the 2-year storm event is less than or equal to the allowable velocity of the channel lining ($V_{2\text{-year}} \leq V_{\text{allowable}}$).
3. Newly constructed vegetated channels must be designed with a minimum of one percent longitudinal slope.
4. Newly constructed vegetated channels with side slopes steeper than 3 to 1 must be lined with EC-2 or a VDOT approved equivalent.
5. Newly constructed paved channels must be constructed of reinforced concrete in accordance with VDOT specifications.
6. Newly constructed paved channels must be designed with a minimum of 0.5% longitudinal slope.
7. Channels as roadside ditches having less than 1% slope and those having sufficient slope to cause erosion shall have a concrete lining. Newly constructed concrete ditch sections shall be continuous with no intermittent break in lining for short sections between slope changes. Additional cross section evaluation/analysis shall be provided at grade breaks along the ditch profiles to justify ending concrete section once it has commenced.
8. Roadside ditches shall have sufficient depth to allow for installation of drainage structure(s), i.e. underdrain endwalls, driveway pipes, etc. in accordance with VDOT Standards. The minimum depth for a roadside ditch shall be 18”.

9. Where the permitting agencies (the USCOE and/or DEQ) have claimed jurisdiction over open channels and have refused to issue the permits to authorizing the impacts necessary to eliminate them, a 25' wide Natural Area to Remain is required on both sides of the channel in accordance with Chapter 21 of the Henrico County Environmental Compliance Manual.

3.07 Stormwater Quality

Standard

Stormwater quality requirements for regulated land-disturbing activities vary, depending on whether a project is considered “grandfathered”, “previously permitted”, or if it falls under the Virginia Stormwater Management Program regulations that went into effect on July 1, 2014. For help determining which category a project falls under, please refer to Chapter 4 of the Henrico County Environmental Compliance Manual.

Projects that qualify as “grandfathered” or “previously permitted” must comply with the technical criteria that are found in Chapter 14 of the Henrico County Environmental Compliance Manual.

All other regulated land-disturbing activities must comply with the technical criteria that are found in Chapter 9 of the Henrico County Environmental Compliance Manual.

Applicability of the Standard

This standard applies to all types of development, including subdivisions, PODs, and CIPs.

Design Requirements

All SWM facilities must be designed and constructed in accordance with the standards and specifications found in the Virginia BMP Clearinghouse and the Henrico County Environmental Compliance Manual.

3.08 Wetlands

Standard

In accordance with Section 10-32 of the Henrico County Code, all regulated land-disturbing activities must comply with the County's requirements for Waters of the United States, State Waters, and Wetlands.

These requirements can be found in Chapter 21 of the Henrico County Environmental Compliance Manual.

Applicability of the Standard

This standard applies to all types of development, including subdivisions, PODs, and CIPs.

Design Requirements

3.09 Site Grading

Standard

Site grading is considered any construction that causes changes in the elevation of existing ground surfaces or alteration of existing surfaces in any way that would affect surface drainage flow.

Applicability of the Standard

This standard applies to all types of development, including subdivisions, PODs, and CIPs.

Design Requirements

Site grading cannot be done in any manner that will restrict the normal surface flow onto or off of the property unless appropriate drainage allowances have been provided.

All grading shall be performed in such a manner as not to cause erosion and shall be in keeping with the Erosion and Sedimentation Control Ordinance.

Construction Plan Requirements - An overall lot drainage map shall be included in all subdivision construction plans at a minimum scale of 1"=200', and include the following:

- a. Flow direction arrows;
- b. Minimum finished floor (MFF) elevation (no less than three feet above the highest grade at the house corners and at least one foot above the 100-year floodplain elevation) for each lot based on required grading to ensure proper drainage (House locations to be shown as determined necessary by the project engineer); and
- c. Necessary grading and drainage improvements that will serve multiple lots including fill for low-lying areas and wetlands; and drainage swales.

Building Permit Special Requirements – Lots which have special building permit requirements shall be identified on the construction plans as follows: **NBP1, NBP2, NBP3.**

- a. **NBP1 – All lots requiring grading and drainage improvements as defined above.** Submittal of a certification of construction compliance is required by the home builder of record prior to issuance of the certificate of occupancy (CO).
- b. **NBP2 – All lots that include storm sewer outfalls.** Submittal of a certified plat identifying the location of the storm sewer easement and installed drainage improvements is required by the engineer of record prior to issuance of permit.

- c. **NBP3 – All lots identified as having permit restrictions related to sediment basin/trap locations.** This includes all lots that contain or are adjacent to a sediment basin or trap. Lots adjacent to or containing a sediment basin or sediment trap that will not be converted to a permanent SWM facility must be identified on the plan sheet and with notes stating that building permits will not be issued for these lots until the basins, traps and/or diversions are removed. Building permits for lots adjacent to a sediment basin or trap may be issued once a letter has been received from the contract purchaser acknowledging the presence of the sediment basin or trap is submitted to the Department of Public Works. A copy of the letter, which can be found in the Henrico County Environmental Compliance Manual, must also be attached to the building permit application.

Building Permit Lot Grading: A minimum of 6” of fall is required over the first 10’ from all sides of the house. After the first 10’, a minimum of 1% of fall will be required to the property line to ensure adequate drainage away from the proposed house. Spot shots will need to be shown on the plat to demonstrate adequate drainage from the proposed house.

3.10 Underdrains

Standard

Standard Pavement Edgedrain, UD-4, are required along the entire length of all proposed public roads and/or road widening within the public right-of-way unless waived by the Director of Public Works.

Standard Combination Underdrain, CD-2, shall be installed under all vertical sags and bridge approaches including roads without curb and gutter. Standard Pavement Edgedrain, UD-4, shall be installed along each raised grass median and/or island curb line to prevent water infiltration through or under the pavement structure. See Pavement Edgedrain for Raised Grass Medians and Islands, Drawing C-33.

If approval from the Director of Public Works is obtained to install an irrigation system in or adjacent to the right-of-way of an existing roadway, a condition of approval shall be the installation of an approved underdrain system. All disturbances associated with the installation of an irrigation system shall be restored to their original condition and approved by Department of Public Works. A Maintenance Agreement, See Appendix D, from a homeowners association or other group shall also be provided.

All underdrains shall be installed in accordance with VDOT Road and Bridge Specifications and Underdrain details in this manual, See Appendix C, Drawing C-33.

Applicability of the Standard

This standard applies to all types of development, including subdivisions, PODs, and CIPs.

Design Requirements

- The outlet end of all underdrains shall terminate in drainage structures or daylight out of fill slopes with a Standard EW-12 endwall placed at the outlet end of the underdrain.
- The invert elevation at outlet end of outlet pipe shall be a minimum of 1'-0" above invert elevation of receiving drainage ditch or structure.

3.11 Bridge and Culvert Design

Standard

All bridges and culverts shall be of concrete construction and shall be HS 20-44 loading or alternate military loading, or both, in accordance with the VDOT requirements and with the current AASHTO bridge design specifications. All supporting design calculations for the structure shall be submitted with the bridge plan for approval. The construction plans, design calculations and specifications shall be signed and sealed by a professional engineer responsible for the structural design. The engineer shall be responsible for geotechnical and associated engineering during construction and shall perform independent inspections to ensure compliance of the plans and specifications. Prior to acceptance, the professional engineer responsible for the structural design shall submit a signed and sealed certification that the structure was built in accordance with the plans and specifications.

Travel lanes, clear of all obstructions, shall be in accordance with the road cross-section details for the road classification. All drainage facilities for bridges shall be in accordance with current VDOT requirements and this Manual.

Applicability of the Standard

This standard applies to all types of development, including subdivisions, PODs, and CIPs.

Design Requirements

- Box culvert minimum height of 6 feet.
- Provide upstream and downstream transition zones.
- Provide the 100-year Backwater Elevation if not in County or FEMA Flood Plain.
- Show sufficient field data on plans to develop grades for inverts and transition zone requirements.
- Headwalls/Endwalls shall be parallel to the roadway.
- Extend pre-cast box culvert units, as necessary, to ensure embankment slopes are not steeper than 2:1 as measured from the closest point of the roadway shoulder to the culvert wingwall.
- Box Culverts - Provide geotechnical report data and show foundation requirements on plans.
- Provide adequate Right-of-Way or Easements for access, installation, and maintenance of structures.
- Sufficient grading information must be provided for the transition zones above and below all culverts showing that stormwater will flow into and out of the culvert unimpeded.

3.12 Roadway Drainage

Standard

Inlets are required at the low point of all sag vertical curves and on continuous grades where the maximum allowable gutter flow spread reaches the maximum allowable width.

Applicability of the Standard

This standard applies to all types of development, including subdivisions, PODs, and CIPs

Design Requirements

The maximum allowable gutter flow spread for a two-year storm is as follows:

- Major and Minor Arterial Roads 8 feet
- Collector Roads 10 feet
- Local Roads 12 feet

Flanking inlets are required adjacent to (within 50 feet of) sag inlets where the longitudinal slope is 0.3 percent or flatter.

3.13 Drop Inlets

Standard

All inlets, junction boxes, and manholes for storm sewer must be constructed in accordance with the VDOT Road and Bridge Standards and Specifications unless otherwise specified in this Manual.

Applicability of the Standard

This standard applies to all types of development, including subdivisions, PODs, and CIPs

Design Requirements

Inlets are not permitted in the curb radius of an intersection.

Inlets in any cul-de-sac cannot have a throat length greater than 6 feet.

Inlets in tangent sections cannot have a throat length greater than 14 feet.

VDOT Standard DI-3 and DI-4 structures will use "Type B" nose.

VDOT Standard DI-2 structures are not permitted within any County maintained right-of-way.

VDOT Standard IS-1 is required in all drop inlets and manholes. Cost of inlet/manhole shaping is considered incidental and shall be included in unit cost of each inlet or manhole.

The maximum allowable distance between any two connected structures connected by storm sewer is 300 feet.

Yard Drainage

Drainage inlets are required to intercept yard drainage in lieu of open-ended pipe. ~~Front~~ All yard drainage structures are limited to VDOT Standard DI-1, DI-5, DI-7, and DI-12 structures. All yard inlets and grate inlets must be located at an elevation that is low enough to drain the surrounding area. Appropriate grading limits must be shown on the construction plan. All yard swales must have at least a one (1) percent longitudinal slope. When DI-5 and DI-7 structures are utilized, Grate Type III (1" openings) must be installed in pedestrian areas and Grate Type I (3" openings) shall be installed in wooded areas. Load carrying grates (Grate B) must be used in areas subject to vehicular traffic. All grates and angle iron must be hot-dipped galvanized.

Structural Design

All drainage structures must be constructed of concrete and/or reinforced concrete (poured in place or precast) and designed in accordance with the VDOT standards and requirements. Smooth dowels (#4 x 8 inches) are required at approximately 12 inches on center in all areas adjacent to abutting concrete to prevent settlement. Precast drop inlets are not permitted at locations where the adjacent curb and gutter grade is less than 1.5 percent. Precast drop inlets having throats with flat inverts are not permitted in sag locations when throat length exceeds 6 feet.

Hydraulic Design

All inlets must be sized to handle the runoff quantities produced by a 10-year storm event.

All grate inlets must be sized under the assumption that the grate is 50% clogged.

3.14 Storm Sewers

Standard

All storm sewers shall be installed and constructed in accordance with VDOT Road and Bridge Specifications and Road and Bridge Standards unless otherwise specified in this Manual.

All storm sewers shall discharge into an adequate outfall channel, or pipe system, which has positive gravity flow to a natural outfall. If such an outfall is not available, it shall be the responsibility of the developer to obtain the outfall easements to construct the outfall system.

The storm sewers and outfalls must be designed and meet the latest standards of the Virginia Stormwater Management Program.

Pipe Materials Minimum

All storm sewer within the County right-of-way and easements must be:

Reinforced Concrete Pipe, (RCP), ASTM C-76, Class III or better with sealed joints in accordance with VDOT specifications.

Or, Polypropylene, (PP), pipe, AASHTO M330, corrugated wall with smooth interior wall, (VDOT Type S or Type D), with gasketed joints in accordance with VDOT specifications.

Abandoned Storm Sewer

Abandoned storm sewers and drainage pipe shall be removed when no longer needed. If removal is not practical, as deemed by the Department of Public Works, the pipes are to be plugged and filled with flowable fill in accordance with VDOT requirements.

Design Requirements for Storm Sewers

The minimum design frequency for storm sewer shall be a 10-year storm.

The minimum pipe size within road right-of-way and public easements will be 15 inches in diameter.

The minimum design velocity in storm sewers shall be two feet per second based on a two-year storm. In no instance, shall the storm sewer design be less than a 0.3% slope.

The maximum slope allowed in the storm sewer is 16%

When velocity exceeds five feet per second, based on a 10-year storm, at the storm sewer discharge, energy dissipation methods are required.

Radial pipe and/or special bends may be used where the design permits or dictates and on approval of the Director of Public Works.

Hydraulic grade lines are required with all proposed storm sewer.

Installation

All drainage pipes and structures shall be installed on a firm foundation as required by the VDOT Road and Bridge Specifications and Road and Bridge Standards. A minimum of 4 inches of pipe bedding (No. 5 Stone) shall be required under all storm sewer pipes, paved ditches and drainage structures.

Post Installation Pipe Inspection

A post installation visual/video camera inspection shall be conducted by the Contractor on all pipes identified on the plans as storm sewer pipe and any culverts as determined by DPW.

Post installation inspection shall be conducted in accordance with Virginia Test Method (VTM) 123 and section 302 of the VDOT Road and Bridge Specifications. Recorded observation shall include detailed annotation for each deficiency observed and a summary of locations identified (with annotations) included with the submittal. A copy of the video inspection with summary and annotation shall be submitted to DPW prior to acceptance of the project or roadways. In the case of subdivision street acceptance, DPW may elect to allow repairs to be completed during the defect period depending on severity of deficiencies.

Excavation & Backfill

Trench width shall not be less than the outside diameter of the pipe plus 18 inches on each side unless, otherwise approved.

The minimum cover for Class III concrete pipe in roadside ditch sections shall be 9 inches from the top of pipe to finished grade.

The minimum cover for polypropylene, (PP), pipe in roadside ditch sections shall be 12 inches from the top of pipe to finished grade and be compacted per pipe manufacturer's guidelines.

A County Inspector must be present to witness the backfill and compaction operations for polypropylene, (PP), pipe installed under roadways with a 24-hour notice requirement.

Storm sewer pipe must be installed at depths that will accommodate minimum height requirements for drop inlets. Note: Detail C-30 depths will not meet this 9" requirement

Unless otherwise approved, all pipe under public travel ways shall be backfilled with an approved crushed aggregate to a minimum elevation of 12 inches over top of the pipe or to finished subgrade where there is an overlap in elevations for the subsequent layer of pavement structure (provided that the total cover over the pipe is at least 12 inches when the subgrade depth is considered). See Detail C-30

Pipes in easements or right-of-way not subject to vehicular traffic must be backfilled with an approved crushed aggregate to the top of the pipe. The remainder of backfill shall be placed and compacted in accordance with the latest edition of the VDOT Road and Bridge Specifications to prevent settlement.

All pipes must be installed to grade as specified on an approved plan. When required by the Department of Public Works, as-built profiles shall be submitted for review

3.15 Erosion and Sediment Control

Standard

In accordance with Section 10-34 of the Henrico County Code, all Virginia Erosion and Sediment Control Program (VESCP) land-disturbing activities must comply with Chapter 8 of the Henrico County Environmental Compliance Manual.

For help determining if a project is a VESCP land-disturbing activity, please refer to Chapter 3 of the Henrico County Environmental Compliance Manual.

Applicability of the Standard

This standard applies to all types of development, including subdivisions and PODs, and CIPs.

Design Requirements

3.16 Dams

Standard

Any newly constructed or existing dam which is regulated under the Virginia Dam Safety Act shall obtain approval under the Virginia Dam Safety Regulations and the Virginia Department of Conservation and Recreation (DCR), as well as the Department of Public Works (DPW). Dams which are not regulated under the Virginia Dam Safety Regulations shall comply with the latest edition of the Virginia Storm Water Management Program Manual. The project engineer shall be responsible for associated geotechnical and civil engineering during construction and shall perform independent inspections to ensure compliance of the design. A signed and sealed certification of compliance shall be submitted to the Department of Public Works upon completion and prior to acceptance.

Virginia Regulated Dams

"Impounding structure" means a man-made structure, whether a dam across a watercourse or other structure outside a watercourse, used or to be used to retain or store waters or other materials. DCR Dam Safety regulations (4 VAC 50-20) apply to any impounding structure or dam over 6' high with over 50 acre-ft of impoundment and over 25' high with over 15 acre-ft. of impoundment. There are exemptions for dams regulated by the State Corporation Commission (SCC), for dams specifically for agriculture purposes as long as the dam is less than 25 ft in height and less than 100 acre-ft impounding capacity; silt retaining dams and obstructions in canals.

The height of an impounding structure is measured from the top of the dam, not at the typical water level or spillway elevation, down to the natural bed of the stream. This provision may make additional structures regulated.

Regulated dams are classified into three categories, **High** hazard (probable loss of life upon failure), **Significant** (potential loss of life upon failure) and **Low** (no expected loss of life). The dam owner is required to determine the dam's hazard classification and meet the DCR regulatory requirements. The Division of Dam Safety and Floodplain Management within the Virginia Department of Conservation and Recreation enforces the Virginia Dam Safety regulations and approves the owner's hazard classification.

DCR requires the owners of regulated dams to obtain a 6 year Operating and Maintenance Certificate, (O&M). In order to get a regular O&M certificate, the dam must be in compliance with DCR regulations listed in 4 VAC 50-20 section 10 through 400. These regulations require development and distribution of Emergency Action Plans and Dam Break Inundation Zone (DBIZ) Maps. No trees or woody vegetation are allowed on the crest or slopes of dam or within 25' of toe of dam.

Inspections by a Professional Engineer are required to be submitted to DCR for regulated dams at a frequency determined by the hazard classification - high hazard are once per year - significant is less, low is once per 6-year O&M renewal cycle. The owner must inspect the dam every year it's not inspected by a PE.

If a dam is not in compliance with DCR regulations, the owner may apply for a 2-year (renewable) conditional O&M certificate. Any structural modification of a regulated dam must obtain an alteration permit.

DPW Controlled Regulated Dams

Henrico DPW controls and maintains the dams at Cox Road in Innsbrook (middle Innsbrook Lake), at Pump Road near Canterbury subdivision, at Park Terrace Drive in the Wellesley subdivision, and at Dominion Club Drive in the Wyndham subdivision.

Applicability of the Standard

This standard applies to all types of development, including subdivisions and PODs.

Design Requirements

Development within DBIZs

DCR regulations require that the locality control development within identified DBIZs; the Planning Department must review submitted DBIZ maps. Virginia state legislative code 10.1-606.3 identifies requirements for any developer within a DBIZ. The developer may have an obligation to assist with the upgrade of a dam spillway if the development changes the hazard classification of the impounding structure. Any DBIZ maps that are obtained by DPW staff must be submitted to the Planning Department.

If development (defined by Henrico County code as three or more residential structures or a single commercial structure) is proposed within a DBIZ, County code section 24-106.4 requires suspension of permitting activities and notification of the Dam Safety Division of DCR. DCR will evaluate whether the hazard classification will change and notify the department within 45 days.

Non-Regulated Dams

Non-regulated dams include BMPs and recreational lakes owned by HOAs or others.

For non-regulated dams, the Dam Break Inundation Zones must be identified for a Sunny Day failure. Residential development within the sunny day DBIZ and adjacent to BMP is restricted.

Roads over Dams

Roadways get special attention in permitting regulated dams. The presence of a roadway over a regulated dam will almost certainly force the dam into the Significant or High hazard category. New public or private roads should not be allowed over new or existing dams.

If a public roadway is proposed on a dam, an agreement acceptable to the Director of Public Works, the County Attorney's Office and the Real Property Office shall be provided prior to plan approval. Other requirements and conditions particular to the proposed dam may apply in addition to the requirements of this Manual. The use of the roadway as an emergency spillway shall not be allowed.

3.17 Floodplain Management

Standard

Flooding is a recurrent issue in some areas of Henrico County. In order to prevent development and land-disturbing activities from increasing flood damages and to make federally subsidized flood insurance available for property within the county, development is controlled and managed in areas identified as subject to flooding.

County Code restricts construction of buildings within areas subject to flooding. Floodplain requirements for land development are in accordance with Chapter 24 of the County Code. Evidence of FEMA approval may be required for all regulated development within FEMA floodplains.

National Flood Insurance Program (NFIP)

The National Flood Insurance Program (NFIP) is managed by the Federal Emergency Management Agency (FEMA) and makes federal flood insurance available to homeowners, renters, businesses, and community associations in NFIP participating communities. Henrico County participates in the NFIP, so flood insurance coverage is available to all County residents, whether they are located in a high-risk flood area or not. Most homeowners and renter's insurance policies do not cover flood damages, so flood insurance coverage is recommend for all properties in flood-prone areas. Flood insurance coverage may be mandatory in FEMA floodplains. Lower cost flood insurance coverage is also available in moderate to low-risk flood areas.

The NFIP has three components:

- Floodplain Management requirements for communities that choose to participate. The NFIP is a voluntary program. Henrico County has participated in the program since the early 1980's.
- Flood Insurance Rate Maps (FIRMs) and Flood Insurance Study (FIS) showing the inundation boundaries and elevations of the 100-year flood.
- Flood Insurance Requirements. Federal rules require that any structure that touches the boundary of the 100-year flood and is covered by a federally backed mortgage maintain flood insurance. FEMA underwrites flood insurance policies. Flood Insurance is sold by most insurance agents.

When a community participates in the NFIP, it is required to manage development in 100-year floodplains identified by FEMA. Henrico County also manages development in county-mapped 100-year floodplains.

Definitions

Base Flood Elevation (BFE) is the water surface elevation of the base flood as shown on either the most recent Federal Emergency Management Agency Flood Insurance Rate Map or Flood Insurance Study or on the county's most recent comprehensive drainage study map, whichever is higher. The county engineer may amend the county's

comprehensive drainage study map at any time upon review of additional engineering studies of floodplain areas. For areas without mapped base flood elevations, the developer shall use the 100-year flood elevations and floodway information from federal and state sources, if available, or, when such information is not available, flood elevations derived from sufficiently detailed hydrologic and hydraulic computations by a professional engineer who certifies the correct use of currently accepted technical concepts.

County comprehensive drainage study map is the most recent map approved by and maintained by the county engineer designating the 100-year floodplain in the county.

Development means any man-made change to improved or unimproved real estate, including but not limited to buildings or other structures, mining, dredging, filling, grading, paving, excavation or drilling operations or storage of equipment or materials.

Dwelling means any building or portion thereof occupied or designed to be occupied exclusively for residential purposes, but not including a tent, cabin or travel trailer or a room in a hotel or motel.

Floodproofing means any combination of structural and non-structural additions, changes, or adjustments to structures which reduce or eliminate flood damage to real estate or improved real property, water and sanitary facilities, structures and their contents.

Floodway is the channel of a river or other watercourse and the adjacent land areas shown on the most recent Flood Insurance Study or Federal Emergency Management Agency Flood Insurance Rate Map that must be reserved from encroachment in order to discharge a base flood without cumulatively increasing the water surface elevation of the flood by more than one foot.

Freeboard means a factor of safety usually expressed in feet above a flood level for purposes of floodplain management. “Freeboard” tends to compensate for the many unknown factors that could contribute to flood heights greater than the height calculated for a selected size flood and floodway conditions, such as wave action, bridge openings, and the hydrological effect of urbanization of the watershed.

Lowest floor is the lowest floor of the lowest enclosed area (including basement). An unfinished or flood-resistant enclosure, usable solely for parking of vehicles, building access or storage in an area other than a basement area, is not considered a building's lowest floor; provided, that such enclosure is not built so as to render the structure in violation of the applicable nonelevation design requirements of the County Code or other applicable codes and ordinances.

Special Flood Hazard Area (SFHA), also referred to as the 100-year floodplain, is used to identify areas subject to inundation by the 1% annual chance storm event. SFHA is also referred to as the 100-year floodplain. The SFHA includes FEMA-identified floodplains and County-identified floodplains.

Water Surface Elevation (WSE) means the height, in relation to a specified datum, of floods of various magnitudes and frequencies in the floodplains of coastal or riverine areas.

Variable Width Drainage Easement is that area on a plan that is identified as 100-year floodplain. Plans and plats must show the SFHA boundaries if it is part of a parcel or adjacent to a parcel being developed.

County Code

- Section 24-3 & Sec. 24-106.1 contain other definitions used in managing development within identified floodplains.
- Section 24-8 outlines the requirements for the enlargement, extension, reconstruction, substitution, or structural alteration of a non-conforming structure.
- Section 24-95(u)(1) prohibits new dwellings within the SFHA, requires a setback from the floodplain boundary, and requires elevation of the lowest floor if the structure is within a specified distance from the floodplain.
- Section 24-106.1 contains the detailed requirements for floodplain management, including the requirement that the lowest floor (including basement) for new construction must be at least one foot above the Base Flood Elevation. Also within this section is a No-Rise requirement that does not allow development to raise the 100-year water surface elevation.

County and FEMA floodplains are identified based on the 1% annual chance (100-year recurrence interval) storm event.

FEMA performs engineering studies using the rainfall and run-off flow based on 100-year storm events and maps the resulting inundations zones. The results are published on Flood Insurance Rate Maps (FIRMs) and in a Flood Insurance Study (FIS). Henrico County's latest FIRMs and FIS became effective in December of 2007.

FEMA FIRMS typically identify 100-year floodplain areas down to one square mile (640 acres) of drainage. In some areas, the FEMA FIRM may also identify areas based on the 500-year (0.2% annual chance) storm event.

County-identified 100-year floodplains are usually mapped for drainage areas down to 100 acres. County-identified floodplains do not typically identify areas based on the 500-year storm event.

Floodplain studies are done with different levels of complexity. FEMA and County-identified floodplains designate inundation areas as "A" Zones when they are based on "Approximate" studies. Approximate studies typically do not include the effects of bridges or culverts. "AE" flood zones are based on detailed studies which typically include the effects of bridges and culvert; detailed studies can include a floodway.

Plan Review and Approval

The Engineering and Environmental Services Division of the Department of Public Works uses a checklist in the review and approval of Plans of Development and other development proposals. The checklist has sections for development projects in or adjacent to identified 100-year floodplains. The following comments are made when a Plan of Development or other development proposal is submitted for approval, as appropriate:

- The County or FEMA 100-year floodplain boundary must be shown on the plans.
- The 100-year Base Flood Elevation must be identified and shown on the plans.
- If the flood study for the area is approximate, the study must be detailed for the effects of a culvert or bridge. This study must be approved by the Henrico County DPW. The 100-year water surface elevation model must use the hydrology of the area based on the approved Henrico County Land-Use plan and the final topography based on the proposed development.
- The proposed detailed study cannot be approved if it shows any increase in 100-year water surface elevations from the approved detailed study. A "No-rise" certification (form accessed through the Henrico County website) must be included in the plan submittal for approval.

FEMA Floodplain Boundary or BFE Changes

FEMA acknowledges that the 100-year floodplains identified on the FIRMs may be modified by improved topographic data, or require changes based on development and changes in the drainage area. The first and simplest Letter of Map Change is called a Letter of Map Amendment (LOMA). This is typically obtained when the published floodplain boundary is incorrect as proven by measuring the elevation of the ground around a structure and comparing it to the BFE at that location. If the Lowest Adjacent Grade (LAG) at a structure is higher than the BFE, then the 100-year event will not inundate the structure. FEMA has published the MT-EZ form which is used to apply for a LOMA.

If the plan requires fill in a FEMA delineated 100-year floodplain, FEMA's approval is required. A Conditional Letter of Map Revision (CLOMR) is required prior to doing the balanced cut and fill work with a final "as-built" Letter of Map Revision (LOMR) after the work is complete. DPW will review the CLOMR/LOMR application submittal and get the Community Acknowledgement form (part of the MT-2 LOMR application package) signed by the County Engineer.

Henrico County can approve the proposed plan with changes in the 100-year floodplain based on an approved CLOMR, but the final plat will not be approved without the physical changes completed and submittal of as-built plans with the approved LOMR. The procedure is as follows:

- Prior to proposed plan approval, prepare & submit the "No Rise" certificate with the technical justification for county review and approval, including cross sections and volume calculations.
- Prior to proposed plan approval, an application for a Conditional Letter of Map Revision (CLOMR) must be prepared and submitted to the County for review and approval.
- Upon approval by Henrico County, the FEMA Community Acknowledgement (CA) form will be signed by the County Engineer and the developer will submit the CLOMR application to FEMA.

- Prior to final plat recordation, FEMA must issue the CLOMR, the fill placed (including all fill within the 100-year floodplain, an as-built certification of fill in floodplain performed, and a final Letter of Map Revision (LOMR) must be issued by FEMA. When FEMA approves the LOMR, all affected landowners must be notified.

County Floodplain Boundary or BFE Changes

County floodplain boundaries or base flood elevations may be modified by improved study methods. These changes must comply with [the Guidelines for Amending Special Flood Hazard Areas in Henrico County](#) and approved by the County Engineer.

- Culvert or bridge backwater calculations may be required where a County floodplain has not been studied in detail including the effects of a culvert or bridge.
- When a County floodplain is modified, there is no requirement for FEMA involvement, but affected landowners must be notified.
- Fill in any 100-year floodplain is not allowed without approval from the County Engineer/Director of Public Works. A developer must make an exception request, including a "No-Rise" certification, that includes justification for the request prior to plan approval. Adequate justification includes engineering data supporting a no-rise certification.
- If the area has not been studied in detail, field topography should be used in creating a detailed study or updating an existing study. The hydrology must be adjusted to the land use in the most recently approved Henrico County Land-Use plan.

Applicability of the Standard

This standard applies to all types of development, including subdivisions and Plans of Development (PODs), and CIPs.

Section 4 – Construction and Inspections

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4.01 General

Standard

All construction within the existing or proposed County right-of-way shall be inspected and approved by the Department of Public Works or by VDOT when the proposed construction is within VDOT maintained right-of-way.

Unless otherwise specified on the approved construction plans or road permits, all materials, construction methods, installations, specifications, and standards shall conform to the latest edition of the VDOT Road and Bridge Specifications and Standards.

A minimum of 24 hours in advance notice shall be required on all construction inspection requests. Depending on the scope of work, additional advance notification may be required.

Applicability of the Standard

This standard applies to all types of development, including subdivisions, PODs, and CIPs.

Design Requirements

4.02 Materials

Standard

All materials shall be in accordance with the VDOT Road and Bridge Specifications and Standards. Concrete, asphalt concrete and aggregate shall be obtained from VDOT approved plants and quarries and shall be produced in accordance with VDOT approved mix designs. Construction materials are to be from approved VDOT sources as published by VDOT Materials Division.

Material Testing, Monitoring and Inspections (Field)

A. Scope of Work

The Contractor shall contract the services of an independent Geotechnical firm licensed by the State of Virginia to perform the Quality Control Field Testing on construction activities and materials incorporated into this project. The type of tests, the frequency of tests and method of testing shall be in accordance with the requirements of the Virginia Department of Transportation's Manual of Instruction for Materials, the Virginia Test Methods (VTM) and the Association Society for Testing and Materials (ASTM).

The Geotechnical firm shall provide resumes for their staff members that will be involved in the project and provide evidence that their technicians are certified by the Virginia Department of Transportation (VDOT) to perform the required testing. Applicable certifications are, but not limited to the following: "Nuclear Safety for Density Devices", "Asphalt Field", "Concrete Field", "Soil & Aggregate Compaction" and "Pavement Markings".

The contractor shall be responsible for scheduling and coordinating the testing, monitoring and inspecting services with applicable construction activities. The contractor and Geotechnical firm shall consult with County's field representatives on a daily basis to ensure compliance with VDOT requirements. The contractor shall be responsible for ensuring that all construction activities are planned, scheduled and conducted in a manner that will facilitate the construction testing and ensure that the testing and monitoring are being performed in a timely manner and required by VDOT regulations. The contractor shall ensure that the Geotechnical firm has the capabilities to furnish and appropriate number of technicians to satisfy the contractor's and/or subcontractors' construction operations and progress. Should it become necessary to delay or postpone a construction activity because of the unavailability of certified technicians, no consideration for an extension of contract time will be allowed.

The Geotechnical firm shall be responsible for furnishing all testing equipment, transportation and documentation. A representative of the Geotechnical firm shall attend all monthly progress meetings on the project to report the status of tests from previous month and their plan activities for the following month to correspond with the contractor's

activities. The Geotechnical firm shall keep the contractor and the County apprised of the status of tests at all times and shall provide the County with all tests results, reports and supporting documentation on the same day, unless otherwise approved.

The frequency of tests, as shown in VDOT's Manual of Instruction for Materials, are considered minimum and are based on obtaining acceptable test results on consistent basis. Should tests reveal unacceptable or inconsistent results, the Geotechnical firm shall immediately notify the contractor and the County's field representative. The contractor shall take immediate action to correct the problem to ensure compliance with the contractor requirements. If the tests yield unacceptable and/or inconsistent results, additional tests will be required as directed by the County. The testing and retesting of materials and construction operations shall have the full cooperation of the contractor and/or their subcontractor.

Examples of required field testing, material inspections and their frequencies for Quality Control are , but not limited to the following:

- 1) Central Mix Aggregate (Subbase / Base Material):
 - a) Depths: In accordance with the Materials Manual and VTM-38B.
 - b) Density: In accordance with The Materials Manual and VTM-10.
- 2) Asphalt Concrete Pavement:
 - a) Density by Nuclear Method: In accordance with the Materials Manual and VTM-76.
- 3) Miscellaneous Concrete Hydraulic Cement: In accordance with Materials Manual and ASTM.
 - a) Compressive Strength: ASTM C31 and C39.
 - b) Air Content: ASTM C173 and C231.
 - c) Consistency (slump): ASTM C143.
 - d) Temperature: ASTM C1064.
- 4) Embankments:
 - a) Density: In accordance with Materials Manual and VTM-10.
- 5) Finished Subgrade (Cuts and Fills)
 - a) Density: In accordance with Materials Manual and VTM-10.
- 6) Backfill for Pipes and Box Culverts:
 - a) Density: In accordance with Materials Manual and VTM-10.
- 7) Backfill for Drop Inlets:
 - a) Density: In accordance with Materials Manual and VTM-10.

- 8) Post Construction Inspection of Underdrains, Cross Drains, and edgedrains: In accordance with VTM-108.
- 9) Post Installation Inspection of Buried Storm Drain Pipe and Pipe Culverts: In accordance with VTM-123.

In addition to performing the actual tests on concrete and density tests on various types of materials (soils, aggregate and asphalt) in the field, the Geotechnical firm shall be responsible for the continuous monitoring of the placement and compaction of aggregate base materials, asphalt concrete pavement and the placement and compaction of earthwork and backfill of trenches and structures to ensure compliance with the Specifications. The Geotechnical firm shall be responsible for the testing and monitoring of pavement markings and the video inspection of underdrains / edgedrains as required by the specifications.

In accordance with VDOT Road and Bridge Specifications, the contractor shall be responsible for the quality control requirements for asphalt pavement. The contractor shall also be responsible for the Quality Control for pavement markings and the video inspection of storm drainage pipes, underdrains, and edgedrains as required by VDOT's Road and Bridge Specifications.

Applicability of the Standard

This standard applies to all types of development, including subdivisions, PODs, and CIPs.

Design Requirements

4.03 Drainage

Standard

All storm drainage facilities installed in right-of-way and/or easements, must be inspected and approved by the Department of Public Works.

No backfilling is permitted on any pipe installation until it has been inspected and approved by the Department of Public Works.

Vertical and horizontal alignment shall be verified visually or with the aid of mirrors to ensure that the alignment is true and no pipe is misplaced.

All storm sewer pipes shall be flushed and thoroughly cleaned prior to a final inspection.

Any field revisions affecting the drainage design, location, and type of construction of structures shall be approved in writing by the Department of Public Works, and sent to the field as a plan revision. No drainage work of any kind shall be allowed without approved construction plans

Applicability of the Standard

This standard applies to all types of development, including subdivisions, PODs and CIPs

Design Requirements

4.04 Roads and Streets

Standard

All roads and streets shall be constructed in accordance with the approved construction plans and current editions of the Henrico County Design Manual, VDOT Road and Bridge Specifications and VDOT Road and Bridge Standards, where applicable. The Department of Public Works shall inspect the subgrade prior to any stone installation to evaluate the existing conditions as set forth in the Pavement Design Section of this Manual, See Section 2.26. Should a revision be required to the pavement design because of the soil conditions, the Department of Public Works will determine the appropriate adjustments to the minimum pavement design requirements or the owner's engineer may submit a revised pavement design for review and approval. The Department of Public Works will work with the owner and engineer to determine a suitable solution and any appeals will be handled as stated in Section 1.04 of this Manual. Prior to paving, stone grade and density checks shall be performed by an independent testing firm provided by the developer. The results of these checks must meet VDOT requirements.

Applicability of the Standard

This standard applies to all types of development, including subdivisions and PODs, and CIPs.

Design Requirements

4.05 Final Inspections

Standard

All final inspections will be scheduled at least 48 hours in advance. It is the responsibility of the owner to have all necessary persons in attendance at the final inspection. When the final inspection is complete, a written punch list will be sent to the owner and the contractor. Once all punch list items are complete and the necessary defect bond posted (subdivisions only), the Department of Public Works will prepare the required documentation to recommend acceptance of the road into the County road system

Applicability of the Standard

This standard applies to all types of development, including subdivisions and PODs.

Design Requirement

Section 5 – Agreements, Declarations, Bonds and Letters of Credit

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5.01 Agreements, Declarations, Bonds and Letters of Credit

Standard

Depending on the development activity, various legal agreements and/or permits must be executed by the applicant, approved by the Department of Public Works, and in some instances the Department of Planning, County Attorney's office, and the Clerk's Office. This section of the Manual includes descriptions of the use and requirements for each of these documents. Refer to Appendix D for examples of the forms.

Applicability of the Standard

This standard applies to all types of development, including subdivisions and PODs.

Design Requirements

N/A

5.02 General Information for Submitting Agreements, Declarations and Letters of Credit

Standard

Because of various legal requirements, all Environmental Compliance Agreements, Letters of Credit, Assignments, and Declarations of Covenants are reviewed by the County Attorney's Office for proper signatures and form. In addition, the Clerk's Office also reviews all Declaration of Covenants submitted for recordation in the Records Room.

Applicability of the Standard

This standard applies to all types of development, including subdivisions and PODs.

Design Requirements

The following has been prepared as a guide for document submittal:

- If there is a need to erase, cross out, or add any information to a preprinted form, the persons who sign the document must also initial each change. To prevent fraud, the document shall not be modified by anyone other than the persons signing it. Changes shall be on an original document, in order to be sure that there are not multiple versions of the document.
- If a church is a contracting party, all trustees for the church must sign the agreement. If the document requires notarization, all signatures must be notarized. The notary's acknowledgement must state that each person signing is a "Trustee of _____."
- There must be at least one document with original signatures and, on forms which require notary signatures, original notary signatures.
- The name of the applicant on the first sheet of the Environmental Compliance Agreement must match the applicant's name on the signature page. For example, if the applicant listed on the first page is an individual, the individual, not a company office, must sign on the signature page.
- The applicant listed in the Letter of Credit or Assignment must be the same as the applicant in the Environmental Compliance Agreement.

- The date of the Environmental Compliance Agreement referenced in the Letter of Credit must be the date of the Environmental Compliance Agreement.
- If a corporation is the contracting party, an officer authorized to sign for the corporation must sign as officer of the corporation and the signature must be notarized as such, e.g., “XYS Corporation, by John Smith, President.” If a partnership is the contracting party, a partner or officer of the partnership authorized to sign must sign for the partnership and have the signature notarized as such.
- Letters of Credit may be issued on out-of-area banks but must list a draw address at a bank in the City of Richmond, Chesterfield County, or Henrico County, Virginia.
- All agreements that will be recorded must contain a Land Records Cover Sheet in accordance with the following:

Since July 1, 2004, the Clerks of both the Chesterfield and Henrico Circuit Courts have required a Land Records Cover Sheet (Cover Sheet) for all documents recorded in the Deed Book. This is pursuant to the *Code of Virginia*. The data contained on these Cover Sheets is scanned via barcode readers, which allows the instruments to be recorded more timely and accurately.

To create the required Cover Sheet, users must access the Cover Sheet software that is made available at the following web site:

<https://csa.landsystems.com/csa/CSALogin.asp>

Although several methods to obtain the software are available, the online monthly subscription option may be best to meet the needs of most attorneys and title firms since it allows storage and retrieval of Cover Sheets from any location in case future adjustments are necessary. Private citizens may either sign up individually at the Landsystems web site listed above or use an attorney or title company to obtain the Cover Sheets for them. An online trial period is available once a user account is established. This allows creation of up to 25 free Cover Sheets and printing of up to 10 free Cover Sheets. Beyond the online trial period, a monthly paid subscription is required.

5.03 Declaration of Covenants for Inspection Maintenance of Runoff Control Measures

Standard

This document is utilized in conjunction with stormwater management (SWM) facilities (quality and quantity) to assure that the County has proper authority to enter the property for inspection and maintenance purposes. It also outlines the inspection and maintenance requirements for each SWM facility. A Declaration of Covenants is required for all Stormwater Management facilities and must be submitted to the Engineering and Environmental Services Division prior to construction plan approval.

Applicability of the Standard

This standard applies to all types of development, including subdivisions and PODs.

Design Requirements

Because they are recorded documents, all Declaration of Covenants for Inspection and Maintenance of Stormwater Management Facilities (BMP Maintenance Agreements) must be submitted with a copy of the Land Records Cover Sheet that is discussed in Section 5.02 of this manual.

Additional information can be found in the Henrico County Environmental Compliance Manual.

5.04 Environmental Compliance Agreement and Bond

Standard

In accordance with Chapter 10 of the County Code, an Environmental Compliance Agreement and Bond are required for land disturbance activity in excess of 2,500 square feet.

Applicability of the Standard

This standard applies to all types of development, including subdivisions and PODs.

Design Requirements

Exceptions to this requirement are stated in Chapter 10 of the County Code. All Environmental Compliance Agreements and bonds must be submitted to the Engineering and Environmental Services Division prior to construction plan approval. The developer or his consultant is responsible for delivering the executed agreement and bond in a form that is acceptable to the County Attorney. The construction plans will not be approved until these documents have been forwarded to the County Attorney.

Additional information regarding the Environmental Compliance Agreement and bond can be found in Chapter 16 of the Henrico County Environmental Compliance Manual.

5.05 Performance Bonds for Roads

Standard

A Performance Bond is required for all roadway construction that is approved under the subdivision process.

Applicability of the Standard

This standard applies to all types of development, including subdivisions and PODs.

Design Requirements

The bond may be submitted as cash, Letter of Credit, or Surety Bond and must be delivered to the Planning Department prior to record plat approval. All submittals must be approved by the Director of Planning and the County Attorney's Office.

The bond amount is determined based on the approved construction plans and includes all roadways, storm sewer, stormwater management facilities, potable water and sanitary sewer utilities, and other improvements necessary to complete the project.

The Department of Public Works provides the Planning Department with the bond amount for the Public Works related improvements shown on the construction plans.

The Planning Department compiles a total bond amount for the project and advises the developer of that amount upon his request. The developer, or his consultant, is responsible for delivering the bond to the Planning Department for approval. Upon approval, the Planning Department will authorize subdivision plat recordation, thus allowing the project to go to record.

Bond Reduction

The developer may request a bond reduction through the Planning Department as the project progresses toward completion. Once the Planning Department advises the Department of Public Works of the request, the Construction Division will conduct an inspection to determine if the bond can be released or reduced. A bond cannot be reduced to less than 10 percent of its original value.

Release of Bond

The bond will be released by the Planning Department once they have been notified by the Department of Public Works (and any other departments with bonded improvements) that the work has been inspected and found to be acceptable. The developer must furnish the Department of Public Works with a Defect Bond prior to release of the Performance Bond.

5.06 Roadway Defect Bond

Standard

The Construction Division will perform a final inspection of a road or roads, when requested to do so by the developer. If the construction is found acceptable, the developer will be notified in writing. Prior to acceptance of the streets into the County system for maintenance, the developer shall submit a Defect Bond to the Department of Public Works and the County Attorney's Office. The purpose of this bond is to insure correction of any unknown defects in the road, curb and gutter, drainage entrances, storm sewer, shoulders, roadside ditches or other improvements that may occur in public right-of-way or public drainage easements for a period of one year.

The Defect Bond may be cash, letter of credit or surety bond acceptable to the County Attorney's Office and the Director of Public Works. The Defect Bond is held by the Department of Public Works for the period of one year commencing with the Board of Supervisors road acceptance approval. Prior to returning the Defect Bond to the developer, the roadways are re-inspected and any defects are identified. If defects are found, a letter will be sent to the developer identifying the defects. The developer will have until the bond expires to correct the defects. If the defects are not corrected in this time frame, the County will utilize the bond to make the corrections and/or repairs.

The Defect Bond amount is:

- \$3,000 for each tenth of a lane mile, and any portion thereafter.

For example, a two-lane road that is 1.22 miles long would have a bond amount of:

- Two lanes x 1.22 miles = 2.44 miles x 10 (tenths per mile) = 24.4 tenths (rounded up to 25)
- 25 times \$3,000 per lane mile = \$75,000

The County of Henrico has the ability to adjust the amount on an annual basis. This amendment of the defect bond amount would be based upon changes in the producer price index for street construction materials. The bond amount cannot be greater than \$5,000 per tenth of a lane mile.

Applicability of the Standard

This standard applies to all types of development, including subdivisions and PODs.

Design Requirements

N/A

5.07 Agreement for Use of Public Right-of-Way

Standard

An Agreement for Use of the Public Rights-of-Way is required for the installation of any private facility within the County right-of-way where the County will not ultimately become the owner of the facility. This agreement must be executed between the Applicant and the County.

Applicability of the Standard

This standard applies to all types of development, including subdivisions and PODs.

Design Requirements

A copy of this agreement is included in Appendix D of this Manual.

Section 6 – Permit to Work in County Right-of-Way

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6.01 Permit to Work in County Right-of-Way

Standard

All work in the County right-of-way, alleys and permanent easements shall have prior approval from the Department of Public Works before any work is performed.

Henrico County Code - Chapter 18 - ARTICLE II, Sections 18-39, through 18-43, require a permit application (Appendix E) shall be obtained from and submitted to the Department Public Works for review and approval. The original permit application and four copies of the plan or drawings shall be submitted to the Department to review the proposed work and provide comment. Review comments are typically returned within 10 business days. A permit fee and a financial guarantee that are commensurate to the amount of work shall be required with each permit application. The financial guarantee in the amount agreeable to the Department of Public Works shall be cash or a surety bond. The Applicant shall be responsible for the work authorized under the permit for a period of one year from the date of completion. Should there be any defects or failures in the work, such as, but not limited to, settlement of trenches in the roadway/shoulders or graded areas, pipe, curb & gutter, driveways, sidewalks, vegetation, etc., corrective work shall be performed immediately upon notification from the County. Failure to respond in a reasonable time frame, as determined by the County based on public need or safety, shall be just cause for the County to take the necessary action to have the defect corrected and to bill the Applicant or draw on the financial guarantee for the cost to correct the defect.

Attached to each approved permit will be a list of Special Provisions, which shall govern the work and set forth-minimum requirements for working in the County right-of-way. Because each permit is different with respect to the scope of work and location, additional requirements may be added to address specific concerns relative to the proposed work. Should the Applicant disagree with any of the terms or conditions required with the permit, the Applicant shall not proceed with any portion of the work until the issue is resolved. Once the work has started, the terms and conditions shall be deemed acceptable and final. The Applicant shall be responsible for notifying the Department of Public Works Construction Division and Traffic Engineering Division at least 24 hours prior to beginning any work. Depending on the scope of work, traffic control requirements and public notification requirements, additional notification time may be necessary.

The Applicant shall be responsible for providing all traffic control in accordance with the latest edition of the Virginia Work Area Protection Manual and/or as required by the Traffic Engineer. All work shall be inspected and approved by the Department of Public Works Construction Division. All materials and construction methods shall be in accordance with the latest edition of the Virginia Department of Transportation Road and Bridge Specifications, unless otherwise approved.

The Permit can be revoked at any time for unsatisfactory work or failure to comply with the requirements of the permit.

The open cutting of roads shall not be permitted unless substantial justification is submitted and approved. If approval is granted, restoration of the pavement shall be as specified in the permit, or as directed by the Department of Public Works. Pavement restoration requirements are subject to change if the amount of actual disturbance is more than what was anticipated when the permit was approved.

The installation of any private facility in the County right-of-way, in which the County will not ultimately become the owner of the facility, cannot be installed in the County right-of-way unless an Agreement for Use of Public Rights-of-Way (Appendix E) has been executed between the Applicant and the County.

Residential Driveways

Individual requests to construct or modify a residential entrance will not be subject to the requirements above, as long as the request is specifically from the homeowner who will accept full responsibility for the work. Once it has been determined that the location of the entrance or modification of an entrance meets County requirements, a letter will be sent to the homeowner, which will serve as a permit to perform the work. The letter will address inspection requirements, time limits, responsibility and workmanship and will include specifications and standards that are applicable to the work. A permit with fee and financial guarantee will be required for this form of a permit as well.

Applicability of the Standard

This standard applies to all types of development, including subdivisions and PODs.

Design Requirements

Appendix A

Right-of-Way Survey “As-Built” Requirements:

1.0 General

The purpose of this section is to set forth procedures for providing right-of-way "As-Built" drawings required by the Henrico County, Department of Public Works. This guidance outlines the minimum required information, the allowable tolerances during survey measurement and the method for providing this information on all drawings submitted as a record of improvements to Henrico County. An “As-Built Drawing” is generally defined as a field run topographic survey.

The following procedures must be followed when submitting “As-Built” drawings for approval by Henrico County:

- a) It will be the responsibility of the project developer or their representative to ensure that the "As-Built" drawings are in compliance with this section before the completion of the project. Right-of-way “As-Built” record drawings are required to be approved before the release of the defect bond.
- b) This section applies to any public or private development project that requires public infrastructure to be installed within Henrico County and/or VDOT right-of-way, whether built by private development or with a County project.

1.1 Procedure

It is the responsibility of the owner/developer to provide right-of-way “As-Built” drawings in an acceptable format to the Henrico County, Department of Public Works. The following process will be followed for the submittal:

- a) All right-of-way "As Built" Plan Sheets are to be sealed and endorsed by a licensed Land Surveyor to the accuracy as defined herein.
- b) Initially, six (6) paper copies of the "As-Built" drawings will be submitted to the Public Works Department - Design Division for review and approval.
- c) The Public Works - Design Division staff will provide copies of the drawings

to the appropriate reviewing agencies. A review comment letter will be provided to the submitter with directions for resubmittal, if required.

- d) Upon approval of the plan drawings, an electronic digital file of the drawings will be provided to the County.
- e) The original "As-Built" project drawings will be filed in the Public Works file system.

1.2 Technical Requirements

This section is not intended to address either construction tolerances or survey practices (e.g., where and how often to take a survey elevation and/or survey horizontal location shot). Usually, the frequency and location of survey shots will match the proposed grade elevations, normally shown on and required by construction plans.

The right-of-way "As-Built" drawings shall include the following minimum information including the specified measurement of survey precision. See the design manual sections 2.06 – 2.08 for County survey standards. A checklist is included with this section to aid in an accurate and complete drawing submittal.

- a) The accuracy of both surface and sub-surface gravity-fed systems will be measured in a survey and recorded to within ± 0.01 foot vertically and \pm one foot horizontally at the structure location.
- b) The accuracy of curb/curb and gutter and pavements measurements will be ± 0.01 foot vertically and \pm one foot horizontally at high points, low points, curb returns, and various other positions following good engineering, construction, and surveying practices.
- c) The accuracy of street sign and light poles will be measured to \pm one foot accuracy, horizontally.
- d) The project title and names must correspond with the approved construction documents, except that the drawing shall be titled "As-Built Survey Drawing of...".
- e) Profiles of improvements shall be a part of the drawing set if a profile was provided in the original project design drawing set.

- f) All public easements provided by the project shall be shown on the drawings along with notation of public record recordation data.
- g) All dimensions and working units will be expressed to the nearest hundredth of a foot. All elevations will be expressed to the nearest hundredth of a foot on solid surfaces and to the nearest tenth of a foot on ground/grass surfaces.
- h) The graphic elements of the As-Built drawing will be registered to the current HORIZONTAL and VERTICAL datums of Henrico County, regardless of the datums of the design plans.
- i) The right-of-way “As-Built” drawings shall show all elements that are shown on the project design plans that lie within right-of-ways and public easements.

1.3 Submittal of Digital “As-Built” Drawing Files

Upon acceptance and approval of a right-of-way “As-Built” drawing a digital copy will be required in a standard AutoCad file. This section provides guidance in order to standardize digital submittals of right-of-way “As-Built” drawings to the Henrico County, Department of Public Works. This section will cover all engineering designs and project plan drawings for public and private project developments. The following information is provided for digital submittals:

- a) **Contract Digital Submittals** - Digital files will be submitted according to the project's contract for all design and project plan record drawing contracts with Henrico County. In addition, Henrico County project right-of-way "As-Built" plans will be submitted in the AutoCad digital design format.
- b) **Development Design Digital Submittals** - Digital files for private development design project drawings will be in AutoCad format.

Submittals shall be provided on DVD in the .dwg format of the version currently used by Henrico County. Submit all information required to reproduce a hard copy of the submitted right-of-way “As-Built” drawing set. All externally referenced drawings and images must be bound to the drawing or provided with the file.

Also include any non-standard or custom settings (e.g. plot styles, fonts, or linetypes) that will be needed to reproduce a hard copy of the plans.

1.4 Right-of-Way Survey “As-Built” Drawing Checklist

A checklist is attached for use in preparation of any right-of-way survey “As-Built” drawings for County approval. This check list is not to be considered a complete specification, but rather as a guideline. This checklist cannot reflect all conditions for all types of “As-Built” drawings, but shall provide guidance in their preparation.

Right-of-way survey “As-Built” drawings shall not be submitted for County review until all construction items are in place and complete. Bonding of any construction item that is required to be on the “As-Built” drawings will delay the approval of the drawings.

Basically, an “As-Built” drawing is a product of an in-field run topographic survey. The survey must be performed by a Land Surveyor that is licensed in the Commonwealth of Virginia. Since the surveyor cannot see the location or depth of newly constructed underground pressure pipes, the information for same must be obtained from the Contractor’s marked up record drawings. These must be furnished to the Surveyor prior to the survey. Many times, changes have been made on the location or depth of these items due to found existing conditions and the surveyor has no information on such changes.

The “As-Built” drawings are to be a true representation of elements that exist as a result of a completed construction project. Therefore, all references to PROPOSED or CONTRACTOR SHALL or any other that refers to a construction process must not be on the survey drawing.

All questions on the right-of-way survey “As-Built” drawings, reviews, comments, etc should be directed to Rob Setzer, County Surveyor within the Public Works Department. The County surveyor can be reached at 804-727-8288.

RIGHT-OF-WAY SURVEY “AS-BUILT” DRAWING CHECKLIST

ROADWAYS

PAVEMENT:

- Centerline of roadway control line with stations
- Entrances, Curbs or Curb and Gutters with top of curb elevations
- Finish pavement elevations along edge of pavement
- Finish pavement elevations along centerline of roadway pavement
- Finish ground elevations along the centerline of grass medians
- Crosswalks, type and detail

TRAFFIC CONTROL:

- Lane paint lines and centerline paint lines
- Painted Turn lane arrows and messages
- Traffic control signage (Stop, Yield, Street Name, Speed, ETC.)
- Traffic Signal Poles, control boxes, etc.

MISCELLANEOUS:

- Right-of-Way monumentation
- Street Light Poles with Pole Numbers
- Sidewalk and multi-use paths with elevations
- Handicap ramps

STORM DRAINAGE SYSTEM

STRUCTURES:

- Type of structure is clearly defined in LEGEND and in PLAN view
- Rim and invert of structure
- Inlet shaping noted if in place
- Invert elevation of each pipe in structure
- End wall or flared end sections clearly noted and shown
- Riprap limits outlined
- Roadside swale elevations
- Monitoring well location, material, size, type, rim and invert elevation



PIPES:

- Size and type of pipe
- Invert of both ends of each pipe
- Slope of pipe based on actual invert elevations

DRAWINGS

GENERAL:

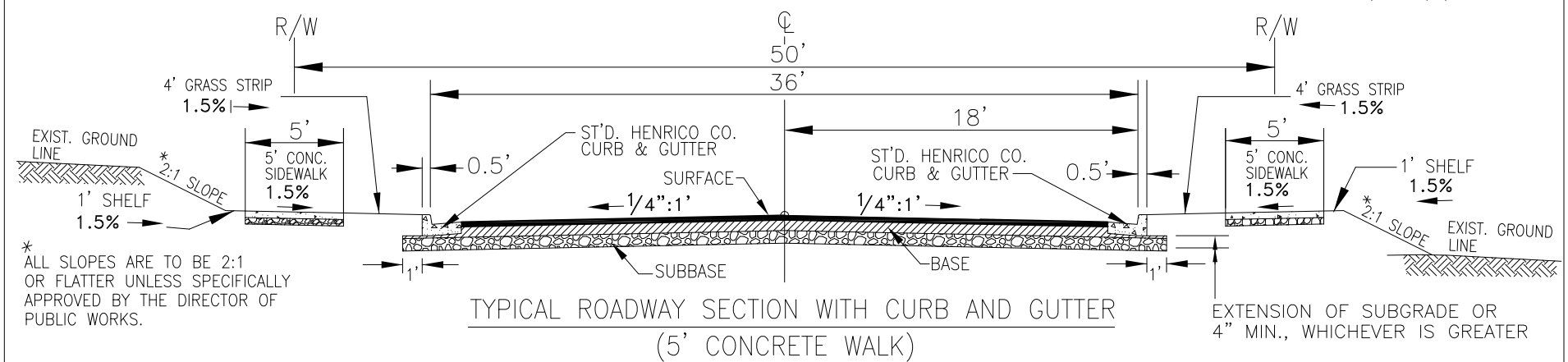
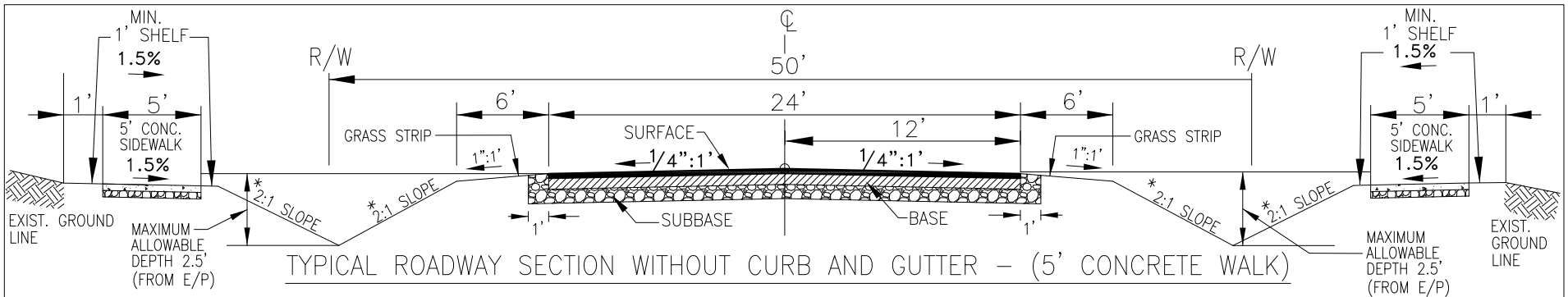
- Survey and Drawing prepared by licensed Land Surveyor
- Surveyor's Seal on all sheets, signed and dated
- Name and address of Surveyor
- Certification Note giving date(s) of survey
- Horizontal Control Datum Note
- Vertical Control Datum Note with Bench Mark reference
- Geodetic Control Network (minimum of 4 coordinates as per Section 2.09 of the DPW Design Manual)
- Site / Project Bench Mark
- Legend depicting all items on survey drawing
- Graphic Scales
- Vicinity Map
- Cover Sheet with Sheet Index if more than two drawing sheets
- Drawing sheets numbered in sequence
- All easements shown and labeled

PLAN SHEETS:

- 24" X 36" Sheets
- Title states **“AS-BUILT” DRAWING**
- Match Lines with sheet match data
- Profile sheets showing grades and utility data
- Note on Profile Sheets depicting source of pressure pipe data

Appendix B – Road Sections

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Typical Road Section – Rural 2-Lane	B-20



- 1. THE SHOULDER WIDTH (NON CURB AND GUTTER SECTION) OR PEDESTRIAN SHELF (CURB AND GUTTER SECTION) WILL BE REQUIRED TO BE EXTENDED BEYOND THE RIGHT-OF-WAY, WITH A PERMANENT EASEMENT PROVIDED, TO ACCOMMODATE THE INSTALLATION OF GUARDRAIL, ROAD-SIDE DITCH, AND/OR SIDEWALK, WHERE REQUIRED BY THE COUNTY.
- 2. THE PAVEMENT DEPTHS ARE MINIMUM COMPACTED DEPTHS.
- 3. THE PAVEMENT DESIGN REQUIRED IS BASED ON A MINIMUM CBR VALUE OF 10. INCREASES TO THE DESIGN MAY BE REQUIRED BASED ON SOIL CONDITIONS AT THE TIME OF CONSTRUCTION. FINAL PAVEMENT DESIGNS MUST BE APPROVED BY THE DEPARTMENT OF PUBLIC WORKS.
- 4. UNDERDRAINS SHALL BE INSTALLED ON ALL ROADWAYS IN ACCORDANCE WITH VDOT SPECIFICATIONS AND THE REQUIREMENTS OF THIS MANUAL.
- 5. MATERIALS AND CONSTRUCTION SHALL BE IN ACCORDANCE WITH THE LATEST EDITION OF THE VDOT ROAD AND BRIDGE SPECIFICATIONS AND STANDARDS, EXCEPT WHERE COUNTY STANDARDS ARE APPLICABLE.
- 6. IF AN IRRIGATION SYSTEM IS PROPOSED WITHIN THE RIGHT-OF-WAY LIMITS, A MAINTENANCE AGREEMENT MUST BE PROVIDED BETWEEN THE DEVELOPER AND THE COUNTY OF HENRICO.
- 7. A UNIFORM CROSS SECTION SLOPE AND PAVEMENT DESIGN ARE REQUIRED FOR ALL ROADWAYS. SLOPES WHICH EXTEND BEYOND THE RIGHT OF WAY SHALL BE IN PERMANENT EASEMENTS.
- 8. ALL ROADSIDE DITCHES SHALL BE SEEDED AND HAVE A PERMANENT STAND OF GRASS AS A MINIMUM. WHERE THE 10-YEAR DESIGN VELOCITY EXCEEDS FOUR (4) FEET PER SECOND, JUTE MESH OR OTHER CHANNEL LINING SHALL BE INSTALLED. IF THE 10-YEAR DESIGN VELOCITY EXCEEDS SEVEN (7) FEET PER SECOND, THE ROADSIDE DITCH SHALL BE LINED WITH EITHER RIPRAP OR CONCRETE. ALTERNATE CHANNEL LININGS MAY BE ACCEPTABLE BASED UPON SOIL SAMPLES AND CERTIFIED DESIGN BY A LICENSED PROFESSIONAL ENGINEER UPON APPROVAL BY THE COUNTY ENGINEER.
- 9. THE DEVELOPER/ENGINEER SHALL WORK WITH TRAFFIC ENGINEERING ON THE LOCATION OF BUMP OUTS. SEE DETAIL B-4 & B-5.
- 10. FOR MINIMUM PAVEMENT DESIGN REQUIREMENTS FOR TYPICAL SECTION CLASSIFICATIONS I-IV REFER SHEET B3 IN APPENDIX B.

TYPICAL SECTION - CLASSIFICATION I-IV

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B-2

**TYPICAL SECTION - CLASSIFICATION I
(0-250 VPD)**

MINIMUM PAVEMENT DESIGN REQUIREMENT		
SUBBASE	BASE	SURFACE
6" AGGREGATE SUBBASE MATERIAL	2" ASPHALT INTERMEDIATE BASE COURSE	2" ASPHALT SURFACE COURSE

**TYPICAL SECTION - CLASSIFICATION II
(251-400 VPD)**

MINIMUM PAVEMENT DESIGN REQUIREMENT		
SUBBASE	BASE	SURFACE
6" AGGREGATE SUBBASE MATERIAL	2" ASPHALT INTERMEDIATE BASE COURSE	2" ASPHALT SURFACE COURSE

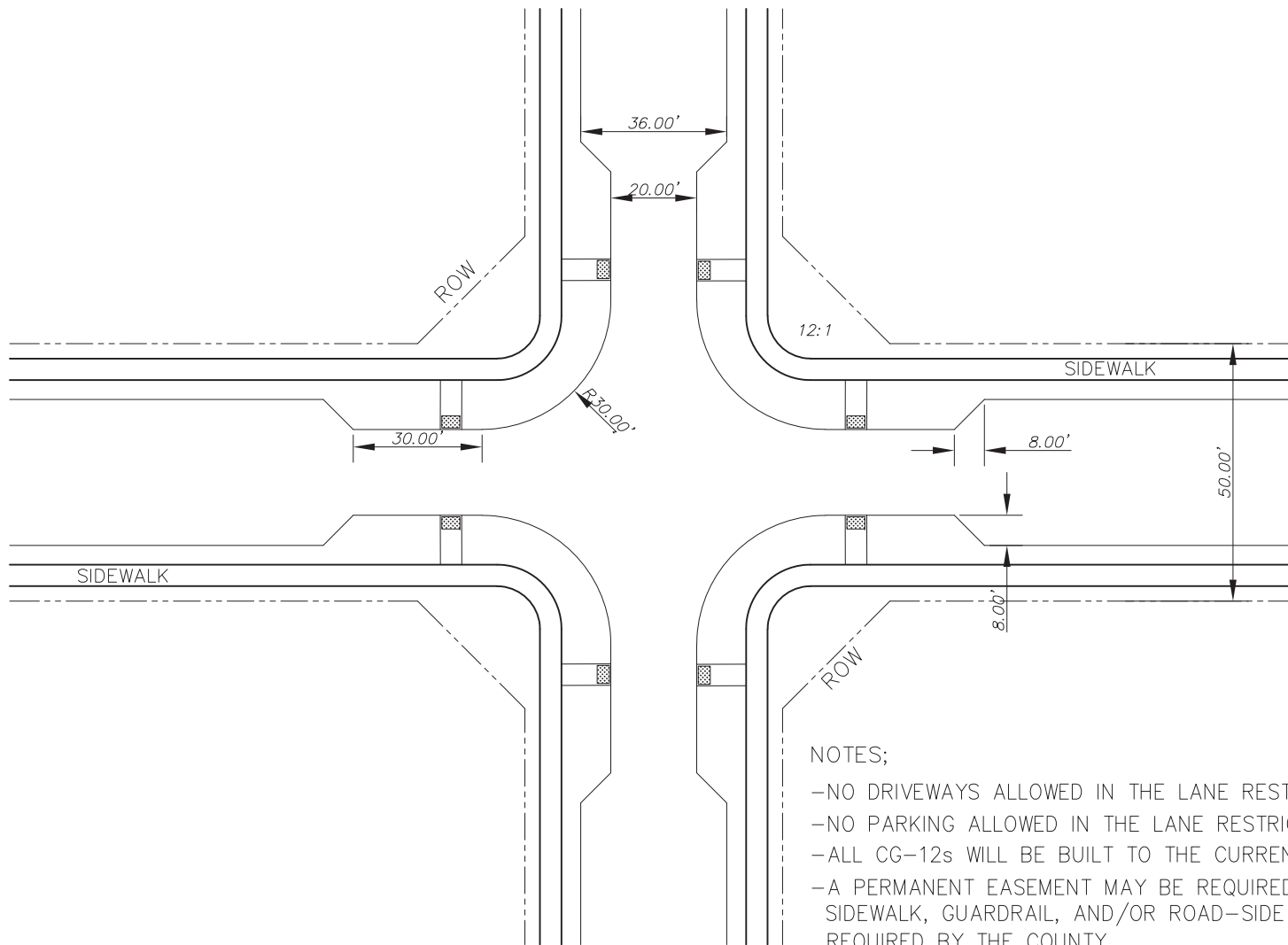
**TYPICAL SECTION - CLASSIFICATION III
(401-750 VPD)**

MINIMUM PAVEMENT DESIGN REQUIREMENT		
SUBBASE	BASE	SURFACE
7" AGGREGATE SUBBASE MATERIAL	2" ASPHALT INTERMEDIATE BASE COURSE	2" ASPHALT SURFACE COURSE

**TYPICAL SECTION - CLASSIFICATION IV
(751-1000 VPD)**

MINIMUM PAVEMENT DESIGN REQUIREMENT		
SUBBASE	BASE	SURFACE
8" AGGREGATE SUBBASE MATERIAL	2" ASPHALT INTERMEDIATE BASE COURSE	2" ASPHALT SURFACE COURSE





NOTES;

- NO DRIVEWAYS ALLOWED IN THE LANE RESTRICTION LOCATIONS
- NO PARKING ALLOWED IN THE LANE RESTRICTION LOCATIONS
- ALL CG-12s WILL BE BUILT TO THE CURRENT VDOT STANDARDS
- A PERMANENT EASEMENT MAY BE REQUIRED TO ACCOMODATE SIDEWALK, GUARDRAIL, AND/OR ROAD-SIDE DITCH, WHERE REQUIRED BY THE COUNTY



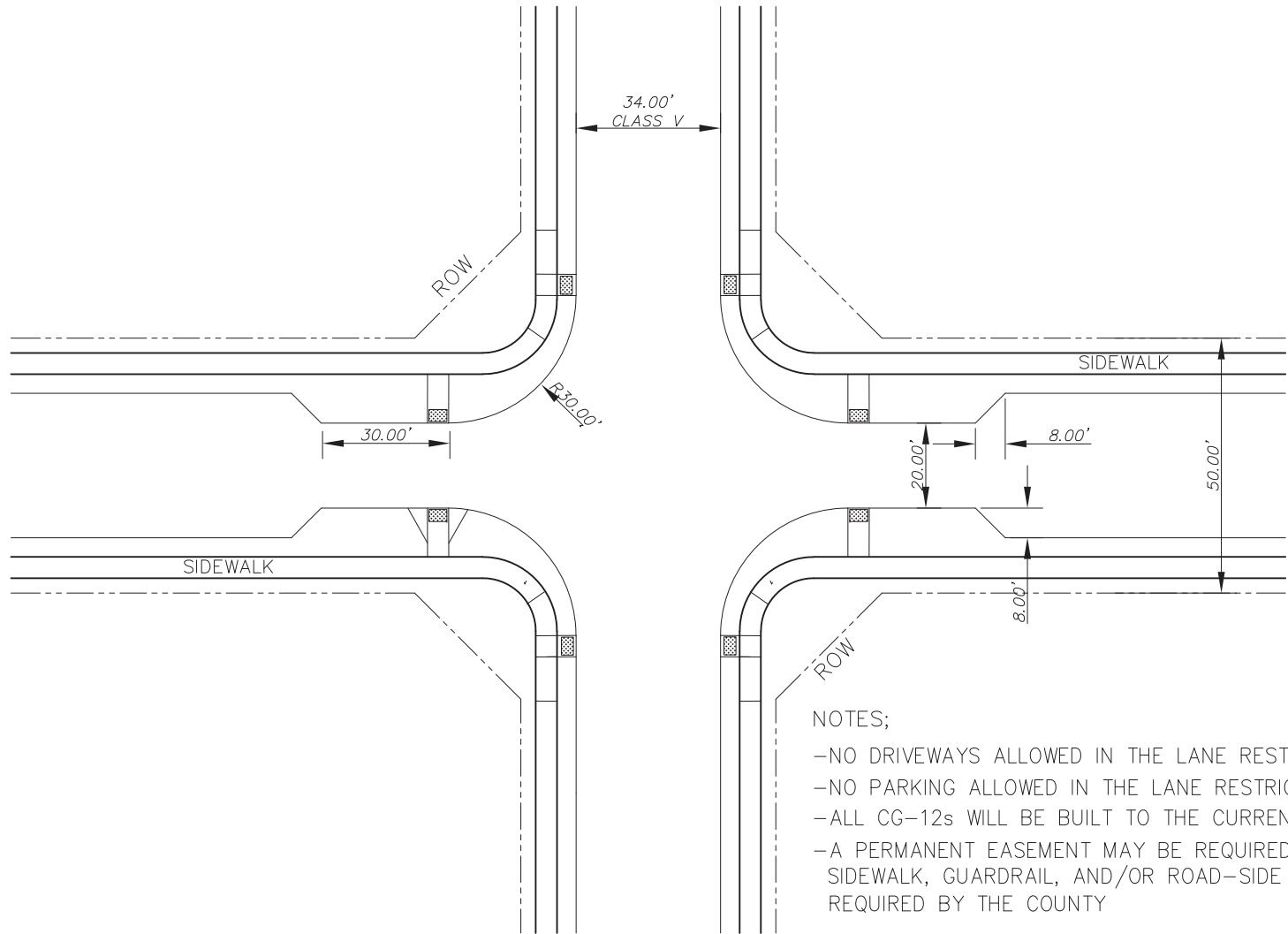
SUBDIVISION INTERSECTION DESIGN CLASS I-IV INTERSECTING WITH CLASS I-IV

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Department of Public Works

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SEPTEMBER 1, 2021

B-4.DWG



- NOTES;
- NO DRIVEWAYS ALLOWED IN THE LANE RESTRICTION LOCATIONS
 - NO PARKING ALLOWED IN THE LANE RESTRICTION LOCATIONS
 - ALL CG-12s WILL BE BUILT TO THE CURRENT VDOT STANDARDS
 - A PERMANENT EASEMENT MAY BE REQUIRED TO ACCOMODATE SIDEWALK, GUARDRAIL, AND/OR ROAD-SIDE DITCH, WHERE REQUIRED BY THE COUNTY



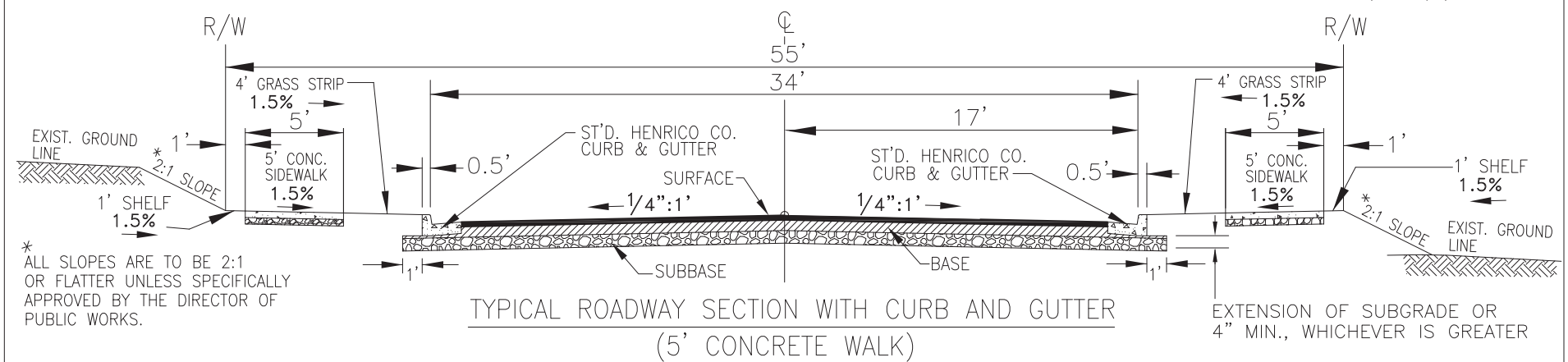
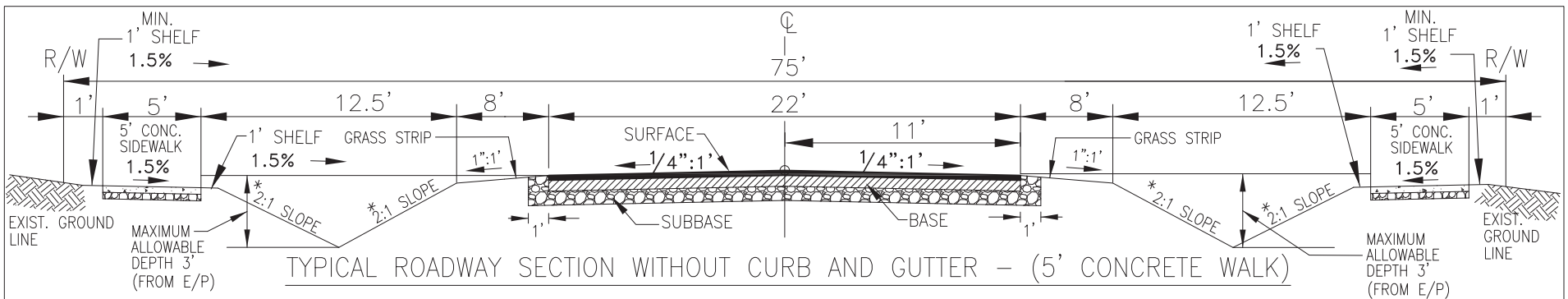
SUBDIVISION INTERSECTION DESIGN
 CLASS I-IV INTERSECTING WITH CLASS V
 County of Henrico
 Department of Public Works

REV/SEPTEMBER 10, 2021

SEPTEMBER 1, 2021

B-5.DWG

B-5



* ALL SLOPES ARE TO BE 2:1 OR FLATTER UNLESS SPECIFICALLY APPROVED BY THE DIRECTOR OF PUBLIC WORKS.

EXTENSION OF SUBGRADE OR 4" MIN., WHICHEVER IS GREATER

MINIMUM PAVEMENT DESIGN REQUIREMENT		
SUBBASE	BASE	SURFACE
8" AGGREGATE BASE MATERIAL	4" ASPHALT BASE COURSE	2" ASPHALT SURFACE COURSE

1. THE SHOULDER WIDTH (NON CURB AND GUTTER SECTION) OR PEDESTRIAN SHELF (CURB AND GUTTER SECTION) WILL BE REQUIRED TO BE EXTENDED BEYOND THE RIGHT-OF-WAY, WITH A PERMANENT EASEMENT PROVIDED, TO ACCOMMODATE THE INSTALLATION OF GUARDRAIL, WHERE NEEDED.
2. THE PAVEMENT DEPTHS ARE MINIMUM COMPACTED DEPTHS.
3. THE PAVEMENT DESIGN REQUIRED IS BASED ON A MINIMUM CBR VALUE OF 10. INCREASES TO THE DESIGN MAY BE REQUIRED BASED ON SOIL CONDITIONS AT THE TIME OF CONSTRUCTION. FINAL PAVEMENT DESIGNS MUST BE APPROVED BY THE DEPARTMENT OF PUBLIC WORKS.
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6. IF AN IRRIGATION SYSTEM IS PROPOSED WITHIN THE RIGHT-OF-WAY LIMITS, A MAINTENANCE AGREEMENT MUST BE PROVIDED BETWEEN THE DEVELOPER AND THE COUNTY OF HENRICO.
7. A UNIFORM CROSS SECTION SLOPE AND PAVEMENT DESIGN ARE REQUIRED FOR ALL ROADWAYS. SLOPES WHICH EXTEND BEYOND THE RIGHT OF WAY SHALL BE IN PERMANENT EASEMENTS.
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TYPICAL SECTION - CLASSIFICATION V (1001-5000 VPD)

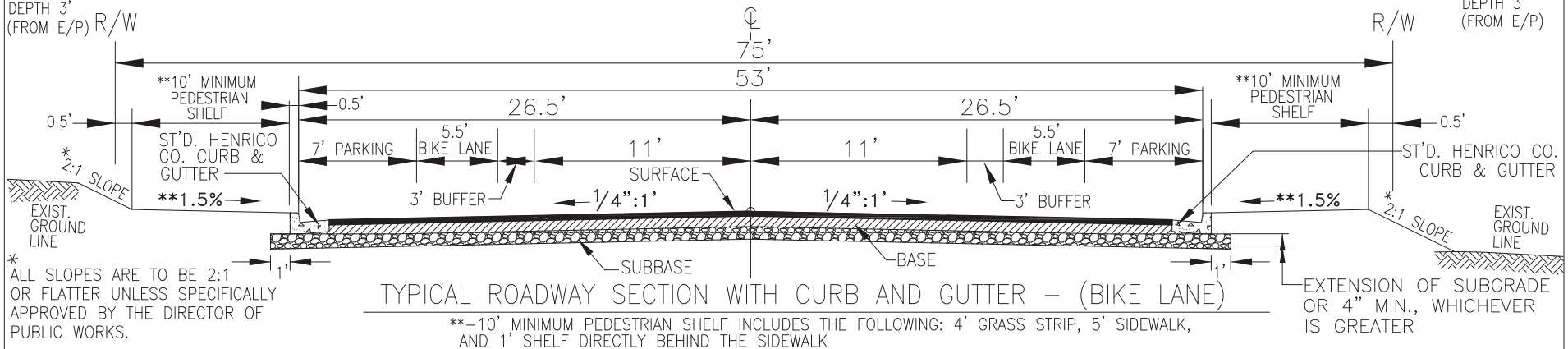
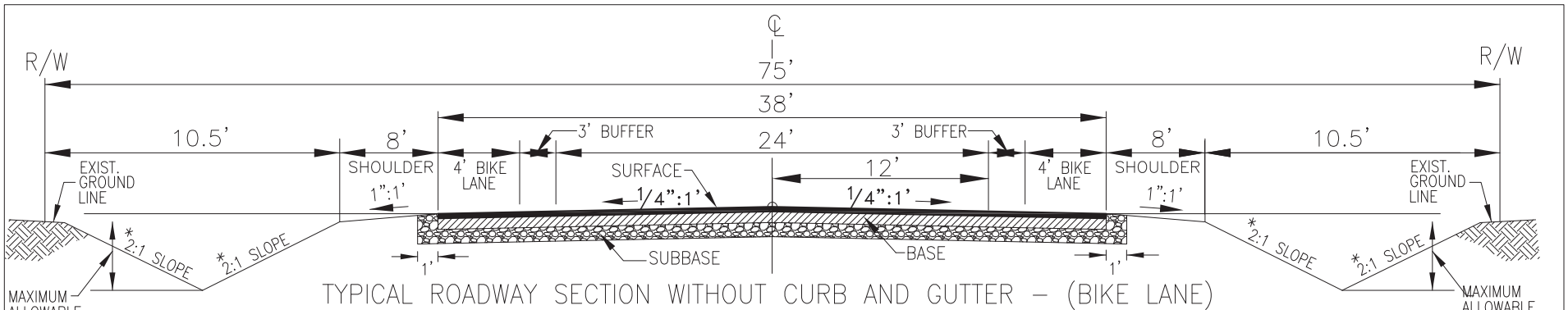
(5' CONCRETE WALK WITHIN PUBLIC RIGHT-OF-WAY)

County of Henrico
Department of Public Works

SEPTEMBER 1, 2021

HENTYPSEC-CL-5-5SW-PUB-RW.DWG





* ALL SLOPES ARE TO BE 2:1 OR FLATTER UNLESS SPECIFICALLY APPROVED BY THE DIRECTOR OF PUBLIC WORKS.

** - 10' MINIMUM PEDESTRIAN SHELF INCLUDES THE FOLLOWING: 4' GRASS STRIP, 5' SIDEWALK, AND 1' SHELF DIRECTLY BEHIND THE SIDEWALK

EXTENSION OF SUBGRADE OR 4" MIN., WHICHEVER IS GREATER

MINIMUM PAVEMENT DESIGN REQUIREMENT		
SUBBASE	BASE	SURFACE
8" AGGREGATE BASE MATERIAL	4" ASPHALT BASE COURSE	2" ASPHALT SURFACE COURSE

1. THE SHOULDER WIDTH (NON CURB AND GUTTER SECTION) OR PEDESTRIAN SHELF (CURB AND GUTTER SECTION) WILL BE REQUIRED TO BE EXTENDED BEYOND THE RIGHT-OF-WAY, WITH A PERMANENT EASEMENT PROVIDED, TO ACCOMMODATE THE INSTALLATION OF GUARDRAIL, WHERE NEEDED.
2. THE PAVEMENT DEPTHS ARE MINIMUM COMPACTED DEPTHS.
3. THE PAVEMENT DESIGN REQUIRED IS BASED ON A MINIMUM CBR VALUE OF 10. INCREASES TO THE DESIGN MAY BE REQUIRED BASED ON SOIL CONDITIONS AT THE TIME OF CONSTRUCTION. FINAL PAVEMENT DESIGNS MUST BE APPROVED BY THE DEPARTMENT OF PUBLIC WORKS.
4. UNDERDRAINS SHALL BE INSTALLED ON ALL ROADWAYS IN ACCORDANCE WITH VDOT SPECIFICATIONS AND THE REQUIREMENTS OF THIS MANUAL.

5. MATERIALS AND CONSTRUCTION SHALL BE IN ACCORDANCE WITH THE LATEST EDITION OF THE VDOT ROAD AND BRIDGE SPECIFICATIONS AND STANDARDS, EXCEPT WHERE COUNTY STANDARDS ARE APPLICABLE.
6. IF AN IRRIGATION SYSTEM IS PROPOSED WITHIN THE RIGHT-OF-WAY LIMITS, A MAINTENANCE AGREEMENT MUST BE PROVIDED BETWEEN THE DEVELOPER AND THE COUNTY OF HENRICO.
7. A UNIFORM CROSS SECTION SLOPE AND PAVEMENT DESIGN ARE REQUIRED FOR ALL ROADWAYS. SLOPES WHICH EXTEND BEYOND THE RIGHT OF WAY SHALL BE IN PERMANENT EASEMENTS.
8. ALL ROADSIDE DITCHES SHALL BE SEEDED AND HAVE A PERMANENT STAND OF GRASS AS A MINIMUM. WHERE THE 10-YEAR DESIGN VELOCITY EXCEEDS FOUR (4) FEET PER SECOND, JUTE MESH OR OTHER CHANNEL LINING SHALL BE INSTALLED. IF THE 10-YEAR DESIGN VELOCITY EXCEEDS SEVEN (7) FEET PER SECOND, THE ROADSIDE DITCH SHALL BE LINED WITH EITHER RIPRAP OR CONCRETE. ALTERNATE CHANNEL LININGS MAY BE ACCEPTABLE BASED UPON SOIL SAMPLES AND CERTIFIED DESIGN BY A LICENSED PROFESSIONAL ENGINEER UPON APPROVAL BY THE COUNTY ENGINEER.

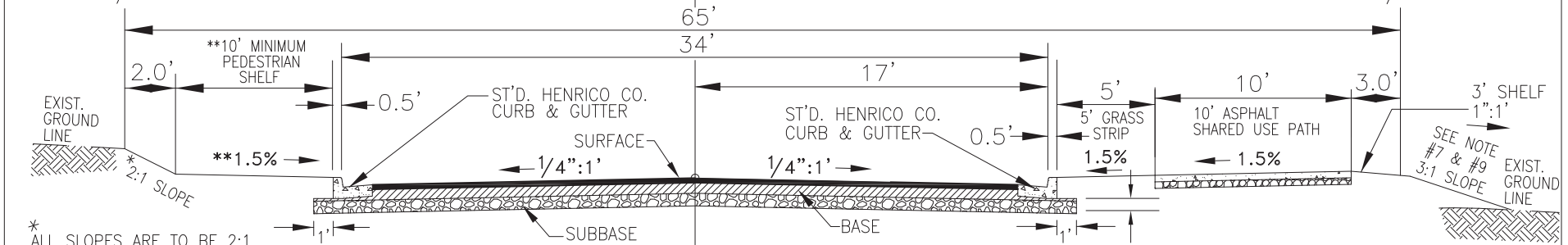
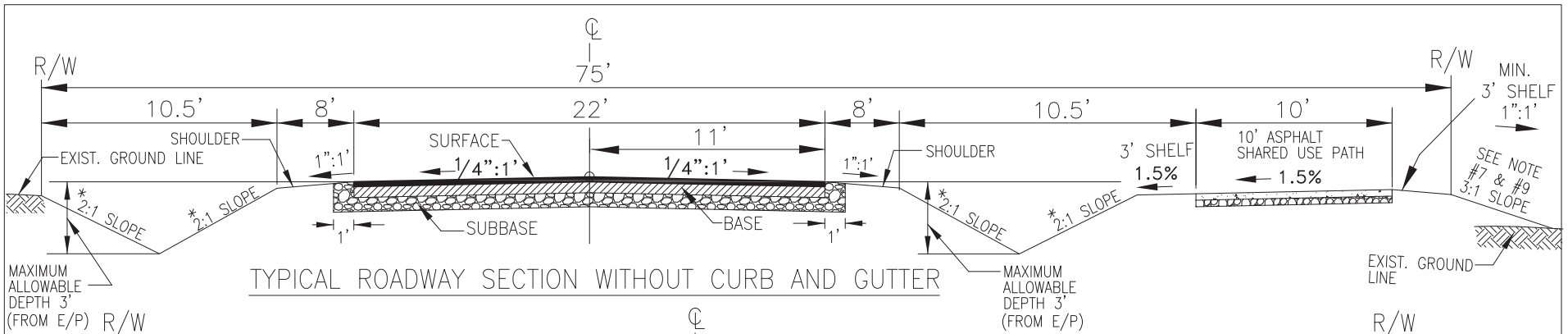


TYPICAL SECTION - CLASSIFICATION V (1001-5000 VPD)

(BIKE LANE WITHIN PUBLIC RIGHT-OF-WAY)
County of Henrico
Department of Public Works

SEPTEMBER 1, 2021

FHENTYPSEC-CL-5-BL-PUB-RW.DWG



* ALL SLOPES ARE TO BE 2:1 OR FLATTER UNLESS SPECIFICALLY APPROVED BY THE DIRECTOR OF PUBLIC WORKS.

**-10' MINIMUM PEDESTRIAN SHELF INCLUDES THE FOLLOWING:
4' GRASS STRIP, 5' SIDEWALK, AND 1' SHELF DIRECTLY BEHIND THE SIDEWALK

MINIMUM PAVEMENT DESIGN REQUIREMENT		
SUBBASE	BASE	SURFACE
8" AGGREGATE BASE MATERIAL	4" ASPHALT BASE COURSE	2" ASPHALT SURFACE COURSE

1. THE SHOULDER WIDTH (NON CURB AND GUTTER SECTION) OR PEDESTRIAN SHELF (CURB AND GUTTER SECTION) WILL BE REQUIRED TO BE EXTENDED BEYOND THE RIGHT-OF-WAY, WITH A PERMANENT EASEMENT PROVIDED, TO ACCOMMODATE THE INSTALLATION OF GUARDRAIL OR HANDRAIL, WHERE NEEDED.
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6. IF AN IRRIGATION SYSTEM IS PROPOSED WITHIN THE RIGHT-OF-WAY LIMITS, A MAINTENANCE AGREEMENT MUST BE PROVIDED BETWEEN THE DEVELOPER AND THE COUNTY OF HENRICO.
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9. FOR SLOPE HEIGHTS GREATER THAN 6' OR STEEPER THAN 3:1 AN APPROVED SAFETY RAIL SHALL BE REQUIRED.
10. BUMPOUTS SHALL BE REQUIRED WITHIN RESIDENTIAL NEIGHBORHOODS. SEE DETAIL B-4 & B-5.

TYPICAL SECTION - CLASSIFICATION V (1001-5000 VPD)

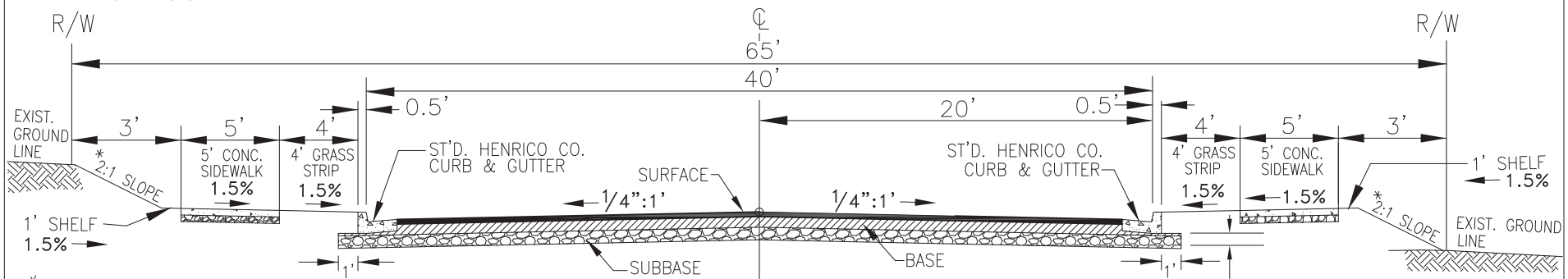
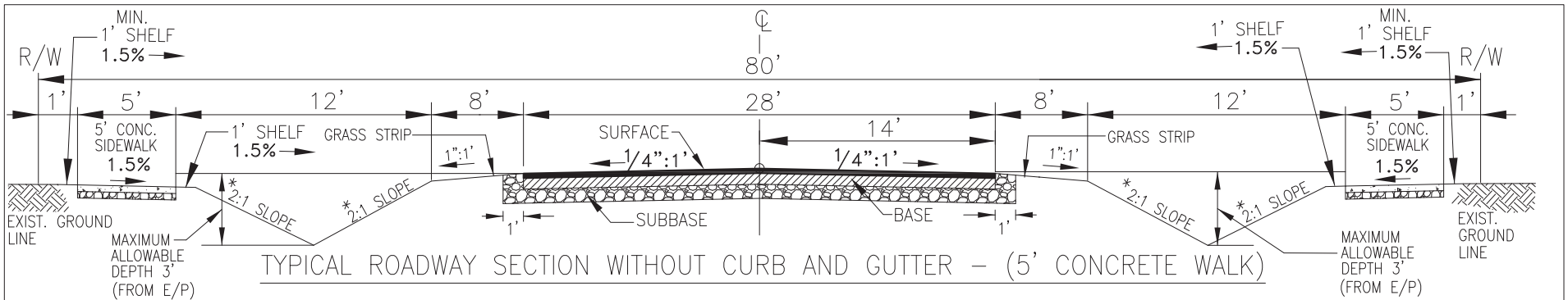
(10' SHARED USE ASPHALT PATH IN PUBLIC RIGHT-OF-WAY)

County of Henrico
Department of Public Works

SEPTEMBER 1, 2021

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* ALL SLOPES ARE TO BE 2:1 OR FLATTER UNLESS SPECIFICALLY APPROVED BY THE DIRECTOR OF PUBLIC WORKS.

MINIMUM PAVEMENT DESIGN REQUIREMENT		
SUBBASE	BASE	SURFACE
9" AGGREGATE BASE MATERIAL	5" ASPHALT BASE COURSE	2" ASPHALT SURFACE COURSE

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TYPICAL SECTION - CLASSIFICATION VI (5001-14000 VPD)

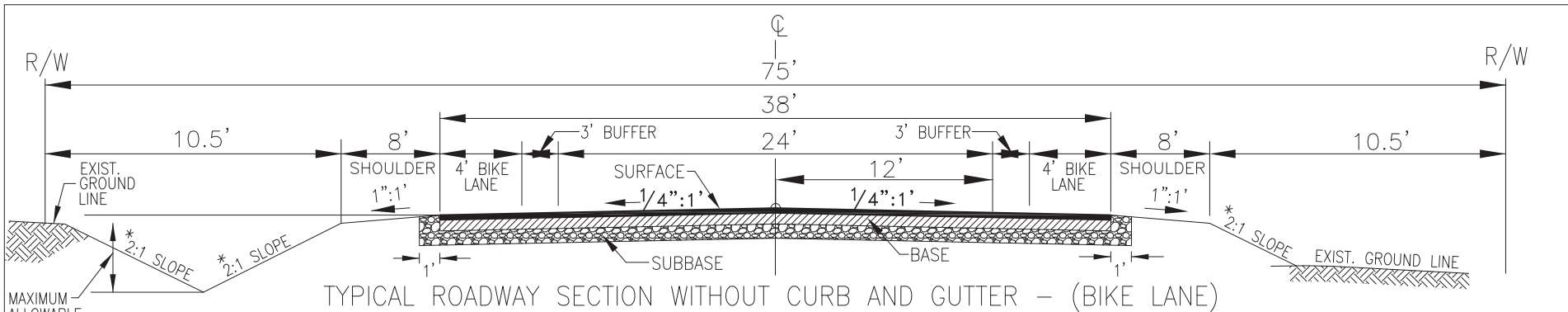
(5' CONCRETE WALK WITHIN PUBLIC RIGHT-OF-WAY)

County of Henrico
Department of Public Works

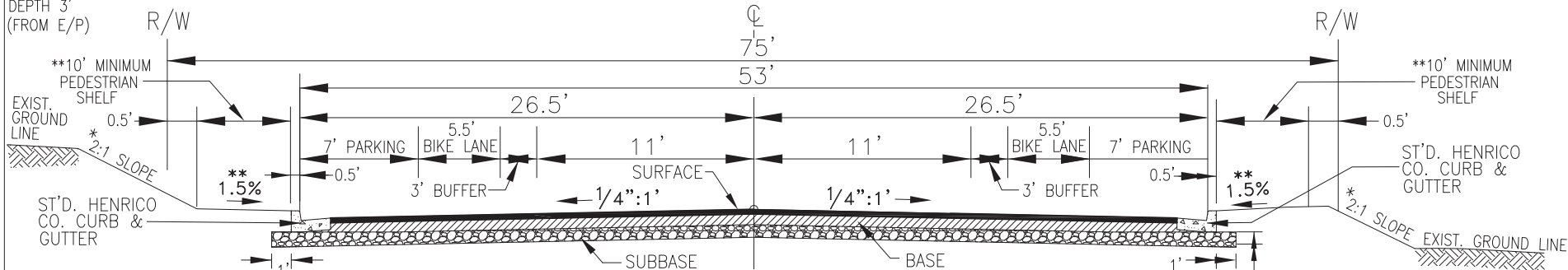
SEPTEMBER 1, 2021

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TYPICAL ROADWAY SECTION WITHOUT CURB AND GUTTER - (BIKE LANE)



TYPICAL ROADWAY SECTION WITH CURB AND GUTTER - (BIKE LANE)

* ALL SLOPES ARE TO BE 2:1 OR FLATTER UNLESS SPECIFICALLY APPROVED BY THE DIRECTOR OF PUBLIC WORKS.

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EXTENSION OF SUBGRADE OR 4" MIN., WHICHEVER IS GREATER

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9" AGGREGATE BASE MATERIAL	5" ASPHALT BASE COURSE	2" ASPHALT SURFACE COURSE

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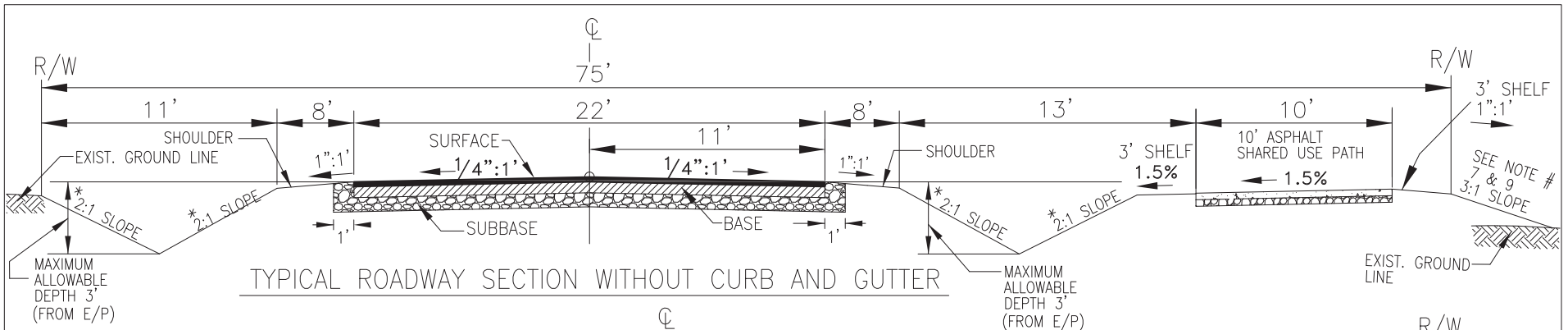
TYPICAL SECTION - CLASSIFICATION VI (5001-14000 VPD)

(BIKE LANE WITHIN PUBLIC RIGHT-OF-WAY)
County of Henrico
Department of Public Works

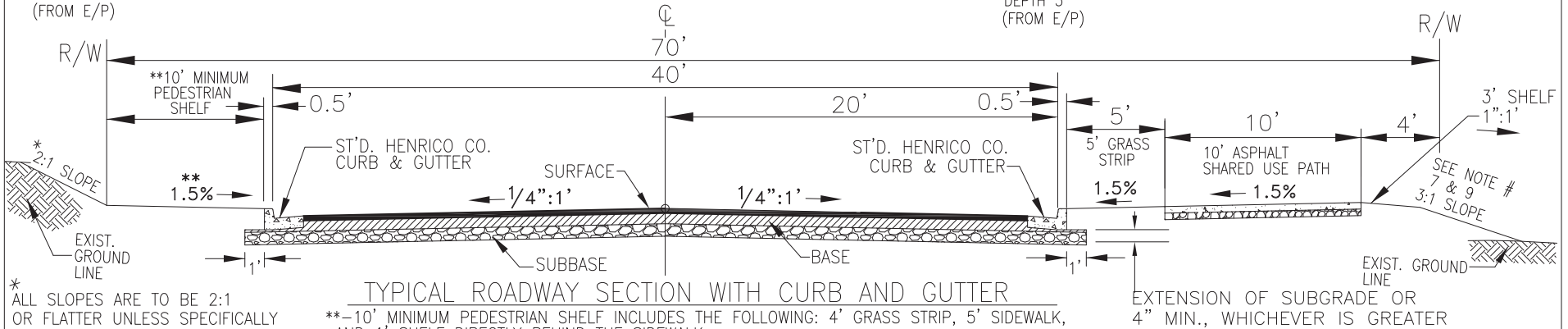
SEPTEMBER 1, 2021

FHENTYPSEC-CL-6-BL-PUB-RW.DWG

B-10



TYPICAL ROADWAY SECTION WITHOUT CURB AND GUTTER



TYPICAL ROADWAY SECTION WITH CURB AND GUTTER

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**-10' MINIMUM PEDESTRIAN SHELF INCLUDES THE FOLLOWING: 4' GRASS STRIP, 5' SIDEWALK, AND 1' SHELF DIRECTLY BEHIND THE SIDEWALK

MINIMUM PAVEMENT DESIGN REQUIREMENT		
SUBBASE	BASE	SURFACE
9" AGGREGATE BASE MATERIAL	5" ASPHALT BASE COURSE	2" ASPHALT SURFACE COURSE

1. THE SHOULDER WIDTH (NON CURB AND GUTTER SECTION) OR PEDESTRIAN SHELF (CURB AND GUTTER SECTION) WILL BE REQUIRED TO BE EXTENDED BEYOND THE RIGHT-OF-WAY, WITH A PERMANENT EASEMENT PROVIDED, TO ACCOMMODATE THE INSTALLATION OF GUARDRAIL OR HANDRAIL, WHERE NEEDED.
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9. FOR SLOPE HEIGHTS GREATER THAN 6' OR STEEPER THAN 3:1 AN APPROVED SAFETY RAIL SHALL BE REQUIRED.

TYPICAL SECTION - CLASSIFICATION VI (5001-14000 VPD)

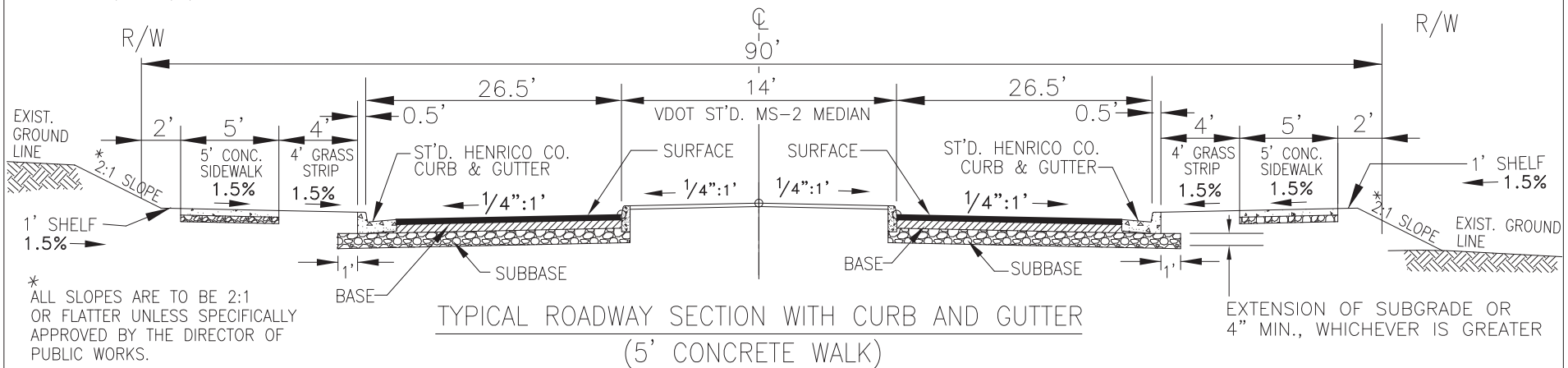
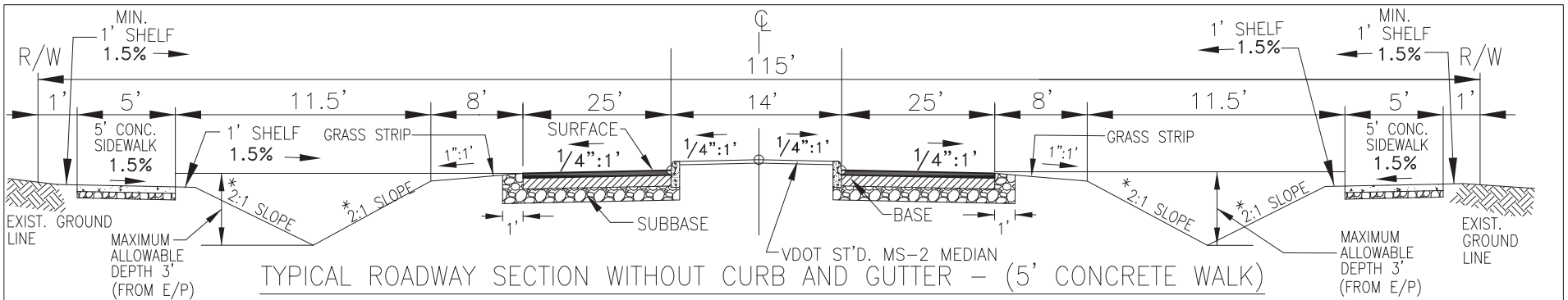
(10' SHARED USE ASPHALT PATH IN PUBLIC RIGHT-OF-WAY)

County of Henrico
Department of Public Works

SEPTEMBER 1, 2021

FHENTYPSEC-CL-6-10SU-PUB-RW.DWG





* ALL SLOPES ARE TO BE 2:1 OR FLATTER UNLESS SPECIFICALLY APPROVED BY THE DIRECTOR OF PUBLIC WORKS.

EXTENSION OF SUBGRADE OR 4" MIN., WHICHEVER IS GREATER

MINIMUM PAVEMENT DESIGN REQUIREMENT		
SUBBASE	BASE	SURFACE
11" AGGREGATE BASE MATERIAL	6" ASPHALT BASE COURSE	2" ASPHALT SURFACE COURSE

1. THE SHOULDER WIDTH (NON CURB AND GUTTER SECTION) OR PEDESTRIAN SHELF (CURB AND GUTTER SECTION) WILL BE REQUIRED TO BE EXTENDED BEYOND THE RIGHT-OF-WAY, WITH A PERMANENT EASEMENT PROVIDED, TO ACCOMMODATE THE INSTALLATION OF GUARDRAIL, WHERE NEEDED.
2. THE PAVEMENT DEPTHS ARE MINIMUM COMPACTED DEPTHS.
3. THE PAVEMENT DESIGN REQUIRED IS BASED ON A MINIMUM CBR VALUE OF 10. INCREASES TO THE DESIGN MAY BE REQUIRED BASED ON SOIL CONDITIONS AT THE TIME OF CONSTRUCTION. FINAL PAVEMENT DESIGNS MUST BE APPROVED BY THE DEPARTMENT OF PUBLIC WORKS.
4. UNDERDRAINS SHALL BE INSTALLED ON ALL ROADWAYS IN ACCORDANCE WITH VDOT SPECIFICATIONS AND THE REQUIREMENTS OF THIS MANUAL.

5. MATERIALS AND CONSTRUCTION SHALL BE IN ACCORDANCE WITH THE LATEST EDITION OF THE VDOT ROAD AND BRIDGE SPECIFICATIONS AND STANDARDS, EXCEPT WHERE COUNTY STANDARDS ARE APPLICABLE.
6. IF AN IRRIGATION SYSTEM IS PROPOSED WITHIN THE RIGHT-OF-WAY LIMITS, A MAINTENANCE AGREEMENT MUST BE PROVIDED BETWEEN THE DEVELOPER AND THE COUNTY OF HENRICO.
7. A UNIFORM CROSS SECTION SLOPE AND PAVEMENT DESIGN ARE REQUIRED FOR ALL ROADWAYS. SLOPES WHICH EXTEND BEYOND THE RIGHT OF WAY SHALL BE IN PERMANENT EASEMENTS.
8. ALL ROADSIDE DITCHES SHALL BE SEEDED AND HAVE A PERMANENT STAND OF GRASS AS A MINIMUM. WHERE THE 10-YEAR DESIGN VELOCITY EXCEEDS FOUR (4) FEET PER SECOND, JUTE MESH OR OTHER CHANNEL LINING SHALL BE INSTALLED. IF THE 10-YEAR DESIGN VELOCITY EXCEEDS SEVEN (7) FEET PER SECOND, THE ROADSIDE DITCH SHALL BE LINED WITH EITHER RIPRAP OR CONCRETE. ALTERNATE CHANNEL LININGS MAY BE ACCEPTABLE BASED UPON SOIL SAMPLES AND CERTIFIED DESIGN BY A LICENSED PROFESSIONAL ENGINEER UPON APPROVAL BY THE COUNTY ENGINEER.
9. SOLID CONCRETE MEDIAN, ST'D. MS-1 REQUIRED WHERE THE MEDIAN WIDTH IS 6'-0" OR LESS.

TYPICAL SECTION - CLASSIFICATION VII (14001-30000 VPD)

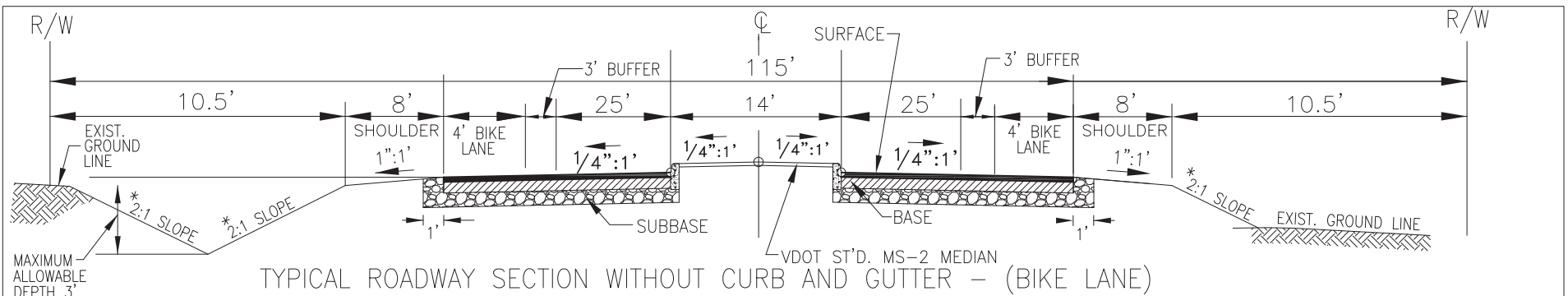
(5' CONCRETE WALK WITHIN PUBLIC RIGHT-OF-WAY)

County of Henrico
Department of Public Works

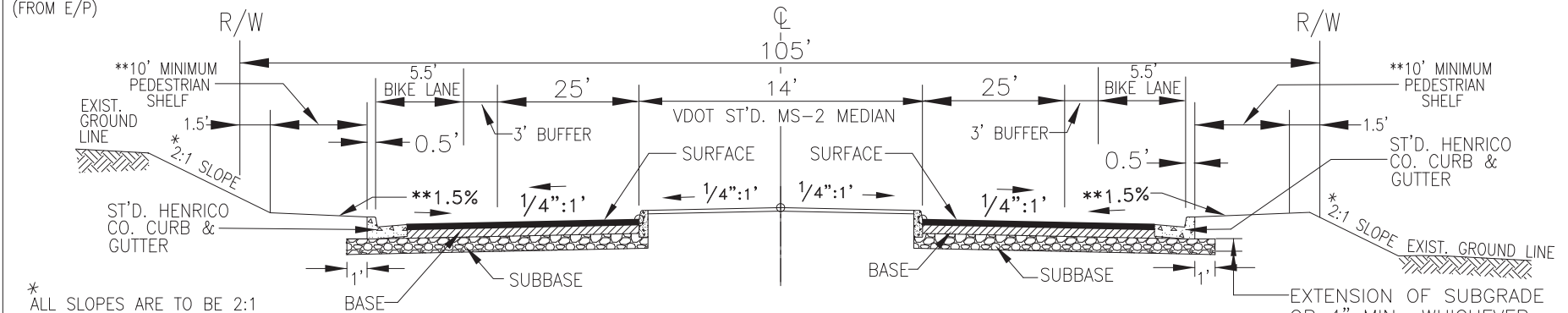
SEPTEMBER 1, 2021

FHENTYPSEC-CL-7-5SW-PUB-RW-rev.DWG





TYPICAL ROADWAY SECTION WITHOUT CURB AND GUTTER - (BIKE LANE)



TYPICAL ROADWAY SECTION WITH CURB AND GUTTER - (BIKE LANE)

* ALL SLOPES ARE TO BE 2:1 OR FLATTER UNLESS SPECIFICALLY APPROVED BY THE DIRECTOR OF PUBLIC WORKS.

** - 10' MINIMUM PEDESTRIAN SHELF INCLUDES THE FOLLOWING: 4' GRASS STRIP, 5' SIDEWALK, AND 1' SHELF DIRECTLY BEHIND THE SIDEWALK

MINIMUM PAVEMENT DESIGN REQUIREMENT		
SUBBASE	BASE	SURFACE
11" AGGREGATE BASE MATERIAL	6" ASPHALT BASE COURSE	2" ASPHALT SURFACE COURSE

1. THE SHOULDER WIDTH (NON CURB AND GUTTER SECTION) OR PEDESTRIAN SHELF (CURB AND GUTTER SECTION) WILL BE REQUIRED TO BE EXTENDED BEYOND THE RIGHT-OF-WAY, WITH A PERMANENT EASEMENT PROVIDED, TO ACCOMMODATE THE INSTALLATION OF GUARDRAIL, WHERE NEEDED.
2. THE PAVEMENT DEPTHS ARE MINIMUM COMPACTED DEPTHS.
3. THE PAVEMENT DESIGN REQUIRED IS BASED ON A MINIMUM CBR VALUE OF 10. INCREASES TO THE DESIGN MAY BE REQUIRED BASED ON SOIL CONDITIONS AT THE TIME OF CONSTRUCTION. FINAL PAVEMENT DESIGNS MUST BE APPROVED BY THE DEPARTMENT OF PUBLIC WORKS.
4. UNDERDRAINS SHALL BE INSTALLED ON ALL ROADWAYS IN ACCORDANCE WITH VDOT SPECIFICATIONS AND THE REQUIREMENTS OF THIS MANUAL.

5. MATERIALS AND CONSTRUCTION SHALL BE IN ACCORDANCE WITH THE LATEST EDITION OF THE VDOT ROAD AND BRIDGE SPECIFICATIONS AND STANDARDS, EXCEPT WHERE COUNTY STANDARDS ARE APPLICABLE.
6. IF AN IRRIGATION SYSTEM IS PROPOSED WITHIN THE RIGHT-OF-WAY LIMITS, A MAINTENANCE AGREEMENT MUST BE PROVIDED BETWEEN THE DEVELOPER AND THE COUNTY OF HENRICO.
7. A UNIFORM CROSS SECTION SLOPE AND PAVEMENT DESIGN ARE REQUIRED FOR ALL ROADWAYS. SLOPES WHICH EXTEND BEYOND THE RIGHT OF WAY SHALL BE IN PERMANENT EASEMENTS.
8. ALL ROADSIDE DITCHES SHALL BE SEEDED AND HAVE A PERMANENT STAND OF GRASS AS A MINIMUM. WHERE THE 10-YEAR DESIGN VELOCITY EXCEEDS FOUR (4) FEET PER SECOND, JUTE MESH OR OTHER CHANNEL LINING SHALL BE INSTALLED. IF THE 10-YEAR DESIGN VELOCITY EXCEEDS SEVEN (7) FEET PER SECOND, THE ROADSIDE DITCH SHALL BE LINED WITH EITHER RIPRAP OR CONCRETE. ALTERNATE CHANNEL LININGS MAY BE ACCEPTABLE BASED UPON SOIL SAMPLES AND CERTIFIED DESIGN BY A LICENSED PROFESSIONAL ENGINEER UPON APPROVAL BY THE COUNTY ENGINEER.
9. SOLID CONCRETE MEDIAN, ST'D. MS-1 REQUIRED WHERE THE MEDIAN WIDTH IS 6'-0" OR LESS.

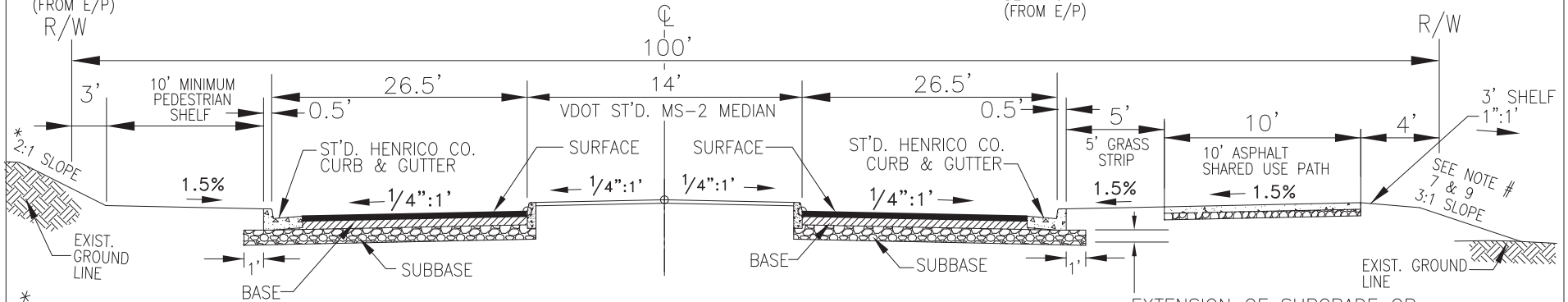
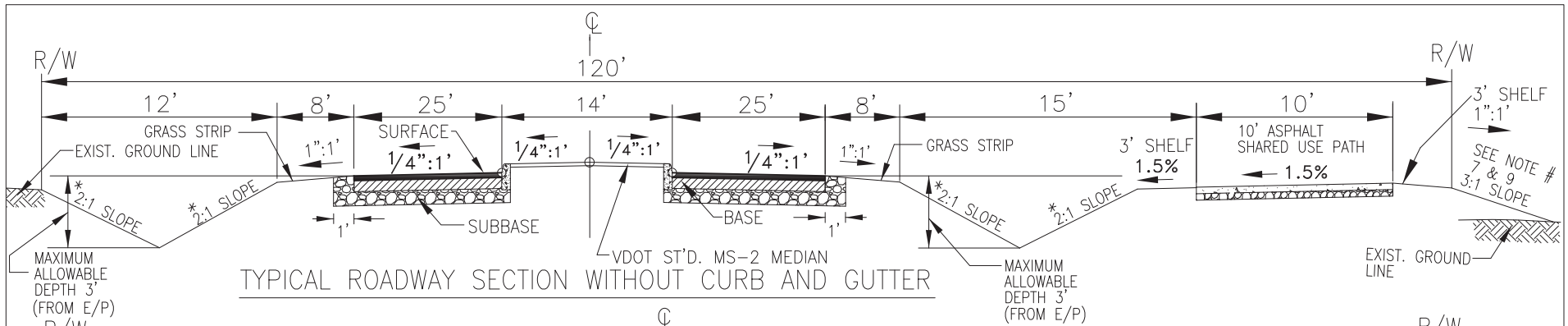
TYPICAL SECTION - CLASSIFICATION VII (14001-30000 VPD)

(BIKE LANE WITHIN PUBLIC RIGHT-OF-WAY)
County of Henrico
Department of Public Works

SEPTEMBER 1, 2021

FHENTYPSEC-CL-7-BL-PUB-RW-rev.DWG





* ALL SLOPES ARE TO BE 2:1 OR FLATTER UNLESS SPECIFICALLY APPROVED BY THE DIRECTOR OF PUBLIC WORKS.

MINIMUM PAVEMENT DESIGN REQUIREMENT		
SUBBASE	BASE	SURFACE
11" AGGREGATE BASE MATERIAL	6" ASPHALT BASE COURSE	2" ASPHALT SURFACE COURSE

1. THE SHOULDER WIDTH (NON CURB AND GUTTER SECTION) OR PEDESTRIAN SHELF (CURB AND GUTTER SECTION) WILL BE REQUIRED TO BE EXTENDED BEYOND THE RIGHT-OF-WAY, WITH A PERMANENT EASEMENT PROVIDED, TO ACCOMMODATE THE INSTALLATION OF GUARDRAIL, WHERE NEEDED.
2. THE PAVEMENT DEPTHS ARE MINIMUM COMPACTED DEPTHS.
3. THE PAVEMENT DESIGN REQUIRED IS BASED ON A MINIMUM CBR VALUE OF 10. INCREASES TO THE DESIGN MAY BE REQUIRED BASED ON SOIL CONDITIONS AT THE TIME OF CONSTRUCTION. FINAL PAVEMENT DESIGNS MUST BE APPROVED BY THE DEPARTMENT OF PUBLIC WORKS.
4. UNDERDRAINS SHALL BE INSTALLED ON ALL ROADWAYS IN ACCORDANCE WITH VDOT SPECIFICATIONS AND THE REQUIREMENTS OF THIS MANUAL.

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6. IF AN IRRIGATION SYSTEM IS PROPOSED WITHIN THE RIGHT-OF-WAY LIMITS, A MAINTENANCE AGREEMENT MUST BE PROVIDED BETWEEN THE DEVELOPER AND THE COUNTY OF HENRICO.
7. A UNIFORM CROSS SECTION SLOPE AND PAVEMENT DESIGN ARE REQUIRED FOR ALL ROADWAYS. SLOPES WHICH EXTEND BEYOND THE RIGHT OF WAY SHALL BE IN PERMANENT EASEMENTS.
8. ALL ROADSIDE DITCHES SHALL BE SEEDED AND HAVE A PERMANENT STAND OF GRASS AS A MINIMUM. WHERE THE 10-YEAR DESIGN VELOCITY EXCEEDS FOUR (4) FEET PER SECOND, JUTE MESH OR OTHER CHANNEL LINING SHALL BE INSTALLED. IF THE 10-YEAR DESIGN VELOCITY EXCEEDS SEVEN (7) FEET PER SECOND, THE ROADSIDE DITCH SHALL BE LINED WITH EITHER RIPRAP OR CONCRETE. ALTERNATE CHANNEL LININGS MAY BE ACCEPTABLE BASED UPON SOIL SAMPLES AND CERTIFIED DESIGN BY A LICENSED PROFESSIONAL ENGINEER UPON APPROVAL BY THE COUNTY ENGINEER.
9. FOR SLOPE HEIGHTS GREATER THAN 6' OR STEEPER THAN 3:1 AN APPROVED SAFETY RAIL MAY BE REQUIRED.
10. SOLID CONCRETE MEDIAN, ST'D. MS-1 REQUIRED WHERE THE MEDIAN WIDTH IS 6'-0" OR LESS.

TYPICAL SECTION - CLASSIFICATION VII (14001-30000 VPD)

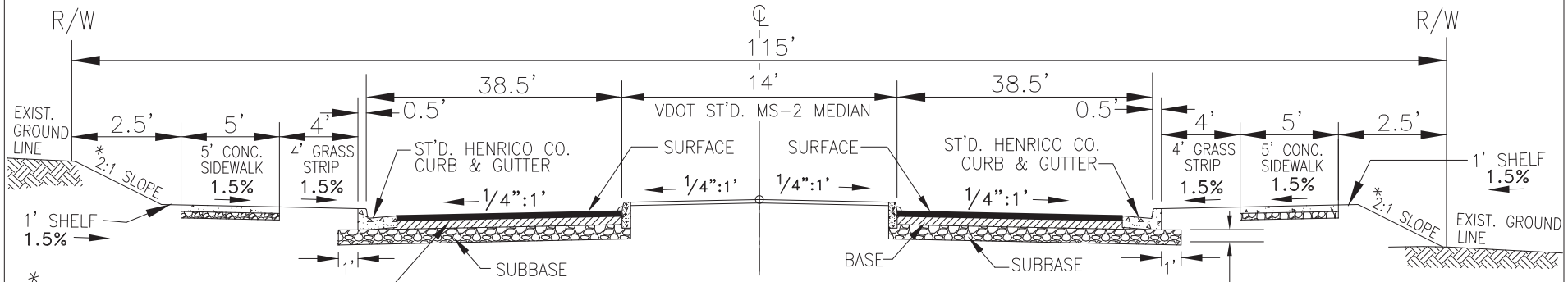
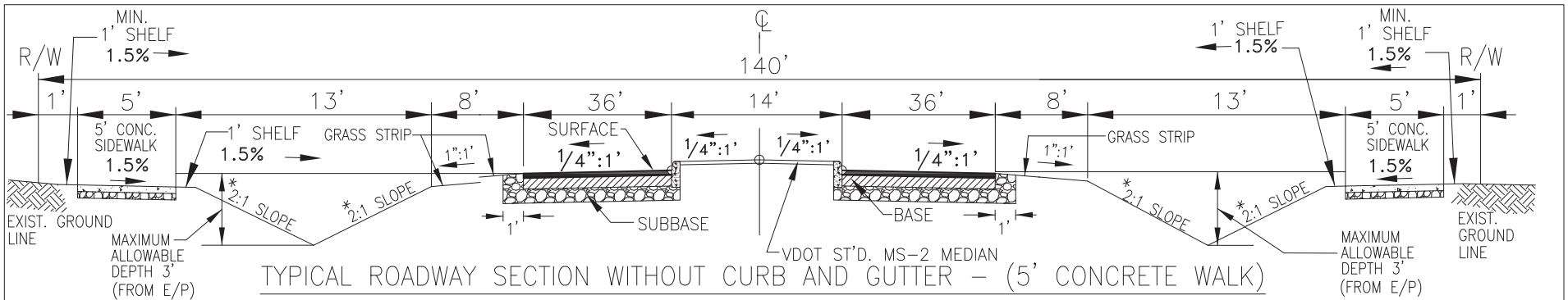
(10' SHARED USE PATH IN PUBLIC RIGHT-OF-WAY)

County of Henrico
Department of Public Works

SEPTEMBER 1, 2021

FHENTYPSEC-CL-7-10SU-PUB-RW-rev.DWG





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EXTENSION OF SUBGRADE OR 4" MIN., WHICHEVER IS GREATER

MINIMUM PAVEMENT DESIGN REQUIREMENT		
SUBBASE	BASE	SURFACE
SPECIAL DESIGN	***SPECIAL DESIGN***	***SPECIAL DESIGN***

1. THE SHOULDER WIDTH (NON CURB AND GUTTER SECTION) OR PEDESTRIAN SHELF (CURB AND GUTTER SECTION) WILL BE REQUIRED TO BE EXTENDED BEYOND THE RIGHT-OF-WAY, WITH A PERMANENT EASEMENT PROVIDED, TO ACCOMMODATE THE INSTALLATION OF GUARDRAIL, WHERE NEEDED.
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6. IF AN IRRIGATION SYSTEM IS PROPOSED WITHIN THE RIGHT-OF-WAY LIMITS, A MAINTENANCE AGREEMENT MUST BE PROVIDED BETWEEN THE DEVELOPER AND THE COUNTY OF HENRICO.
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9. SOLID CONCRETE MEDIAN, ST'D. MS-1 REQUIRED WHERE THE MEDIAN WIDTH IS 6'-0" OR LESS.

TYPICAL SECTION - CLASSIFICATION VIII (30001 + VPD)

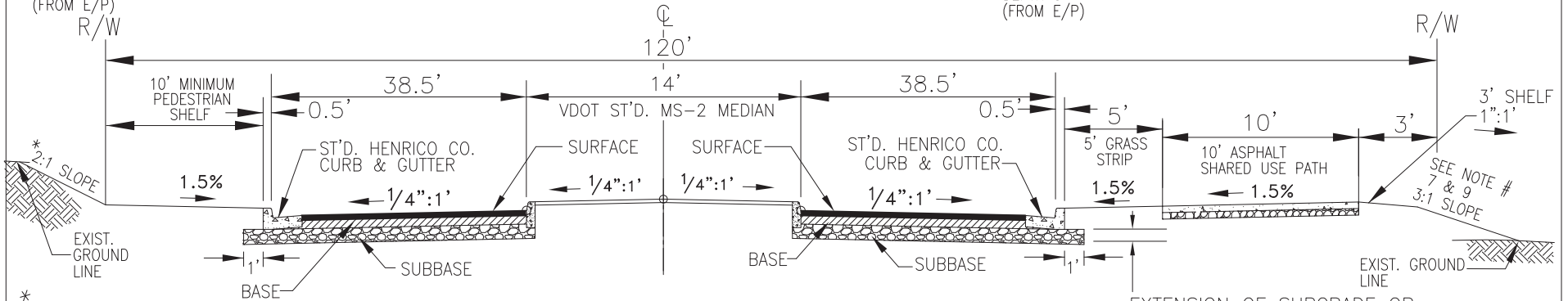
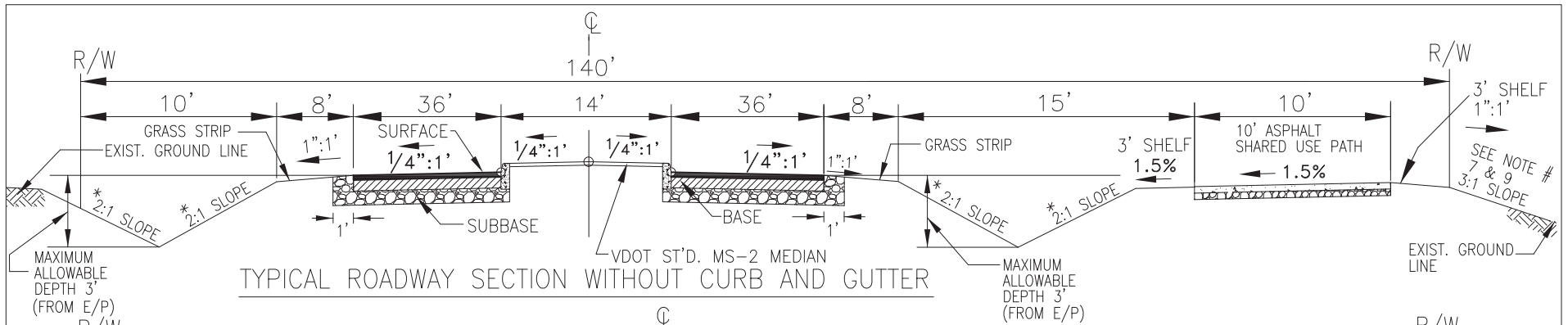
(5' CONCRETE WALK WITHIN PUBLIC RIGHT-OF-WAY)

County of Henrico
Department of Public Works

SEPTEMBER 1, 2021

FHENTYPSEC-CL-8-5SW-PUB-RW-rev.DWG





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MINIMUM PAVEMENT DESIGN REQUIREMENT		
SUBBASE	BASE	SURFACE
SPECIAL DESIGN	***SPECIAL DESIGN***	***SPECIAL DESIGN***

1. THE SHOULDER WIDTH (NON CURB AND GUTTER SECTION) OR PEDESTRIAN SHELF (CURB AND GUTTER SECTION) WILL BE REQUIRED TO BE EXTENDED BEYOND THE RIGHT-OF-WAY, WITH A PERMANENT EASEMENT PROVIDED, TO ACCOMMODATE THE INSTALLATION OF GUARDRAIL, WHERE NEEDED.
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9. FOR SLOPE HEIGHTS GREATER THAN 6' OR STEEPER THAN 3:1 AN APPROVED SAFETY RAIL MAY BE REQUIRED.
10. SOLID CONCRETE MEDIAN, ST'D. MS-1 REQUIRED WHERE THE MEDIAN WIDTH IS 6'-0" OR LESS.

TYPICAL SECTION - CLASSIFICATION VIII (30001 + VPD)

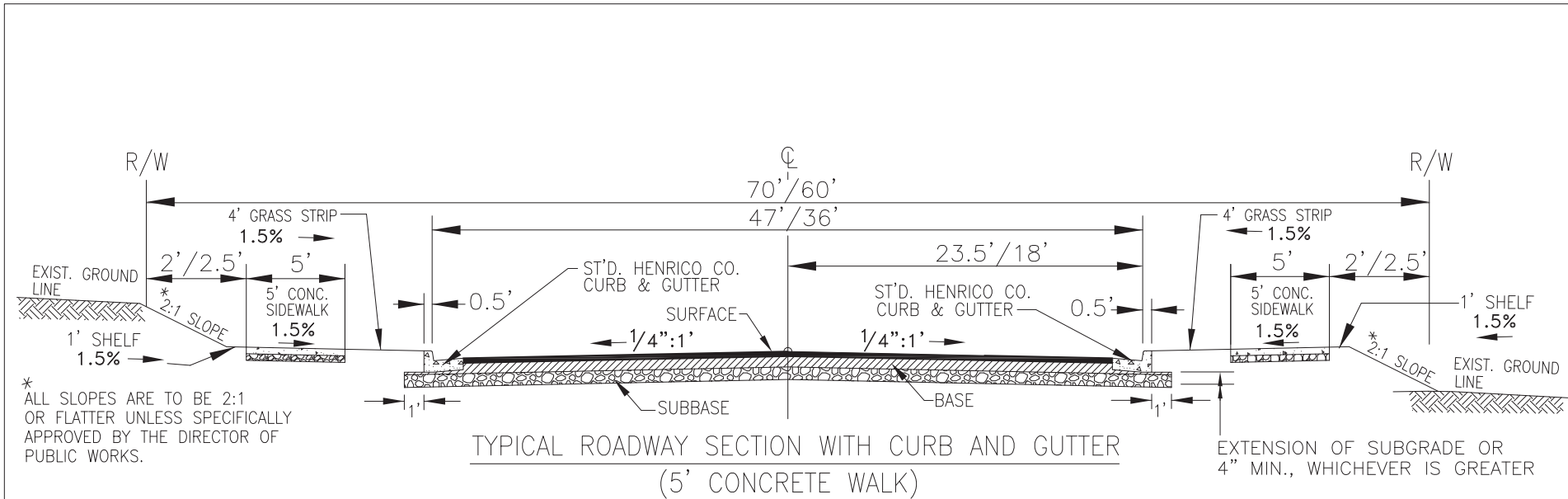
(10' SHARED USE PATH IN PUBLIC RIGHT-OF-WAY)

County of Henrico
Department of Public Works

SEPTEMBER 1, 2021

FHENTYPSEC-CL-8-10SU-PUB-RW-rev.DWG





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EXTENSION OF SUBGRADE OR 4" MIN., WHICHEVER IS GREATER

MINIMUM PAVEMENT DESIGN REQUIREMENT		
SUBBASE	BASE	SURFACE
SPECIAL DESIGN	***SPECIAL DESIGN***	***SPECIAL DESIGN***

1. THE SHOULDER WIDTH (NON CURB AND GUTTER SECTION) OR PEDESTRIAN SHELF (CURB AND GUTTER SECTION) WILL BE REQUIRED TO BE EXTENDED BEYOND THE RIGHT-OF-WAY, WITH A PERMANENT EASEMENT PROVIDED, TO ACCOMMODATE THE INSTALLATION OF GUARDRAIL, WHERE NEEDED.
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9. A RIGHT-OF-WAY OF 70' SHALL BE USED ON THROUGH STREETS, CONNECTORS TO ARTERIALS OR ROADS PROVIDING DIRECT PUBLIC ACCESS. A 60' RIGHT-OF-WAY MAYBE USED ON CUL-DE-SACS, NON-THROUGH ROADS OR INTERNAL CONNECTOR ROADWAYS.



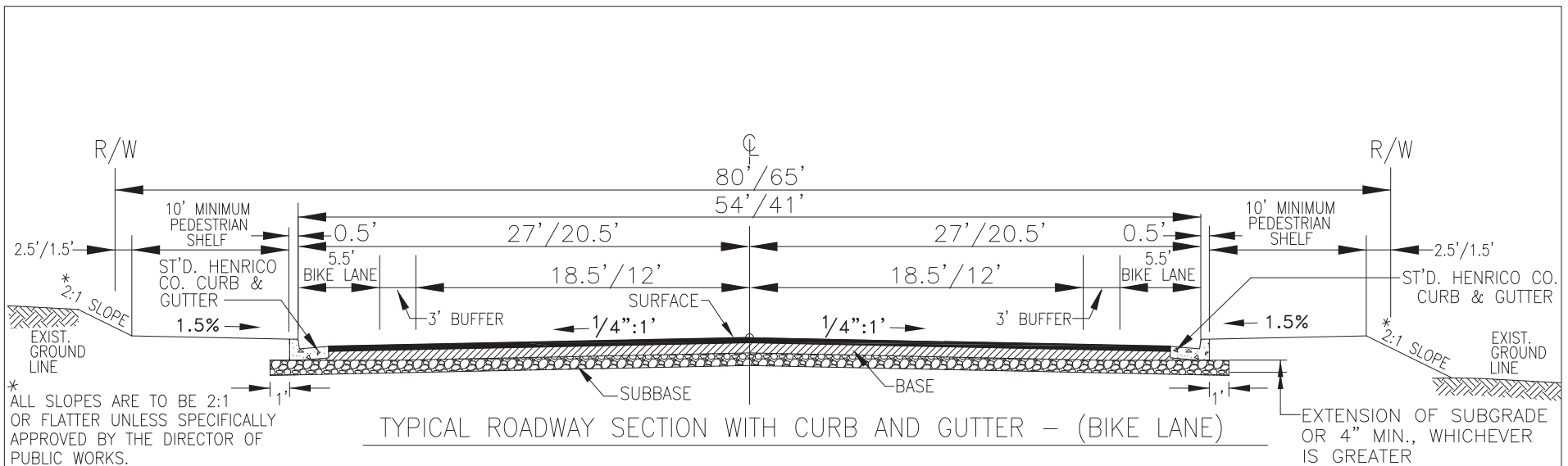
TYPICAL SECTION COMMERCIAL/INDUSTRIAL DEVELOPMENT

(5' CONCRETE WALK WITHIN PUBLIC RIGHT-OF-WAY)

County of Henrico
Department of Public Works

SEPTEMBER 1, 2021

FHENTYPSEC-CL-10-5SW-PUB-RW.DWG



MINIMUM PAVEMENT DESIGN REQUIREMENT		
SUBBASE	BASE	SURFACE
SPECIAL DESIGN	***SPECIAL DESIGN***	***SPECIAL DESIGN***

1. THE SHOULDER WIDTH (NON CURB AND GUTTER SECTION) OR PEDESTRIAN SHELF (CURB AND GUTTER SECTION) WILL BE REQUIRED TO BE EXTENDED BEYOND THE RIGHT-OF-WAY, WITH A PERMANENT EASEMENT PROVIDED, TO ACCOMMODATE THE INSTALLATION OF GUARDRAIL, WHERE NEEDED.
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9. A RIGHT-OF-WAY OF 80' SHALL BE USED ON THROUGH STREETS, CONNECTORS TO ARTERIALS OR ROADS PROVIDING DIRECT PUBLIC ACCESS. A 70' RIGHT-OF-WAY MAYBE USED ON CUL-DE-SACS, NON-THROUGH ROADS OR INTERNAL CONNECTOR ROADWAYS.

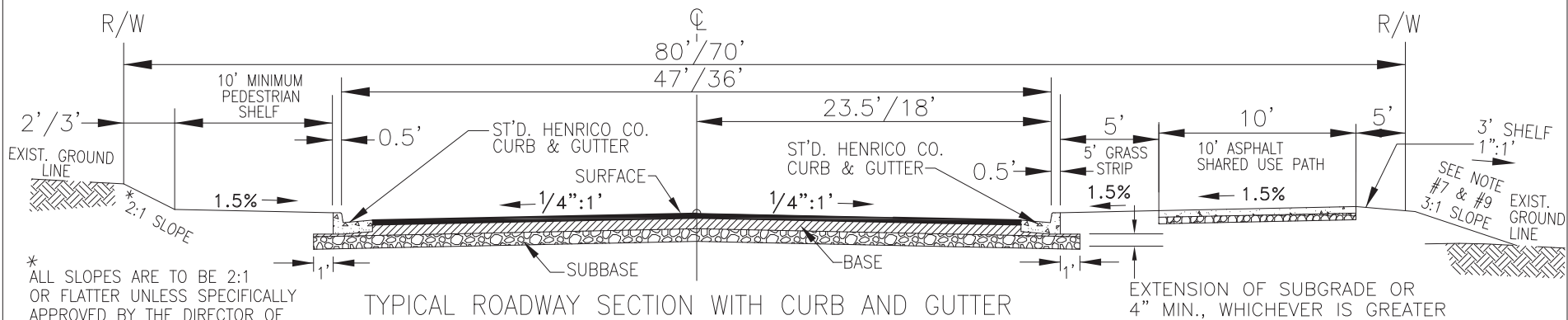


TYPICAL SECTION COMMERCIAL/INDUSTRIAL DEVELOPMENT

(BIKE LANE WITHIN PUBLIC RIGHT-OF-WAY)
County of Henrico
Department of Public Works

SEPTEMBER 1, 2021

FHENTYPSEC-CL-10-BL-PUB-RW.DWG



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MINIMUM PAVEMENT DESIGN REQUIREMENT		
SUBBASE	BASE	SURFACE
SPECIAL DESIGN	***SPECIAL DESIGN***	***SPECIAL DESIGN***

1. THE SHOULDER WIDTH (NON CURB AND GUTTER SECTION) OR PEDESTRIAN SHELF (CURB AND GUTTER SECTION) WILL BE REQUIRED TO BE EXTENDED BEYOND THE RIGHT-OF-WAY, WITH A PERMANENT EASEMENT PROVIDED, TO ACCOMMODATE THE INSTALLATION OF GUARDRAIL OR HANDRAIL, WHERE NEEDED.
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9. FOR SLOPE HEIGHTS GREATER THAN 6' OR STEEPER THAN 3:1 AN APPROVED SAFETY RAIL MAY BE REQUIRED.
10. A RIGHT-OF-WAY OF EIGHTY FEET SHALL BE USED ON THROUGH STREETS, CONNECTORS TO ARTERIALS OR ROADS PROVIDING DIRECT PUBLIC ACCESS. A SEVENTY FOOT RIGHT-OF-WAY MAYBE USED ON CUL-DE-SACS, NON-THROUGH ROADS OR INTERNAL CONNECTOR ROADWAYS.



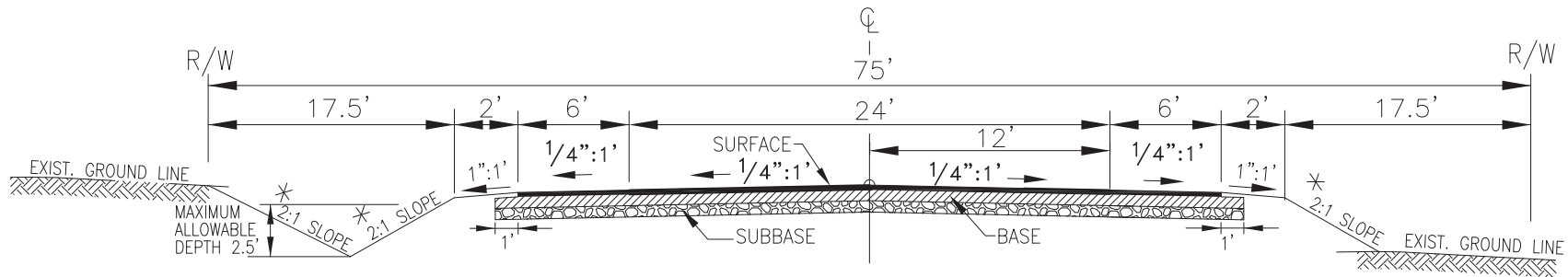
TYPICAL SECTION COMMERCIAL/INDUSTRIAL DEVELOPMENT

(10' SHARED USE ASPHALT PATH IN PUBLIC RIGHT-OF-WAY)

County of Henrico
Department of Public Works

SEPTEMBER 1, 2021

FHENTYPSEC-CL-10-10SU-PUB-RW.DWG



TYPICAL RURAL 2-LANE ROADWAY SECTION WITHOUT CURB AND GUTTER

MINIMUM PAVEMENT DESIGN REQUIREMENT		
SUBBASE	BASE	SURFACE
9" AGGREGATE BASE MATERIAL	5" ASPHALT BASE COURSE	2" ASPHALT SURFACE COURSE

1. THE SHOULDER WIDTH (NON CURB AND GUTTER SECTION) WILL BE REQUIRED TO BE EXTENDED BEYOND THE RIGHT-OF-WAY, WITH A PERMANENT EASEMENT PROVIDED, TO ACCOMMODATE THE INSTALLATION OF GUARDRAIL, WHERE NEEDED.
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3. THE PAVEMENT DESIGN REQUIRED IS BASED ON A MINIMUM CBR VALUE OF 10. INCREASES TO THE DESIGN MAY BE REQUIRED BASED ON SOIL CONDITIONS AT THE TIME OF CONSTRUCTION. FINAL PAVEMENT DESIGNS MUST BE APPROVED BY THE DEPARTMENT OF PUBLIC WORKS.
4. UNDERDRAINS SHALL BE INSTALLED ON ALL ROADWAYS IN ACCORDANCE WITH VDOT SPECIFICATIONS AND THE REQUIREMENTS OF THIS MANUAL.
5. MATERIALS AND CONSTRUCTION SHALL BE IN ACCORDANCE WITH THE LATEST EDITION OF THE VDOT ROAD AND BRIDGE SPECIFICATIONS AND STANDARDS, EXCEPT WHERE COUNTY STANDARDS ARE APPLICABLE.
6. CENTERLINE AND EDGE LINE RUMBLE STRIPS ARE REQUIRED.
7. IF AN IRRIGATION SYSTEM IS PROPOSED WITHIN THE RIGHT-OF-WAY LIMITS, A MAINTENANCE AGREEMENT MUST BE PROVIDED BETWEEN THE DEVELOPER AND THE COUNTY OF HENRICO.
8. A UNIFORM CROSS SECTION SLOPE AND PAVEMENT DESIGN ARE REQUIRED FOR ALL ROADWAYS. SLOPES WHICH EXTEND BEYOND THE RIGHT OF WAY SHALL BE IN PERMANENT EASEMENTS.
9. ALL ROADSIDE DITCHES SHALL BE SEEDED AND HAVE A PERMANENT STAND OF GRASS AS A MINIMUM. WHERE THE 10-YEAR DESIGN VELOCITY EXCEEDS FOUR (4) FEET PER SECOND, JUTE MESH OR OTHER CHANNEL LINING SHALL BE INSTALLED. IF THE 10-YEAR DESIGN VELOCITY EXCEEDS SEVEN (7) FEET PER SECOND, THE ROADSIDE DITCH SHALL BE LINED WITH EITHER RIPRAP OR CONCRETE. ALTERNATE CHANNEL LININGS MAY BE ACCEPTABLE BASED UPON SOIL SAMPLES AND CERTIFIED DESIGN BY A LICENSED PROFESSIONAL ENGINEER UPON APPROVAL BY THE COUNTY ENGINEER.
10. IF TRAFFIC VOLUME EXCEEDS 14000 VPD, THEN 4-LANES ARE REQUIRED.
11. FOR MINIMUM PAVEMENT DESIGN REQUIREMENTS FOR TYPICAL SECTION CLASSIFICATIONS I-IV REFER SHEET B3 IN APPENDIX B.



TYPICAL SECTION - RURAL 2-LANE (5001-14000 VPD)

SEPTEMBER 1, 2021

County of Henrico
Department of Public Works

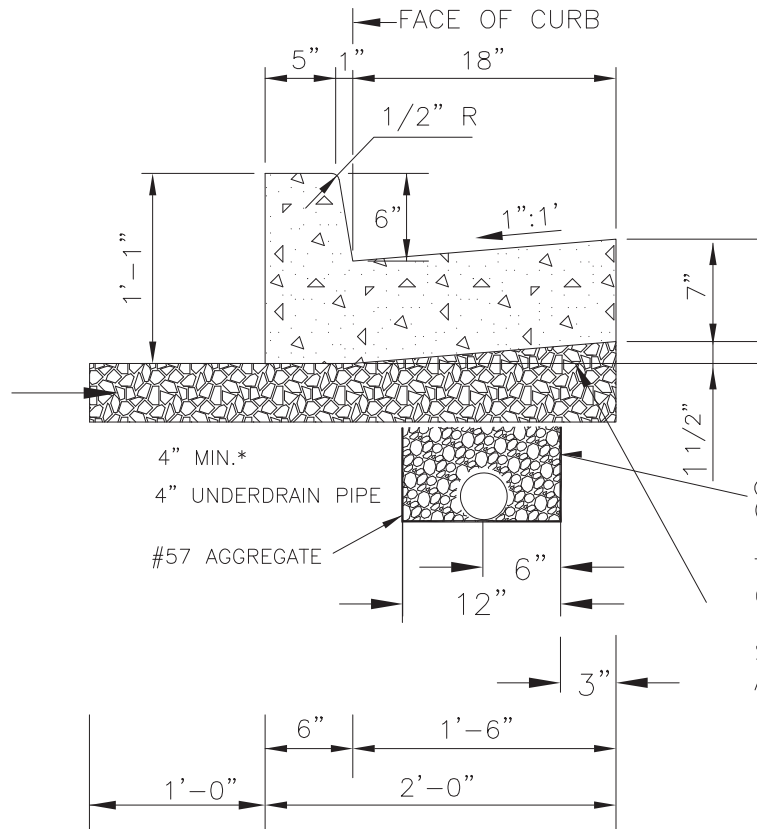
FHENTYPSEC-RURAL-2-LANE.DWG

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4" #21B STONE (MIN)
DEPTH TO MATCH
SUBGRADE



GEOTEXTILE DRAINAGE FABRIC
(OVERLAP 1'-0" @ TOP)

THE BOTTOM OF THE CURB AND
GUTTER MAY BE CONSTRUCTED
PARALLEL TO THE SLOPE OF
SUBSURFACE COURSES PROVIDED
A MINIMUM DEPTH OF 7" IS
MAINTAINED.

NOTES:

1. #21-B STONE SHALL BE COMPACTED IN ACCORDANCE WITH DPW DESIGN MANUAL SECTION 2.48.
2. CONCRETE SHALL BE CLASS A-3
- * MAINTAIN 4" MIN #57 STONE ABOVE TOP OF UNDERDRAIN PIPE

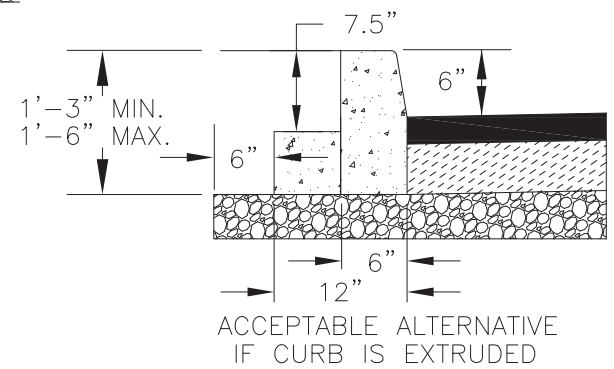
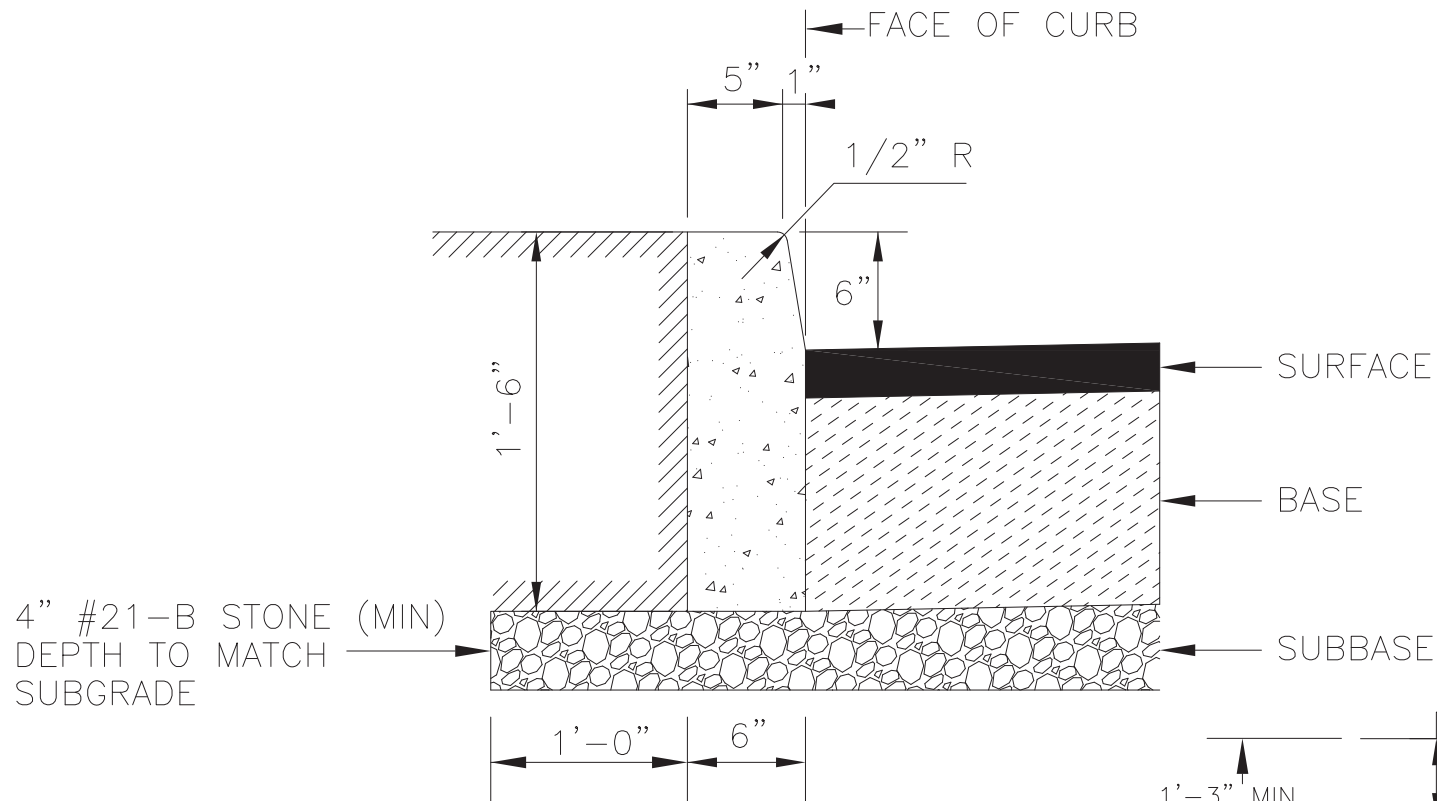


CURB AND GUTTER

County of Henrico
Department of Public Works

SEPTEMBER 1, 2021

C-3.DWG



NOTES:

1. #21-B STONE SHALL BE COMPACTED IN ACCORDANCE WITH DPW DESIGN MANUAL SECTION 2.48.
2. CONCRETE SHALL BE CLASS A-3

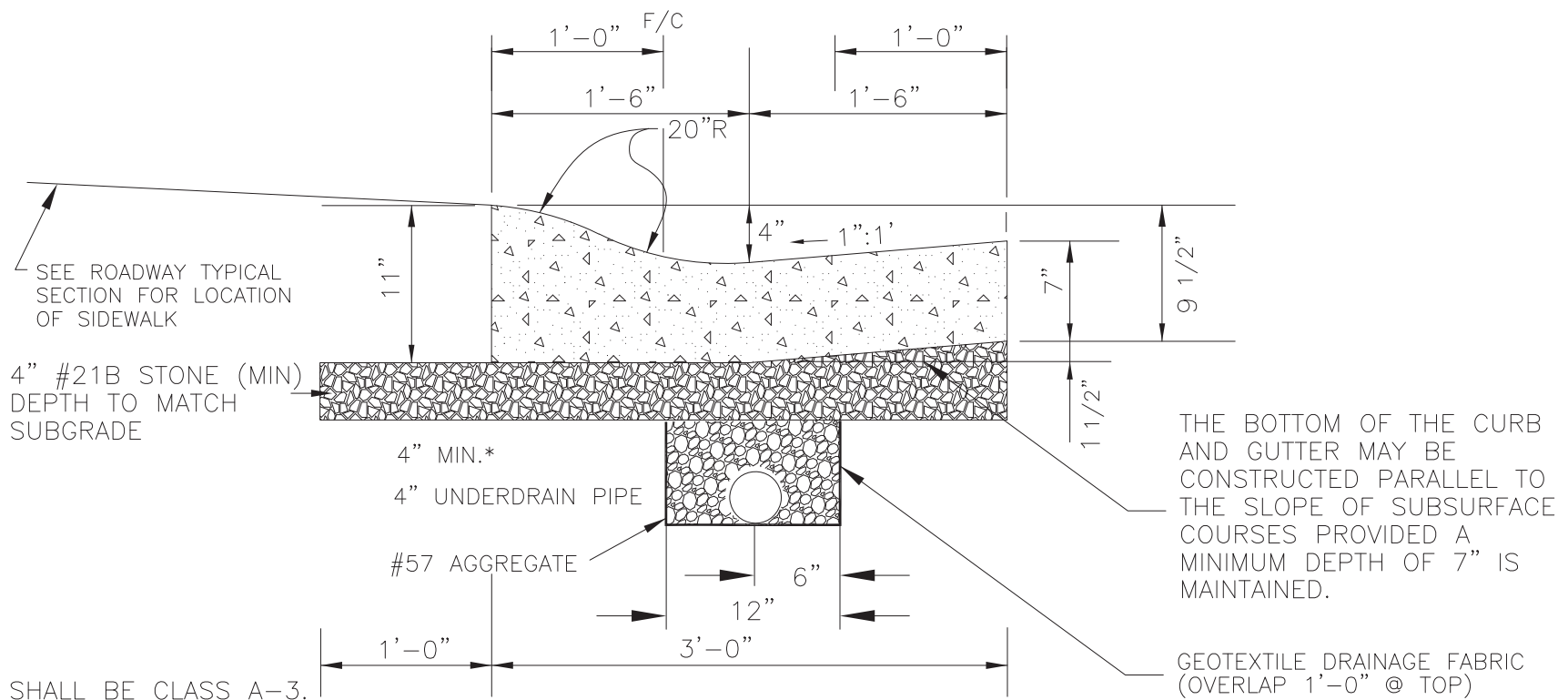


INDEPENDENT CURB

County of Henrico
Department of Public Works

SEPTEMBER 1, 2021

C-4.DWG



NOTES:

1. CONCRETE SHALL BE CLASS A-3.
2. APRONS ARE NOT REQUIRED AT DRIVEWAYS WITH ROLL FACE CURB AND GUTTER UNLESS A CURB CUT DETAIL IS USED.
3. TYPE 'B' NOSE IS REQUIRED ON ALL INLETS INSTALLED WITH ROLL FACE CURB AND GUTTER. FOR CURB AND GUTTER TRANSITIONS SEE ROLL FACE CURB TRANSITIONS IN APPENDIX 'C' OF THIS MANUAL.
4. #21-B STONE SHALL BE COMPACTED IN ACCORDANCE WITH DPW DESIGN MANUAL SECTION 2.48.
5. CONCRETE SIDEWALK SHALL EXTEND ACROSS DRIVEWAY. SIDEWALK CROSS SLOPE (2%) MUST BE MAINTAINED. DRIVEWAY RUNNING GRADE TO BEGIN AT BACK SIDE OF SIDEWALK.

* MAINTAIN 4" MIN #57 STONE ABOVE TOP OF UNDERDRAIN PIPE

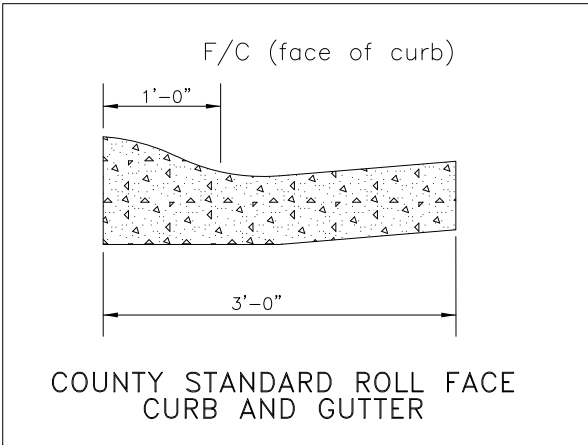
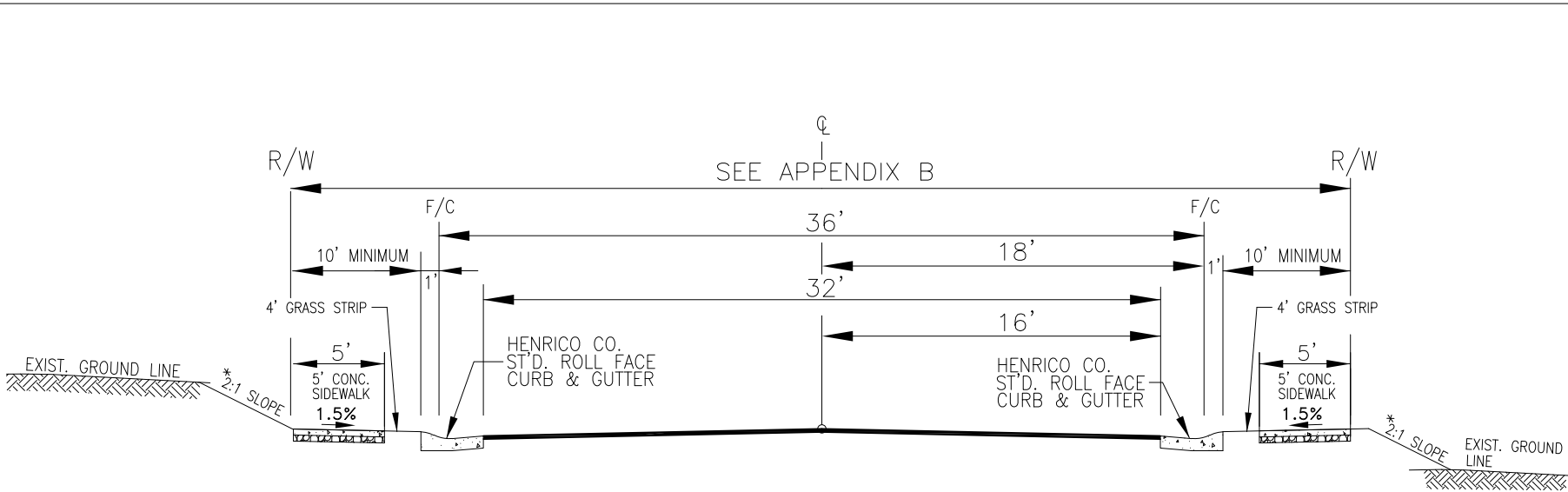
ROLL FACE CURB AND GUTTER

County of Henrico
Department of Public Works

SEPTEMBER 1, 2021

C-5.DWG





NOTES:

1. FOR ADDITIONAL DETAILS ON ROLL FACE CURB AND GUTTER SEE DETAIL SHEET FOR ROLL FACE CURB AND GUTTER IN APPENDIX 'C' OF THIS MANUAL.
2. FOR ADDITIONAL DETAILS ON TYPICAL SECTIONS SEE APPENDIX 'B' OF THIS MANUAL.
3. INSTALLATION OF INLETS WITH ROLL FACE CURB AND GUTTER MUST UTILIZE A TYPE 'B' NOSE. FOR CURB AND GUTTER TRANSITIONS AT INLETS, SEE ROLL FACE CURB TRANSITION DETAIL IN APPENDIX 'C' OF THIS MANUAL.
4. ROLL FACE CURB AND GUTTER PERMITTED UP TO AND INCLUDING CLASS IV ROADS.

PAVEMENT DIMENSIONS FOR ROLL FACE CURB AND GUTTER

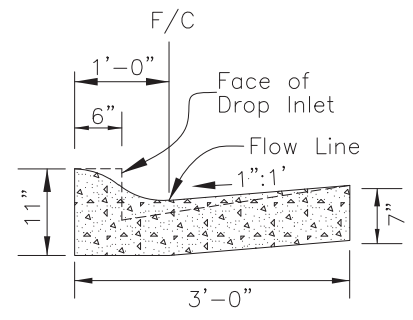
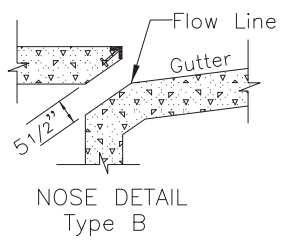
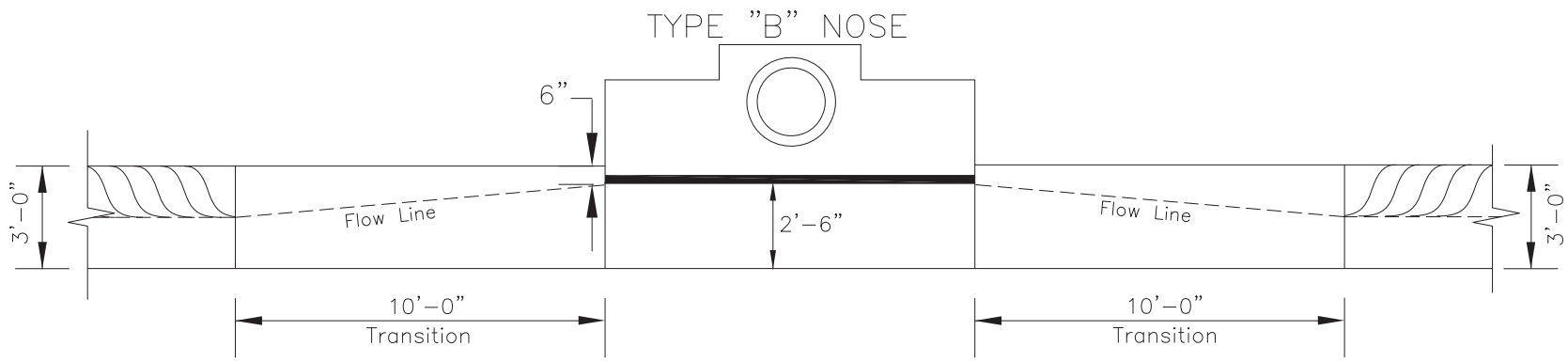
County of Henrico
Department of Public Works

REV. JANUARY 31, 2022

SEPTEMBER 1, 2021

C-6.DWG





ROLL FACE CURB TRANSITIONS

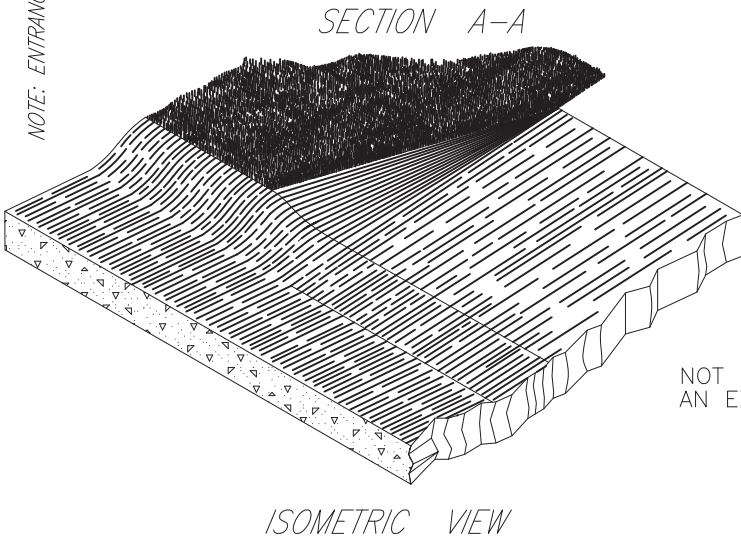
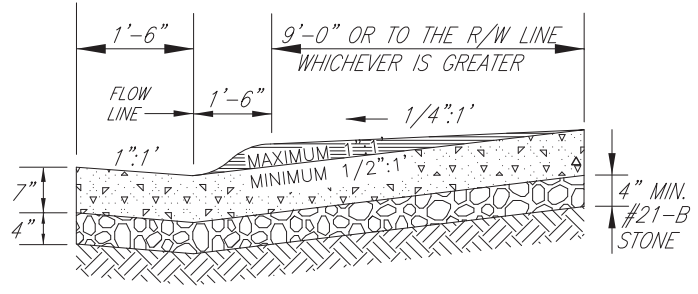
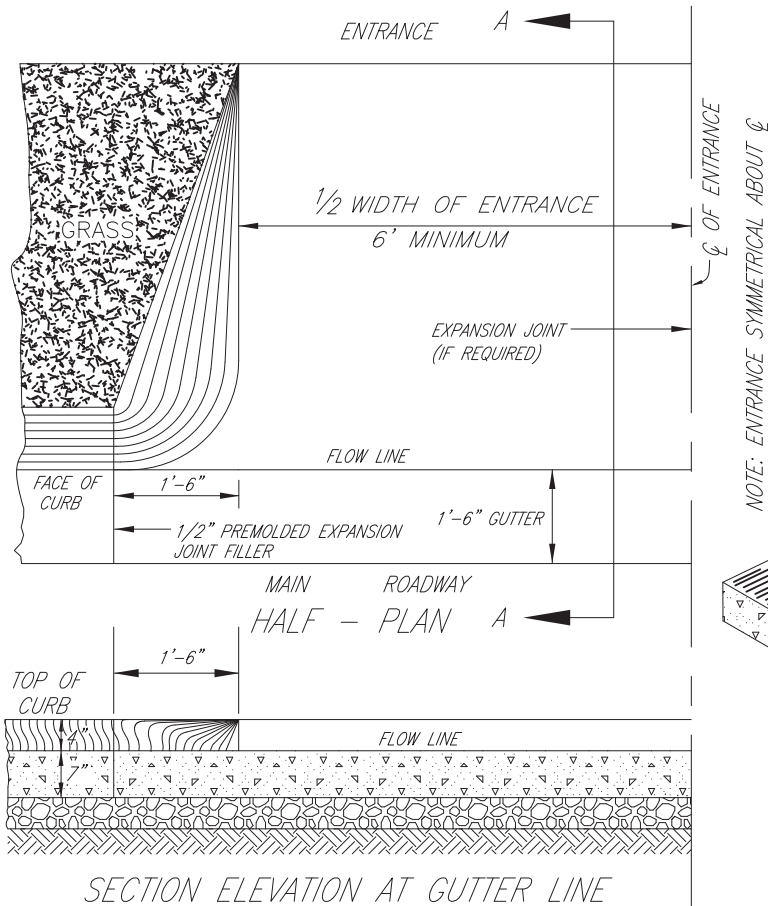
County of Henrico
Department of Public Works

SEPTEMBER 1, 2021

C-7.DWG

C-7





NOTE: ENTRANCE SYMMETRICAL ABOUT ϕ

NOT FOR USE IF THERE IS AN EXISTING SIDEWALK

CONCRETE APRONS ARE REQUIRED IF ANY OF THE FOLLOWING ARE PRESENT

1. THERE IS A CURB INLET WITHIN 25' OF THE ENTRANCE.
2. THE LOT ADJACENT TO THE DRIVEWAY IS LOWER THAN THE CURB.
3. IN A SAG OF A VERTICAL CURVE

NOTES:

1. MODIFICATIONS TO THIS DETAIL MAY BE REQUIRED FOR SIDEWALKS AND MOBILITY IMPAIRMENT REQUIREMENTS.
2. #21-B STONE SHALL BE COMPACTED IN ACCORDANCE WITH DPW DESIGN MANUAL SECTION 2.48.
3. CONCRETE SHALL BE CLASS A-3.

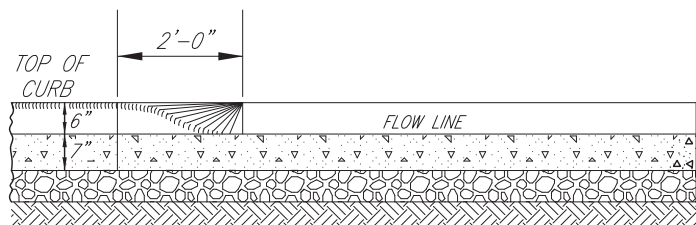
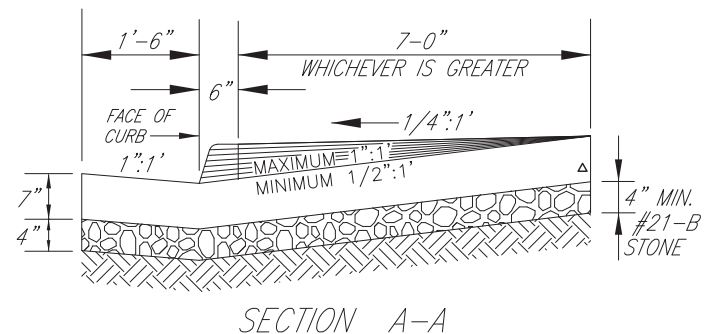
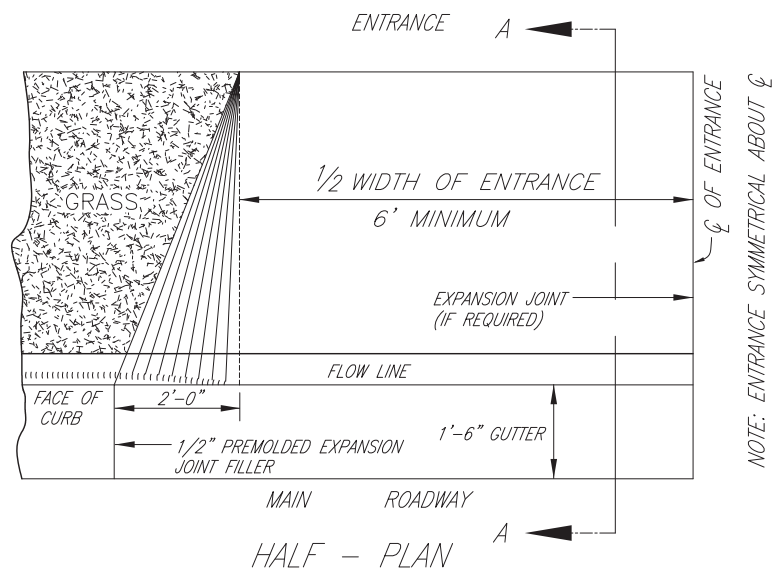
STANDARD ENTRANCE APRON (FOR ROLL FACE CURB & GUTTER)

County of Henrico
Department of Public Works

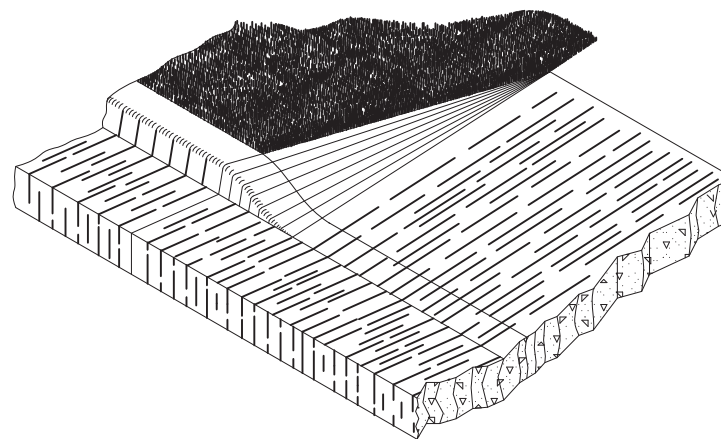
SEPTEMBER 1, 2021

C-8.DWG





SECTION ELEVATION AT GUTTER LINE



NOTES:

1. MODIFICATIONS TO THIS DETAIL MAY BE REQUIRED FOR SIDEWALKS AND MOBILITY IMPAIRMENT REQUIREMENTS.
2. #21-B STONE SHALL BE COMACTED IN ACCORDANCE WITH DPW DESIGN MANUAL SECTION 2.48.
3. CONCRETE SHALL BE CLASS A-3.

CONCRETE APRONS ARE REQUIRED IF:

1. THERE IS A CURB INLET WITHIN 25' OF THE ENTRANCE.
2. THE LOT ADJACENT TO THE DRIVEWAY IS LOWER THAN THE CURB.
3. IN A SAG OF A VERTICAL CURVE

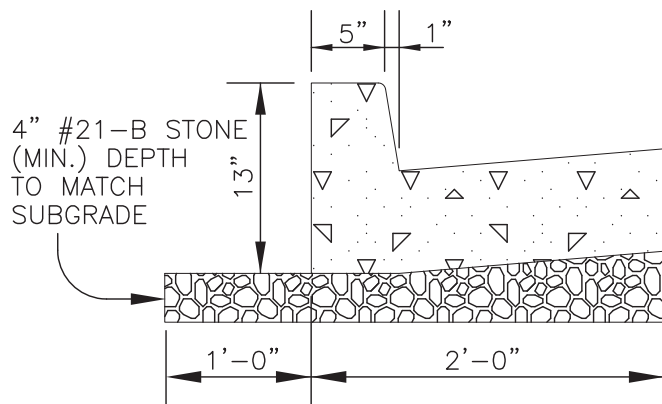


STANDARD ENTRANCE APRON (FOR RESIDENTIAL USE ONLY)

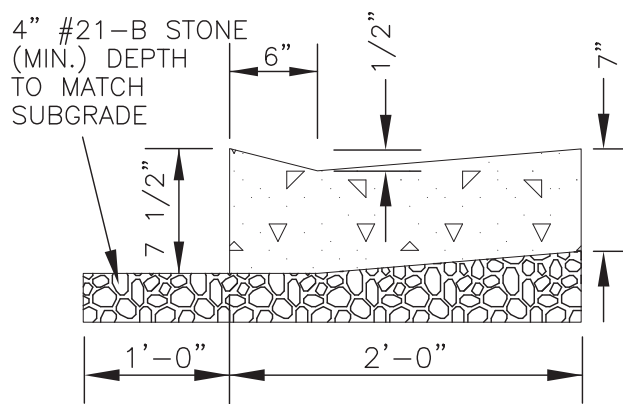
County of Henrico
Department of Public Works

SEPTEMBER 1, 2021

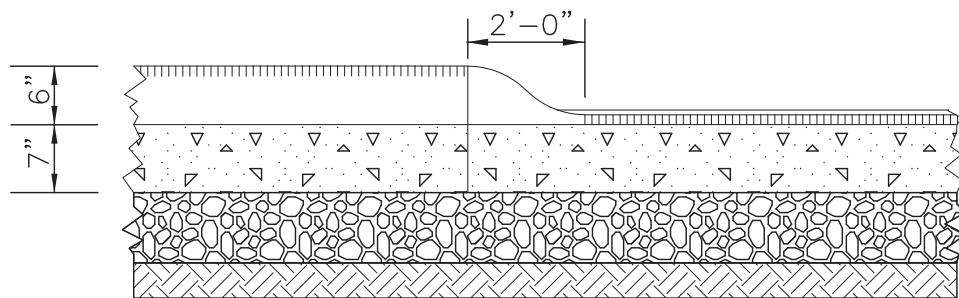
C-9.DWG



SECTION A-A



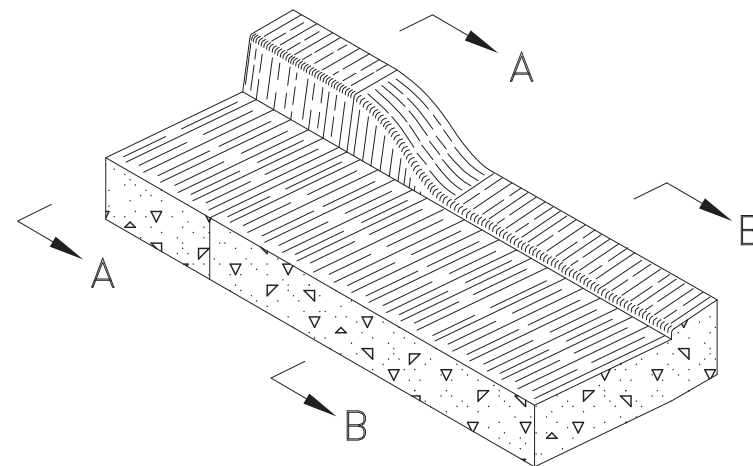
SECTION B-B



SECTION ELEVATION @ GUTTER LINE

CONCRETE APRONS ARE REQUIRED IF ANY OF THE FOLLOWING ARE PRESENT

1. THERE IS A CURB INLET WITHIN 25' OF THE ENTRANCE.
2. THE LOT ADJACENT TO THE DRIVEWAY IS LOWER THAN THE CURB.
3. SEE APRON STANDARD



ISOMETRIC VIEW

NOTES:

1. #21-B STONE SHALL BE COMPACTED IN ACCORDANCE WITH DPW DESIGN MANUAL SECTION 2.48
2. WHEN A CURB CUT IS INSTALLED IN EXISTING CURB & GUTTER, THE EXISTING CURB & GUTTER SHALL BE COMPLETELY REMOVED (INCLUDING THE GUTTER PAN) BETWEEN EXISTING JOINTS AND A COMPLETE CURB CUT SECTION INSTALLED. IN LIEU OF REMOVING THE EXISTING CURB & GUTTER BETWEEN JOINTS, THE EXISTING CURB & GUTTER MAY BE SAWCUT PROVIDED THAT THE REMAINING SECTIONS ARE 5' OR GREATER IN LENGTH.

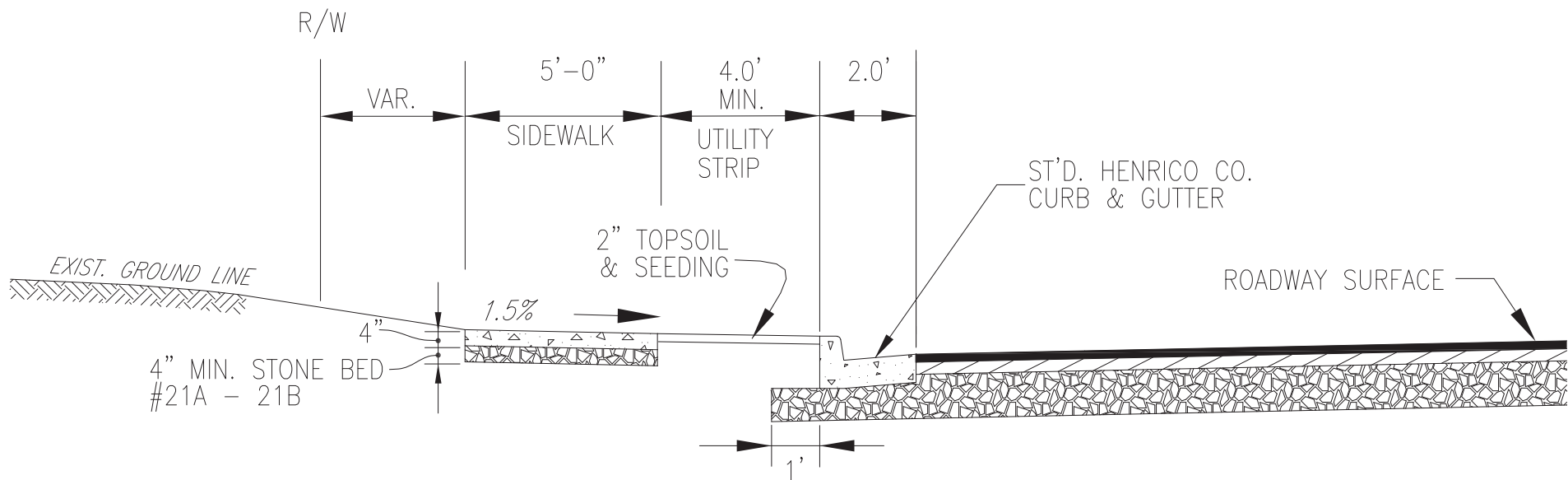


RESIDENTIAL CURB CUT FOR DRIVEWAYS

County of Henrico
Department of Public Works

SEPTEMBER 1, 2021

C-10.DWG



NOTES:

DEPTH OF CONCRETE SIDEWALK SHALL BE 7" AT ALL LOCATIONS SUSCEPTIBLE TO VEHICULAR TRAFFIC.

CONCRETE SHALL BE CLASS A-3.

SEE VDOT ST'D CG-12B FOR SIDEWALK TREATMENT ADJACENT TO COMMERCIAL ENTRANCES AND INTERSECTIONS.

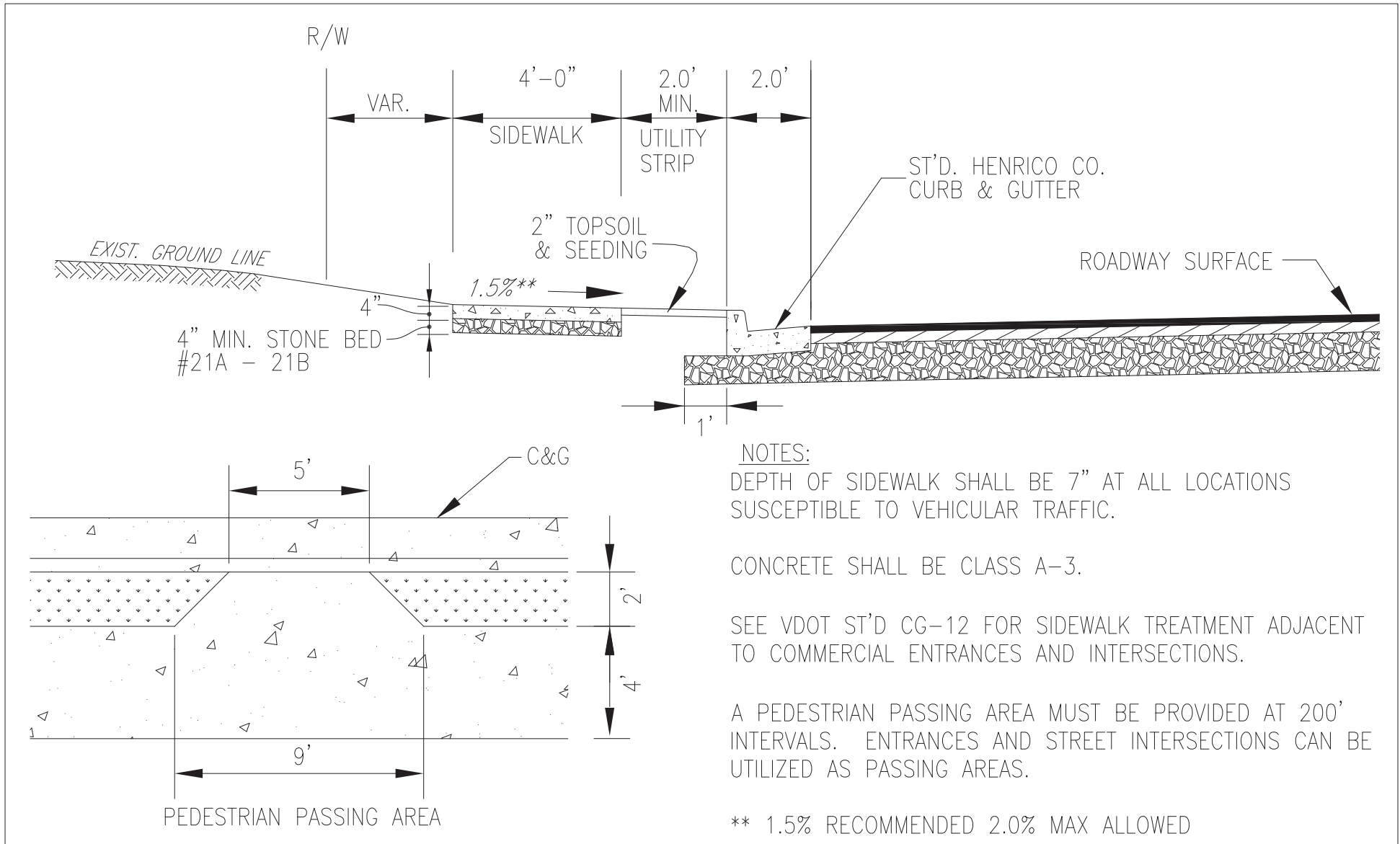


SIDEWALK DETAIL

County of Henrico
Department of Public Works

SEPTEMBER 1, 2021

C-11.DWG

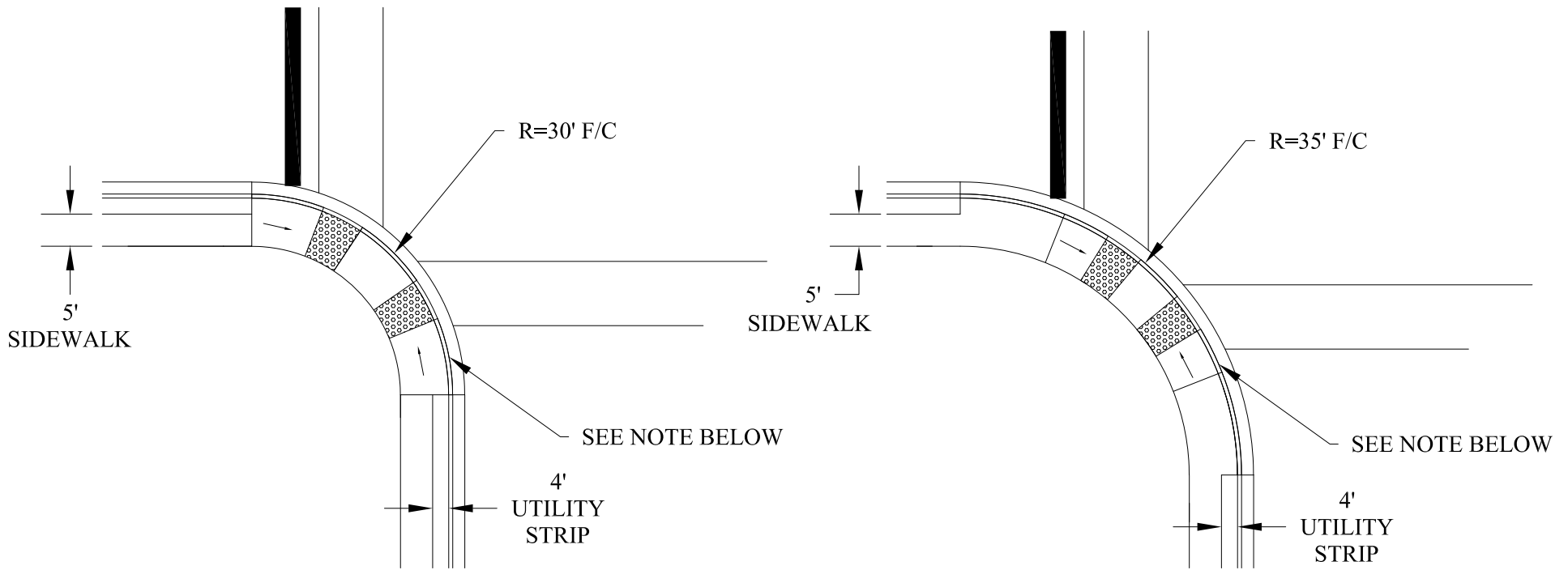


SIDEWALK DETAIL
 FOR RETROFIT APPLICATIONS ONLY
 County of Henrico
 Department of Public Works

SEPTEMBER 1, 2021

C-12.DWG





NOTE: A COMBINATION CURB CUT AND CURB RAMP SHALL BE PROVIDED AT ALL INTERSECTIONS. SEE VDOT STANDARD CG-12B FOR DETAILS. R.O.W. IS NOT SHOWN FOR CLARITY.



COMBINATION CURB CUT AND RAMP

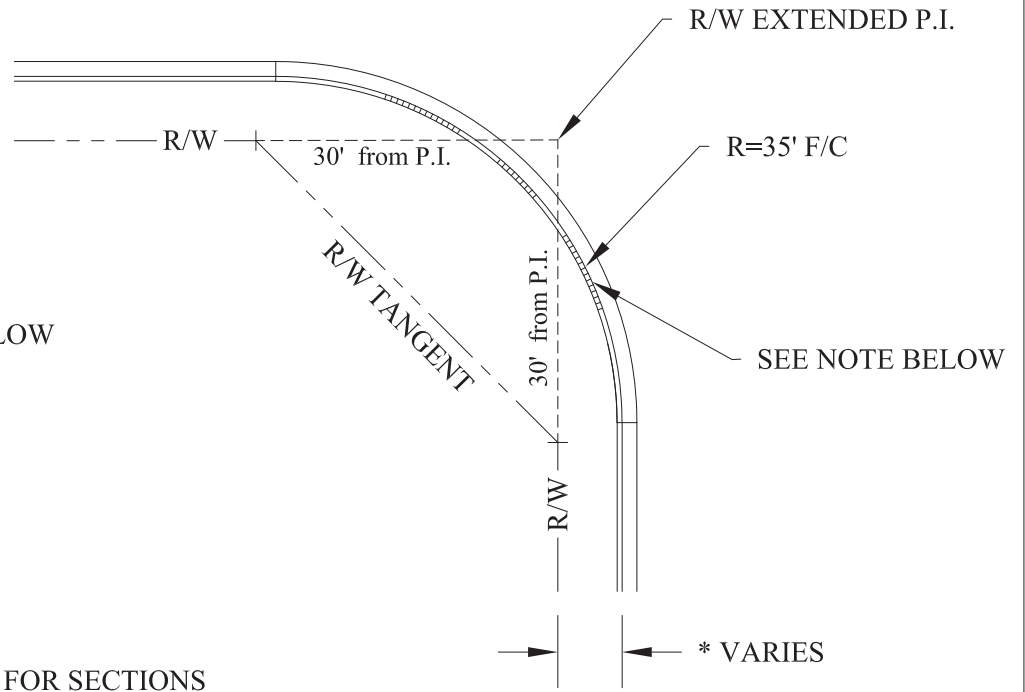
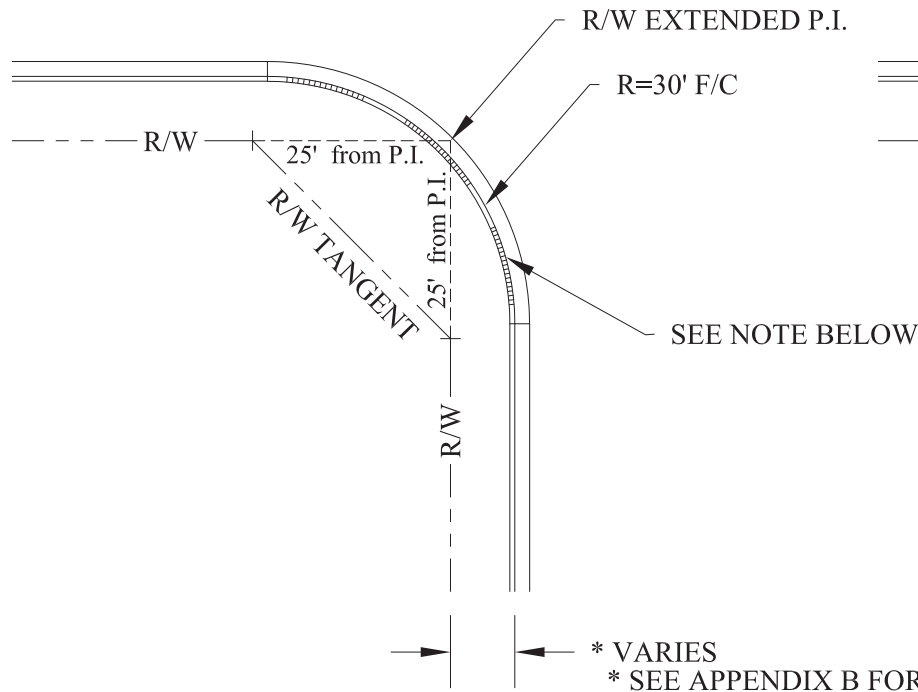
County of Henrico
Department of Public Works

SEPTEMBER 1, 2021

C-13.DWG

CURB RADIUS = 30'

CURB RADIUS = 35'



NOTE: CURB CUTS SHALL BE PROVIDED AT ALL INTERSECTIONS. A COMBINATION CURB CUT AND CURB RAMP SHALL BE PROVIDED WHERE SIDEWALKS EXIST OR ARE TO BE PROVIDED. SEE VDOT STANDARD CG-12 FOR DETAILS. FOR RADIUS LESS THAN 30', THE DETAIL OF THE CURB RADIUS 30' WILL BE USED.

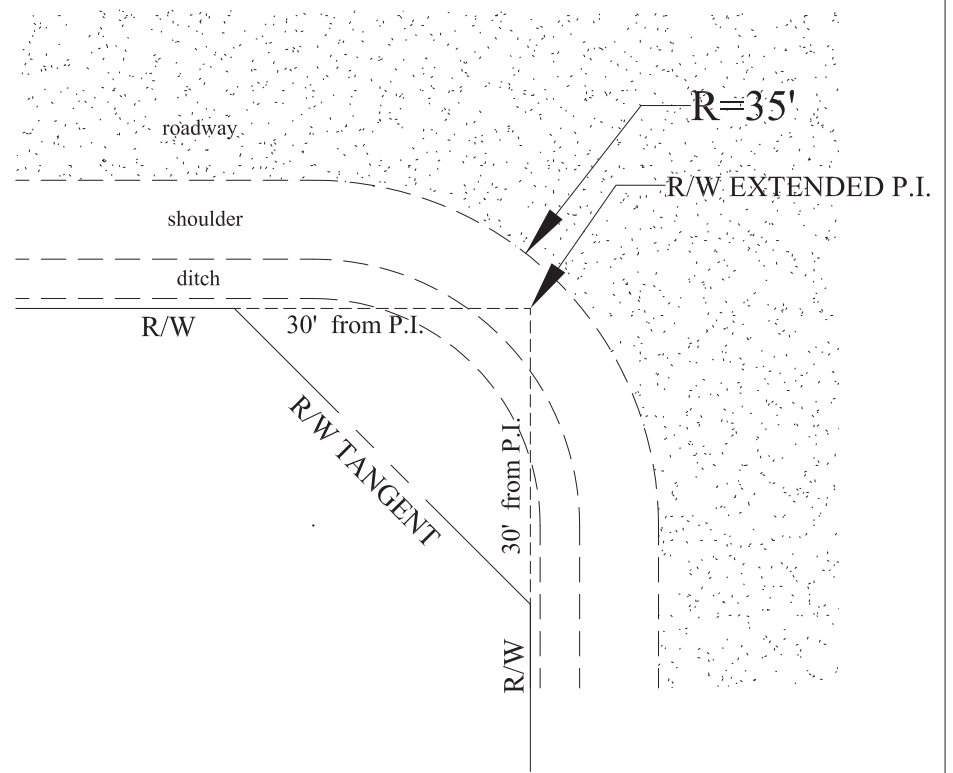
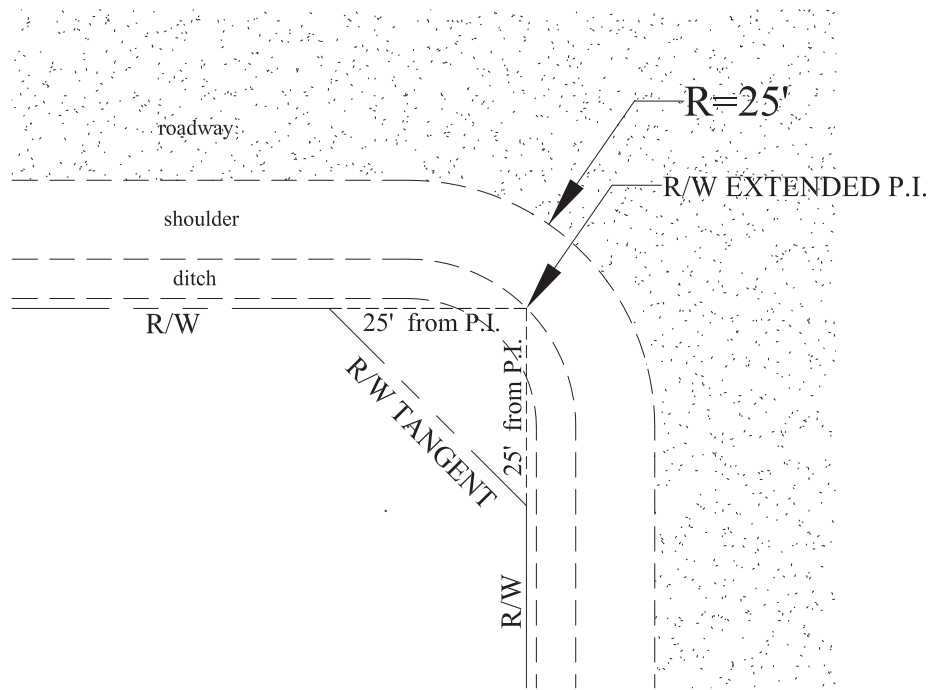


RIGHT-OF-WAY AT CURB RETURNS

County of Henrico
Department of Public Works

SEPTEMBER 1, 2021

C-14.DWG

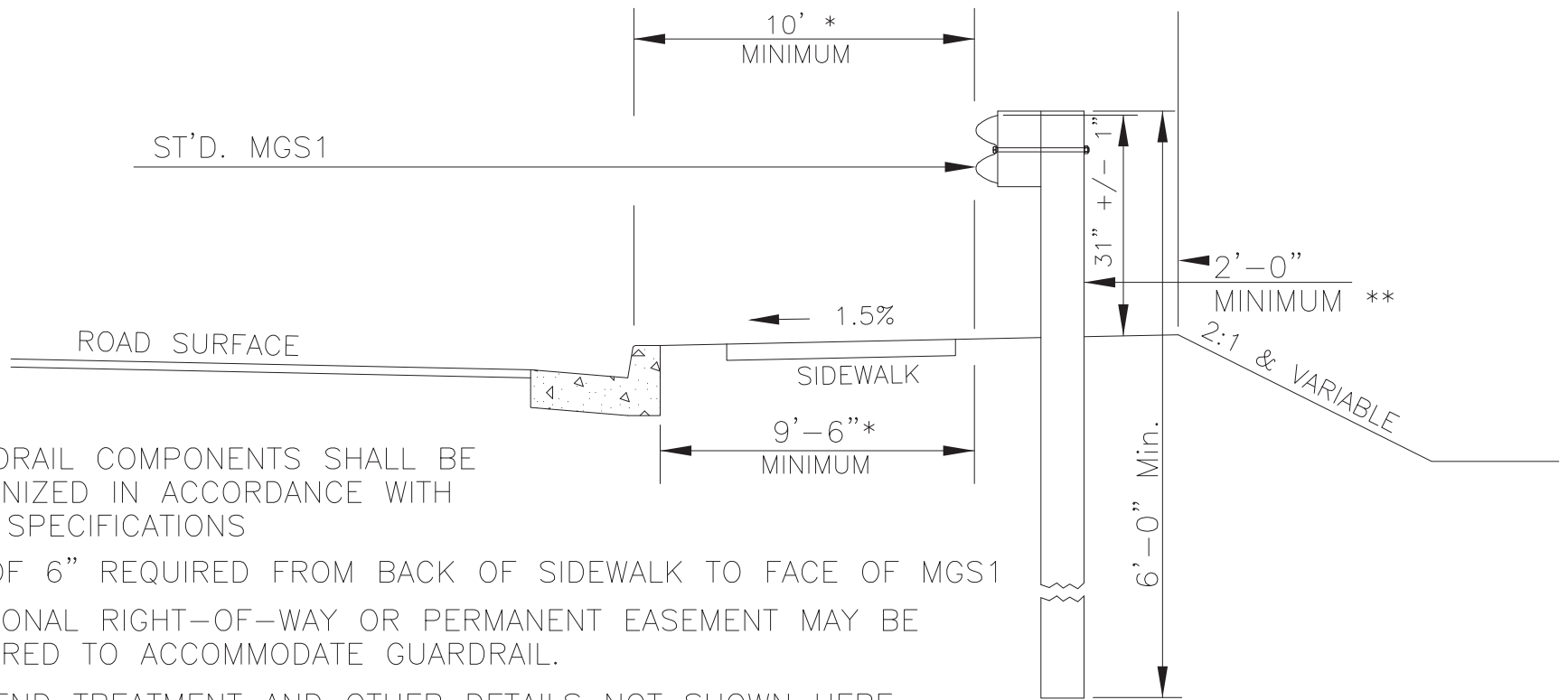


EDGE OF PAVEMENT RETURN

County of Henrico
Department of Public Works

SEPTEMBER 1, 2021

C-15.DWG



GUARDRAIL COMPONENTS SHALL BE GALVANIZED IN ACCORDANCE WITH VDOT SPECIFICATIONS

MIN OF 6" REQUIRED FROM BACK OF SIDEWALK TO FACE OF MGS1
 ADDITIONAL RIGHT-OF-WAY OR PERMANENT EASEMENT MAY BE REQUIRED TO ACCOMMODATE GUARDRAIL.

FOR END TREATMENT AND OTHER DETAILS NOT SHOWN HERE, REFER TO VDOT STANDARDS FOR GUARDRAIL.

* FOR SPEEDS GREATER THAN 45 MPH THE GUARDRAIL SHALL BE CONSTRUCTED SO THAT THE FACE OF THE RAIL WILL BE FLUSH WITH THE FACE OF THE CURB

** LESS THAN 2'-0" IS ALLOWED WITH A 9' POST

THIS DETAIL IS TO BE USED WITH CURB & GUTTER, SIDEWALK AND/OR SIDEWALK SHELF.

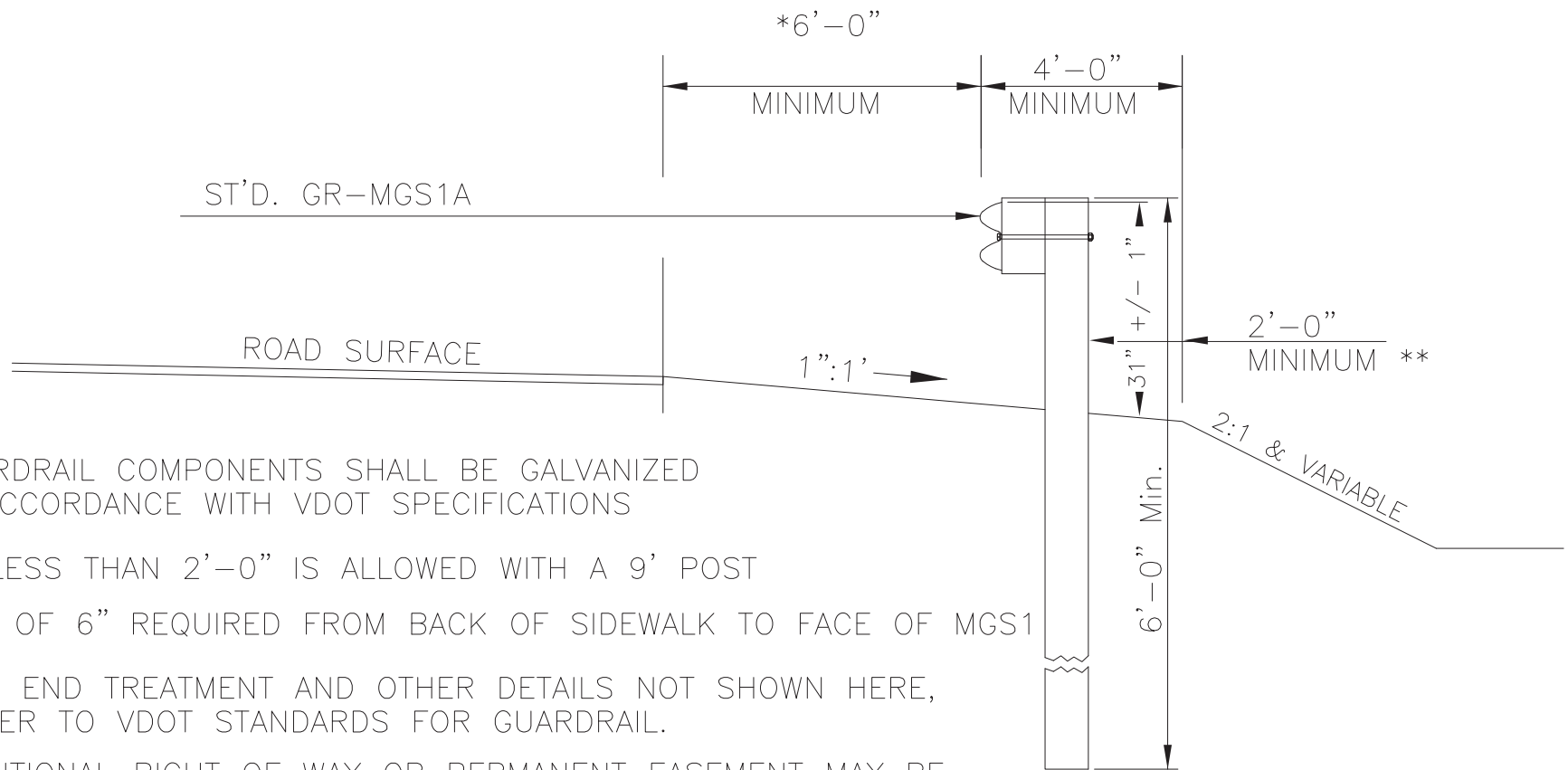


GUARDRAIL DETAIL WITH CURB & GUTTER

County of Henrico
 Department of Public Works

SEPTEMBER 1, 2021

C-16.DWG



GUARDRAIL COMPONENTS SHALL BE GALVANIZED
IN ACCORDANCE WITH VDOT SPECIFICATIONS

** LESS THAN 2'-0" IS ALLOWED WITH A 9' POST

MIN OF 6" REQUIRED FROM BACK OF SIDEWALK TO FACE OF MGS1

FOR END TREATMENT AND OTHER DETAILS NOT SHOWN HERE,
REFER TO VDOT STANDARDS FOR GUARDRAIL.

ADDITIONAL RIGHT OF WAY OR PERMANENT EASEMENT MAY BE
REQUIRED TO ACCOMMODATE GUARDRAIL.

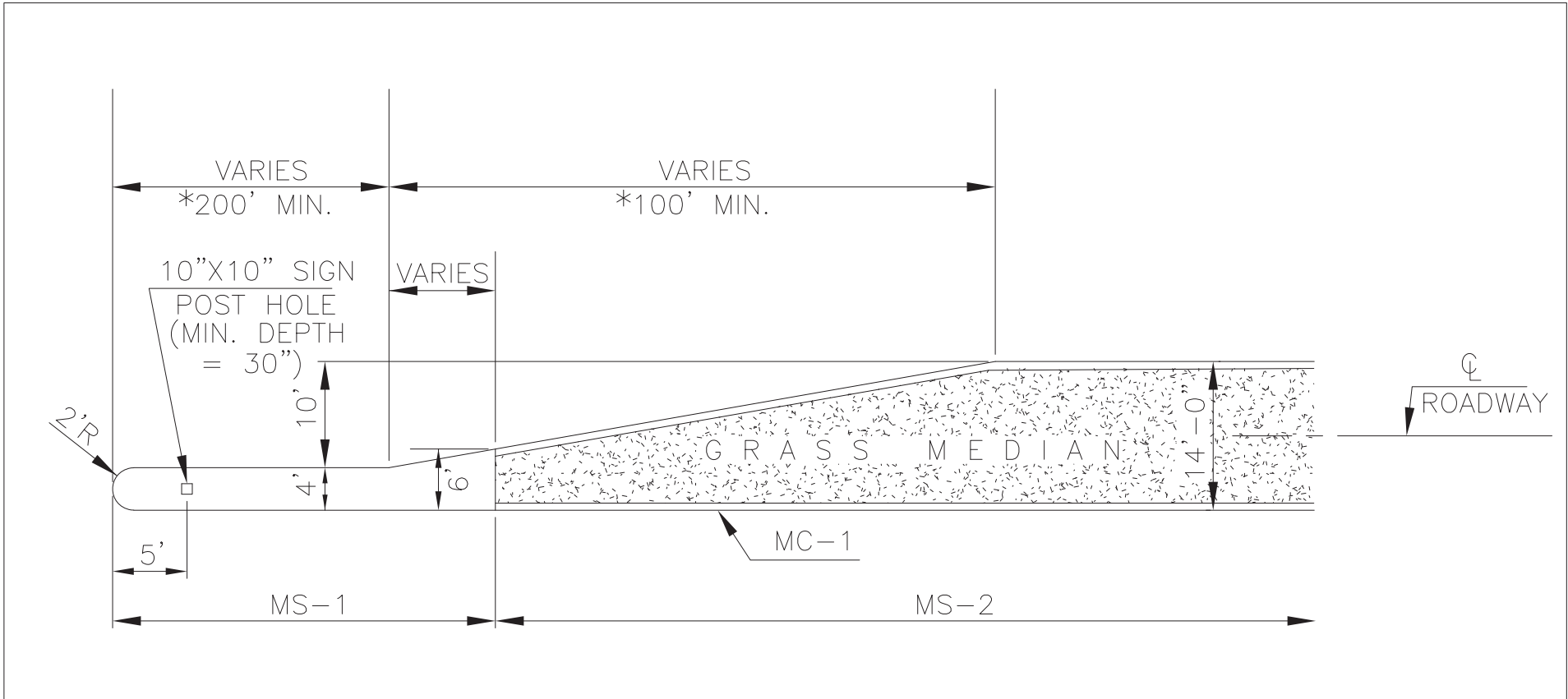


GUARDRAIL DETAIL WITHOUT CURB & GUTTER

County of Henrico
Department of Public Works

SEPTEMBER 1, 2021

C-17.DWG



*TAPER AND LANE LENGTHS ARE TO BE APPROVED BY THE TRAFFIC ENGINEER.

NOTE: REFER TO VDOT STANDARDS FOR ADDITIONAL INFORMATION ON MEDIAN GRADING. SEE APPENDIX C FOR INDEPENDENT CURB FACE CONFIGURATION. CONCRETE SHALL BE CLASS A-3.



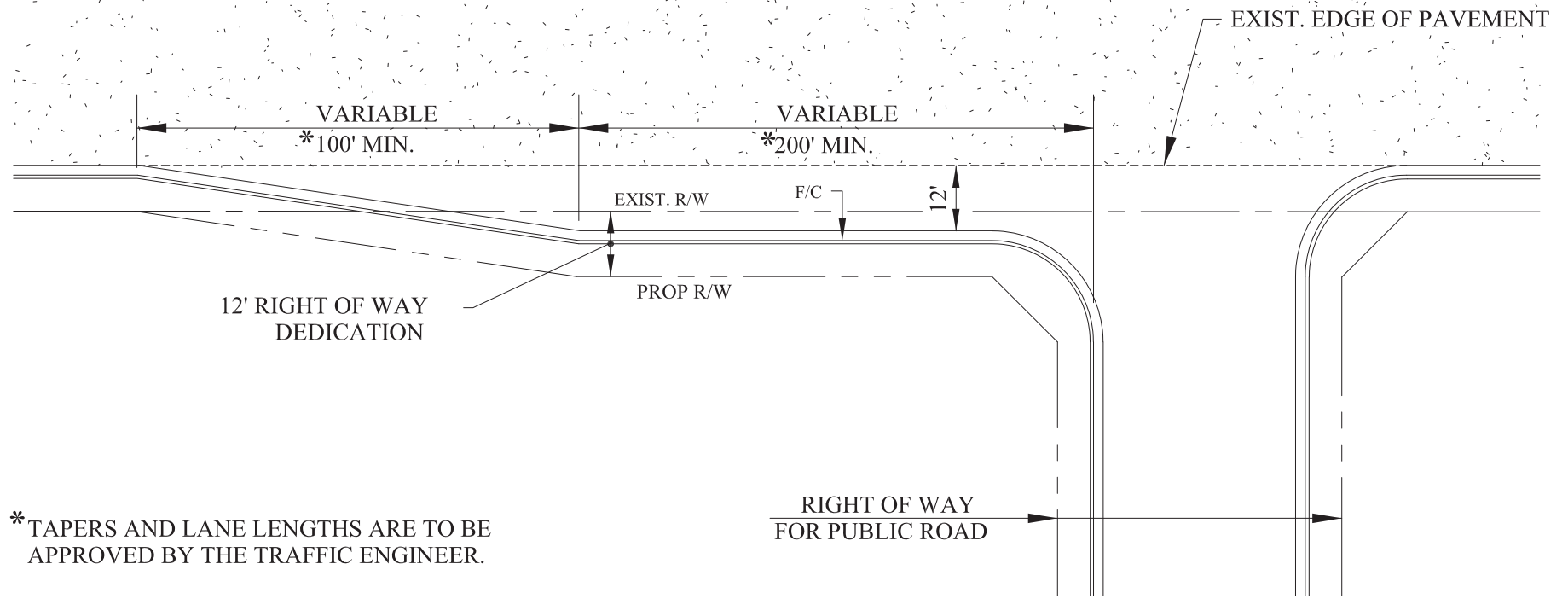
RAISED 14' MEDIAN w/LEFT TURN LANE DETAIL

County of Henrico
Department of Public Works

SEPTEMBER 1, 2021

C-18.DWG

C-18



* TAPERS AND LANE LENGTHS ARE TO BE APPROVED BY THE TRAFFIC ENGINEER.

NOTE SIDEWALKS AND ADA RAMPS NOT SHOWN FOR CLARITY

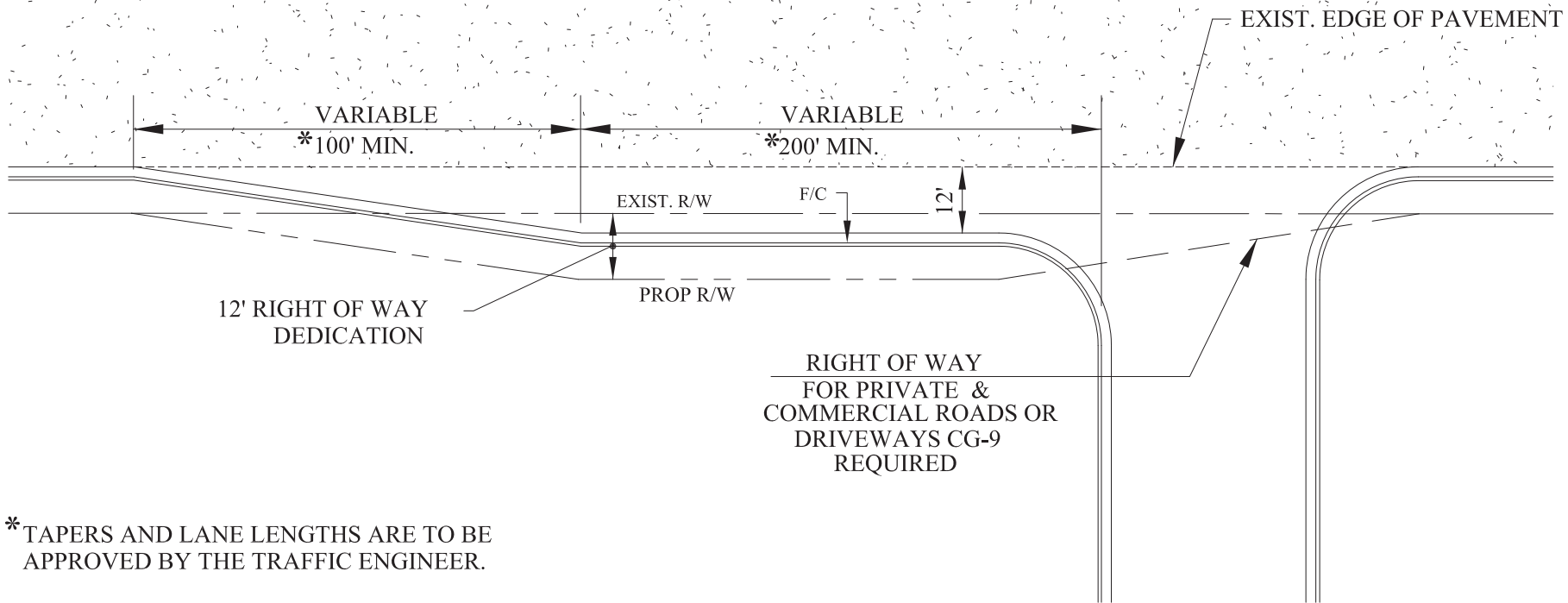
RIGHT TURN LANE - PUBLIC ROAD

County of Henrico
Department of Public Works

SEPTEMBER 1, 2021
C-19.1.DWG



C-19.1



*TAPERS AND LANE LENGTHS ARE TO BE APPROVED BY THE TRAFFIC ENGINEER.

NOTE SIDEWALKS AND ADA RAMPS NOT SHOWN FOR CLARITY



RIGHT TURN LANE - PRIVATE ROAD

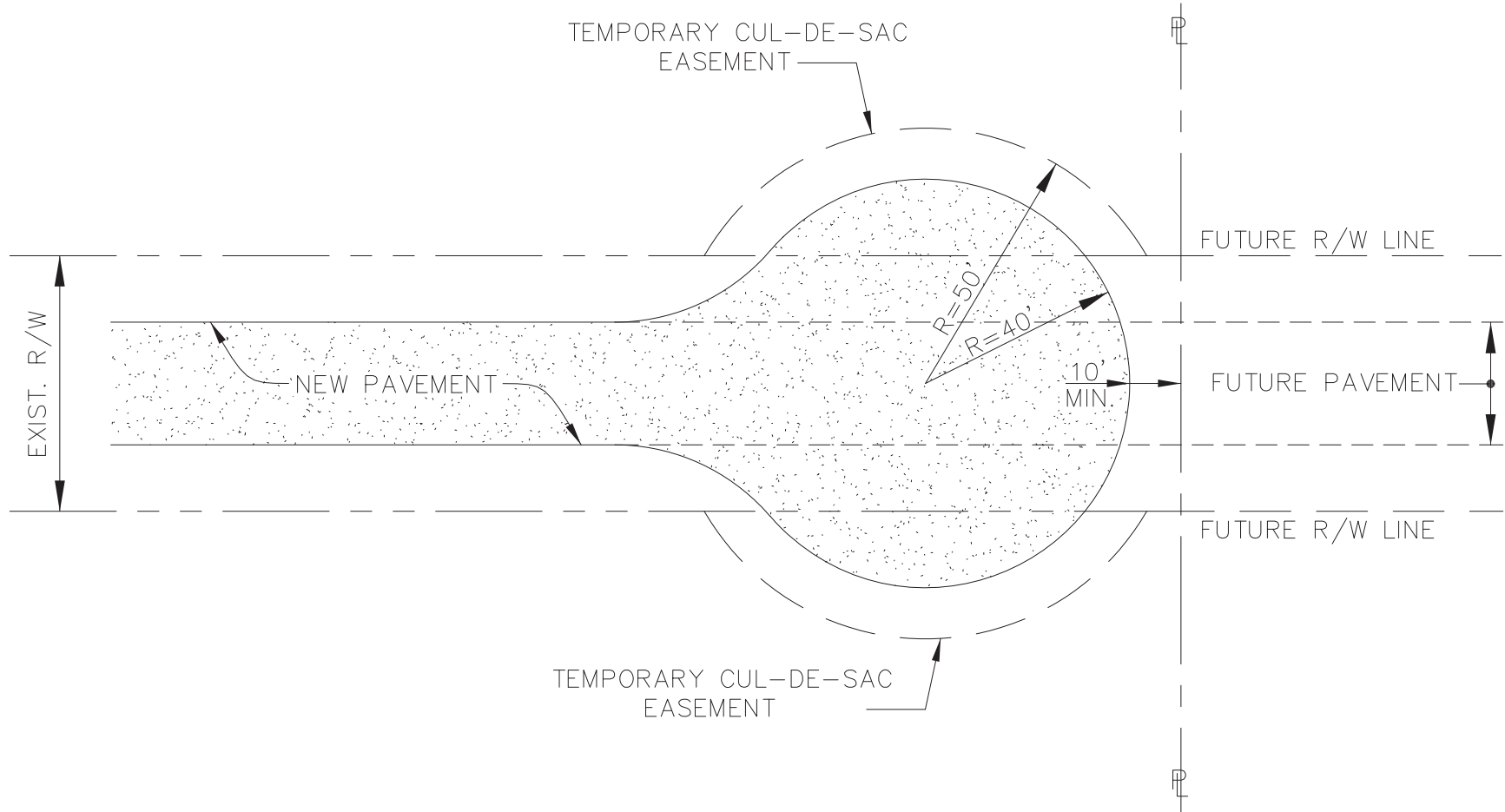
County of Henrico
Department of Public Works

SEPTEMBER 1, 2021

C-19.2.DWG

C-19.2

SEE SECTIONS 2.07 AND 2.22 FOR
ADDITIONAL INFORMATION CONCERNING
TEMPORARY CUL-DE-SACS.



C-20



TEMPORARY CUL-DE-SAC

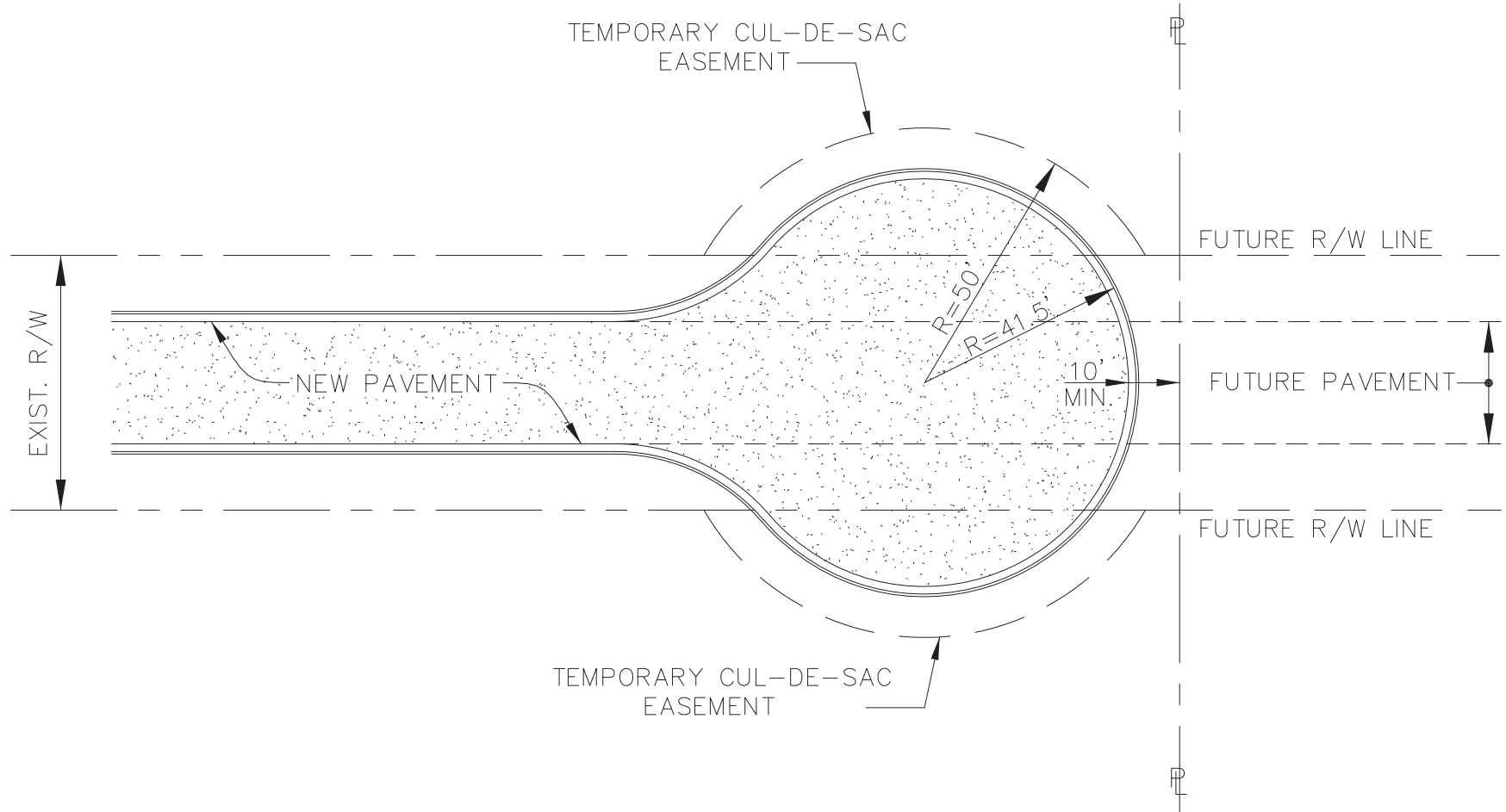
WITHOUT CURB & GUTTER

County of Henrico
Department of Public Works

SEPTEMBER 1, 2021

C-20.DWG

SEE SECTIONS 2.07 AND 2.22 FOR
ADDITIONAL INFORMATION CONCERNING
TEMPORARY CUL-DE-SACS.



C-21



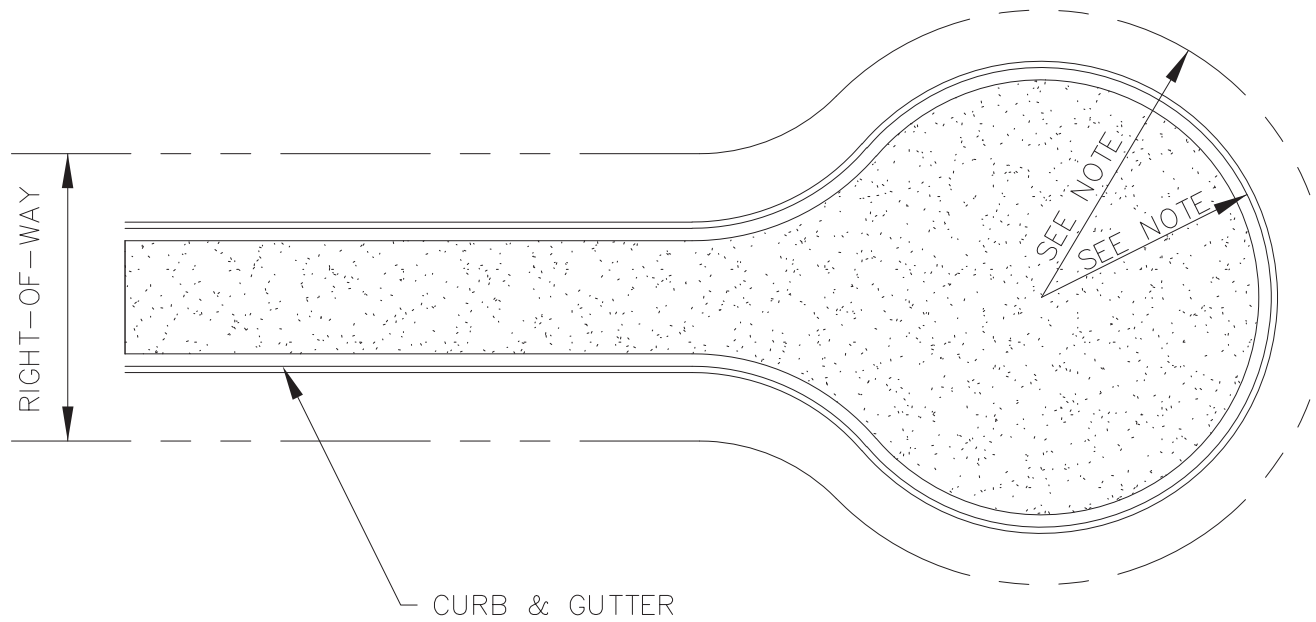
TEMPORARY CUL-DE-SAC

WITH CURB & GUTTER

County of Henrico
Department of Public Works

SEPTEMBER 1, 2021

C-21.DWG



NOTE: FOR CUL-DE-SAC DIMENSIONS SEE PERMANENT CUL-DE-SAC DESIGN CRITERIA TABLE ON THE FOLLOWING PAGE.



PERMANENT CUL-DE-SAC

County of Henrico
Department of Public Works

SEPTEMBER 1, 2021

C-22.DWG

ROADWAY		CURB & GUTTER?	CUL-DE-SAC DESIGN	
R/W WIDTH	PAVEMENT WIDTH (*1)		R/W RADIUS	PAVEMENT RADIUS (*1)
50'	24'	No	55'	42'
50'	36'	Yes	55'	48'
ALL OTHERS	ALL OTHERS		(*2)	(*2)

1. Dimensions based on "edge of pavement to edge of pavement" width or "face of curb to face of curb" width.
2. Contact the Department of Public Works for cul-de-sac design details appropriate for the proposed development and use.

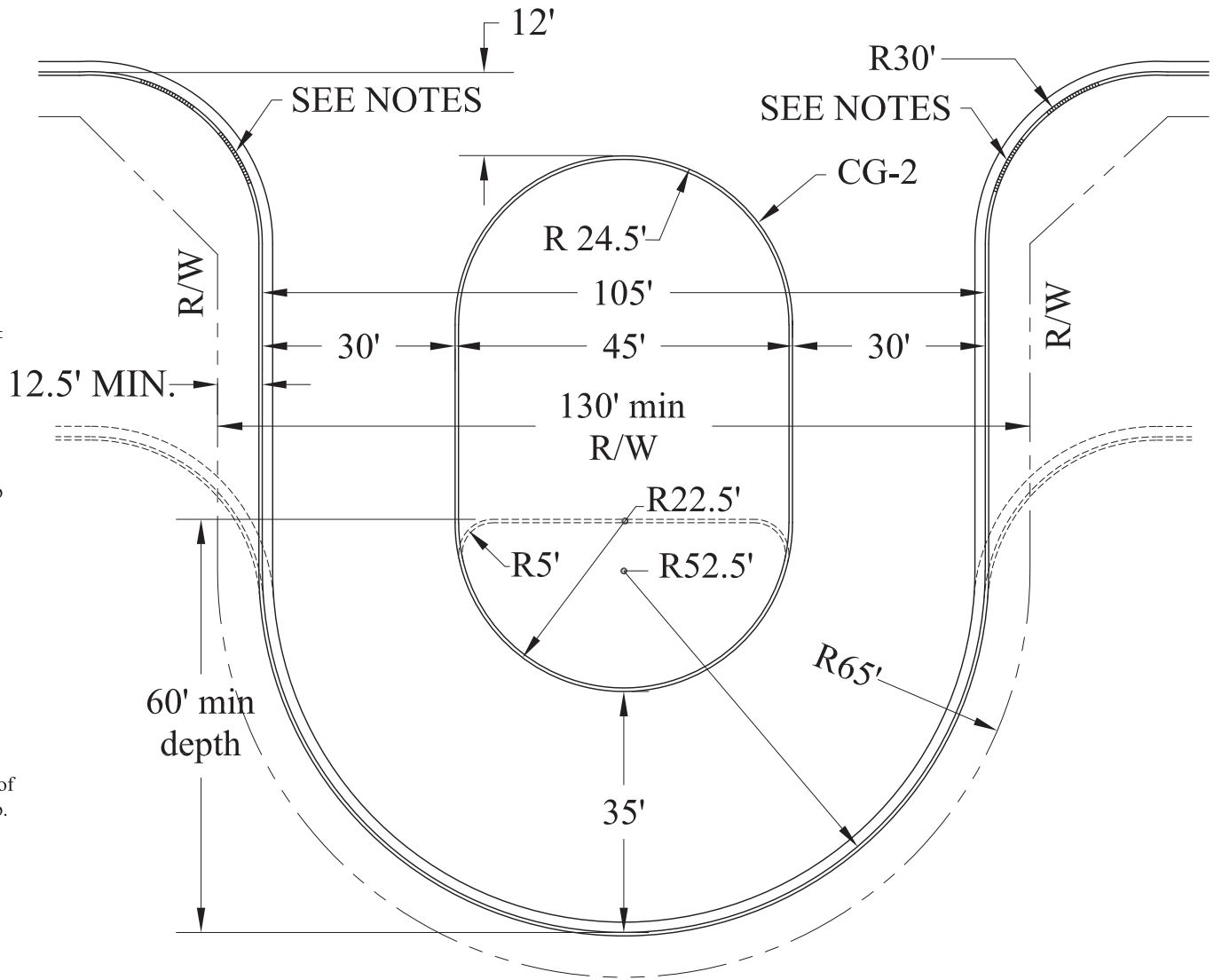


PERMANENT CUL-DE-SAC DESIGN CRITERIA

County of Henrico
Department of Public Works

SEPTEMBER 1, 2021

C-23.DWG



NOTES:

1. Right-of-way is a minimum of 12.5 feet behind face of curb
2. Island is to be within right-of-way
3. If cul-de-sac depth is less than 85 feet, the curb of the island should be parallel with the curb lines of the street as shown by the dashed lines
4. A maintenance agreement must be provided between the developer/community association and the County for landscape and maintenance of island
5. A combination curb cut and curb ramp shall be provided at all intersections. See VDOT standard CG-12 for details.
6. All dimensions shown to the curb are to the face of curb. See curb details for location of face of curb.



MODIFIED CUL-DE-SAC

County of Henrico
Department of Public Works

SEPTEMBER 1, 2021

C-24.DWG



- Notes: 1. All fonts are green FHWA HWYB
 2. Green Border is 5/8" thickness
 3. Sign face must be reflectorized to a minimum of engineering grade white sheeting sign must be made of a minimum 0.08 thickness aluminum

ROAD EXTENSION SIGN

County of Henrico
 Department of Public Works

SEPTEMBER 1, 2021

C-25.DWG





- Notes: 1. All fonts are Black FHWA T2000HWYB
 2. Black Border is 5/8" thickness
 3. Sign face must be reflectorized to a minimum of Hi-Intensity grade yellow sheeting
 4. Sign must be made of .080" x 30" x 30" aluminum

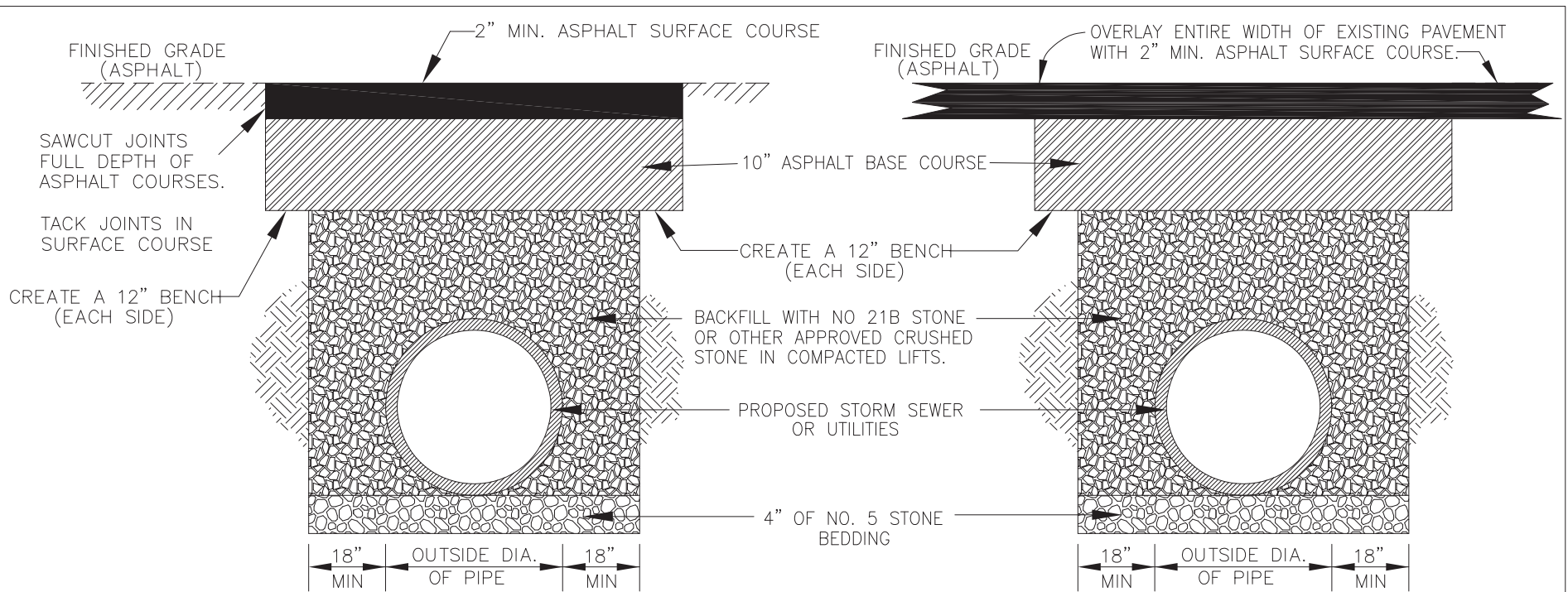


UNMAINTAINED ROAD SIGN

County of Henrico
 Department of Public Works

SEPTEMBER 1, 2021

C-26.DWG



SKETCH SHOWING PAVEMENT PATCH FOR SINGLE ISOLATED CUTS

SKETCH SHOWING PAVEMENT OVERLAY FOR LONGITUDINAL OR MULTIPLE CUTS

NOTES:

1. THIS DETAIL IS TO BE USED IN ALL LOCATIONS WHERE PROPOSED STORM SEWER OR UTILITY CROSSES EXISTING PAVEMENT.
2. OVERLAYS IN SHOULDER SECTIONS MUST BE WEDGED DOWN TO EXISTING SHOULDERS AT A 1":1' GRADE WITH MATERIAL MATCHING EXISTING CONDITIONS.
3. IN CURB AND GUTTER SECTIONS, MILLING FULL WIDTH OF PAVEMENT IS REQUIRED PRIOR TO PLACEMENT OF THE OVERLAY.
4. TEMPORARY OR PERMANENT ASPHALT MUST BE PLACED IN ROADWAY TRENCHES BY THE CLOSE OF EACH WORKDAY.
5. EXISTING PAVEMENT RESTORATION REQUIREMENTS WILL BE DETERMINED BY PAVEMENT STRUCTURE CORES. FOR ADDITIONAL INFORMATION, SEE SECTION 2.26 OF THE DESIGN MANUAL.

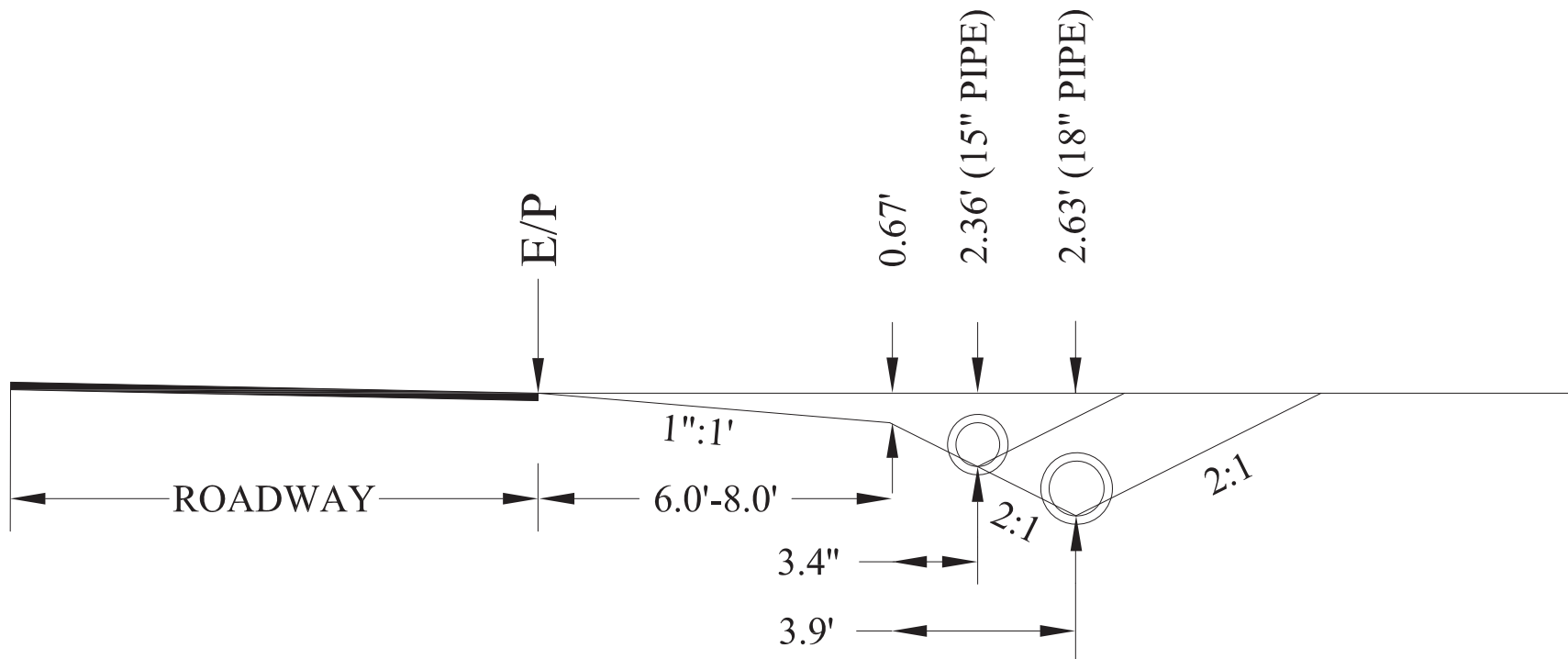


PAVEMENT REPLACEMENT, BEDDING AND BACKFILL FOR PIPE TRENCH

County of Henrico
Department of Public Works

SEPTEMBER 1, 2021

C-28.DWG



NOTE: MAXIMUM ALLOWABLE DITCH = 3.0'

THE ABOVE CUT ELEVATIONS, AS REFERENCED FROM THE EDGE OF PAVEMENT, ARE MINIMUM AND DO NOT REFLECT THE THICKNESS OF THE PIPE OR THE PIPE COVER.

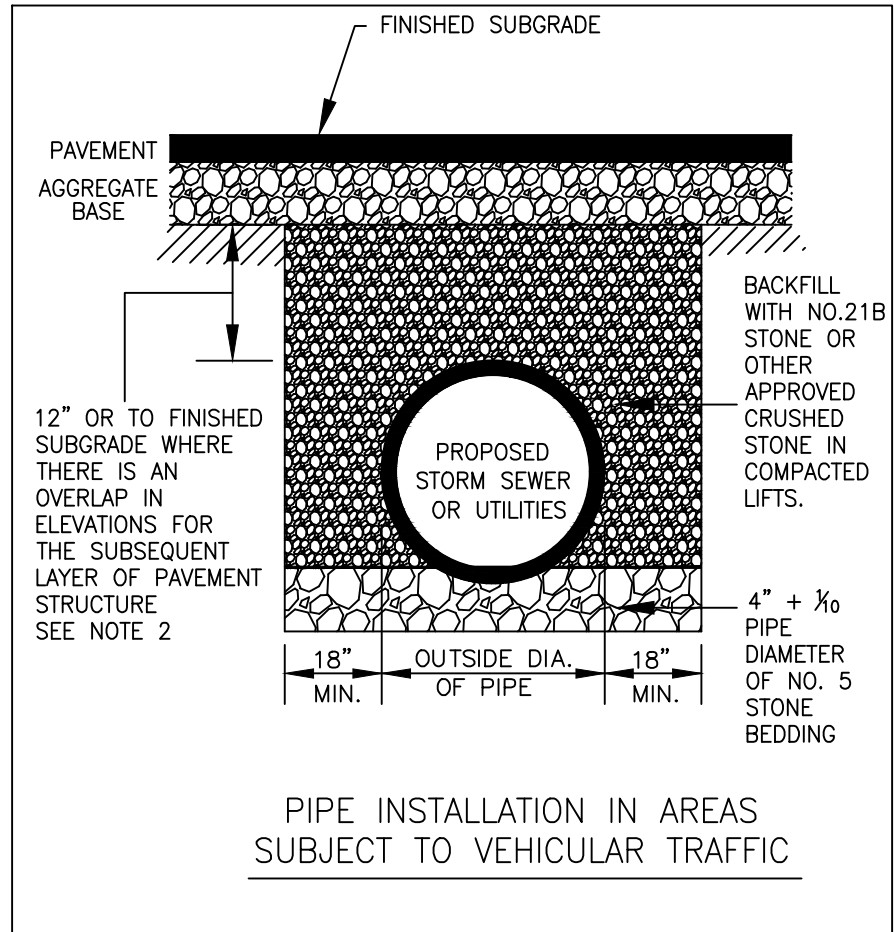
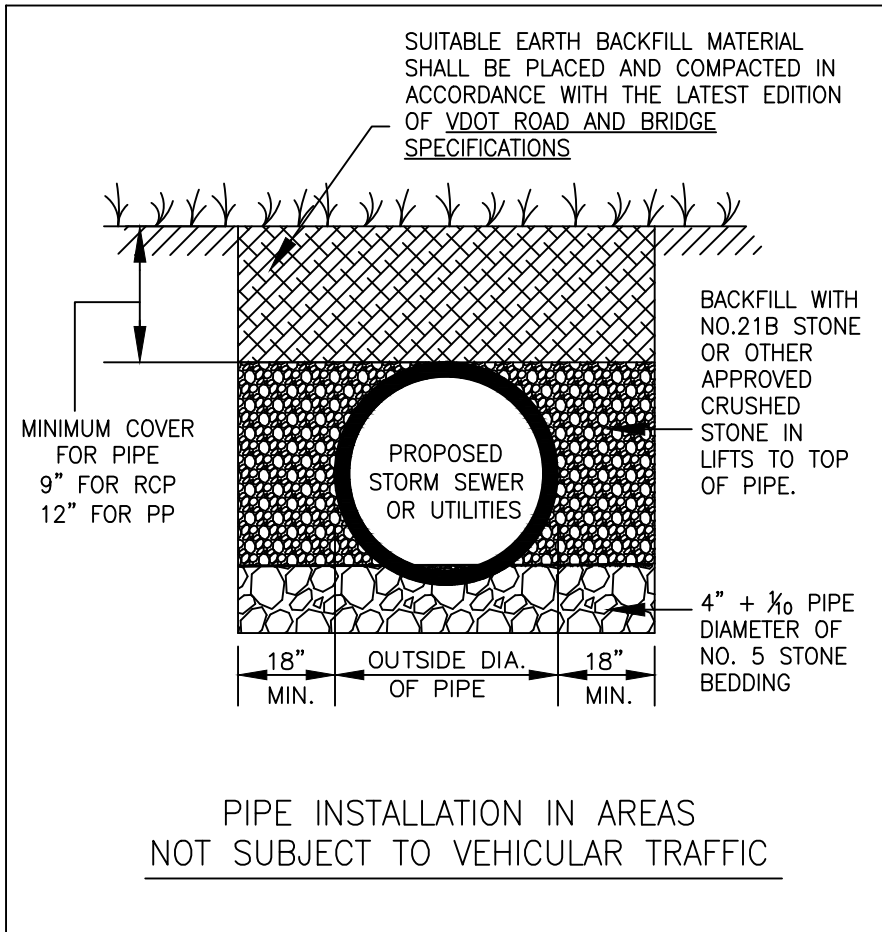


INSTALLATION OF ENTRANCE PIPE

County of Henrico
Department of Public Works

SEPTEMBER 1, 2021

C-29.DWG



- NOTES: 1. SEE APPENDIX C FOR PAVEMENT REPLACEMENT BEDDING AND BACKFILL DETAILS FOR PIPES IN EXISTING ROADWAYS.
2. IF SUB-GRADE ELEVATION HAS BEEN ACHIEVED PRIOR TO TRENCH EXCAVATION FOR STORM SEWER OR UTILITIES. THE TRENCH WILL BE BACKFILLED TO SUB-GRADE ELEVATION WITH NO. 21-B STOVE OR OTHER APPROVED CRUSHED STONE IN COMPACTED LIFTS.



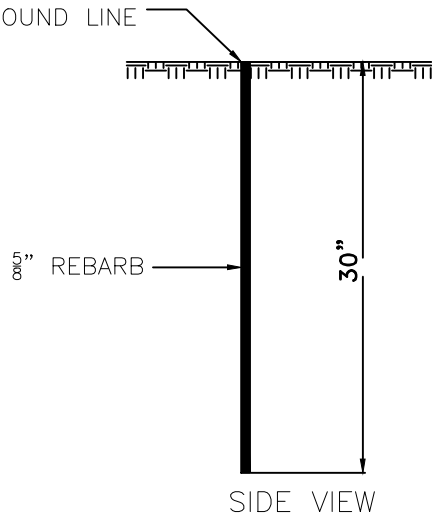
PIPE BEDDING & BACKFILL
 (For New Development & New Road Construction)
 County of Henrico
 Department of Public Works

AUGUST 11, 2023

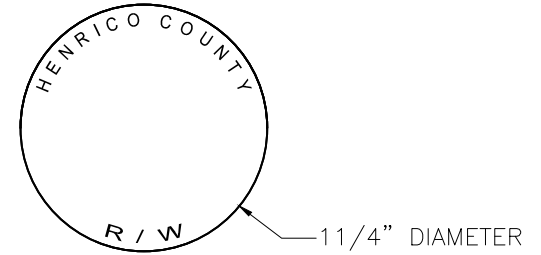
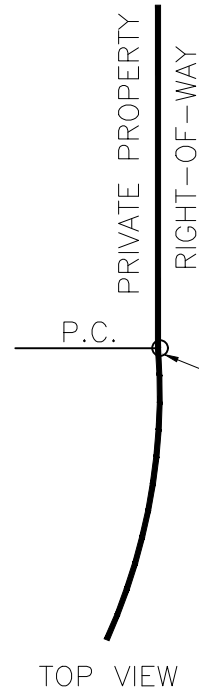
C-30.DWG

RIGHT OF WAY MONUMENTS ARE TO BE SET PLUMB

CAP TO BE SET FLUSH WITH THE GROUND LINE



PIN TO BE ACCURATELY SET BY SURVEY PARTY AND CAP PUNCHED TO INDICATE R/W LINE.



DETAIL N.T.S.

PLASTIC CAP IS TO BE HIGH VISIBILITY ORANGE WITH STAMPED BLACK LETTERS.

MONUMENT TO BE SET AT PUNCH MARK OF PLASTIC CAP. (SEE DETAIL)

NOTE: RIGHT-OF-WAY MONUMENTS ARE TO BE INSTALLED FLUSH WITH THE EXISTING GROUND.
RIGHT-OF-WAY MONUMENTS ARE REQUIRED AT ALL P.C.'S AND P.T.'S AND AT INTERVALS ON TANGENTS TO BE VISIBLE FROM EACH AND AT ALL BREAKS IN THE RIGHT-OF-WAY LINES.

RIGHT-OF-WAY MONUMENT

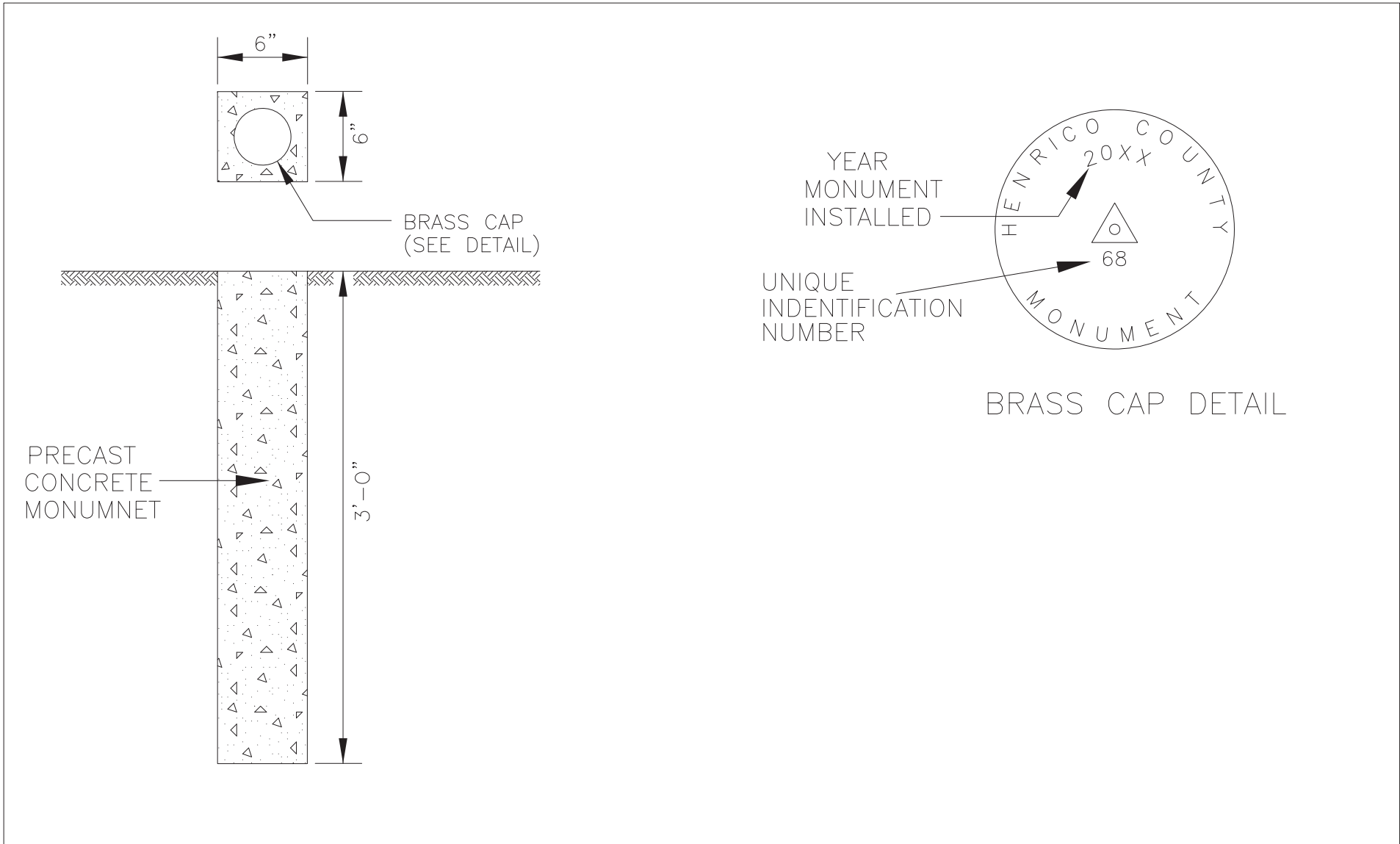
County of Henrico
Department of Public Works

JUNE 2023

C-31-REVISED.DWG

C-31-REVISED





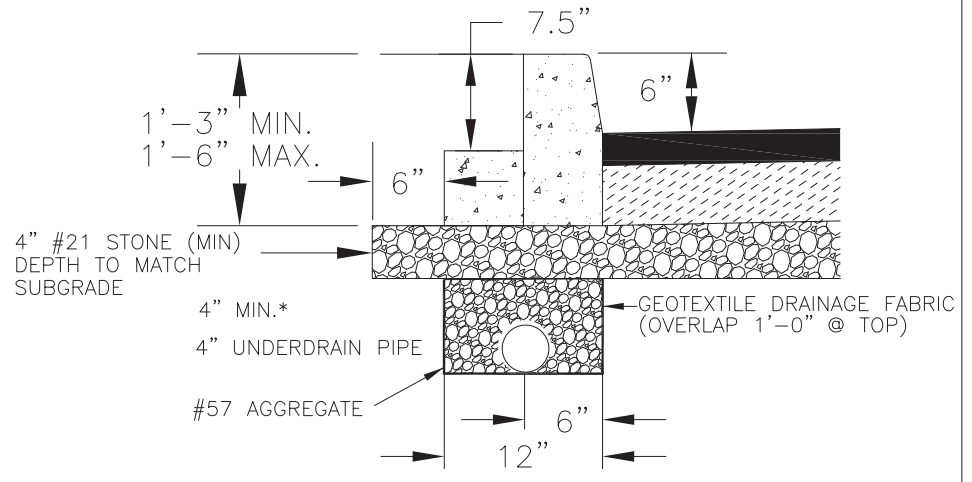
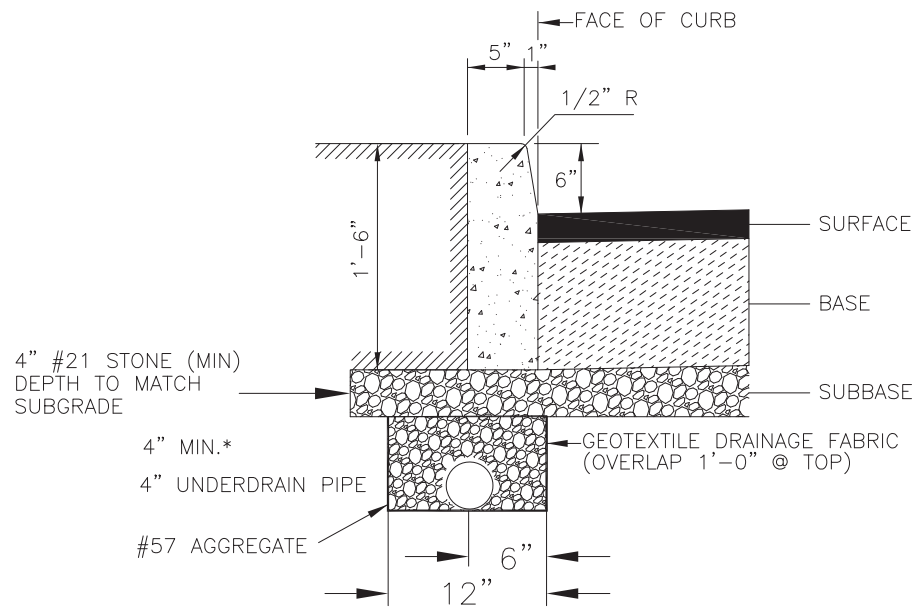
GPS CONTROL NETWORK MONUMENT

County of Henrico
Department of Public Works

SEPTEMBER 1, 2021

C-32.DWG

C-32



* MAINTAIN 4" MIN #57 STONE ABOVE TOP OF UNDERDRAIN PIPE

* MAINTAIN 4" MIN #57 STONE ABOVE TOP OF UNDERDRAIN PIPE

ACCEPTABLE ALTERNATIVE
IF CURB IS EXTRUDED

EDGEDRAINS REQUIRED ALONG EACH SIDE OF
MEDIAN / ISLAND CURB.

FOR OTHER NOTES AND DETAILS NOT SHOWN REFER
TO VDOT STANDARDS FOR UD-4 UNDERDRAINS

CONCRETE SHALL BE CLASS A-3



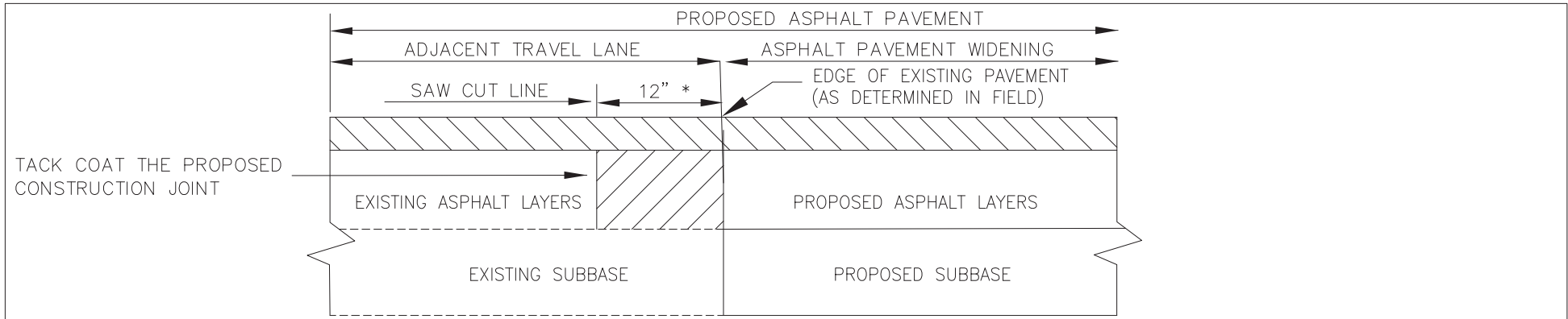
PAVEMENT EDGEDRAIN FOR RAISED GRASS MEDIANS & ISLANDS

County of Henrico
Department of Public Works



SEPTEMBER 1, 2021

C-33.DWG

C-33



CONSTRUCTION JOINT DETAIL

-  SAW CUT TO REMOVE EXISTING ASPHALT LAYERS TO EXISTING SUBBASE AND REPLACE WITH PROPOSED ASPHALT WIDENING LAYERS (SEE NOTE 2)
-  PROPOSED MINIMUM 2 INCH THICK ASPHALT COURSE (SEE NOTE 5)

* PROPOSE MINIMUM 12 INCHES OR GREATER AS NECESSARY TO ABUT THE FULL THICKNESS OF EXISTING ASPHALT LAYERS AS DETERMINED BY CORES (SEE NOTE 3)

NOTES:

1. ASPHALT PAVEMENT WIDENING SHALL HAVE A PAVEMENT DESIGN IN ACCORDANCE WITH SECTION 2.26 OF THIS MANUAL AND BE APPROVED BY THE CONSTRUCTION ENGINEER.
2. THE PAVEMENT DESIGN FOR THE ASPHALT PAVEMENT WIDENING SHALL MEET OR EXCEED THE DEPTHS AND TYPES OF THE LAYERS OF THE EXISTING PAVEMENT. SUBSURFACE DRAINAGE OF THE EXISTING AND PROPOSED PAVEMENT SHALL BE ADDRESSED IN THE PAVEMENT DESIGN.
3. A MINIMUM OF THREE CORES SHALL BE TAKEN ALONG THE CENTER OF THE ADJACENT TRAVEL LANE TO DETERMINE THE TYPE AND THICKNESS OF EXISTING LAYERS. THESE CORES SHALL BE SPACED NO MORE THAN 500 FEET APART. CORED HOLES SHALL BE REPAIRED IN ACCORDANCE WITH VDOT SPECIFICATIONS.
4. THE ADJACENT TRAVEL LANE SHALL BE MILLED A MINIMUM DEPTH OF 2 INCHES AND REPLACED WITH AN ASPHALT SURFACE COURSE TO MATCH THE PROPOSED PAVEMENT WIDENING SURFACE COURSE, UNLESS WAIVED BY THE ENGINEER.
5. THE CONSTRUCTION ENGINEER MAY REQUIRE THE MILLING DEPTH OF THE EXISTING PAVEMENT TO BE ADJUSTED TO ACHIEVE AN ACCEPTABLE PAVEMENT CROSS SLOPE AND EFFECTIVE SURFACE DRAINAGE.
6. EXISTING PAVEMENT MARKINGS AND MARKERS WITHIN THE PROJECT LIMITS SHALL BE RESTORED SUBJECT TO THE APPROVAL OF THE TRAFFIC ENGINEER.
7. FINAL TRANSVERSE PAVEMENT TIE-IN SHALL CONFORM TO THE REQUIREMENTS OF SECTION 315.05(C) OF VDOT SPECIFICATIONS EXCEPT THAT ALL JOINTS AT TIE-IN LOCATIONS SHALL BE TESTED USING A 10 FOOT STRAIGHTEDGE IN ACCORDANCE WITH THE REQUIREMENTS OF SECTION 315.07(c) OF VDOT SPECIFICATIONS. THE VARIATION FROM THE TESTING EDGE OF THE STRAIGHTEDGE BETWEEN ANY TWO CONTACT POINTS WITH THE PAVEMENT SURFACE SHALL NOT EXCEED 1/4"
8. OVERLAY THE EXISTING PAVEMENT AS SHOWN IN THE CONSTRUCTION JOINT DETAILS.
9. A STRAIGHT PERPENDICULAR CONSTRUCTION JOINT SHALL BE PROVIDED AT ALL LOCATIONS WHERE NEW PAVEMENT ABUTS EXISTING PAVEMENT.
10. THE AREA OF PAVEMENT SHALL BE TRENCHED TO THE SUBGRADE AND COMPACTED PER VDOT SPECIFICATIONS. SURFACE OF WIDING AREA SHALL BE FLUSH WITH THE SURFACE OF EXISTING PAVEMENT PRIOR TO MILLING AND OVERLAY. MILLING OF NEW AND EXISTING PAVEMENT MAY BE REQUIRED TO ACHIEVE ACCEPTABLE PAVEMENT CROSS-SLOPE AND PAVEMENT DRAINAGE.
11. SAWCUT FULL DEPTH OF ASPHALT PAVEMENT IS TO BE CONSIDERED INCIDENTAL AND THE COST SHALL BE INCLUDED IN OTHER PAY ITEMS.
12. OVERLAY THE ENTIRE AREA OF THE NEW AND EXISTING PAVEMENT WITH A MINIMUM OF 220 LBS/SQ YD OF ASPHALT CONCRETE.

C-34

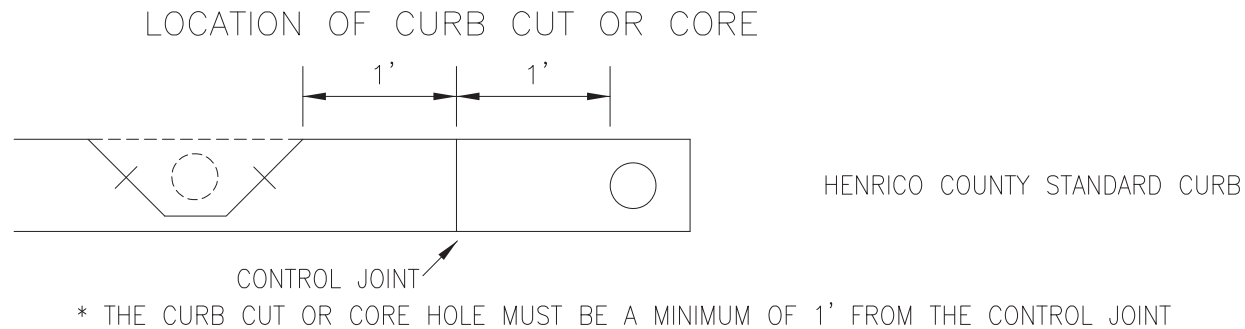
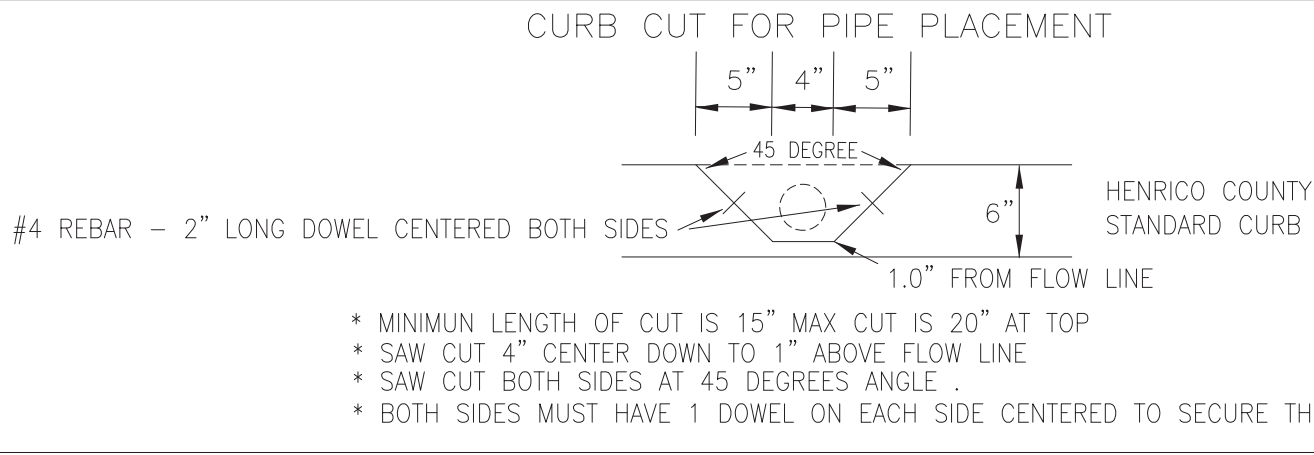
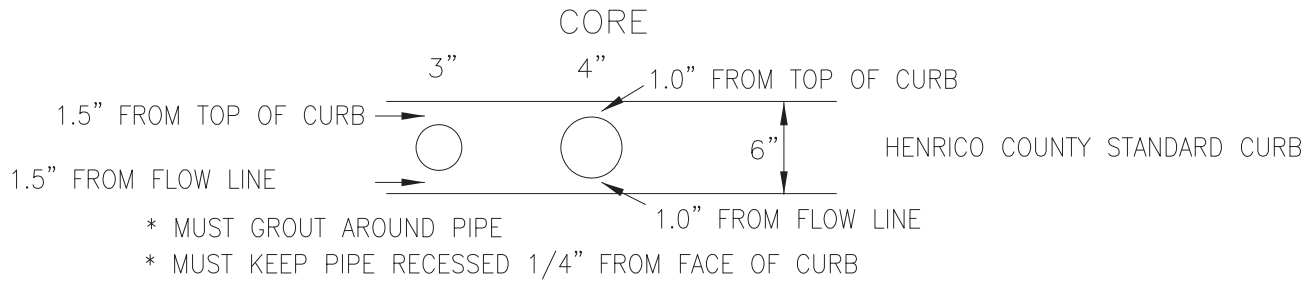


ASPHALT PAVEMENT WIDENING

FOR WIDENING SUBJECT TO TRAFFIC
County of Henrico
Department of Public Works

SEPTEMBER 1, 2021

C-34.DWG

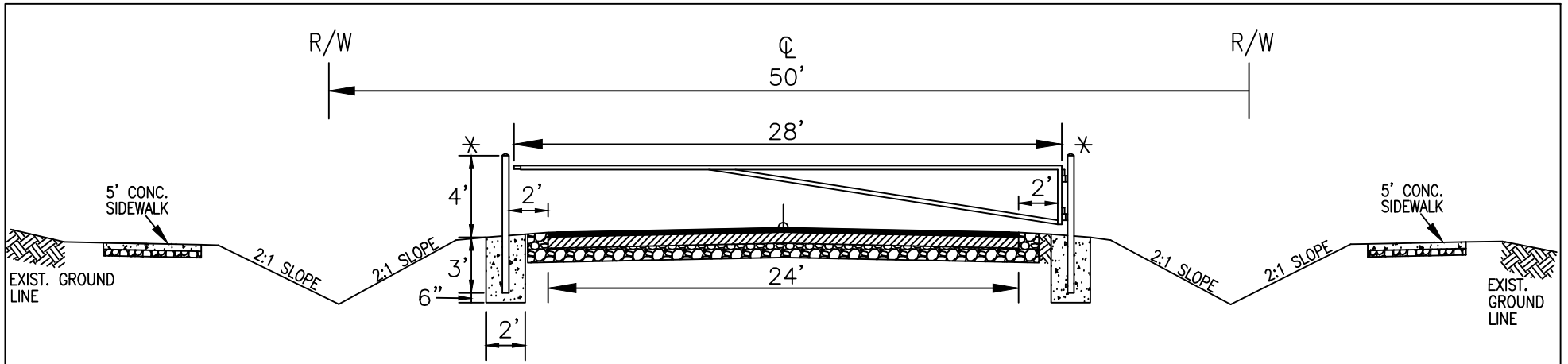


3" OR 4" PIPE CORE AND CURB CUT DETAIL

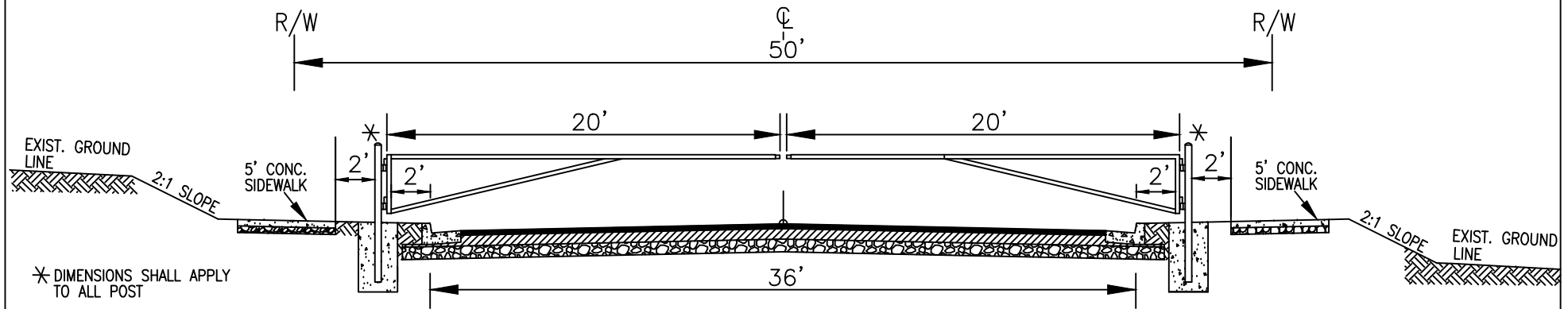
County of Henrico
Department of Public Works

SEPTEMBER 1, 2021

C-35.DWG



TYPICAL ROADWAY SECTION WITH ACCESS GATE AND WITHOUT CURB AND GUTTER



TYPICAL ROADWAY SECTION WITH DOUBLE GATE AND CURB AND GUTTER

TYPICAL SECTION - ROAD VEHICLE GATE CLASSIFICATIONS I-IV

NOT TO SCALE

OCTOBER 3, 2023

County of Henrico
Department of Public Works

TSRVG.DWG



Appendix D – Agreements and Bonds

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**Henrico County
Department of Public Works**

Information for Submitting Agreements, Declarations and Letters of Credit

Because of various legal requirements, all Erosion and Sediment Control Agreements, Letters of Credit, Assignments, and Declaration of Covenants are reviewed by the County Attorney's Office for proper signatures and form. In addition, the Clerk's Office also reviews all Declaration of Covenants submitted for recordation in the Records Room.

In order to help you submit documents which can be approved, the County Attorney's Office has prepared the following information. Any documents that do not comply will be rejected.

1. If there is a need to erase, cross out, or add any information to a preprinted form, the persons who sign the document must also initial each change. To prevent fraud, the document may not be modified by anyone other than the persons signing it. Changes must be on an original document, not a copy, in order to be sure that there are not multiple versions of the document.
2. If a church is a contracting party, all trustees for the church must sign. If the document requires notarization, all signatures must be notarized. The notary's acknowledgement should state that each person signing is "Trustee of _____."
3. There must be at least one document with original signatures and, on forms which require notary signatures, original notary signatures.
4. The name of the applicant on the first sheet of the Erosion and Sediment Control Agreement must match the applicant's name on the signature page. For example, if the applicant listed on the first page is an individual, the individual, not a company office, must sign on the signature page.
5. The applicant listed in the Letter of Credit or Assignment must be the same as the applicant in the Erosion Control Agreement.
6. The date of the Erosion and Sediment Control Agreement listed in the Letter of Credit must match the date of the Erosion and Sediment Control Agreement.
7. If a corporation is the contracting party, an officer authorized to sign for the corporation must sign as officer of the corporation and the signature should be notarized as such, e.g., "XYS Corporation, by John Smith, President." If a partnership is the contracting party, a partner or officer of the partnership authorized to sign must sign for the partnership and have the signature notarized as such.
8. Letters of Credit may be issued on out-of-area banks but must list a draw address at a bank in the City of Richmond, Chesterfield County, or Henrico County, Virginia.

POST OFFICE BOX 90775 / HENRICO, VIRGINIA 23273-0775
FAX (804) 501-7470 ASSIGNMENT FOR SUBDIVISION DEFECT BOND

ASSIGNMENT FOR SUBDIVISION DEFECT BOND

This Assignment made and entered into by and among _____ ("Developer"), the County of Henrico, Virginia, a political subdivision of the Commonwealth of Virginia ("County"), and _____ ("Bank") provides as follows:

1. The Developer owns a certain parcel of real estate located in Henrico County, Virginia, described as Exhibit A attached hereto, which real estate is contemplated to be further developed as a single family residential subdivision ("Property"), known as _____.

2. The Developer has entered into a contract ("Contract") with certain Subcontractors ("Subcontractors") by which the Subcontractors will construct the Improvements in accordance with requirements of the Code of Henrico County, Virginia, Henrico County Department of Public Works, and conditions imposed hereunder by the Planning Commission (all of which are collectively referred to herein as the "Requirements").

3. In connection with its approval of development of the Property, the County desires to obtain security, through the assignment of certain funds evidenced by a Certificate of Deposit held at the Bank, against all loss, cost, damage or expense incurred in the repair and/or replacement of roadway pavement, underlying base material and structures, curb and gutter, driveway entrances, storm sewers, roadway shoulders, and side ditches ("Improvements") from damage or deterioration which occurs within the boundaries of the public right of way and/or public drainage easement, or for damage to such Improvements occurring, appearing or manifesting itself within the one (1) year period described herein.

NOW, THEREFORE, in consideration of the mutual covenants contained herein, the parties agree as follows:

1. Assignment of Certificates of Deposit. The Developer hereby irrevocably assigns to the County all of its right, title, and interest in and to funds represented by a Certificate of Deposit in the face amount of \$_____ issued by the Bank, copies of which are

attached hereto as Exhibit B ("Certificate"), as security for the maintenance of the Improvements. The Certificate shall be held by the Bank as escrow agent for the County. The Bank shall hold the Certificate and its principal amount for the benefit of the County. The Bank shall not release the Certificate to the Developer or other third party unless directed by the official of the County charged with the enforcement of the Requirements pursuant to the terms and conditions set forth in this Assignment.

2. Payment of Assigned Proceeds. If the Developer does not complete, construct, repair and maintain the Improvements in accordance with the Requirements within one (1) year of the date of this assignment, then the funds evidenced by the Certificate shall be paid directly by the Bank to the County. As a condition precedent to receiving the funds assigned hereunder, the County shall provide the Bank with a certified statement, signed by an official charged with the enforcement of Requirements, stating that the Developer has failed to satisfactorily repair and maintain the Improvements in accordance with the Requirements. Upon receipt of such certified statement, the Bank will be unconditionally obligated to release the funds to the County. Upon receipt of such funds from the Bank, the County shall forthwith apply same for the sole and exclusive purpose of maintenance of the Improvements, and upon completion of such Improvements, shall promptly return all unused amounts thereof to the Developer.

3. Termination. This Assignment shall terminate and be of no further force and effect on the date upon which maintenance of all Improvements has been completed and accepted in accordance with the Requirements, as evidenced by a certified statement signed by an official charged with the enforcement of the Requirements stating that the Developer has satisfactorily repaired and maintained all Improvements required by this Agreement and authorizing all funds assigned hereunder to be returned to the Developer.

4. Warranties. The Bank warrants that there are no legal or equitable defenses currently available to the Bank that might affect the County's ability to use proceeds of the Certificate for

the purpose of completing repair or maintenance of the improvements. The Developer warrants that there are no defects or prior liens incumbent on the properties.

5. Effect of Assignment. Nothing herein shall be construed to relieve the Developer of its independent legal obligation to complete and maintain the Improvements.

6. Interpretations. This Assignment shall be governed by and construed in accordance with the laws of Commonwealth of Virginia and shall be binding on the parties, their successors and assigns.

WITNESS the following signatures and seals all as of this ____ day of _____.

(Bank)

By _____
Title

(Developer)

By _____
Title

COUNTY OF HENRICO, VIRGINIA

By _____
Director of Public Works/County Engineer

Approved as to form:

Assistant County Attorney

ASSIGNMENT FOR EROSION CONTROL MEASURES

This Assignment made and entered into by and among _____ ("Developer"), the County of Henrico, Virginia, a political subdivision of the Commonwealth of Virginia ("County"), and _____ ("Bank") provides as follows:

1. The Developer owns a certain parcel of real estate located in Henrico County, Virginia, described as Exhibit A attached hereto, which real estate has been developed as a single family residential subdivision or plan of development ("Property"), known as _____.

2. The Developer has entered into a contract ("Contract") with certain Subcontractors ("Subcontractors") by which the Subcontractors will construct the Erosion Control Measures in accordance with requirements of the Code of Henrico County, Virginia, and conditions imposed hereunder by the Department of Public Works (all of which are collectively referred to herein as the "Requirements"); and

3. In connection with its approval of development of the Property, the County desires to obtain security, through the assignment of certain funds evidenced by a Certificate of Deposit held at the Bank, for the installation and maintenance of Erosion Control Measures in accordance with the Requirements.

NOW, THEREFORE, in consideration of the mutual covenants contained herein, the parties agree as follows:

1. Assignment of Certificates of Deposit. The Developer hereby irrevocably assigns to the County all of its right, title, and interest in and to funds represented by a Certificate of Deposit in the face amount of _____ issued by the Bank, copies of which are attached hereto as Exhibit B ("Certificate"), as security for construction, completion, and the maintenance of the Erosion Control Measures. The Certificate shall be held by the Bank as escrow agent for the

County. The Bank shall hold the Certificate and its principal amount for the benefit of the County. The Bank shall not release the Certificate to the Developer or other third party unless

directed by the official of the County charged with the enforcement of the Requirements pursuant to the terms and conditions set forth in this Assignment.

2. Payment of Assigned Proceeds. If the Developer does not complete, construct, and maintain the Erosion Control Measures in accordance with the Requirements of Henrico County Department of Public Works, then the funds evidenced by the Certificate shall be paid directly by the Bank to the County. As a condition precedent to receiving the funds assigned hereunder, the County shall provide the Bank with a certified statement, signed by an official charged with the enforcement of the Requirements, stating that the Developer has failed to satisfactorily construct, complete, and maintain the Erosion Control Measures in accordance with the Requirements. Upon receipt of such certified statement, the Bank will be unconditionally obligated to release the funds to the County. Upon receipt of such funds from the Bank, the County shall forthwith apply same for the sole and exclusive purpose of construction, completion and maintenance of the Improvements, and upon completion of such Erosion Control Measures, shall promptly return all unused amounts to the Developer.

3. Termination. This Assignment shall terminate and be of no further force and effect on the date that completion of the land-disturbing activity and achievement of adequate stabilization of the land has occurred, as evidenced by a certified statement signed by the Director of the Department of Public Works verifying that the Developer has satisfactorily constructed, completed and maintained all Erosion Control Measures and adequately stabilized the disturbed area(s) required by this Agreement and authorizing all funds assigned hereunder to be returned to the Developer. If the improvements are not completed at the end of the term of the Certificate, the Certificate shall be renewed.

4. Warranties. The Bank warrants that there are no legal or equitable defenses currently available to the Bank that might affect the County's ability to use proceeds of the Certificate for the purpose of completing maintenance of the Erosion Control Measures. The Developer warrants that there are no defects or prior liens incumbent on the properties.

5. Effect of Assignment. Nothing herein shall be construed to relieve the Developer of its independent legal obligation to complete and maintain the Erosion Control Measures.

6. Interpretations. This Assignment shall be governed by and construed in accordance with the laws of Commonwealth of Virginia and shall be binding on the parties, their successors and assigns.

WITNESS the following signatures and seals all as of this _____ day of _____, 20__.

(Bank)

By _____
Title

(Developer)

By _____
Title

COUNTY OF HENRICO, VIRGINIA

By _____
Director of Public Works/County Engineer

Approved as to form:

Assistant County Attorney

ASSIGNMENT FOR UNIMPROVED DRIVE APRONS

This Assignment made and entered into by and among _____ ("Developer"), the County of Henrico, Virginia, a political subdivision of the Commonwealth of Virginia ("County"), and _____ ("Bank") provides as follows:

1. The Developer owns a certain parcel of real estate located in Henrico County, Virginia, described as Exhibit A attached hereto, which real estate is contemplated to be further developed as a single family residential subdivision ("Property"), known as _____.

2. The Developer has entered into a contract ("Contract") with certain Subcontractors ("Subcontractors") by which the Subcontractors will construct the Improvements (Driveway Aprons) in accordance with requirements of the Code of Henrico County, Virginia, the Virginia Department of Transportation, Henrico County Department of Public Works, and conditions imposed hereunder by the Planning Commission (all of which are collectively referred to herein as the "Requirements"); and

3. In connection with its approval of development of the Property, the County desires to obtain security, through the assignment of certain funds evidenced by a Certificate of Deposit held at the Bank, for the installation and maintenance of Improvements (Driveway Aprons) remaining to be completed at the execution of this Agreement in accordance with the Requirements. NOW, THEREFORE, in consideration of the mutual covenants contained herein, the parties agree as follows:

1. Assignment of Certificates of Deposit. The Developer hereby irrevocably assigns to the County all of its right, title, and interest in and to funds represented by a Certificate of Deposit in the face amount of _____ issued by the Bank, copies of which are attached hereto as Exhibit B ("Certificate"), as security for construction, completion, and the maintenance of the Improvements (Driveway Aprons). The Certificate shall be held by the Bank as escrow agent for

the County. The Bank shall hold the Certificate and its principal amount for the benefit of the County. The Bank shall not release the Certificate to the Developer or other

third party unless directed by the official of the County charged with the enforcement of the Requirements pursuant to the terms and conditions set forth in this Assignment.

2. Payment of Assigned Proceeds. If the Developer does not complete, construct, and maintain the Improvements (Driveway Aprons) in accordance with the Requirements of Henrico County Department of Public Works within one (1) year of the date of this assignment, then the funds evidenced by the Certificate shall be paid directly by the Bank to the County. As a condition precedent to receiving the funds assigned hereunder, the County shall provide the Bank with a certified statement, signed by an official charged with the enforcement of the Requirements, stating that the Developer has failed to satisfactorily construct, complete, and maintain the improvements in accordance with the Requirements. Upon receipt of such certified statement, the Bank will be unconditionally obligated to release the funds to the County. Upon receipt of such funds from the Bank, the County shall forthwith apply same for the sole and exclusive purpose of construction, completion and maintenance of the Improvements, and upon completion of such Improvements, shall promptly return all unused amounts to the Developer.

3. Termination. This Assignment shall terminate and be of no further force and effect on the date upon which construction and maintenance of all Improvements has been completed and accepted in accordance with the Requirements, as evidenced by a certified statement signed by an official charged with the enforcement of the Requirements stating that the Developer has satisfactorily constructed, completed and maintained all Improvements required by this Agreement and authorizing all funds assigned hereunder to be returned to the Developer.

4. Warranties. The Bank warrants that there are no legal or equitable defenses currently available to the Bank that might affect the County's ability to use proceeds of the Certificate for the purpose of completing the Improvements. The Developer warrants that there are no defects or prior liens incumbent on the properties.

5. Effect of Assignment. Nothing herein shall be construed to relieve the Developer of its independent legal obligation to complete and maintain the Improvements.

6. Interpretations. This Assignment shall be governed by and construed in accordance with the laws of Commonwealth of Virginia and shall be binding on the parties, their successors and assigns.

WITNESS the following signatures and seals all as of this ___ day of _____.

(Bank)

By _____
Title

(Developer)

By _____
Title

COUNTY OF HENRICO, VIRGINIA

By _____
Title

Approved as to form:

Assistant County Attorney

DECLARATION OF COVENANTS

INSPECTION/MAINTENANCE OF RUNOFF CONTROL MEASURES

THIS DECLARATION, made this ____ day of _____, 20 ____, between _____, and all successors in interest, hereinafter referred to as the "COVENANTOR(S)," owner(s) of the following property:

_____ on which best management practices, hereinafter referred to as "BMPs", or stormwater management facilities, hereinafter referred to as "SWM Facilities", to control stormwater runoff have been constructed, and County of Henrico, Virginia, hereinafter referred to as the "COUNTY."

WITNESSETH:

We, the COVENANTOR(S), with full authority to execute deeds, mortgages, other covenants, and all rights, titles and interests in the property described above, do hereby covenant with the COUNTY as follows:

1. The COVENANTOR(S) shall provide maintenance for the BMPs and/or SWM Facilities located on and serving the above-described property to ensure that the BMPs and/or SWM Facilities are and remain in proper working condition in accordance with approved design standards and with applicable legal requirements.

2. If necessary, the COVENANTOR(S) shall levy regular or special assessments against all present or subsequent owners of property served by the BMPs January 1,

2002 D-12 and/or SWM Facilities to ensure that the BMPs and/or SWM Facilities are properly maintained.

3. The COVENANTOR(S) shall provide and maintain perpetual access from public rights-of-way to the BMPs and/or SWM Facilities for the COUNTY, its agents and its contractors.

4. The COVENANTOR(S) shall grant the COUNTY, its agents and its contractors, a right of entry to the BMPs and/or SWM Facilities for the purpose of inspecting, operating, installing, constructing, reconstructing, maintaining or repairing the BMPs and/or SWM Facilities, as necessary.

5. If, after reasonable notice by the COUNTY, the COVENANTOR(S) shall fail to maintain the BMPs and/or SWM Facilities to control stormwater runoff in accordance with the requirements of Section 24-106.3 of the County Code in effect at the date of these covenants, the COUNTY may perform all necessary repair or maintenance work, and the COUNTY may assess the COVENANTOR(S) and/or all property served by the BMPs and/or SWM Facilities for the cost of the work and any applicable penalties.

6. The COVENANTOR(S) shall indemnify and save the COUNTY harmless from any and all claims for damages to persons or property arising from the installation, construction, maintenance, repair, operation or use of the BMPs and/or SWM Facilities.

7. The COVENANTOR(S) shall promptly notify the COUNTY when the COVENANTOR(S) legally transfer any of the COVENANTOR(S)' responsibilities for the BMPs and/or SWM Facilities. The COVENANTOR(S) shall supply the COUNTY with a copy of any document of transfer, executed by both parties.

8. The covenants contained herein shall run with the land and shall bind the

COVENANTOR(S) and the COVENANTOR(S)' heirs, executors, administrators, successors and assignees, and shall bind all present and subsequent owners of

property served by the BMPs and/or SWM Facilities as long as they own an interest in the property.

9. This COVENANT shall be recorded in the Circuit Court of Henrico County.

IN WITNESS WHEREOF, the COVENANTOR(S) have executed this
DECLARATION OF COVENANTS as of this _____ day of _____, 20____.

COVENANTOR(S)

ATTEST:

COVENANTOR(S)

ATTEST:

STATE OF VIRGINIA
CITY/COUNTY OF

I hereby certify that on the ____ day of _____, 20____, before the
subscribed, a Notary Public of the State of Virginia, and for the City/County of
_____, aforesaid personally appeared before
me _____,

Name of COVENANTOR(S)

and did acknowledge the foregoing instrument to be their Act.

IN WITNESS WHEREOF, I have hereunto set my hand and official seal this
_____ day of _____, 20_____.

Notary Public

My Commission expires:

Approved as to form:

RUNOFF CONTROL MEASURES DEFECT BOND

KNOW ALL MEN BY THESE PRESENTS, that we, _____,
(Principal) and _____, a corporation duly incorporated under the laws of
the State of _____, (Surety) are held firmly bound unto the County of
Henrico, Virginia, (County) in the full and just sum of _____ Dollars (\$ _____),
current money of the United States, to be paid to the County, to payment whereof we hereby bind
ourselves and each of us and each of our heirs, executors, administrators, successors and
assigns, jointly and severally, this _____ day of _____,
20_____.

WHEREAS, Principal has constructed and County has accepted or will in the near future
determine whether or not to accept into the County system of roads, the street, road and drainage
improvements described below together with adjacent street or roadway pavement, underlying
base material, surface and subsurface structures, curb and gutter, driveway entrances, storm
sewers, roadway shoulders and side and public drainage improvements lying within the
boundaries of the right-of-way and/or any public drainage easement described as follows:

NOW, THEREFORE, the condition of this obligation is such that if Principal shall, according to
the terms of the defect bond, indemnify and save harmless the County for a period of one (1) year
from the date of acceptance of the above-described improvements by the County from all loss,
cost, damage or expense incurred in the repair and/or replacement of roadway pavement,
underlying base material and structures, curb and gutter, driveway entrances, storm sewers,
roadway shoulders, and side ditches, which damage or deterioration occurs within the boundaries
of the public right-of-way and/or any public drainage easement, and damage to other work or
improvements resulting therefrom and occurring, appearing or manifesting itself
within the one (1) year period described herein, then this obligation shall be void; otherwise, it
shall remain in full force and effect.

It is expressly understood that this bond shall not be cancelled by Surety and nothing
herein shall operate to relieve, release or discharge Surety from liability on this bond.

Whenever Principal shall fail, and be declared by County to have failed, to repair or replace the above-described improvements or correct such damage or deterioration:

Surety, upon demand by County, shall promptly remedy or cause to be remedied such failure; or, County, after five (5) days written notice to Surety may perform or arrange for performance of Principal's obligations and Surety shall promptly reimburse County for the actual cost of such performance; provided, however, that in no event shall the liability of Surety exceed the face amount of this bond.

The expiration of this bond shall not relieve Surety from any liability previously accrued pursuant to this bond.

IN WITNESS WHEREOF, Principal and Surety have caused these presents to be executed and their seals affixed on the day and during the year above written.

Principal

Name

Address

Surety

By _____
Attorney In Fact

Countersigned:

Resident Virginia Agent

ACKNOWLEDGEMENT FOR PRINCIPAL

State of _____

County/City of _____, to wit:

I, _____, a Notary Public in and for the County/City and State aforesaid, do certify that _____, whose name is signed to the foregoing bond, personally appeared before me in my County/City and State aforesaid and acknowledged the same to be his act and deed.

My commission expires _____.

Given under my hand and seal this _____ day of _____, 20__.

Notary Public

ACKNOWLEDGEMENT FOR SURETY

State of _____

County/City of _____, to wit:

I, _____, a Notary Public in and for the County/City and State aforesaid, do certify that _____, whose name is signed to the foregoing bond, personally appeared before me in my County/City and State aforesaid and acknowledged the same to be his act and deed.

My commission expires _____.

Given under my hand and seal this _____ day of _____, 20__.

Notary Public

Erosion and Sediment Control Agreement

THIS AGREEMENT, made this _____ day of _____, _____, by and _____, hereinafter called "Developer", party of the first part, and the County of Henrico, Virginia, hereinafter called "County", party of the second part.

WITNESSETH

WHEREAS, Developer desires approval of plans for _____, which include provisions for erosion and sediment control measures as required by Chapter 10 of the Code of the County of Henrico, Virginia, and

WHEREAS, County desires to insure the installation, maintenance, and adequate performance of such control measures.

NOW, THEREFORE, in consideration of the foregoing premises and the following terms and conditions, as well as approval of the aforesaid plans by the County and the issuance of permits for the work, the parties hereto agree as follows:

1. Developer has provided the County financial security for the performance of its obligations in the amount of _____ by cash, irrevocable letter of credit or an assignment for erosion control measures ("assignment"), the terms and conditions of which are acceptable in substance and in form to the County Attorney. The cash deposit, letter of credit or assignment is designed to insure full and complete reimbursement to the County in the event that it performs work or causes work to be performed pursuant to paragraphs 2, 3, and 4 of this agreement.

2. In the event developer has not conducted measures for the control of sedimentation and erosion as provided by the plans, or on any approved revision, prior to the occurrence of any rainstorm or other event actually causing any sedimentation or erosion, County shall have the right to enter upon Developer's property and construct such measures or do such other work as may be necessary to prevent further erosion or sedimentation, provided that County shall first give notice in writing to Developer.

3. In the event Developer has constructed measures for the control of sedimentation and erosion but through overload or inadequate maintenance, they fail to perform the function for which they were intended, County may enter upon Developer's property to perform such reconstruction or maintenance as may be necessary to restore performance in accord with the plans, or approved revisions thereof, upon giving notice in writing to Developer.

4. In the event sedimentation or erosion from the property covered by the plans occurs in sufficient quantity to adversely affect downstream drainage, or travel on any street, road, highway, or other public way, then County may take all necessary steps to restore functions to the affected drainage area or travel way without prior written notice.

5. In the event County performs or causes to be performed work under the provisions of paragraphs 2, 3, and 4 above, either by County forces or private contractor, the County may draw upon Developer's cash deposit, letter of credit or assignment in the amount necessary for complete reimbursement of County for such work. The County will deliver or mail to Developer a copy of an invoice for work performed.

6. In the event County draws upon the Developer's financial security, Developer agrees within ten (10) calendar days of such disbursement either:

- a. to deposit an amount sufficient to restore the cash amount to its original balance; or
- b. to furnish an additional letter of credit or assignment in the amount necessary to restore the amount of the initial letter of credit or assignment.

7. In addition to paragraph 6 above, where the cost to the County for work performed pursuant to the provisions of paragraphs 2, 3, and 4 above exceeds the amount of the cash deposit, letter of credit or assignment held by the County, Developer shall pay in full to the County the cost incurred by the County in excess of the cash deposit, letter of credit or assignment within ten (10) calendar days of the time the County incurred such cost.

8. The parties agree that the purpose of this agreement is to insure the installation, maintenance, and performance of measures for the control of erosion and sedimentation and to provide for the restoration of facilities for drainage or vehicular travel if such facilities are adversely affected by sedimentation or erosion from the Developer's property.

9. The parties agree that the cash deposit, letter of credit or assignment shall be held by the County until utilized in accordance with paragraph 5 or released in writing by the County's Director of Public Works.

WHEREFORE, the parties have executed this agreement by their signatures below.

Developer

Attest _____
Its

By: _____(Seal)

County of Henrico, Virginia

By: _____
Director of Public Works/County Engineer

BANK LETTERHEAD

Date

County of Henrico, Virginia
Department of Public Works
P.O. Box 90775
Henrico, Virginia 23273

Attention: County Engineer

Gentlemen:

We hereby open our Irrevocable Letter of Credit No. (_____) in your favor for the account of (_____ Name of Developer _____), (_____ Address _____) for a sum not exceeding (Gross sum required on Erosion and Sediment Control Agreement) available by your sight drafts on the (Name of Bank) at (address), Richmond, Virginia, and accompanied by documents specified below:

A certified statement signed by an official of Henrico County, Virginia stating that the (Name of Developer) has not satisfactorily provided for the control of sedimentation and/or erosion as required by Chapter 10 of the Code of the County of Henrico, Virginia, as stated in the Erosion and Sediment Control agreement dated (Date) and as provided by the approved plans for (Name of Project).

A statement signed by an official of Henrico County to the effect that the drawing is for the explicit purpose of providing for the control of sedimentation and/or erosion pursuant to the terms of the Code of the County of Henrico, Virginia (and any amendment thereto) and as provided on the approved construction plans for (Name of Project).

All drafts must bear the clause "Drawn under the (Name of Bank) Letter of Credit No. (_____) dated (_____)."

We hereby engage with drawers, endorsers, and bona fide holders that all drafts drawn in compliance with the terms of this credit shall be duly honored upon presentation and delivery of the documents. This Irrevocable Letter of Credit shall remain in full force and effect for a period of three (3) years from the date hereof. While this Letter of Credit is in effect, the County may draw up to the full amount of the sum at (must be a Richmond location). This credit shall be terminated upon the County of Henrico's County Engineer (or his appointed agent) giving written release to (Name of Developer) stating that he has well and truly performed and fulfilled the obligations of the required improvements for (Name of Project). This Irrevocable Letter of Credit shall be construed in accordance with the "Uniform Customs and Practices for Commercial Documentary Credits" promulgated by the XIII Congress of the International Chamber of Commerce (International Chamber of Commerce Brochure No. 500, 1993 revision) and the provisions of the Uniform Commercial Code - Letters of Credit - Title 8.5 of the Code of Virginia, 1950, as amended.

Very truly yours,

(Name of Bank)

(Authorized Bank Officer)

(Corporate Seal)

**MAINTENANCE AGREEMENT FOR IMPROVEMENTS IN THE PUBLIC RIGHT-OF-WAY
HENRICO COUNTY DEPARTMENT OF PUBLIC WORKS**

THIS AGREEMENT (“Agreement”) is entered into this _____ day of _____, 20__, by and between _____ a _____ (“Owner”), and COUNTY OF HENRICO, VIRGINIA, a political subdivision of the Commonwealth of Virginia (“County”).

WITNESSETH:

Recitals

Owner is the owner and developer of certain real property in the _____ District of Henrico County, Virginia, known as _____. Pursuant to the development of _____, Owner wishes to place improvements in the public right-of-way.

In accordance with plans prepared by _____ (“Engineer”) dated _____, (“Plans”), Owner will install a _____ within the right-of-way of _____ (“Road”). Owner and County enter into this agreement to provide for the installation and maintenance of such _____.

Agreement

In consideration of the mutual promises, benefits and covenants contained herein, the receipt and sufficiency of which are acknowledged by each of the parties hereto, the parties hereto agree as follows:

1. Plans. Owner has caused Engineer to prepare Plans, which have been approved by County. All changes and revisions to the Plans shall, as they are prepared and prior to construction, be submitted to and subject to the written approval of the County Engineer.

2. Improvements. Owner shall have the right to install the _____ contemplated by the Plans in accordance with the Plans. Owner shall be responsible for the operation and maintenance of the _____. County shall have no responsibility whatsoever in connection with the operation and maintenance of such _____, and Owner shall indemnify and hold County harmless from any liability that may result from the operation or deterioration of the _____. Any damage to the roadbed or other public structures resulting from installation or maintenance of the _____ shall be the responsibility of Owner.

3. Maintenance. If at any time the County Engineer determines that any

maintenance is required of Owner within the right-of-way of the Road, the County Engineer will give Owner written notice stating in reasonable detail the required maintenance work. Thereafter, Owner shall, at its own expense, promptly perform such maintenance work. If such maintenance work is not completed within sixty (60) days from receipt of such notice, or if within such sixty (60) day time period the work is not, in the sole opinion of the County Engineer, being diligently pursued and continues not to be diligently pursued to completion (unless prevented or delayed because of adverse or unfavorable weather conditions), or in the event of an emergency requiring that maintenance work be performed immediately in the sole opinion of the County Engineer, then the County may but is not required to perform maintenance work, and the County Engineer or his designee shall notify Owner of the amount of all costs incurred in performing such work. Owner hereby agrees to fully reimburse the County for the cost of such maintenance work. The foregoing shall not be deemed to prevent Owner from disputing whether such work is the responsibility of Owner under the terms of this Agreement.

4. Miscellaneous.

a. Owner shall have the right to assign its rights and obligations hereunder to an owner's association ("Association"), organized to maintain the _____ within the right-of-way of the Road in which event the obligations of Owner hereunder shall terminate. This Agreement shall be binding upon successors and assigns of the rights and obligations of Owner or Association as provided herein, but it is not intended to and shall not be a covenant running with any real estate now or hereafter owned by Owner or the Association, or either of their respective successors and/or assigns. No obligations imposed on Owner or the Association, or either of their successors and assigns, by this Agreement shall constitute a lien or otherwise encumber the title to any such real estate, it being intended that all obligations of Owner and the Association provided herein are personal to Owner or the Association, as the case may be, and the successors and assigns of their respective rights and obligations contained herein. Owner shall, at its expense, cause this Agreement to be recorded in the Clerk's Office of the Henrico County Circuit Court and indexed in the name of Owner as grantor and the County as grantee.

b. Nothing herein shall be construed to limit the right of Owner or the Association to sell, lease or otherwise dispose of or transfer title to all or any part of any land owned by either of them.

5. Termination. This Agreement shall terminate and be of no further force or effect upon the discontinuance and abandonment of the _____ with the right-of-way of the Road in accordance with procedures approved by the County, which approval shall not be unreasonably withheld.

6. Notices. All notices required, permitted or given pursuant to or in

connection with this Agreement shall be sufficient if in writing and delivered in person or mailed by certified mail, return receipt requested, to the following persons at the following addresses:

Owner: (Name _____)
(Title) _____

County: The County of Henrico, Virginia
P.O. Box 90775
Henrico, Virginia 23273
Attention: County Engineer

or to such other addresses of which notice shall have been pursuant to this paragraph. Notices shall be deemed given upon mailing.

The obligations of Owner shall neither be assigned nor transferred to any successor or assign of Owner until such time as Owner and such successor or assign shall have each notified the County Engineer, in writing, of the name and address or a person duly authorized to receive notice on behalf of the successor or assign pursuant to this Agreement.

If the name or address of any person authorized to receive notification pursuant to this Agreement changes, each party to this Agreement covenants that such party shall immediately notify, in writing, by the above-described procedure, each other party to this Agreement of such change.

7. Complete Agreement. This Agreement contains the entire understanding of the parties, and no amendment or modification shall be binding unless in writing and signed by all parties hereto.

8. Waiver. The failure of the County, the Association or Owner, their successors and assigns, to exercise, or to delay in exercising any right under this Agreement in the event of default, shall not be deemed to be and shall not constitute a waiver with respect to any subsequent default.

9. Paragraph Headings. The paragraph headings contained in this Agreement are intended for convenient reference only, and shall not be construed to affect the meaning or construction of any provisions of this Agreement.

10. Successors and Assigns. Whenever used in this Agreement, “successors and assigns” means the successors and assigns of Owner to its rights and obligations under this Agreement, or the successors and assigns of the Association to its rights and obligations under this Agreement, as the case may be, and does not refer to any other successors and assigns of Owner or the Association.

11. Jurisdiction. This agreement shall be governed by the laws of the Commonwealth of Virginia, and all disputes shall be resolved in the Circuit Court of the County of Henrico.

WHEREFORE, the parties hereto have caused this Agreement to be executed by their respective duly authorized representatives:

_____,
a _____

By: _____
Title: _____

COUNTY OF HENRICO, VIRGINIA
A political subdivision of the
Commonwealth of Virginia

By: _____
Title: _____

ATTEST:

Clerk

APPROVED AS TO FORM:

(Assistant) County Attorney
STATE OF _____,
CITY/COUNTY OF _____, to wit:

The foregoing instrument was acknowledged before me this _____ day of _____, 20____, by _____, _____, a _____, on behalf of the

My commission expires: _____

Notary Public

COMMONWEALTH OF VIRGINIA

CITY/COUNTY OF _____, to wit:

The foregoing instrument was acknowledged before me this _____ day of _____, 20____, by _____, _____, of the County of Henrico, a political subdivision of the Commonwealth of Virginia.

My commission expires: _____

Notary Public

**NON-MAINTAINED COUNTY RIGHT-OF-WAY AGREEMENT FOR A PRIVATE
DRIVEWAY IN AN UNIMPROVED PUBLIC RIGHT-OF-WAY**

THIS AGREEMENT ("Agreement") is entered into this _____ day of _____, 20 ____, by and between _____, and all successors and assigns in title and interest, hereinafter referred to as the "Owner" and COUNTY OF HENRICO, VIRGINIA, a political subdivision of the Commonwealth of Virginia ("County").

WITNESSETH:

Recitals

Owner is the owner and developer of certain real property in the _____ District of Henrico County, Virginia, known as _____ (Site Address). Pursuant to the development of a single-family residence at _____ (Site Address), Owner wishes to establish and/or use a private driveway in the unimproved public right-of-way known as _____ (Road Name) to provide access to the proposed single-family residence. In accordance with building permit _____ and plans prepared by _____ dated _____, Owner will use and/or establish a driveway within the right-of-way of _____ (Road Name).

Agreement

In consideration of the mutual promises, benefits and covenants contained herein, the receipt and sufficiency of which are acknowledged by each of the parties hereto, the parties hereto agree as follows:

1. Owner acknowledges that the County will not participate in any maintenance of the driveway or its associated structures (ditches, pipes, etc.);
2. Owner acknowledges that the County may construct or allow construction of a public road and associated structures (ditches, pipes, etc.) in the right-of-way in the future but does not intend to do so at this time.
3. Owner acknowledges that this agreement only authorizes the establishment and/or use of a driveway within the right-of-way.
4. Termination. This Agreement shall terminate and be of no further force or effect upon the construction and acceptance by the County of a public roadway in the unimproved public right-of-way known as _____ (Road Name) in accordance with applicable standards as specified by the County.
5. Complete Agreement. This Agreement contains the entire understanding of the parties, and no amendment or modification shall be binding unless in writing and signed by all parties hereto.

6. Waiver. The failure of the County, the Association or Owner, their successors and assigns, to exercise, or to delay in exercising any right under this Agreement in the

event of default, shall not be deemed to be and shall not constitute a waiver with respect to any subsequent default.

7. Paragraph Headings. The paragraph headings contained in this Agreement are intended for convenient reference only, and shall not be construed to affect the meaning or construction of any provisions of this Agreement.

WHEREFORE, the parties hereto have caused this Agreement to be executed by their respective duly authorized representatives:

_____ (Owner),
 a _____ (Corporation, LLC, etc.)
 By: _____ (Signature)
 Title: _____

COUNTY OF HENRICO, VIRGINIA
 A political subdivision of the
 Commonwealth of Virginia
 By: _____
 Title: _____

ATTEST: _____
 Clerk

APPROVED AS TO FORM: _____
 (Assistant) County Attorney

STATE OF _____,

CITY/COUNTY OF _____, to wit:

The foregoing instrument was acknowledged before me this _____ day of _____, 20____, by _____ (Name of Signator), a _____ (Title), on behalf of the _____ (Company).

My commission expires: _____

 Notary Public

COMMONWEALTH OF VIRGINIA

CITY/COUNTY OF _____, to wit: The foregoing instrument was acknowledged before me this _____ day of _____, 20____, by _____, _____, of the County of Henrico, a political subdivision of the Commonwealth of Virginia.

My commission expires: _____

Notary Public

Appendix E – Right-of-Way and Insurance

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Permit to Work in the Right-of-Way	E-2
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**PERMIT TO WORK IN THE RIGHT-OF-WAY
DEPARTMENT OF PUBLIC WORKS
COUNTY OF HENRICO
P.O. BOX 90775
HENRICO, VIRGINIA 23273-0775**

PERMIT NO. _____

One (1) copy of application and four (4) copies of plans are hereby made to the Director of Public Works at Henrico County, Richmond, Virginia, for a permit to perform the work shown on the accompanying plans and further described as follows:

DESCRIPTION OF WORK: _____

The work is to be done under and in accordance with the rules and regulations of the County of Henrico, Virginia on the _____ Road, between _____ and _____ Road, and to be completed within _____ days from date of approval.

Attached is a check or cash for \$ _____ to cover the inspection fee and a guaranty of \$ _____ to save the County harmless for any damage done. If a Bond is furnished as guaranty, give the amount of bond and the name and address of Bonding Company. Bond \$ _____ Name: _____
Address: _____

It is understood that the County may use any or all of the guaranty to repair any damage resulting from the work and that the balance, if any, will be refunded to the applicant. Work must be inspected during construction by the Department of Public Works, County of Henrico.

Dated this _____ day of _____ 20____.

Company Name
Address
By
Phone No.

Name of contact person and phone number to call in case of emergency:

Permission is hereby given to (Name) _____ by the County of Henrico, under the powers granted to it by Act of Assembly-1942 to perform the work described at the locations given as set forth above as shown on the plan or sketch submitted in conformance with the attached Special Provisions

Approved _____
Time limit expires on: _____

County of Henrico, Virginia

By: _____

Please attach plans/sketches to this application

**COUNTY OF HENRICO
DEPARTMENT OF PUBLIC WORKS**

Special Provisions for Work in County Right-Of-Way

This permit is issued with the full understanding that all work shall be performed in a manner acceptable to the Department of Public Works (DPW) at all times. It shall be further understood that this permit can be revoked for unsatisfactory work or failure to comply with the below list of governing conditions for work in the County right-of-way.

Unless otherwise noted herein, all materials, mix designs, and construction methods shall be in accordance with the Virginia Department of Transportation (VDOT) Road & Bridge Specifications and Standards.

Special Provisions:

1. The applicant shall be responsible for any and all defects resulting from the work in County right-of-way for a period of 12 months from the date all work is completed. Defects shall include but are not limited to pavement, trenches, shoulders, ditches, lawns, pipes, driveways, sidewalks, curb and gutter, etc.
2. A minimum of 24 hours prior to any work, notify the DPW construction inspector. Normal work days are Monday through Friday from 8:00AM to 4:30PM, but shall not include any County observed holidays. Work on Saturdays must be coordinated with DPW Construction Division 48 hours in advance of the work. Work on Sunday is prohibited.
3. Traffic control shall be in accordance with the latest edition of Virginia Work Area Protection Manual and it shall be the sole responsibility of contractor to install, maintain, and remove. Additional signs, barricades, certified flaggers, electronic arrows and other traffic control devices may be required by the Traffic Engineer, depending on the nature and location of the work. Installation, changes, and removal of traffic control devices shall be performed by the contractor or his representative possessing an active VDOT Intermediate Work Zone Traffic Control Training and Flagger certification. A representative having, at a minimum, Basic Work Zone Traffic Control Training and certification shall be on-site during all construction activities requiring temporary traffic control. Unless approved by the Traffic Engineer, all lanes of traffic shall be open at the close of each work day.
4. The Traffic Engineer shall be notified 24 hours in advance of lane closures or traffic restrictions on arterial or collector roads. Depending on the scope of work, traffic control requirements and public notification requirements, additional notification time may be necessary. Unless otherwise approved, lane closures on arterial and collector

roads will be permitted only between 9:00 a.m. and 3:30 p.m.

5. All road closures shall have prior approval of the Traffic Engineer. Sufficient notification of the anticipated road closure is essential to allow for required detour signing and appropriate notifications to the general public, schools, public transportation and emergency services.
6. Henrico County Public Schools – Pupil Transportation shall be notified 24 hours in advance of any road closures or traffic restrictions on all county roads. HCPS Pupil Transportation points of contact for road construction information are as follows. Call main phone number 804-226-5577 and also email Josh Davis (Director) cjdavis@henrico.k12.va.us, Kevin Roye (Assistant Director) ktroye@henrico.k12.va.us, and Alyson Beverly (Routing) akbeverly@henrico.k12.va.us
7. Use of steel plates shall be prohibited unless approved by the Traffic Engineer.
8. No open excavation shall be allowed after the close of the workday.
9. Unless otherwise approved by the Traffic Engineer, no equipment or materials are to be left in the County right-of-way after work hours. Should permission be given to allow equipment and materials in the right-of-way after work hours, Group II channelizing devices (plastic barrels with prismatic sheeting) shall be used to delineate the area. Equipment and materials shall be placed in areas that would have no adverse impact to the property owners and shall not obstruct any sight distances.
10. Dust shall be controlled by watering or applying calcium chloride whenever determined necessary by DPW.
11. All dirt, mud and debris tracked onto roadways shall be immediately removed and the road cleaned.
12. The applicant shall comply with all state and federal environmental regulations as well as the County of Henrico Environmental Ordinance (Chapter 10) requirements. All erosion control should be performed in a manner consistent with the [Virginia Erosion and Sediment Control Handbook](#) and Chapter 5 of the Henrico County Environmental Compliance Manual.
13. In accordance with Sec. 10-32 of the Henrico County Code, an Environmental Compliance Plan (ECP) must be provided for projects with land disturbance of 2500 S.F. or greater. The ECP must satisfy the requirements set forth in Chapter 5 of The County of Henrico’s Environmental Compliance Manual. Please use the link provided for a thorough explanation of what is required.
<http://henrico.us/pdfs/works/Chapter05ENVIRONMENTALCOMPLIANCEPLAN.pdf>
14. Prior to any work in or adjacent to streams and/or wetlands, contact DPW’s Environmental Inspector at 727-8328 / 727-8325.
15. Access to adjacent properties shall be maintained at all times.

16. When it appears that the permitted work may have some impact to adjacent private or commercial properties, the applicant shall inform the owners of the proposed work and keep them apprised of time schedules, delays, impacts, changes in pedestrian and vehicle access or traffic patterns and final restoration plans.
17. Restoration of road and earth disturbances shall be on-going as work progresses.
18. All disturbances shall be restored to pre-construction condition to the satisfaction of DPW.
19. Install cable, manholes and/or boxes as close to the right-of-way line as possible. If utility easements are available the facilities shall be installed beyond the right of way within easements. Navigating may be required on backside of ditches in wooded areas.
20. The applicant shall coordinate utility installations with developer and/or owner in areas of on-going development.
21. Unless otherwise approved, utility installations shall maintain 24" horizontal and 12" vertical minimum clearances from the outside diameter of storm sewers and structures.
22. Utility installations across paved driveways, sidewalks, landscaped areas, irrigation systems or sodded lawns shall be bored/navigated unless approved by the Construction Division.
23. When open cutting of driveways and sidewalks is permitted, replacement shall be from the back edge of the trench to the edge of pavement or curb and gutter. Prior to excavation, trench limits shall be sawcut full depth, so as to avoid damage to sections to remain.
24. Disturbed shoulders, ditches and slopes shall be restored to the original typical sections with regards to widths, slopes and elevations and vegetated in a timely manner.
25. Disturbed mailboxes and roadway signs shall be reset immediately after backfill and no later than the close of each workday. Regulatory signs (stop, yield, etc.) shall be maintained at all times.
26. Disturbances to gravel driveways shall be restored with the same type of aggregate.
27. Damage to storm sewers and/or drainpipes shall be reported immediately to DPW and shall be repaired or replaced, prior to the end of each workday, as directed by DPW.
28. Storm sewer pipe shall be inspected by County Inspector prior to backfilling and compacting trench. Any Storm sewer pipe installed without Inspector approval shall be

subject to video inspection per VTM 123 or may be required to be removed at contractor's expense. Video inspection files will be supplied to County for approval and County records.

29. Trenches for utility installation shall be of sufficient width to allow for the operation of appropriate compaction equipment. Trenches within roadway shall be backfilled with No. 21B stone in uniform compacted lifts to 95% of maximum dry density, per Appendix C, Drawing C-28.
30. Open cut trenches within 2 feet of the existing edge pavement will require the edge of pavement to be re-constructed as directed by DPW Construction Division.
31. Asphalt pavement shall be restored in accordance with the attached sketches using VDOT approved materials and asphalt mix designs. Flush patching will only be permitted for a single isolated transverse cut in the pavement, an isolated disturbance for an abandonment and /or an adjustment to a valve box and/or manhole frame and cover. Whenever possible, patches in close proximity to each other (valve removal, abandonment, existing patches etc.) shall be combined into one uniform patch. Patches within existing patches will not be allowed. The existing patch shall be removed and replaced along with the new restoration to form one uniform patch. Flush patches are considered permanent and must be installed in a professional manner with reasonably square corners, smooth and uniform. If unacceptable, the patch must be removed and replaced until deemed acceptable by DPW.
32. Multiple transverse cuts, "Miss Utility" test holes or longitudinal cuts in the pavement will require full width asphalt overlays throughout the length of disturbance. Asphalt overlays shall be transitioned (10' min.) to tie to existing roadway elevation. In curb and gutter sections, milling will be required prior to placement of the overlay. Generally, it will be acceptable to mill only the curb lanes unless the road has been previously overlaid, in which case the entire road must be milled to avoid undesirable cross slopes. Unless otherwise approved, temporary or permanent asphalt shall be placed in trenches at the close of each workday. Prior to asphalt overlays, all manhole frame and covers and valve boxes shall be adjusted to proposed finished grade. In shoulder sections, a 12:1 wedge of No. 21B stone to match the surface of the existing shoulder, shall be placed along overlay to tie-in the shoulder to the finished grade of the overlay. Asphalt overlay shall be a minimum of 2" in depth. Pavement restoration limits shall include all test holes and be in accordance with the attached sketch for flush patches.
33. Pavement joints shall be minimized as much as possible.
34. Where asphalt overlays are required in road intersections, the overlay must encompass the entire intersection. To avoid raised joints and uneven pavement, the overlay shall terminate at the far radius point. If curb and gutter exist around the returns, pavement milling will be required prior to the overlay. Where asphalt overlays are shown to terminate within close proximity of another overlay, an existing joint, an intersection or end of road, the asphalt overlay must be extended as directed by the construction inspector to the logical point of termination.
35. Asphalt Surface Course and Asphalt Base Course shall be a VDOT approved mix design

with a minimum lay down temperature of 250° F.

36. In curb and gutter sections and areas where overlay would create undesirable cross slopes, it will be necessary to mill the lanes, throughout the length of disturbance, to a depth of 2 inches prior to the full width road overlay. Provide a consistent cross slope from the crown of the roadway to the edge of pavement. Deviation from a consistent cross slope shall be limited to a maximum 1% variation. At no time shall the cross slope from the crown of the roadway to the edge of pavement create a “valley” like section of pavement in the travel way. Temporary wedges shall be placed for a transition onto uneven pavement. It shall be the design engineer’s responsibility to determine existing roadway cross slope. Pavement cores shall be taken for each roadway that will enable the design engineer to determine that the existing pavement structure depth allows for the roadway to be milled and overlaid without subbase materials being disturbed. Pavement core location and data shall be shown in project plans. “Edge Milling” is not allowed. The repaving of milled areas shall be performed within 3 days of the milling operation.
37. The applicant shall be responsible for replacing all disturbed pavement markings and messages within 48 hours of pavement restoration. VDOT certified pavement marking contractors shall perform the work.
38. Prior to any work adjacent to a signalized intersection, the applicant shall contact “MISS UTILITY” and DPW signal shop at 727-8303. The applicant shall be responsible for all costs associated with damage to loop detectors, underground conduit, junction boxes, cables, etc.
39. Unless otherwise approved, trenches within shoulders shall be backfilled entirely with No. 21B stone in uniform compacted lifts. In addition, 2" of topsoil shall be placed over disturbed areas where grass shoulders existed and areas seeded. Areas outside of the roadway prism shall be backfilled with suitable material in compacted lifts. Surplus and unsuitable excavation shall be removed from the right-of-way and properly disposed of at an approved location.
40. When proposed work is within 250 LF of a signalized intersection, and/or when required by the Traffic Engineer, off-duty police shall be used in conjunction with temporary traffic control requirements. Applicant is responsible for all associated costs of traffic control.
41. The restoration of concrete items within the County right-of-way and easements shall be made with Class A3 Concrete in accordance with VDOT specifications.
42. For future identification purposes, hand holes, manholes and/or junction boxes shall have the name of the company owning the facility, permanently marked on all access covers.
43. Approval of this permit does not guarantee that sufficient space exists within the County right-of-way for the placement of any portion of this facility. Changes in the routing of the cable and/or easements may have to be obtained by the applicant

to facilitate the installation.

44. All contractors working within the Right of Way shall have their company name visible on both sides of all work vehicles. Any subcontractors working on behalf of a permitted contractor shall be listed on the permit as a subcontractor.
45. Upon completion of the work, the contractor/owner shall be responsible to contact the County construction inspector 48 hours in advance and request a final inspection. When the final inspection is complete and approved, a one year warranty period will begin. 90 days prior to the end of the one year warranty period the contractor/owner shall request in writing that the posted bond be released. The bond will be released if no additional repairs are determined to be necessary.

Contact numbers:

Construction Division	727-8249
Traffic Engineer	727-8282
Environmental Inspector	727-8328

AGREEMENT FOR USE OF PUBLIC RIGHTS-OF-WAY IN HENRICO COUNTY, VIRGINIA

This Agreement is made this _____ day of _____, _____ between _____ (hereinafter referred to as “User”) and the County of Henrico, Virginia (hereinafter referred to as “County”) to establish the conditions for use of the County’s rights-of-way.

1. The County agrees to give the User whatever rights it has for the User to perform work in the County rights-of-way pursuant to each permit issued by the County Department of Public Works. User shall be responsible for obtaining the permission of any other County, state or federal government agency whose permission is required to work in the County’s rights-of-way.
2. User shall obtain a permit for each project in which work will be done in the County’s rights-of-way. Issuance of each permit shall be based upon the County review of plans indicating the work to be done. User agrees to comply with all provisions of each permit and the project plans which have been reviewed by the County. Should User discover conflicts or other conditions that prevents it from working as specified in the User’s plans, User shall notify the County Department of Public Works and, if the User desires to continue said project, User shall obtain any necessary private easement, at its own expense, should sufficient area for installation be unavailable in the County rights-of-way.
3. User assumes full responsibility for all damage to the County rights-of-way and other adjacent properties that occurs as a result of work performed by User. User shall repair all damage caused by installation, maintenance, relocation or removal activities of User in or adjacent to the County rights-of-way. User shall defend and hold the County and its officers, employees and agents harmless for all damage to persons or property caused by work performed by the User in or outside of the County rights-of-way. The County shall be responsible for damages to persons or property caused by the negligent acts or omissions of the County during work in the right-of-way.
4. User shall maintain as-built plans and records of all facilities and equipment in the County rights-of-way and make such records available to the County upon request.
5. User shall resolve any conflict with existing utility facilities in the County rights-of-way at the time User (i) installs its facilities and equipment or (ii) changes the use of

its facilities and equipment within the County rights-of-way.

6. User shall comply with all requirements imposed by each permit, including time limits

for the work, the payment of any permit application and inspection fees, and the provision of a financial guarantee, conforming to the attached schedule, required by the County Department of Public Works to insure repair of any damage caused by the User. The amount of fees and financial guarantees may vary among permits based upon the work encompassed by the permits.

7. Underground installations shall be at a minimum depth of thirty-six (36") inches.

8. User shall be permitted to work in County rights-of-way during the hours provided in the permit. Emergency work will be permitted to take place during hours other than those stipulated on the permit only when conditions exist with the User's facilities and equipment which jeopardize the health, safety or welfare of the general public. When such an emergency occurs, the User shall advise the County Department of Public Works as soon as practical of the emergency condition which exists. The User will be permitted to work in the County rights-of-way until the emergency condition has been resolved.

9. User shall not be permitted to work in County rights-of-way on the holidays specified in the permit except during emergency conditions as defined in paragraph number 8 above. When such an emergency occurs, the User shall advise the County Department of Public Works as soon as practical of the emergency condition which exists. The User will be permitted to work in the County rights-of-way until the emergency condition has been resolved.

10. When specified on the permit, a pre-construction meeting will be held with the County Department of Public Works prior to the start of work. User shall not be permitted to work in any areas not covered by the permit and plans unless otherwise approved by the County Department of Public Works.

11. User must relocate its facilities and equipment located in the County rights-of-way at its expense, upon notification from the County that the County has need for the area in which User's facilities and equipment are located for a public improvement project. User shall relocate its facilities as soon as possible when notified by the County that emergency conditions exist which jeopardize the health, safety or welfare of the general public. During other situations, relocation shall be complete within 60 days of the date of notification unless the County Department of Public Works agrees to a longer period in writing. The County shall provide room within the relocated rights-of-way for User's reinstallation of its facilities and equipment.

12. Upon request from the County for such information, User must inform the County whether the User's facilities and equipment located in a specified portion of the

County rights-of-way have been abandoned. The User shall field check its facilities and equipment and advise the County, in writing, of the status of its facilities and

equipment. The County shall be entitled to require removal of the abandoned

facilities and equipment if User does not wish to transfer title to County or if County has no use for the abandoned facilities and equipment. All notices under this Agreement shall be sent to the addresses listed with the written request for such information.

13. This agreement shall not be transferred to third parties without the County’s written consent, which shall not be unreasonably withheld. Notwithstanding the foregoing, the User has the right to assign or transfer its rights, privileges and obligations created under this Agreement to a subsidiary of the User without the County’s prior written consent so long as said sale, lease or assignment is made subject to this Agreement.

14. User shall provide a certificate of insurance or letter of explanation showing that they meet the attached insurance specifications with their application for a permit. The insurance specifications can be met through any combination of purchased insurance and/or self-insurance as long as it is spelled out on the certificate or in the letter of explanation. All submissions shall be subject to review and approval by the County. This insurance must remain valid as long as the User has facilities in the County right-of-way to cover maintenance of the facilities and potential liability concerns.

15. In the event that the User fails to comply with any material term of this Agreement or any related permit, the County shall provide written notice to User of the noncompliance and further provide the User a reasonable opportunity to cure such noncompliance prior to terminating the agreement.

16. This Agreement shall remain in effect until such time that the County determines a need for revisions to address changes in policy, regulations or requirements. In such a situation, the County shall advise the User of the revised Agreement. Any permits obtained under this Agreement prior to the notification of the revised Agreement shall continue to be governed by this Agreement. Any permits requested after the above notification shall be governed by the revised Agreement.

WHEREFORE, the parties have executed this Agreement by the signatures below.

By: _____
Title: _____
Date: _____

COUNTY OF HENRICO
By: _____
Title: _____
Date: _____

SCHEDULE FOR CALCULATING FINANCIAL GUARANTEES FOR WORK IN COUNTY RIGHTS-OF-WAY

The following values will be used to determine minimum financial guarantee that must be posted prior to the issuance of a permit to work in the County rights-of-way.

The total sum of the applicable items of work listed below is the amount of the bond that shall accompany any permit application. However, in no case shall the financial guarantee that is posted be less than \$1,000.00

ITEM	UNIT
Manhole or Junction Box	\$ 1,500.00/each
Bores (under roads/drives)	
Two Lane Road	\$ 1,000.00/each
Three Lane Road	\$ 1,500.00/each
Four Lane Road	\$ 2,000.00/each
Each Additional Lane Over Four Lanes	\$ 500.00/each
Directional Bores (other than roads/drives)	\$ 1.00/linear foot
Trenching	
Inside Pavement	\$ 10.00/linear foot
Outside Pavement	\$ 1.00/linear foot
Poles	\$ 1,000.00/each

The financial guarantee that is provided must be in the form of either a cash bond or Letter of Credit. Letters of Credit may be issued on out-of-area banks but must list a draw address at a bank in the City of Richmond, Chesterfield County or Henrico County, Virginia.

INSURANCE SPECIFICATIONS

The Contractor shall carry Public Liability insurance in the amount specified below, including the contractual liability assumed by the Contractor, and shall deliver the Certificate of Insurance from carriers acceptable to the owner specifying such limits, with the County named as an additional insured. In addition, the insurer shall agree to give the County 30 days notice of its decision to cancel coverage.

1. Workman’s Compensation and Employer’s Liability

- Coverage A – Statutory Requirements
- Coverage B - \$1,000,000 Per Occurrence
- Coverage C - \$100,000/\$100,000 Accident and/or Disease All States Endorsement

2. Automobile Liability, including Owned, Non-Owned and Hired Car Coverage. Limits of Liability-

- | | | |
|---|-----------|--|
| Bodily Injury | | \$1,000,000 each person
\$1,000,000 each occurrence |
| Property Damage | <u>OR</u> | \$1,000,000 each occurrence |
| Single Limit:
Bodily Injury
Property Damage | | \$2,000,000 each occurrence |

3. Comprehensive General Liability. Limits of Liability –

- | | | |
|---|-----------|-----------------------------|
| Bodily Injury | | \$1,000,000 each occurrence |
| Property Damage | <u>OR</u> | \$1,000,000 each occurrence |
| Single Limit:
Bodily Injury
Property Damage | | \$2,000,000 each occurrence |

- Including –
- A. Completed Operations/Products
 - B. Contractual Liability for Specified Agreement
 - C. Personal Injury
 - D. (XCU) Explosion, Collapse and Underground Coverage
 - E. Broad Form Property Damage

NOTE 1: Contractual Liability covers the following indemnity agreement:

“The Contractor shall indemnify and hold harmless the Owner against and from all liability, claims, damages and costs, including attorney’s fees of every kind and nature and attributable to bodily injury, sickness, disease or death or to damage or destruction of property resulting from or in any manner arising out of or in connection with the project and the performance of the work under this contract.”

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