

Chapter 14 - Subdivisions

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Chapter 14 - Subdivisions

14.1 Introduction

14.1.1 Objective

This chapter is devoted primarily to the design criteria and technical aspects of the design of drainage facilities for subdivision streets and roads that are designated to become a part of the State Secondary System of Highways.

It should be recognized that subdivision land drainage is the responsibility of the local government in whose jurisdiction the land lies. The policies, criteria, and design recommendations contained herein apply only to the streets and roads that are or will be maintained by VDOT. Once the streets and roads have been accepted into the System for maintenance they should be considered as another property within the watershed and the Department should be considered another property owner when assigning responsibility for drainage or drainage improvements within a watershed.

For more comprehensive information concerning administrative requirements for subdivisions, refer to the current editions of VDOT *Subdivision Street Requirements* and the *Guide for Additions, Abandonments, and Discontinuance – Secondary System of State Highways*. Both publications are produced by the VDOT Maintenance Division in Richmond and can be obtained on VDOT's web site <http://www.virginiadot.org>.

For the purpose of administering the State Transportation's Board's policy concerning subdivisions, a subdivision is defined as "the division of lot, tract, or parcel into two or more lots, plats, sites, or other division of land for the purpose, whether immediate or future, of sale or of building development."

Any re-subdivision of a tract or parcel of land is interpreted as a new subdivision under this definition and must satisfy all VDOT requirements for street additions to the Secondary System irrespective of the date of the original subdivision.

*Rev. 9/09

14.2 Policy

14.2.1 Applicability

These requirements are applicable to all subdivision streets which are designated to become a part of the State Secondary System of highways. Department engineers are allowed to exercise discretionary judgment for the practical application, in peculiar individual situations, that will allow the optimum development of land without sacrificing the integrity of the policy.

The Department's review and approval is applicable only to streets that are proposed to ultimately be added to the State Secondary System.

14.2.2 Agency Permits and Coordination

Plats and/or plans of all proposed subdivisions within a Residency's geographical boundary, whose streets are intended to be added to the Secondary System, should be submitted to the appropriate Resident Engineer for his review. In counties which have administrative staffs who administer the county ordinance, these submissions should be made through the county staff instead of directly to the Department's Resident Engineer. The plats and/or plans should include:

The complete drainage layout including all pipe sizes, types, drainage easements, and means of transporting the drainage to a natural watercourse (For a definition, in a legal sense, of a natural watercourse, see Chapter 4). Not only should we consider the present drainage of the immediate development, but the evaluations relative to future expansion or new adjacent development should be made as to their effect on the facilities proposed for the immediate development. Care must be taken to ensure that sufficient easements are provided to a natural watercourse or to furnish an acceptable agreement from county authorities to save the Department harmless from future claims.

- A typical cross section showing the proposed street construction, width, depth, type of base, type of surface, etc.
- A profile or contour map showing the proposed grades for the streets and drainage facilities
- A location map indicating the tie-in with the existing VDOT road system
- CBR tests for the Department's review of pavement design

It is not intended that VDOT do the design work for the developer. Therefore, all computations utilized in determining the drainage facilities (including design calculations along with bridge plans that may be part of the subdivision) should be submitted for review. The Department's engineers will check computations that are pertinent, but the original design work should be done by the developer's representatives who are licensed by law to do such work.

Upon receipt of the plats and/or plans, the Resident Engineer is to study the layout thoroughly and determine if it is in compliance with all requirements of the Department, noting thereon any changes he feels should be made and:

- The drainage features may be referred to the district drainage engineer for review. Should there be a subdivision on which the district feels it should obtain further advice, the matter should be referred to the Hydraulics Section of the Location and Design Division
- Where a situation other than drainage appears to be complicated, and if the Resident Engineer has any doubt regarding it, he is to forward the prints and all data to the District Engineer for advice. Likewise, the District Engineer should consult further with the Maintenance Division and the Location and Design Division on any matter which he feels is necessary. After appropriate corrections or changes have been noted on the plats and /or plans by those making the review, they should be returned to the Resident Engineer for his further processing
- The Resident Engineer will return to the developer, or where applicable to the county official, the plats and/or plans approved subject to notations thereon, keeping one copy for his files. He should list the required changes in his letter of transmittal. In counties where the plats and/or plan are not signed by the Resident Engineer, the board of supervisors of the county should be notified that the subdivision prints have been reviewed, certain recommendations made, and, if the subdivision is developed according to plans, that the streets will be eligible for State maintenance funding
- Plan approval by the Resident Engineer signifies his recommendation for VDOT approval of that which was shown on the plats and/or plans at the time of submittal and includes revisions noted thereon by him. Any other revisions thereto, additions, or deletions require detailed written approval of each change
- * Plans and computations submitted to the Department for review must specify the type of pipe used in the storm drain system and the storm drain system must be designed using the acceptable “n” value for that type. After plans are approved, no substitution or change in the type of pipe material will be allowed until the designer or contractor submits revised plans to the Department for review. The revised design cannot be implemented until approved by the Department.

* Rev. 7/14

14.3 Design Criteria

Where the local subdivision control ordinance requirements exceed VDOT requirements, the local ordinance should become the VDOT policy and govern when VDOT acts as an agent of the local governing body by the review and acceptance of subdivision streets. Drainage facilities, including off-site facilities when necessary to provide adequate drainage, must meet the minimum requirements for Maintenance, adequately pass the 10-year frequency runoff and comply with the following:

14.3.1 Hydrology

Peak discharge should be determined by methods appropriate for the size, location, and character of the watersheds involved. Where floodplain reports have been prepared for the area, they should be considered in the design. If these floodplains are affected by tides, tidal action reports should be included. Appropriate design storm frequencies should be utilized depending upon the risk of damage to both adjacent property and the roadway. Minimum design criteria applicable to the roadway may not be acceptable relative to the adjacent property damage potential, thus requiring higher design criteria.

Refer to Chapter 6 for more specific information relative to hydrology.

14.3.2 Hydraulic Design

No exact criteria for flood frequency or allowable headwater/ backwater values can be set which will apply generally to various locations. In the hydraulic design of drainage structures, the following risk evaluations should be considered.

- Damage to adjacent property
- Damage to the roadway and/or structure
- Traffic interruption
- Hazard to human life
- Damage to stream and floodplain environment
- Emergency access

Hydraulic design and analysis techniques should be appropriate for the type of structure or system of structures involved and may require flood profiles and water surface profile analyses. In areas involving floodplains, the Federal Flood Insurance requirements, relative to zoning and hydraulic design to accommodate the 100-year flood, should be fully considered.

The hydraulic design of drainage facilities for subdivisions should comply with or exceed the minimum requirements for maintenance as noted in other chapters in this manual and shall, in addition to the above, be designed to adequately pass the 10-year frequency runoff without interruption to traffic.

14.3.2.1 Culvert Hydraulics

The minimum design for culverts in a subdivision will accommodate the 10-year flood frequency runoff where the primary concern is the maintenance of traffic and convenience to the highway user.

For other culvert design considerations and a design procedure for the selection of highway culverts for use in subdivisions, refer to Chapter 8, Culverts.

For safety concerns in residential subdivisions, the minimum length of an entrance culvert should be the entrance width plus 8'. For example, a 16' wide entrance would require a 24' culvert. The length may be lessened when endwalls are used.*

14.3.2.2 Storm Drain Hydraulics

Storm drains in subdivisions will be designed to accommodate the runoff from a 10-year frequency storm. Exceptions to this will be based on local conditions where potential damage to contiguous property is excessive or Federal or State regulations dictate the employment of a design storm of less frequency (greater intensity).

For other information concerning the design of storm drains and for design aids, see Chapter 9, Storm Drains.

14.3.3 Channels

Where open channels are used in lieu of closed storm drain systems, the minimum requirements should provide for a 10-year recurrence interval runoff without exceeding the banks of the channel. The dispersion of water from the termination of artificially constructed channels should be accomplished in such a manner as to avoid damage to adjacent properties. Where the combination of soil conditions and velocities will result in erosion, channel linings should be provided to prevent erosion. Where standard roadside ditches have insufficient capacity for the 10-year runoff, a storm drain system should be provided. Open channels may be considered if their construction can be accomplished without creating a hazard or condition detrimental to the appearance of the subdivision.

Additionally, the design of channels in subdivisions must adequately consider the protection of adjacent property, the roadway, the environment, and floodplains during floods of greater magnitude than the 10-year design storm, in accordance with Chapter 7, Ditches and Channels.

*Rev. 7/14

14.3.4 Structural Design of Culverts, Storm Drains, and Bridges

Pipes for culverts and storm drains shall comply with the current VDOT Road and Bridge Specifications, and the current Road Designs Manual and the current Road and Bridge Standards, to the extent that they are respectively applicable to secondary roads and subdivision streets.

Bridges and box culverts shall be in accordance with the current bridge design specifications established by AASHTO. Calculations utilized in the design should be submitted with each bridge plan in order to expedite Department review.

14.3.5 Dams

Whenever dams are to be utilized as roadways, they shall be considered roadway dams and an alternate way of ingress and egress, which is open to the public, must be provided. Plans for dams which are designated for such use shall be reviewed and approved by the Hydraulics Section of the Department's Location and Design Division prior to construction. A formal agreement must be executed between the developer and the Department regarding the relative responsibility of the maintenance of various elements of the dam prior to the Department's acceptance of the roadway on the dam for maintenance. The agreement must absolve the Department of any responsibility for the maintenance of the dam and its control devices and for any damages claimed due to the existence or failure of the dam or its control devices. A sample agreement is found in "Guide for Additions, Abandonments, and Discontinuances – Secondary System of State Highways", by the VDOT Maintenance Division.

Subdivision streets which cross a dam may be eligible for acceptance into the secondary system of state highways subject to the criteria listed in the Subdivision Street Requirements manual by the VDOT Maintenance Division. This manual defines dams as an embankment or structure intended or used to impound, retain, or store water, either as a permanent pond or as a temporary storage facility.

Dams shall comply with the applicable General Instructions and Criteria established in 4 VAC 50-20-10 and with the current applicable regulations of the State. Virginia Law, Dam Safety Act, Article 2, Chapter 6, Title 10.1, requires that dams be certified by the State Department of Conservation and Recreation (DCR), according to the information posted on their web site at <http://www.dcr.virginia.gov>.

*Rev. 9/09

A related situation is roadway embankments that cross impoundment areas upstream of the actual dam. The roadway embankment of these types of crossings typically functions as a causeway and exerts no influence over the function or control of the impoundment area. Increasingly, the Department is being requested to accept these causeway crossings into its maintained secondary system of roadways. In evaluating such request, the Department must consider future maintenance and liability issues regarding long term exposure of the embankment material to saturation and the inspection/repair/replacement of a drainage structure partially or fully inundated by a permanent water pool. In order to address these concerns, the guidelines included in Appendix 14 D-1 have been developed for use in the design of these “causeway” crossings and in evaluating their acceptability for inclusion into the VDOT maintained roadway system.

For additional information, see the DCR web site for Dam Safety Programs at <http://www.dcr.virginia.gov>.

14.3.6 Drainage Easements

Drainage easements should be provided from all drainage outfalls to extend to a natural watercourse, as defined in Chapter 8, or furnishes an acceptable agreement from county authorities to save the Department harmless from future claims.

In some counties, stormwater detention is required by County ordinances. This is recognized by VDOT as a viable stormwater management practice. However, stormwater detention, per se, is not an acceptable alternative to providing a drainage easement and outfall down to a natural watercourse, unless through agreement, the County assumes responsibility for maintenance of the detention facilities and the outfall and agrees to hold the Department harmless in case of damages claimed due to the existence or failure of the detention facilities or the outfall.

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14.4 Design Procedures

14.4.1 Design Documentation

All design data and design considerations, including survey, hydraulic computations, floodplain studies, watershed and land use zones delineation, and other pertinent design data should be properly recorded.

The design documentation assembly should be submitted to the Department along with the subdivision plats and/or plans in order to facilitate the expeditious review of the plans and to minimize the turn-around time of the review process.

Some of the major items that should be addressed are as follows:*

A. Perform a spot check of drainage calculations for:

- 1. Proper/applicable design methods and procedures**
- 2. Completeness and accuracy**
- 3. Change in flow patterns and diversions**

B. Review the drainage that would have a direct effect on the roadway.

- 1. Check for adequate pavement drainage and proper placement of drainage structures**
- 2. Check the location and method by which pavement drainage is conveyed from the travelway. Ensure that drainage off of roadway does not flow into building sites/pads**
- 3. Review future driveway locations and driveway pipe sizes**

C. Review drainage structures.

- 1. Check existing structures (storm sewers, ditches, etc.) for adequacy to convey the runoff that will come to them in conformance with applicable criteria/requirements**
- 2. Check hydraulic design of proposed drainage facilities with applicable criteria/requirements**

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3. Check for proper treatment at ends of drainage facilities (riprap, paved ditches, etc.)*

4. Check detention facilities for required hydraulic performance, proper outfall, and adequate roadway protection

D. Review erosion control*

1. Check for current and potential erosion and siltation problems

2. Check for impact of the development

3. Check for the adequate placement of erosion control devices

E. Check involvements with regulatory flood plains and/or the 100-year zone

F. Check to ensure that all necessary drainage easements have been designated

A sample subdivision review checklist that can be used in the plan review process is included as Appendix 14 B-1. The checklist is an indication of the pertinent data considered in the design and design review of subdivision plans.

* Rev. 9/09

14.5 References

Guide for Additions, Abandonments, and Discontinuances – Secondary system of State Highways, VDOT Maintenance Division

Virginia Law, Dam Safety Act, Article 2, Chapter 6, Title 10.1

DCR Dam Safety Req.

VDOT^{*} Subdivision Street Requirements (SSR)

VDOT Secondary Street Acceptance Requirements (SSAR)

VDOT Land Development Inspection Documentation Best Practices Manual

* Rev. 1/17

VDOT Sample Subdivision Checklist

To be used by Citizens, Developers, Engineers, Surveyors, other Interested Parties, and VDOT

This checklist provides an itemized list of plans, documents, design calculations and other requirements for proposed subdivision roadway improvements to be submitted to VDOT for review and approval.

Subdivision Name / Phase: _____

Nearest State Route No.: _____	County / Town: _____
Plan Date: _____	Latest Revision Date: _____
Submittal Date: _____	Submittal No. (1st, 2nd): _____
Name of Firm, Designer, Phone No.: _____	

The following items should be shown or addressed in subdivision roadway plans and documents submitted to VDOT for approval. Check appropriate blank next to each item, sign last page, and submit checklist with plans. Right blank is for VDOT use only.

A. GENERAL

Yes	No	N/A	VDOT	Item	Description
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	1.	Three (3) copies of submittal letter attached outlining proposed development & discussing any waivers or modifications from VDOT Standards either being requested or previously agreed upon.
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	2.	Three (3) copies of traffic study, erosion & sediment control narrative and drainage calculations, pavement & typical road section design calculations. Bound, pages numbered, no loose pages, table of contents. May combine in one report.
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	3.	Four (4) copies of plans (if rolled, please have print facing out)
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	4.	All plans are to be in accordance with VDOT Subdivision Street Requirements, Road & Bridge Standards, Road & Bridge Specifications, Minimum Standards of Entrances to State Highways, Road Design Manual, L&D Instructional and Informational Memoranda, Drainage Manual, Hydraulic Design Advisories and other applicable VDOT and Federal polices.
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	5.	Plans should be self-explanatory with sufficient notes to explain the intent or purpose of the design.
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	6.	Title Sheet
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	7.	Subdivision name, phase, owner w/ address and phone number
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	8.	Designer with address, phone number, and professional stamp
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	9.	Tax Map number, Magisterial District, County, City or Town
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	10.	Master Plan (show which roads built, which roads in system)
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	11.	Plat, if available, showing rights-of-way, lots, & easements.
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	12.	Type of development (i.e., industrial, commercial, single-family residential, etc.)
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	13.	Current and proposed zoning of property & adjacent parcels
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	14.	Location map with scale
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	15.	General Notes including required VDOT general notes
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	16.	Date, revision dates
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	17.	Sheet Index with all sheets numbered and dated
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	18.	All lines and symbols clear & labeled; all text legible
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	19.	Existing vs. proposed items easily distinguishable
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	20.	Plans must clearly indicate which roads are to be built for acceptance into VDOT Secondary System of Highways

B. REVISIONS

Yes	No	N/A	VDOT	Item	Description
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	1.	Letter from designer must accompany revised plans submitted to VDOT for re-evaluation, describe changes made on revised plans, and provide dates of old & revised plans. Letter should discuss any items that were not changed as requested and modifications that were made due to request of other agencies.
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	2.	Mark changed items with highlighter on 2 of the 5 sets of plans. Large revised areas need only be circled with a highlighter.

C. TRAFFIC ANALYSIS

Yes	No	N/A	VDOT	Item	Description
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	1.	Traffic Impact Analysis must be included with land development subdivision submitted. (completely replaces existing 1.)
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	2.	Traffic Impact Analyses are to be prepared in accordance with VDOT Land Development Manual-Volume 1, dated December 1, 1995 Chapter 5 "Guidelines For a Traffic Impact Study" (or latest revision). Developer is responsible for roadway improvements to accommodate the acceptable level of service. (Developer responsible for supplying sufficient information to support designs shown.)
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	3.	Detailed plans and studies may be required that address: <ul style="list-style-type: none"> • traffic analysis of existing and proposed conditions • intersection analysis including need for signalization / channelization / turn lanes & modification to existing signals • proposed roadway improvements to accommodate traffic generated by proposed development

D. PLAN SHEETS

Yes	No	N/A	VDOT	Item	Description
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	1.	North arrow, scale
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	2.	Match lines clearly keyed to adjoining sheets w/ stationing
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	3.	Limits of subdivision, limits of each phase
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	4.	Both edges of pavement (EP), shoulder width, and right-of-way (R/W) of connecting or adjacent streets along entire development plus 200' minimum each way. Show existing road spot elevations of both EPs and centerline @ 25' intervals near connection. Pavement design of existing streets.

Yes	No	N/A	VDOT	Item	Description
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	5.	Existing crossovers, entrances, utilities, storm sewers, etc., that may be affected by proposed development.
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	6.	Street names and state route numbers
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	7.	Distance reference (to 0.01 mile) to nearest intersection
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	8.	Centerline: <ul style="list-style-type: none"> • stationed w/ 50' ticks, 100' or 500' labels • stations of begin / end, intersections, PC, PI, PT • curve data
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	9.	Proposed EP, curb, and R/W lines and construction limits
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	10.	Intersection sight distances, especially at connection to existing state route (field measure w/ target 10' off EP)
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	11.	Posted speed limit of existing adjacent roads
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	12.	Lengths of turn lanes and tapers
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	13.	EP and R/W radii for cul-de-sac and flares (fillets)
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	14.	Lots: <ul style="list-style-type: none"> • lot lines and numbers • entrances per Standard PE-1 or CG-9 • * entrance pipe size, type, & length (can show in schedule)
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	15.	Preliminary guardrail design, where needed, shown with lengths & terminals per VDOT standards. Final approval of layout to be provided by VDOT's Traffic Engineering Section after grading is mostly complete.
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	16.	Relevant on-site & off-site topographic features / structures
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	17.	All existing and proposed utilities (See K. UTILITIES)
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	18.	All existing and proposed. drainage facilities (See I. DRAINAGE)
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	19.	Include Erosion & Sediment Control Plan Sheets

E. TYPICAL ROAD SECTIONS

Yes	No	N/A	VDOT	Item	Description
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	1.	Road and stations to which each applies
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	2.	Proposed traffic count and design speed for each street (can be shown in a schedule)
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	3.	Centerline and R/W width
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	4.	Width & slope of pavement, shoulder, ditch, etc.; type shoulder and cut and fill slopes.
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	5.	Curb type, sidewalk, utility strip, etc., if applicable
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	6.	Pavement design in accordance with VDOT Subdivision Street Requirements, Superpave Asphalt Design Mixes, and Pavement Design Guide for Subdivision & Secondary Roads in Virginia.
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	7.	Show types, depths, and application rates of all pavement and aggregate layers and prime coats.
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	8.	All aggregate layers are to extend 1' beyond EP or back of curb.
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	9.	The connections for intersections and commercial entrances (including Std. CG-11) shall be modified such that the street approach pavement is the same as the new roadway / entrance or mainline pavement, whichever has the highest structural value, or as determined by the District Materials Engineer.

F. OTHER TYPICAL SECTIONS / DETAILS

Yes	No	N/A	VDOT	Item	Description
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	1.	Where each applies
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	2.	Pavement widening or overlays of existing roads; crossovers
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	3.	Special ditches: show shape, depth, slope, lining, min./max. grade. If paved, show details or reference VDOT Standard.
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	4.	Entrances (internal, commercial, or private)
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	5.	Special undercut or fill measures for unsuitable material, existing ponds, sinkholes, controlled fill, etc.
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	6.	Special drainage designs, structures, basins, berms, etc.
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	7.	Details of all items that are not a VDOT Standard or are a modification of a VDOT Standard.
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	8.	Cross sections of road, drainage, or other proposed construction may be required at areas of concern such as at connections to primary roads, when work is close to exterior property lines, at other constricted areas, etc.

G. ROAD PROFILES

Yes	No	N/A	VDOT	Item	Description
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	1.	Street name
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	2.	Horizontal and vertical scale and grid
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	3.	Existing ground line (extended 100' minimum beyond slope tie-in)
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	4.	Proposed finished grade line
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	5.	Percent grade, vertical curve data including K value (=L/A)
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	6.	Stations and elevations at begin / end, 50' min. intervals high & low points, PVC, PVI (CG), PVT, @ intersecting roads EPs and centerline (include super), & at subdivision phase limits
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	7.	Provide adequate landing
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	8.	Intersection sight distances: eye = 3.5', object = 3.5'
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	9.	Stopping sight distance (crest curves): eye = 3.5', object =2.0'
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	10.	Culverts: size, type, invert, pipe number
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	11.	Storm sewer profiles and drainage structures (within R/W)
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	12.	Ditch profile (where non-standard)
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	13.	Water lines, sanitary sewer, and existing underground utilities
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	14.	Special undercut or fill areas

H. OTHER PROFILES

Yes	No	N/A	VDOT	Item	Description
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	1.	Special ditches, storm sewers, outfalls - extend ground line 100' minimum beyond tie-in
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	2.	Entrances needing special attention, i.e. steep, constricted. (Tie proposed grade to edge of shoulder, not EP).

I. DRAINAGE (shown on plan & profile sheet, supplemental or detail sheet)

Yes	No	N/A	VDOT	Item	Description
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	1.	Contour plan of entire development and adjacent area: <ul style="list-style-type: none"> • *every 5th contour highlighted & elevation clearly labeled • minimum contour interval usually two feet • shown on road plans or as separate sheet showing entire drainage system design • stationed centerline and R/W lines shown • drainage sub-areas outlined, labeled and areas shown • * showing topographic features, existing buildings, etc.
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	2.	Existing and relocated streams and drainage ways.
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	3.	Existing and proposed pipes, storm sewers, and drainage structures with location, size, type, lengths, inverts, design cover, and flow arrows.
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	4.	Proposed ditches (center of all shown graphically accurate by either flow arrows, finished contours, lining symbols or other methods). Show where linings begin and end.
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	5.	Std. CD-1 or CD-2 underdrains @ lower ends of cuts, vertical sags, and bridge approaches.
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	6.	Storm sewer system w/ VDOT standard structures. Show top, rim, height, grate, & invert elevations and throat lengths.
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	7.	Plan, profile and typical section of all ditches other than standard roadside ditches
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	8.	Proposed drainage easements to natural watercourses (usually 20' minimum width).
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	9.	Existing drainage facilities possibly affected by proposed development: location, size, inverts, etc.
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	10.	Erosion & sediment control measures
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	11.	Stormwater management plans and computations, where necessary.
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	12.	Stormwater management low impact development (LID) or other water quality techniques for the roadway are shown within the R/W detail sheets and computations.
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	13.	Have Maintenance agreements for LID or other water quality techniques, between the county, developer and VDOT been executed.

J. DRAINAGE COMPUTATIONS

Yes	No	N/A	VDOT	Item	Description
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	1.	Should be self-explanatory. (See Item A.2)
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	2.	Subdivision name, date, author, professional stamp
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	3.	In accordance with VDOT's current criteria including VDOT's Drainage Manual. Discuss any methods or references used that are not generally used by VDOT.
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	4.	Sufficient background, supporting information and summary of any computer printouts submitted
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	5.	Copy of USGS topo map showing drainage patterns of area.
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	6.	Discuss whether future sections are considered in design.
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	7.	Hydrology: drainage sub-areas to agree with contour plan, design discharge calculations, pre- & post-development flows.
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	8.	Hydraulics: Pipe, ditch, storm sewer & inlet computations.
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	9.	Outfall analysis (evaluation of receiving channel / structure)
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	10.	MS4 outfall data for the new street is provided to VDOT

K. UTILITIES

Yes	No	N/A	VDOT	Item	Description
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	1.	Show all existing underground and overhead utilities and easements, proposed water and sanitary mains, service laterals, types, sizes, and appurtenances.
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	2.	Utilities should be located off R/W, where possible.
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	3.	Utilities should be located out of pavement, where possible.
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	4.	Adjustment of existing utilities, where needed.
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	5.	Proposed utility crossings of existing roads: show location, alignment, size, type, encasements, lengths, crossing methods
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	6.	Route utilities under culverts where possible
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	7.	Set fire hydrants at R/W on lot lines, where possible.
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	8.	Set manholes, valves, etc. in shoulder, utility strip or behind sidewalk, where possible.
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	9.	Set streetlights at R/W line, outside clear zone.
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	10.	Check for conflicts between utilities, road and drainage.

L. TEMPORARY CUL-DE-SACS / ROADS TO BE EXTENDED

Yes	No	N/A	VDOT	Item	Description
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	1.	Traffic study must address ultimate projected traffic. If master plan of future area to be served is unavailable, give information on & discuss acreage, access & zoning of adjacent land. Discuss any County Comprehensive Plan available.
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	2.	Indicate pavement design.
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	3.	Provide adequate temporary easement.

<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	4.	On profile, extend existing ground line and future grade line enough to show a satisfactory extension is possible.
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M. CURB & GUTTER STREETS

Yes	No	N/A	VDOT	Item	Description
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	1.	Show street widths and radii to face of curb
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	2.	Show entrance type
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	3.	Show Std. CG-12's @ intersections & other req'd. locations
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	4.	Tie standard CD-1 underdrains into drop inlets
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	5.	Intersection and cul-de-sac details are usually needed to show: type of intersection (i.e., Std. CG-11), how drainage is handled, top of curb and EP elevations around radii, etc.
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	6.	Provide necessary drainage computations

N. MISCELLANEOUS

Yes	No	N/A	VDOT	Item	Description
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	1.	If subdivision identification sign is desired, provide for in easement off R/W
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	2.	If any special use of R/W is desired such as bike paths, landscaping, irrigation system, lighting, parking, retaining walls, etc., provide full details and technical specs. These may need to be shown on separate plan sheets.
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	3.	Details of any special entrance road design (i.e., one-way, islands, medians, etc. Details of cluster mailbox pull-offs.

O. GEOTECHNICAL – General Information

Yes	No	N/A	VDOT	Item	Description
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	1.	Soil Technician / Engineer qualification statement.
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	2.	Statement that investigation was completed under the direction of VDOT personnel.
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	3.	Contact information for developer, designer, soil testing laboratory, and soil technician.
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	4.	Site Map showing project location.

P. PAVEMENT DESIGN

Yes	No	N/A	VDOT	Item	Description
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	1.	Contact information for developer, designer, soil testing laboratory, and soil technician.
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	2.	Statement that samples were obtained according to the frequencies provided in the VDOT Pavement Design Guide for Subdivisions and Secondary Roads, Page 4, Section A.2.a.
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	3.	Sample Location Map showing borehole, test pit, and/or surface sample collection sites in reference to proposed alignment.
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	4.	Sieve Analysis Report in accordance with VTM-25.
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	5.	Atterberg Limits Report in accordance with VTM-7 (for soils with more than 35% passing No. 200 sieve).
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	6.	Maximum Density / Optimum Moisture (Proctor) Report in accordance with VTM-1
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	7.	CBR Report in accordance with VTM-8.
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	8.	Reports should include sample location, depth and natural water content
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	9.	Documentation that the projected average daily traffic (ADT) volume to be used for design purposes follows the VDOT Road Design Manual, Appendix B, including %HCV and adjusted by Pavement Design Guide for Subdivision and Secondary Roads, Appendix IV
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	10.	Complete Flexible Pavement Design Worksheet for New Subdivision Streets (Pavement Design Guide for Subdivision & Secondary Roads in Virginia)
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	11.	Please note that there are design, subgrade, and drainage considerations in addition to the procedure described in Appendix IV. Also, where locality requirements exceed the pavement design determined by Appendix IV, that locality's design method governs. No checklist or worksheet will relieve the designer's responsibility for the proper use and application of the design methods provided, or adherence to VDOT standards and specifications.

Q. PIPE/BOX CULVERT FOUNDATION DESIGN REQUIREMENTS

Yes	No	N/A	VDOT	Item	Description
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	1.	Contact information for developer, designer, testing laboratory, and soil technician.
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	2.	For box culverts or pipes with diameter 36" or greater, a minimum of one boring shall be advanced at each endwall and at 200-foot intervals along the alignment of pipe or culvert. Borings should extend at least one pipe diameter below the invert elevation, fully penetrating unsuitable material or fill and extending at least 5 feet into underlying natural soils.
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	3.	Sample Location Map showing borehole, test pit, and/or surface sample collection sites in reference to proposed box culvert location.
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	4.	Logs indicating sample location (station & offset), SPT data, Unified Soil Classification System (USCS) description of subsurface materials, as well as natural water content.

<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	5.	Test reports should include soil pH and soil resistivity results.
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	6.	Provide box culvert foundation design in accordance with VDOT Road & Bridge Standards and Specifications.
					Additional review may be required. Please contact the District Structure & Bridge, Environmental and Hydraulics Offices.

R. BRIDGE FOUNDATION DESIGN REQUIREMENTS

Yes	No	N/A	VDOT	Item	Description
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	1.	Contact information for developer, designer, testing laboratory, and soil technician.
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	2.	For bridges less than 100 feet wide, a minimum of two borings shall be advanced within the proposed footprint of each, abutment and pier. For bridges over 100 feet wide, advance three borings per each abutment and pier.
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	3.	For shallow foundations, borings should be advanced to a depth at least twice the estimated width of the pier footing, or 4 times the width of the strip footing (L/B>10). Borings shall fully penetrate unsuitable material or fill, and extend at least 10 feet into material with suitable bearing capacity. If rock is encountered, it shall be cored to a depth of at least 5 feet.
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	4.	For deep foundations, borings should extend at least 15 feet below the anticipated pile or shaft tip elevation or a minimum of 2 times the maximum pile group dimension, whichever is greater. For piles bearing on rock, at least 10 feet of core shall be taken from each boring. For drilled shafts bearing on rock, at least 10 feet or 3 times the shaft diameter of rock core shall be taken from each boring.
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	5.	Sample Location Map showing borehole locations in reference to footprints of proposed locations for bridge substructure units.
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	6.	Borehole logs indicating location (station & offset, northing & easting, <u>and</u> latitude & longitude), SPT data, RQD for cored rock, USCS description of subsurface materials, initial and static groundwater elevations (if encountered), color digital photographs of individual rock cores, and any associated in-situ and lab test reports
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	7.	Provide bridge foundation design for each bridge substructure unit. Include the estimated allowable bearing capacity of the materials encountered at the proposed foundation elevation.
					Additional review may be required. Please contact the District Structure & Bridge, Environmental and Hydraulics Offices.

S. RETAINING WALL / SOUND WALL FOUNDATION DESIGN REQUIREMENTS

Yes	No	N/A	VDOT	Item	Description
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	1.	Contact information for developer, designer, testing laboratory, and soil technician.
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	2.	Borings shall be advanced for each 100-200 feet along the proposed alignment over the full length of the wall, with a minimum of two borings. Borings shall be advanced to a depth of

					twice the proposed wall height, should fully penetrate unsuitable material or fill, and extend 10 feet into competent material or 5 feet into rock..
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	3.	Sample Location Map showing borehole locations in reference to wall alignment.
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	4.	Borehole logs indicating location (station & offset), SPT data, RQD for cored rock, USCS description of subsurface materials, natural water content, and any associated in-situ and lab test reports.
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	5.	Provide retaining wall foundation design in accordance with VDOT Standards and Specifications. Include the estimated allowable bearing capacity of the materials encountered at the proposed foundation elevation.
					Additional review may be required. Please contact the District Structure & Bridge Office

T. STORM WATER MANAGEMENT BASIN DESIGN REQUIREMENTS

Yes	No	N/A	VDOT	Item	Description
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	1.	Contact information for developer, designer, testing laboratory, and soil technician.
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	2.	A minimum of two borings shall be advanced for basins less than 2 acres in extent (one additional boring for each additional acre), one in the impoundment area and another in the dam. Borings shall be advanced 5 feet below the proposed bottom elevation of the impoundment area and to a depth twice the embankment height at the dam, should fully penetrate unsuitable material or fill, and extend 10 feet into competent material or 5 feet into rock. A groundwater observation well should be installed to monitor long-term groundwater levels
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	3.	Sample Location Map showing borehole locations in reference to basin layout and dam location
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	4.	Borehole logs indicating location (station & offset), SPT data, RQD for cored rock, USCS description of subsurface materials, natural water content, and any associated in-situ and lab test reports.
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	5.	Test reports to include gradation, Atterberg, USCS description and natural water content. A minimum of one sample from the impoundment subgrade should be tested for permeability
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	6.	Provide stormwater management basin design in accordance with VDOT Standards and Specifications.
					Additional review may be required. Please contact the District Environmental and Hydraulics Offices.

U. SOIL SLOPE DESIGN REQUIREMENTS

Yes	No	N/A	VDOT	Item	Description
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	1.	Contact information for developer, designer, testing laboratory, and soil technician.
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	2.	In fill embankments, advance one boring every 200 feet along the toe of the proposed slope. Borings should be advanced to a depth twice the height of embankment for embankments over 15 feet in height; to a depth equal to the height of embankment for smaller embankments, but at least 5 feet below subgrade elevation.
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	3.	In cut slopes, advance one boring every 200 feet along the top of the proposed slope. Borings should be advanced to a depth at least 10 feet below the proposed minimum elevation of cut for slopes greater than 15 feet in height; at least 5 feet below subgrade elevation for smaller slopes.
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	4.	Borings should fully penetrate unsuitable material or fill and extend at least 15 feet (for large slopes) or 5 feet (small slopes) into underlying suitable soils. At least one groundwater observation well should be installed to monitor long-term groundwater levels. If rock is encountered above design grade, it should be cored to the full depth of the planned cut
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	5.	Sample Location Map showing borehole locations in reference to slope alignment
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	6.	Borehole logs indicating location (station & offset), SPT data, RQD for cored rock, USCS description of subsurface materials, natural water content, and any associated in-situ and lab test reports.
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	7.	Test reports to include gradation, Atterberg Limits and USCS descriptions. May require advanced geotechnical tests to include direct and/or triaxial shear and consolidation testing
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	8.	Provided soil slope design in accordance with VDOT Standards and Specifications.

CERTIFICATION

I hereby certify to the best of my knowledge that the above stated information is included in the submitted plans and attachments.

Designer's Signature: _____ Date: _____

 Designer's Name (printed): _____
 Design Firm: _____

**Appendix 14C-1 General Instructions and Criteria
 Pertaining to Use of
 Highway Embankment as Dams**

Roadway Dams

In accordance with the provisions contained herein, VDOT may approve the use of highway embankments as dams.

Highway embankments as referred to herein shall include all of those roads and streets within the jurisdiction of VDOT.

The term “dam” as used herein shall mean a barrier to confine or raise water for storage, a diversion, or to create a hydraulic head.

In general when a permit is requested for use of an embankment as a dam, whether it be an existing or proposed embankment within the highway system or one ultimately to become a part of the system, it must be accompanied by plans and supporting data as outlined in the following paragraphs.

1. Purpose of Impoundment
2. Location

A map of the vicinity with notations sufficient to accurately locate the project site will be required.

3. Plans

The plans shall in general contain the following:

- a. Plan of reservoir area and dam site showing contours
- b. Sectional view of dam taken through control structure
- c. Details of control structures showing dimensions, types of materials, cutoff or antiseep collars, anti vortex devices, energy dissipators, and other pertinent details applicable to the particular project
- d. Where channel outlets are used for spillways, sufficient profile and cross sections shall be shown to permit checking the hydraulic characteristics
- e. Where the existing embankments are to be used, details will be given as to existing drainage structures and the materials and compaction used in the construction of the dam

**Appendix 14C-1 General Instructions and Criteria
 Pertaining to Use of
 Highway Embankment as Dams**

4. Analyses – Computations
 - a. Hydrologic data used and its source
 - b. Hydrographs
 - c. Hydraulic computations for control structures, outlet channels and other applicable devices
5. Administrative Procedures

The plans shall be prepared by a licensed engineer or by a governmental agency whose engineers have previously prepared similar plans. The National Resources Conservation Service (NRCS) will generally assist in plan preparations when the impoundment is for conservation purposes.

Prints of plans and copies of supporting computation data shall be submitted in duplicate, one set to be reviewed by the Department and remain in the files of the Central Office, and the other to be returned with any pertinent notations. Prior to approval, for construction, revised prints of plans will be submitted in triplicate, one for each for the Central, District, and Residency offices.

All requests will be initiated through the Resident Engineer and be forwarded through proper channels to the Central Office. Where applicable, the petitioner will be required to furnish a performance bond or certified check to cover cost of work and any balance not expended by the Highway Commission will be returned to the petitioner.

All costs shall be borne by the petitioner and no permit will be granted for work which will result in additional expenditures by the Department. Where protective devices such as guardrails do not exist or would normally not be provided by the Department, such protective devices will be provided at the expense of the petitioner.

Under no circumstances shall the Department be committed to reconstruction, relocation, adjustment or protection of the highway at the expense of Highway funds without approval of the Commissioner.

Construction inspection under the supervision of VDOT may be required or certification by petitioner, obtained from a licensed professional.

**Appendix 14C-1 General Instructions and Criteria
 Pertaining to Use of
 Highway Embankment as Dams**

6. Design Specifications & Criteria

- a. Watershed Area: The area contributing to a reservoir shall be accurately determined. Delineation on dependable topographic maps or aerial photographs, when available, may be used for this purpose.
- b. Reservoir Area: The area of the impoundment must be determined with sufficient accuracy at various elevations to permit the development of a storage curve. Where maps having a close contour interval (one or two foot) are available they may be used in lieu of field survey or reconnaissance.
- c. Dam:(Roadway embankments) : The embankment will, in addition to being constructed to the Department's specifications, have either a core or upstream blanket. If upstream blanket construction is used, the material will consist of a layer of highly impervious material placed on the reservoir floor and extended up the upstream slope of the embankment. In general a core will be required where the depth of impoundment is 15 feet or greater.
- d. Hydraulic Structure: All structures conducting the effluent through highway fills shall be adequate to pass the design flood originating in the watershed. Generally, structures shall be so designed and constructed that the maximum high water stage from the design storm shall not be higher than eighteen inches below the outer edge of the shoulder of the highway at it lowest point adjacent to the reservoir.

The design storm for impoundments, wherein the only consideration is the highway, will generally be for a return period of 25-year or 50-year.

Where the failure of the dam would result in property damage or hazard to life, the criteria found on DCR's web site at <http://www.dcr.virginia.gov> under Dam Safety should be followed.

**Appendix 14C-1 General Instructions and Criteria
 Pertaining to Use of
 Highway Embankment as Dams**

There are many factors to be considered which may necessitate special consideration and, therefore, anyone contemplating the construction of a road as a dam wherein the Department would have an interest is advised to consult with the Hydraulic Section prior to development of the plans.

No moveable gates or valves will be permitted to serve as outlet control structures; however, gates will be provided to permit draining for management purposes. In general, no portion of the roadway will be permitted to serve as a spillway.

- e. Landscaping: The shoreline shall be cleared of all weeds and stumps and maintained in a neat manner.

7. Legal Provisions

Where deemed necessary or desirable, by the Department, legal responsibilities and obligations shall be set forth as a condition in the permit or shall be provided for by a separate instrument.

Appendix 14D-1 Guidelines for the Design and Acceptance of Roadway Causeways

1) Definitions

For the purposes of this document, the following definitions apply:

- a) The term “roadway dam” means an embankment designed to impound water, either temporarily or permanently, that also serves as a roadbed for motor vehicles.
- b) The term “roadway causeway” means an earthen embankment intended to serve as a roadbed for motor vehicles across an area designated as a storm water impoundment area.
- c) The term “stormwater impoundment area” means an area designed to be inundated by stormwater, either temporarily or permanently.
- d) The term “permanent impoundment area” means the area within a stormwater impoundment area designed to be normally and permanently inundated by a pool of water.
- e) The term “design impoundment area” means the total area designed to be temporarily inundated by storm water run-off resulting from a 10 year frequency design storm, inclusive of any permanent impoundment area.
- f) The term “design flood area” means the area extending beyond the design impoundment area which will be inundated by storm water run-off resulting from a 100 year frequency design storm.

b) Design Criteria

- a) Roadway Dams – Design criteria for roadway dams is found in Chapter 14 of the VDOT Drainage Manual. The criteria for accepting roads that cross dams as part of the secondary system of state highways is found in VDOT’s Subdivision Street Requirements.
- b) Roadway Causeways Impacted By A Permanent Impoundment Area (See Figures 1 & 1A)

Because of the potential operational and maintenance issues associated with embankments and drainage structures permanently inundated by water, roadway causeways impacted by a permanent impoundment area shall be designed as roadway dams. The criteria for VDOT’s acceptance of a road on such a causeway as part of the VDOT maintained secondary system of state highways shall be the same as that for roadways crossing dams.

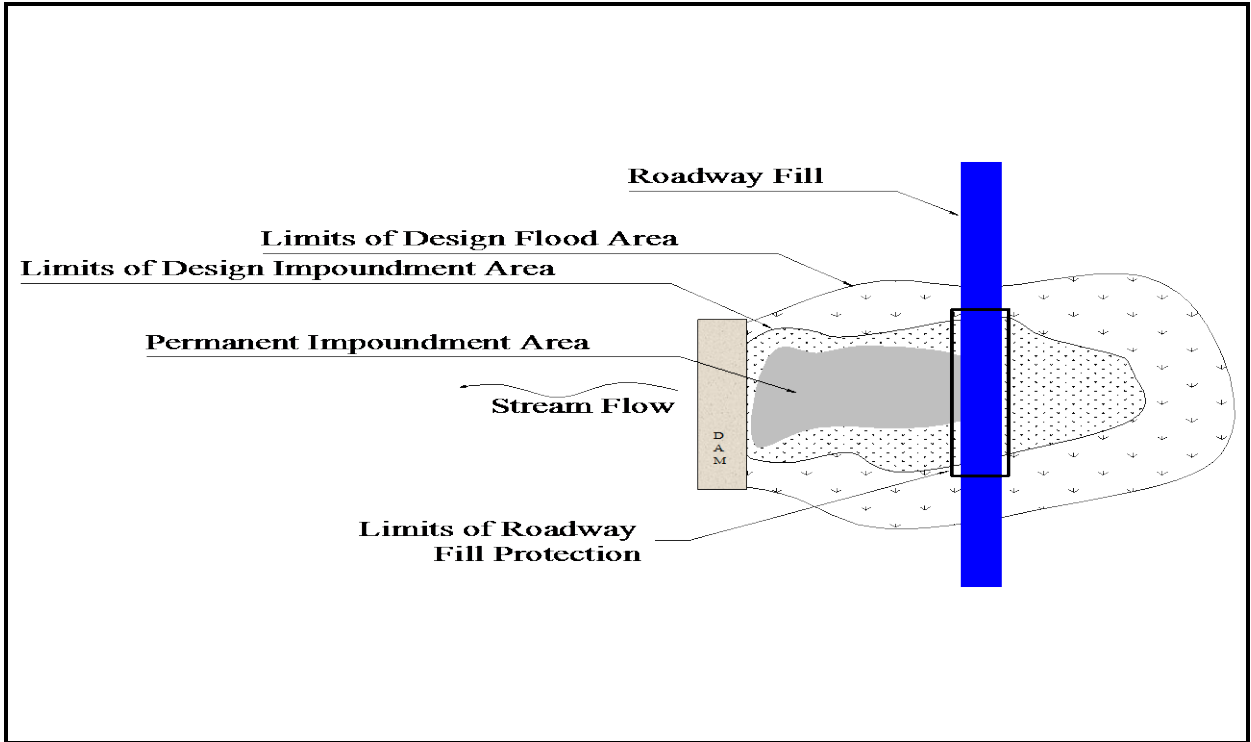


Figure 1

Permanent Impoundment Area abutting one side of a roadway causeway. Causeway is treated as a dam.

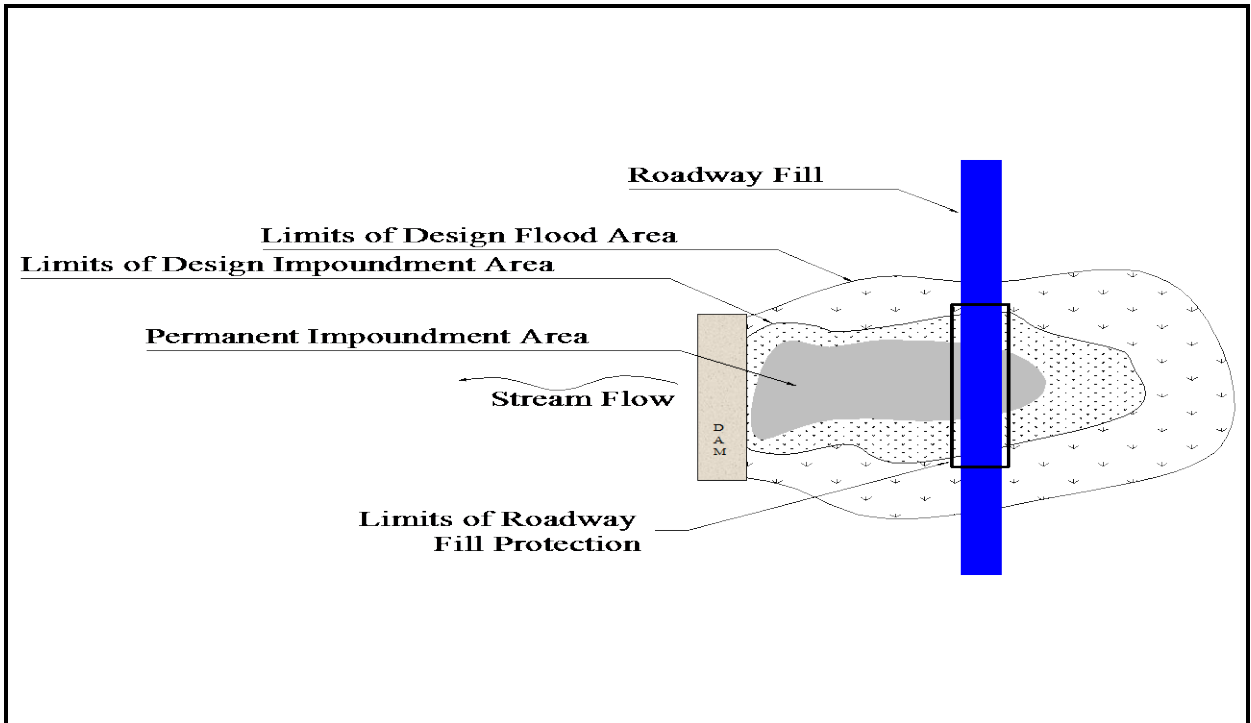


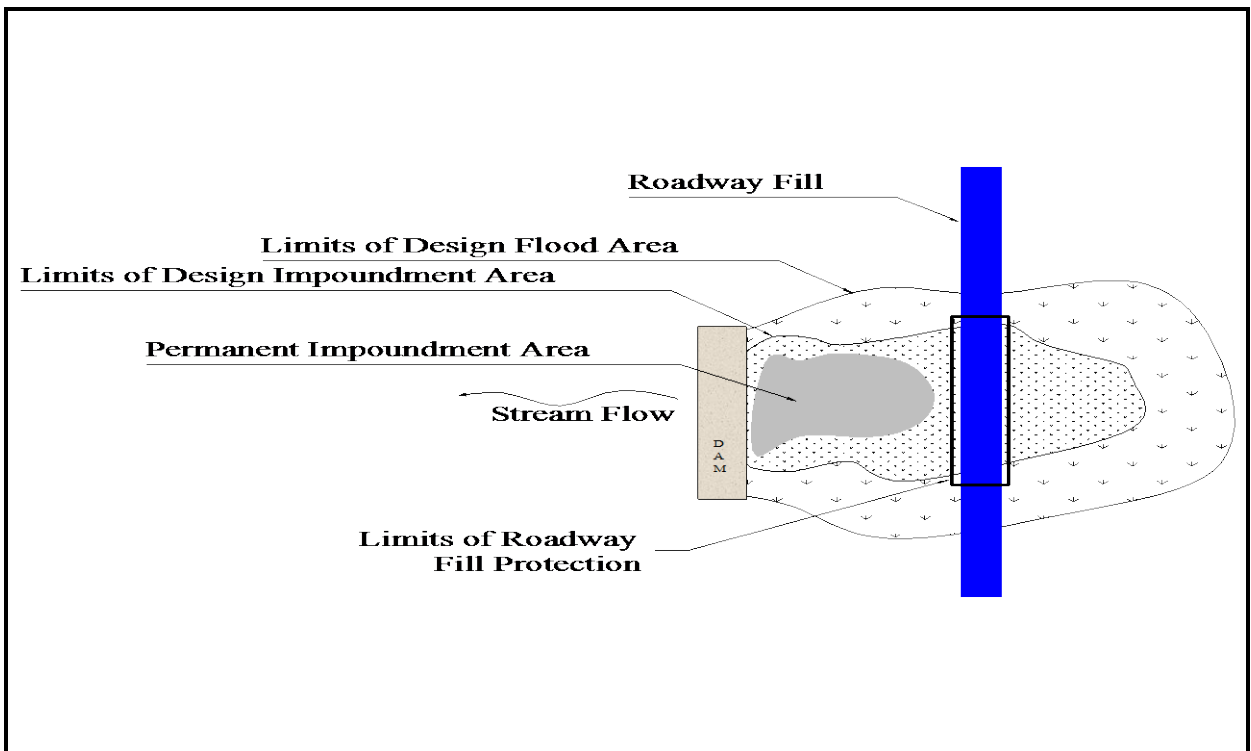
Figure 1A

Permanent Impoundment Area abutting both sides of a roadway causeway. Causeway is treated as a dam.

c) Roadway Causeways Crossing A Design Impoundment Area But Outside The Limits Of A Permanent Impoundment Area (if present) – See Figure 2

Roadway causeways crossing a design impoundment area but outside the limits of any permanent impoundment area shall not be treated as a roadway dam, provided the hydraulic capacity of the drainage facility under the roadway causeway equals or exceeds the hydraulic capacity of the principal spillway of the downstream dam. However, the embankment of such causeways shall, in addition to being constructed to the Department’s specifications, have all slopes within the design impoundment area protected by a blanket of highly impervious material (a layer of clay material with a one foot minimum thickness or a geosynthetic clay liner, as approved by the Department) extending from the floor of the impoundment area to an elevation not less than 2 feet above the surface elevation of the design impoundment area or to the edge of the roadway shoulder, whichever is less. The material used for the clay blanket must meet all of the following minimum specifications:

- 50% or more must pass the No. 200 sieve and,
- the Liquid Limit must be less than 50 and,
- the Plasticity Index must be greater than 7.

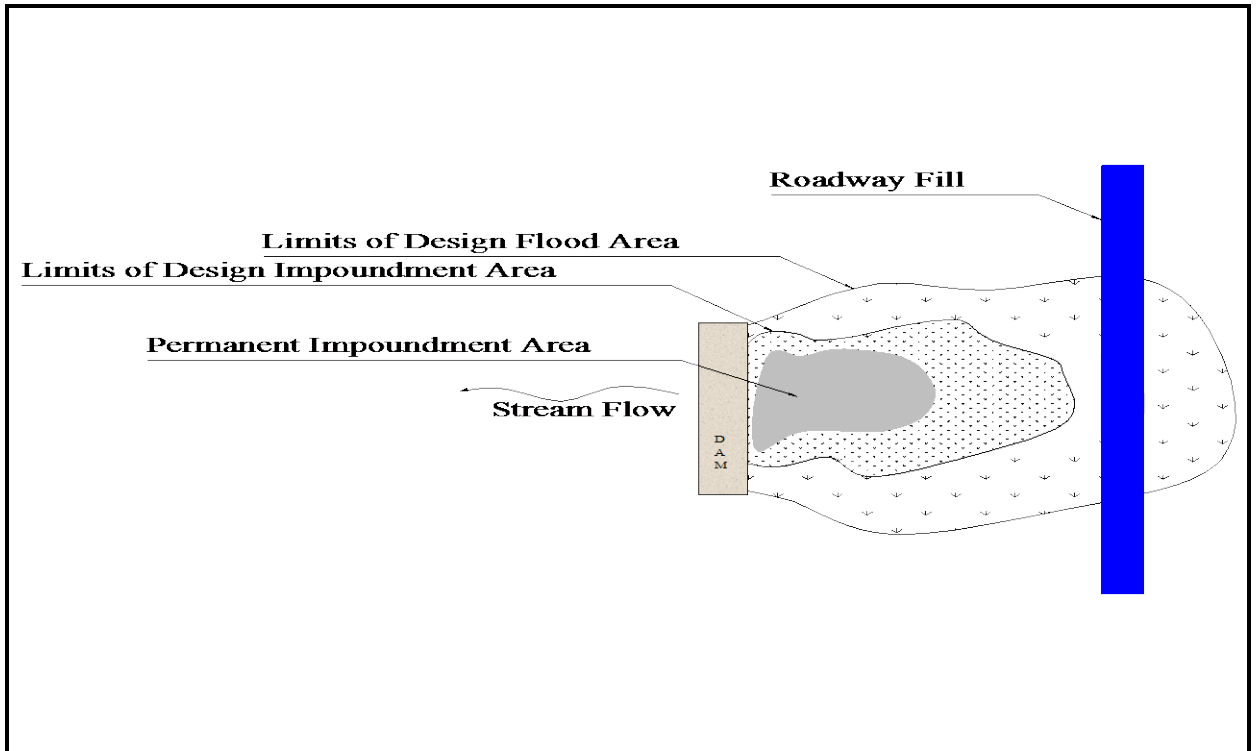


Example 2

Roadway causeway within a Design Impoundment Area but outside the limits of a Permanent Impoundment Area. Causeway is not treated as a dam provided the hydraulic capacity of the drainage facility under the causeway equals or exceeds the hydraulic capacity of the principal spillway of the downstream dam.

d) Roadway Causeways Crossing A Design Flood Area (See Figure 3)

Roadway causeways crossing a design flood area beyond the limits of the design impoundment area shall not be subject to the requirements of this document and shall only be subject to the Department’s standard specifications and criterion for roadway embankments and drainage structures.



Example 3

Roadway causeway within the Design Flood Area but outside the limits of the Design Impoundment Area. Causeway is not treated as a dam.