Constructing a beveled or tapered pavement edge so that any edge drop that develops has a reduced impact on the recovery maneuver.

Reconstruction of shoulders.

INTERSECTIONS

Many intersection improvements can be made at a relatively low cost and are safety cost-effective, particularly at higher traffic volumes.

The intersection improvements must be tailored to site-specific conditions and rely heavily on professional judgment and experience along with current Department guidelines.

DESIGN EXCEPTIONS

All efforts should be made to adhere to the guidelines stated herein. However, under unusual conditions, it may be necessary to use values that are less than the minimum values shown. If lesser values are proposed for use, a justification report will be needed and approval by the State

Location and Design Engineer and the Federal Highway Administration on Federal aid funded projects must be granted before developing the project further.

Methods of showing design exceptions on the plans are noted in Instructional and Informational Memorandum IIM-LD-227. Design Exceptions are to be requested on Form LD-440, maintained on the VDOT website at http://www.extranet.vdot.state.va.us/forms/ . If approved, the completed Form LD-440 is to be attached to Form LD-430 Scoping Report for submittal at advertisement stage.

PLANNING DRAINAGE DESIGN ELEMENTS

The hydraulic consequences of a highway improvement need to be addressed during the planning phase of the project. Failure to assess the hydraulic aspects of the improvement could result in an increase in damages to adjacent property as well as the highway facility. Although detailed site information may not be required, it is important that a hydraulic assessment be made by a drainage engineer in the planning phase to determine that engineering and regulatory constraints can be met.

Items to be considered include:

- Hydraulic impacts
- Interaction with other agencies
- Utilities
- R/W and property owners' concerns
- Environmental concerns and permits.

REPLACEMENT OR REHABILITATION OF DRAINAGE ELEMENTS

The decision to rehabilitate or replace a structure should not be made without checking hydraulic adequacy. Normally, the highway designs that improve upstream flooding conditions should generally result from meeting highway flooding criteria. Scour protection, spur dikes, or other protective measures should be included with the bridge rehabilitation.

The decision regarding the rehabilitation or replacement of existing bridges or culverts is often a structural or functional decision. Hydraulic input is important when the cost of the rehabilitation is high enough to consider replacement or where the contemplated rehabilitation involves a change in the roadway profile which, by lessening roadway overflow, could increase hydraulic stresses on the structure and change flow distribution.

Rehabilitation or replacement of culverts often becomes necessary when the culvert is no longer structurally sound. Consideration of the remaining service life of the existing culvert is, therefore, a very important factor in deciding to rehabilitate or to replace it.

In some instances, structures may require replacement due to inadequate waterway area and subsequent frequent interruption of traffic due to flooding. Prolonged ponding behind an embankment caused by an inadequate culvert may also lead to embankment saturation or piping along the culvert.

HYDRAULIC CHARACTERISTICS

The hydraulic considerations for RRR improvement projects are, in many respects, the same as those for a highway on new alignment. The primary difference is that the hydraulic characteristics of the existing facility are already established. These hydraulic characteristics include:

- Culvert performance (inlet or outlet control or headwater at culvert sites).
- Culvert outlet velocities and scour tendencies.
- Flow lines and culvert alignment.
- Backwater at bridge sites.
- Flow distribution.
- Scour patterns at bridge piers, bridge abutments and adjacent banks.
- Skew and channel alignment.
- Storm drain systems and their performance.

The engineer must consider the need for changing and the consequences of changes to these hydraulic characteristics.

Most improvement projects will require some modification of the existing drainage structures. If the hydraulic performance of a drainage structure is changed, the change should be investigated for both upstream and downstream effects of the change.

Because the hydraulic effects of existing structures are usually well established, there is sometimes opposition to change from the landowner(s) affected. This is particularly true in developed areas.

Debris conditions may be changed and should be considered in design. Roadside ditch drainage patterns may be altered. These conditions should be thoroughly studied before any change is allowed.

SAFETY IMPROVEMENTS RELATIVE TO DRAINAGE DESIGN

Where the hazard is a culvert headwall, the options usually are to extend the culvert, protect traffic with guardrail,or construct a protective grate over the headwall. The alternative selected should be based on particular site conditions. Grates on cross culverts with the potential to collect significant debris are undesirable because of the potential hazard created for local flooding. A good way to evaluate the risk is to assume the grate will be plugged and then determine what flood hazard will be created. In all cases, it is very important that grates on culvert end be inspected frequently and always cleared of debris. Spaces between grate bars should be as large as practicable in order to lessen the probability of plugging.

The wide openings tend to minimize the flood hazard by reducing the potential of debris plugging the culvert.

BRIDGE RESTORATION

Hydraulically equivalent Replacement Structure (HERS) definition:

> The waterway opening of the proposed structure provides the same height, width obstructions (piers) and geometric configuration as the existing structure.
>
> The proposed roadway grades on the approaches and the structure provide the same overtopping characteristics as the existing facility.
>
> Any of the above characteristics of the proposed facility are less restrictive to the passage of flood flows than are the characteristics of the existing facility.
>
> Every waterway crossing whose 1% exceedance probability discharge is anticipated, estimated or expected to be 14.15 cubic meters per second or greater **MUST** be reviewed by an appropriate river mechanics specialist. When the proposed facility is determined to be the hydraulic equivalent of the existing facility, no formal design analysis will be required.
>
> If a rehabilitation of the structure and/or its approach roadway does not conform to the HERS requirements, it must be treated as a bridge replacement, and an engineering analysis is required.

BRIDGE REHABILITATION

Bridge repairs are often required because of structural deterioration, damage from floods, and damage from vehicles. Bridge rehabilitation consists of physical changes to a bridge which are necessary because of inadequate width, structural capacity, hydraulic capacity, or because of scour or degradation.

Where bridge repair or rehabilitation is being considered, the cost of the repair should be compared with the cost of complete replacement. See BRIDGE REHABILITATION OR REPLACEMENT SELECTION POLICY in Section A-4M.(Metric). The hydraulic requirements of the bridge should also be reviewed when extensive repair or rehabilitation is being contemplated. This hydraulic review is particularly important if a change in the roadway profile is to be included in the rehabilitation.

In some cases, the grade may be raised so that roadway overflow is eliminated without changing the bridge size. This can be a deliberate change of the grade or a slow change, such as maintenance forces placing asphalt overlays on the grade over a period of years. These changes should always be reviewed by the hydraulics design section for effect on flow distribution, on backwater, and on velocity through the bridges.

A replacement bridge may have a deeper superstructure and solid rails. These differences will affect a stream crossing unless compensating adjustments are made in the profile gradeline.

Where the profile grade is raised, the effect may be to eliminate or lessen roadway overflow which could force more water to flow through the bridge opening. Solid rails can have the same effect. If the grade is lowered, the flow pattern and the amount of flow directed over the road and into downstream property could be increased.

When replacement bridges have shorter spans than the existing bridge, the resulting increase in the number of piers could add a debris and scour problems or increase backwater.

CULVERT REPLACEMENT

When an existing culvert is to be replaced, an analysis should be made to see if the size of the existing culvert is either smaller or larger than necessary.

CULVERT REHABILITATION

A properly installed culvert generally loses its structural integrity through corrosion and/or abrasion of its invert, although overall loss of material in the pipe wall can occur some installations due to the corrosive action of the backfill material or the water flowing through the culvert. Common restoration techniques include:

Provision for replacement of the culvert invert.

Threading of a smaller size culvert or liner plate through the original culvert and grouting of the voids between the two culverts.

Use of commercial products for relining pipe with epoxy-coated fabric materials.

Any proposed culvert rehabilitation scheme should be analyzed for hydraulic adequacy and outlet protection. Normally, the smaller cross sectional area resulting from culvert rehabilitation will lead to higher headwater elevation; however, this effect may be insignificant if there is storage upstream or if the potential for damage is minimal. Another consequence of a reduction in pipe size may be higher outlet velocities. This factor should also be assessed during the design of a culvert rehabilitation project.

Use of smooth linings, improved inlets, etc. may also improve the hydraulic performance of the relined culvert and essentially offset the loss of cross sectional area.

Many older culverts were built during a period when less attention was given to the need for accommodating fish passage. Such accommodations can often be incorporated by the addition of baffles in the culvert barrel; however, such designs should be checked to ensure that the revised design is hydraulically adequate.

CULVERT EXTENSIONS

The extension of an existing culvert can result in significant changes to the hydraulic performance. Extending the inlet of a culvert operating in inlet control establishes a higher inlet flow line, which will raise the inlet headwater elevation an equal amount. Extending a culvert which operates under outlet control may also increase the headwater because of head losses associated with the longer barrel.

Culvert extensions can cause the approach or the exit flow alignment to be unacceptable. This can usually be corrected by either extending the culvert on a skew angle that will fit the channel alignment or modifying the channel.

Long culvert extensions could cause the culvert to switch from inlet control to barrel (outlet) control, which will result in an increase in headwater.

In addition to the above noted changes, a long culvert extension may also create problems with fish passage through the culvert that should be addressed during the design.

SIGNING, SIGNALS AND PAVEMENT MARKINGS

Traffic control devices such as signing, signals, and pavement markings must be updated in accordance with the Manual on Uniform Traffic Control Devices and the VDOT's Road and Bridge Standards.

While traffic control devices cannot fully mitigate all problems associated with substandard geometric features, they are a relatively low cost measure that can compensate for certain operational deficiencies.

Where roadway geometry or other roadway or roadside features are less than standard, do not meet the driver's expectancy, and reconstruction is not feasible, additional signs, markings, delineation and other devices beyond normal requirements of the MUTCD should be considered.

Judicious use of special traffic regulations, positive guidance techniques, and traffic operational improvements can often forestall expensive reconstruction by minimizing or eliminating adverse safety and operational features on or along existing highways.

Signals are to be provided at warranted locations.

PLAN REVIEWS

Preliminary plan reviews and field inspections are to be held in accordance with the standard procedures. The Federal Highway Administration (FHWA) is to be notified of each and invited to attend.

PUBLIC INVOLVEMENT

RRR projects are to be developed utilizing the Department's Public Involvement Policy to keep the public sufficiently informed and involved as the project progresses so that a formal public hearing can be eliminated in most, if not all, cases.

RIGHT OF WAY

Although RRR type improvements are normally made within the existing right of way, additional right of way may be required to provide the necessary improvements.

Any required right of way and/or easements will normally be secured by donation. However, right of way may be acquired.

All right of way negotiations are to be conducted in accordance with the applicable statutes, regulations, policies, and procedures stipulated in the Right of Way and Utilities Division's Manual of Instructions and related memoranda.

UTILITIES (UNDERGROUND AND OVERHEAD)

Where utilities are involved on RRR projects, the Department's General Guidelines for Accommodating Utilities Within Highway Right of Way are to be followed.

Relocation or adjustment may be required if the minimum clear zone requirements are not met or if the utility system conflicts with proposed RRR improvements and sufficient right of way is available. For Federally funded RRR projects, an exception request must be made if the project does not meet the minimum clear zone requirements.

In some cases, the utility system on RRR projects may be retained without adjustment or relocation if the accident history does not indicate the existence of a hazard or if the system has demonstrated adequate performance and does not conflict with proposed improvements.

TORT LIABILITY AND GEOMETRIC DESIGN

In recent years highway agency administrations have become increasingly concerned about the growth of tort claims. Such claims allege that highway agencies have committed a legal wrong by improper or negligent highway design, operation, or maintenance that became a cause or partial cause of a highway accident. Claims against highway agencies are part of a nationwide problem of rising liability insurance premiums and increasing costs of tort actions.

Studies indicate that the geometric design features covered in RRR standards are usually not the central focus of tort claims. Pavement features, traffic control devices, and roadside barriers account for the large majority of tort claims.

BACKGROUND ON TORT LIABILITY

Tort is defined as a civil wrong or injury, and a tort action seeks repayment for damages to property and injuries to an individual. If a defendant is found negligent in his actions, or lack of action, he is liable for a tort claim and must compensate the plaintiff. State laws and rulings differ regarding tort claims against a governmental entity. In Virginia, as in most states, the courts or state legislatures have eliminated sovereign immunity (whereby an individual cannot sue the state or its agents for negligence).

Highway agencies are spending substantial sums as a result of tort claims. The costs of handling tort claims include not only the direct costs of judgment awards, settlements, and insurance, but also attorneys' fees and the cost of engineers' and other staff time.

Negligence can be alleged on two grounds particularly relevant to highway agencies:

- Agency (or person) improperly performs its duties (misfeasance).

- Agency (or person) fails to perform its duties (nonfeasance).

RRR IMPROVEMENTS AND TORT CLAIMS

Little is known about how frequently the geometric features addressed by RRR design guidelines are cited in tort claims against highway agencies. Few states maintain data on tort claims by alleged defect. Further, classifying tort lawsuits is difficult because most involve several defects that differ in importance.

Geometric features (such as cross-sections, alignment, and intersections) usually covered by RRR guidelines account for a small percentage of total claims filed against highway agencies. Of the cases in which a geometric feature is at issue, horizontal and vertical curves are the most often cited.

Pavement features including edge drops, potholes, surface deterioration and slippery pavements, account for large amounts of the settlement costs.

SUSCEPTIBILITY OF RRR PROJECTS AND GUIDELINES TO TORT CLAIMS

The standards selected for RRR projects, the design process followed, and the scope of the improvements may influence the litigation of future tort claims. The issues that might arise in a tort action are:

- Did the project meet the appropriate design standards?
- Are the standards reasonable?
- Was the design process reasonable?
- Did the improvements correct existing dangers?
- Should unimproved roads be judged by standards used for roads that are unimproved?

The resolution of tort claims alleging an inadequate geometric design is contingent on determining the appropriate set of design standards used to assess negligence.

Determining whether a highway improvement project is sufficiently extensive to qualify as reconstruction can be a key issue in a tort claim because reconstruction projects usually must meet current new construction standards.

Deficient roadside signs or pavement markings and pavement edge-drop problems, which are often the basis of tort claims, can be routinely corrected on RRR projects.

DEFENSE OF A RRR PROJECT DESIGN

Although planning and design activities are exempt from liability in most states, this immunity has been held not to apply to decisions made without prior study or conscious deliberation.

Documentation of the planning process should be part of the state highway agency's defense.

For RRR projects, documentation should demonstrate that safety aspects of the roadway design were properly considered. Reports that identify deficiencies in existing roadways are potentially threatening to the public agency preparing the report if the deficiencies are not addressed. Thus, if any exception to an applicable design standard was granted, documentation should explain the reasons for the exception and show that logic and orderly procedures were followed in obtaining it.

When a highway agency contemplates a design exception for a geometric or roadside feature, it should be prepared to prove why the feature need not meet the same standards as other facets of the roadway design. Often, the best defense in this situation is to demonstrate that the safety cost-effectiveness of further upgrading the feature does not meet any reasonable criteria.

Courts seldom rule that the unavailability of funds is justification for not correcting an alleged defect, but the issue of availability of funds can be part of the defense in relation to the agency's programming procedures.

The following points are important to such a defense:

- The agency is aware of the condition of its facilities
- Deficiencies have been ranked on a logical basis
- Given the existing funding, items are being corrected in the order of priority

Appropriate warnings or other temporary measures should be used to alert the public that deficiencies have not been corrected. The highway agency can then affirm that it has performed its duties in the best way possible with the available resources.

In order to receive immunity for planning and design activities, a state must thoroughly document the design process in order to defend challenges.

A rational and orderly process must be followed if a plan or design is to be considered immune from claims of negligence. If a feature built during construction was not called for in the plans or was altered from the specifications, it is open to a claim of negligence in a tort action.

RRR NOTE ON PROJECT TITLE SHEET

For applicable projects, the following note shall be placed on the plan title sheet under the Functional Classification and Traffic Data Block:

NOTE: THESE PLANS WERE DESIGNED IN ACCORDANCE WITH VIRGINIA RRR GUIDELINES.

SECTION A-6M-AIRPORT CLEARANCE REQUIREMENTS

FOR PROJECTS

During the Project Planning Stage, the Designer will determine if there is a potential for substandard airway - highway clearance, or other potential hazard, as determined by the project's location listed below:

1. Within 7,000 meters of public use or military airports with at least one runway greater than 975 meters in length.

2. Within 3,000 meters of public use or military airports with runways with a length of 975 meters or less.

3. Within 1,500 meters of public use, military, or hospital heliports.

4. Any permanent or temporary construction or alteration including any equipment, materials or apparatus that would be more than 61 meters in height above ground level at its site.

5. Construction of wetlands or stormwater management ponds within 8100 meters of a public use or military airport.

The Designer will request a review and coordinate notice requirements for any project determined to be within the applicable limits as listed above. A list of airports, as of the printing of these instructions, is provided at the end of this section for assistance in locating applicable airports. The request for review will be made to the Location & Design Airport Clearance Coordinator in the Photogrammetry and Survey Section by Form LD-252.

The Airport Clearance Coordinator will determine current Federal Aviation Administration (FAA) requirements pertaining to the subject project and notify the FAA as early as possible. Part 77 of the Federal Aviation Regulations and the U. S. Department of Transportation FAA Advisory Circular 70/7460-21 contain FAA requirements as of the printing of these instructions.

All evaluations will be determined by using U.S.G.S. or N.G.S. (U.S.C. & G.S.) datum or datum matching quadrangle sheets. In no case will assumed data or local city or town datum be used.

When a new corridor is being developed or an existing corridor is being redeveloped to add lanes, interchanges, etc., the entire corridor is to be reviewed for clearance requirements at a very early stage.

For Final Design, the corridor will probably be divided into multiple projects and be handled by different design sections and/or in a District Office. The establishment of the proposed grade elevations based on the airport clearance requirements at an early stage is important because grade adjustments on a Final Design Project by a section may create major design adjustments on an adjoining project that is being prepared by another section or District Office.

When lighting is required on a project or a possible addition in the future, the pole heights are to be considered in the initial review for clearance requirements. Although a highway may present no problems with vertical clearances, the use of certain types of materials (such as fencing, lighting, etc.) may affect navigational equipment. Also, the use of large construction equipment (such as cranes) may cause encroachment of navigable airspace. Encroachment problems may also result from signs and/or lighting added several years after the roadway completion.

When proposed construction or maintenance activities initiated by other Divisions (i.e. Environmental, Structure and Bridge, Asset Management , Traffic Engineering) or a District Office are within the limits (specified earlier in this section) of airports or heliports, the Location and Design Highway Airport Clearance Coordinator is to be notified by Form LD-252.

When potential clearance conflicts are determined, the designer will contract the Highway Airport Clearance Coordinator via Form LD-252 and request a review. The Designer will submit Form LD-252; one (1) print of the title, typical section(s), and applicable plan and profile sheets for the Highway Airport Clearance Coordinator's review.

The Highway Airport Clearance Coordinator will evaluate the appropriate desirable clearance dimensions between highway surfaces and airway approach zones and, if necessary, request that the designer furnish prints of applicable project plan sheets. This is for early communication between the FHWA, FAA, and the Department and for alerting the FAA of potential hazards to aviation.

When a potential problem exists, FAA Form 7460-1 (notice of proposed construction or alternation), or current form, along with appropriate project review data will be filled by the Highway Airport Clearance Coordinator. A Notice of Construction or Alteration to the Federal Aviation Administrator is required for any proposed construction or alteration. This applies to, but is not limited to, the following:

1. Any object of natural growth or terrain.

2. Permanent or temporary construction or alteration, including equipment or materials used therein, and/or apparatus of a permanent or temporary character.

3. Structures with a change in height (including appurtenances) or lateral dimensions, including equipment or materials used therein.

4. Proposed changes in the land use practices that would attract or sustain hazardous wildlife populations at or near airports.

Associated City	**Airport**
Abingdon	Virginia Highlands Airport
Ashland	Hanover County Municipal Airport
Blacksburg	Virginia Tech Airport
Blackstone	Blackstone AAF/A. C. Perkinson
Bridgewater	Bridgewater Airpark
Brookneal	Brookneal-Campbell County Airport
Bumpass	Lake Anna Airport
Charlottesville	Charlottesville-Albemarle Co. Airport
Chase City	Chase City Airport
Chesapeake	Chesapeake Municipal Airport
Chesterfield	Chesterfield County Airport
Clarksville	Marks Municipal Airport
Crewe	Crewe Municipal Airport
Culpeper	Culpeper County Airport
Danville	Danville Regional Airport
Dublin	New River Valley Airport
Emporia	Emporia Municipal Airport
Farmville	Farmville Municipal Airport
Forest	New London Airport
Franklin	Franklin Municipal Airport
Fredericksburg	Shannon Airport
Front Royal	Front Royal-Warren County Airport
Galax	Twin County Airport
Gordonsville	Gordonsville Municipal Airport
Grundy	Grundy Municipal Airport
Hot Springs	Ingall's Field
Kenbridge	Lunenburg County Airport
Lawrenceville	Lawrenceville-Brunswick Co. Airport

Leesburg	Leesburg Municipal Airport
Louisa	Louisa County Airport/Freeman Field
Luray	Luray Caverns Airports
Lynchburg	Falwell Airport
	Lynchburg Regional Airport
Manassas	Manassas Municipal Airport
	Whitman Strip
Marion/ Wytheville	Mountain Empire
Martinsville	Blue Ridge Airport
Melfa	Accomack County Airport
Moneta	Smith Mountain Lake Airport
New Market	New Market Airport
Newport News	Newport News-Williamsburg International
Norfolk	Norfolk International Airport
Orange	Orange County Airport
Pennington Gap	Lee County Airport
Petersburg	Petersburg-Dinwiddie Airport
Portsmouth	Hampton Roads Airport
Quinton	New Kent Airport
Tazewell	Tazewell Airport
Richmond	Richmond International Airport
	Chesterfield County Airport
	Hanover County Municipal Airport
	New Kent County Airport
Roanoke	Roanoke Regional Airport
Saluda	Hummel Field
Somerville	Hartwood Airport
South Boston	William M. Tuck Airport
South Hill	Mecklenburg-Brunswick Airport
Staunton	Shenandoah Valley Regional Airport
Suffolk	Suffolk Municipal
Tangier	Tangier Island Airport
Tappahannock	Tappahannock Municipal Airport
Wakefield	Wakefield Municipal Airport
Warrenton	Warrenton-Fauquier Airport
Washington, D.C.	Washington Dulles International Airport
	Washington National Airport
Waynesboro	Eagle's Nest
Weirwood	Kellam Field
West Point	West Point Municipal

(continued list of airports)

Associated City	**Airport**
Williamsburg	Williamsburg - Jamestown Airport
	Newport News-Williamsburg International
Winchester	Winchester Regional Airport
Wise	Lonesome Pine Airport

Associated Area	**Military Airfields**
Fort Belvoir	Davidson AAF
Fort Eustis	Felker AAF
Norfolk	NAS Norfolk
Poquoson	Langley
Quantico	MCAF Quantico
Va. Beach	NAS Oceana
	NALF Fentress

SECTION A-7M-"NO PLAN" AND "MINIMUM PLAN" PROJECTS

GENERAL CONCEPTS

Description

The "No Plan" and "Minimum Plan" concept provides for the accomplishment by contract of the type improvements that would not require complete and detailed surveys and plans, and where the use of modified Specifications would be appropriate. Generally, the improvements will consist of widening, grading, draining and stabilizing primary and secondary roads with relatively low traffic volumes by using engineering judgment. "No Plan" and "Minimum Plan" concepts are to be used only for projects where significant reductions in the cost of engineering and construction can be experienced by using these concepts to obtain the quality of improvement necessary for the particular situation. To optimize the usefulness of this concept, very careful initial study and project selection by the District and Residency staff is required. The Federal Highway Administration has concurred with the use of the "No Plan" and "Minimum Plan" concept on selected projects with Federal Oversight.

"No Plan" projects are used when no survey, engineering, hydraulic analysis or river mechanics studies are needed or when there will be no major structures with "B" or "D" designation numbers. Right of way may be acquired on "No Plan" projects provided it is acquired thru donations and no condemnation is required. A "No Plan" project is an assembly of letter size sketches showing the location of the project with a typical cross section and estimated quantities.

A "Minimum Plan" project differs in that limited survey is needed to provide the information necessary to secure right of way by the Right of Way and Utilities Division and a profile sheet is provided. In the establishment of such projects, attention should be given to determine that the project location and selection is in an area where disruption due to construction can be tolerated by the users of that particular roadway for a reasonable period of time.

PUBLIC HEARING AND RIGHT OF WAY

All right of way negotiations are to be conducted in accordance with the applicable statutes, regulations, policies, and procedures stipulated in the Right of Way and Utilities Division’s Manual of Instructions and related memoranda.

Any required right of way and/or easements will normally be secured by donation. However, right of way may be purchased by individual deeds or under the minimum plan concept (see - second paragraph under "Minimum Plan" Projects).

The Commonwealth Transportation Board's resolution of February 16, 1961 specifies a minimum 12.2 m right of way is to be provided for any initial improvement to the secondary system, except in extenuating circumstances.

Section 33.1 - 70.1, Code of Virginia permits consideration for hard surfacing of a secondary road on less than a 12.2 m right of way.

Right of Way - Donations

Public hearing requirements will normally be waived on "No Plan" and "Minimum Plan" projects when all landowners are willing to donate the right of way provided there is no evidence of controversy, the landowners have been advised of their right to receive just compensation prior to requesting donations, and the project files have been so documented.

Right of Way - Acquisitions

When Right of Way must be acquired, a "Willingness to Hold a Public Hearing" will be advertised and public hearings will be conducted upon request. A public hearing handout and appropriate environmental document, on projects with Federal Oversight, will be prepared following the usual guidelines. If there are questions concerning the public hearing requirements or procedures, check with the State Location and Design Engineer.

SPECIAL DESIGN STRUCTURES, SOIL SURVEY AND PAVEMENT DESIGN

"No Plan" projects may include drainage structures; however, major structures with "B" or "D" designation numbers and all standard box culverts that require a hydraulic study are to be constructed under the "Minimum Plan" concept. When pipes are to be extended and endwalls, end sections, pipe spillouts, etc., are to be provided, separate bid items are to be set up.

The District Materials section is to review the project site to determine if soil samples may be necessary and the District Materials Engineer is to furnish recommendations regarding any undercutting and pavement design.

MOBILIZATION AND FIELD OFFICE

Mobilization is to be set up as a contract item on "No Plan" and "Minimum Plan" projects in accordance with VDOT's Road and Bridge Specifications.

When it is necessary to set up a field office, it is set up as a contract item in accordance with VDOT's Road and Bridge Specifications at the discretion of the District; however, other arrangements should be considered such as the use of existing facilities where feasible to eliminate the need for the extra cost of a field office.

EROSION AND SEDIMENT CONTROL

Temporary and permanent erosion and sediment control measures are required in accordance with the Department's standard practices and procedures. Seeding operations, erosion control, and sedimentation measures shall be included as specific contract items in accordance with standard specifications and procedures or shall be performed by State Forces, at the discretion of the District. When seeding operations and other items are to be performed by State Forces, a plan note must be included to denote such State Force work; and, in the event of Federal Oversight, finding of cost effectiveness must be furnished in accordance with existing policy and procedures.

CONTRACT TIME LIMIT

Generally, a 90 to 180 calendar day time limit should be established; however, the contract time limit should be determined after thorough consideration of the need to realize the lowest cost possible to provide the improvement at the earliest practical date.

PROCEDURES

General

A general description of the work must be provided on Form C-99 (No Plan and Minimum Plan Quantity Support Report) and the Field Narrative to denote the nature of the work to be performed, such as daylighting of slopes; realignment; intersection improvement; or widening of shoulders and ditchlines are to be completed by the District Construction Engineer or the District Administrator’s Staff. "Simple" sketches may be used in lieu of the narrative. They are to be submitted with the project assembly for the purpose of providing information concerning the general description of construction work from which to develop and support the construction cost estimate. For all projects disturbing more than 929 square meters of soil (or greater than 232 sq. meters of soil in Tidewater Virginia), a plan narrative or sketch with profile which must include erosion and sediment control measures and specify placement of those items. Stormwater management facilities may be addressed in a similar fashion provided sufficient detail is included to ensure their proper construction. Sketches shall be

included in the no-plan assembly to define the construction of these items. The Field Narrative will also become part of the contract assembly.

PROJECT SCOPING & INITIAL FIELD REVIEW

All projects are to be scoped and an Initial Field Review is to be held in accordance with IIM LD-210. These procedures will define the potential need for field and office engineering as well as right of way and environmental requirements.

"NO PLAN" PROJECTS

The "No Plan" concept should be used when:

(a) survey data is not required
*(b) improvements to roadways do not involve major structures or special design items
*(c) Hydraulic or River Mechanics Studies are not required.
(d) rights-of-way are acquired thru donations and no condemnation is required.
(e) environmental permits will not normally be required
(f) construction activities must be handled in an expeditious manner
(g) detailed engineering is not required

* Exception - when a project requires an extensive study (survey, hydraulic or river mechanics study, etc.) for a major structure, the "No Plan" concept may be used only if the necessary studies for the structure design are performed. When a major structure is located on a long No Plan project, the site should be treated as a Minimum Plan exception to the No Plan Project.

The District Construction Engineer normally obtains any donated right of way by use of the appropriate Right of Way Forms. When a "No Plan" project is to be constructed within existing right of way, a note must placed on the title sheet indicating that "All construction is to be performed within existing right of way."

Metes and bounds plans are required for right of way from unique clients (e.g. Federal and State agencies, the National Forest, railroads, Virginia Power, etc.) - see VDOT's Road Design Manual Chapter 2E, Section 2E-5.

The construction baseline should generally follow the center of the existing roadway; however, minor relocation and alignment improvements (horizontal and vertical), roadway widening, and turn lanes may be accomplished. The geometrics should comply with the appropriate design standards. However, where it is impractical or not economical to obtain the minimum design and an exception is required, permission shall be secured from the State Location and Design Engineer and, if applicable, from the Federal Highway Administration.

The Project Manager, with the assistance of the project designer, determines the typical section and furnishes an estimate of quantities on the "Quantity Support Report" (Form C-99). Grading should generally be balanced and set up as a lump sum quantity. Form C-99 should indicate an estimate of grading quantities, including anticipated waste quantities, to guide the Scheduling and Contract Division in preparing the construction cost estimate.

When borrow material is anticipated, "Borrow Excavation" is to be set up as a separate bid item in accordance with VDOT's Road and Bridge Specifications. Borrow sources should be located and designated whenever possible in accordance with VDOT's Road Design Manual Chapter 2E, Section 2E-1 - SOIL SURVEY AND PAVEMENT DESIGN.

A unit price for extra excavation is to be established by the District Construction Engineer or the District Administrator's staff and entered on Form C-99 for inclusion in the contract assembly by the contract section.

The Project Manager is responsible for conducting the utility field inspections and preparing the field inspection reports, determining utility conflicts, method of adjustment, cost responsibility and for obtaining and forwarding all plans and estimates from utility owners to the District Administrator (District Utilities Engineer) for processing. The District Construction Engineer is also responsible for advising the District Administrator (District Utilities Engineer) in writing, no later than 60 days prior to the advertisement of the project, when all arrangements have been made with the utility owners to adjust the utilities prior to or in conjunction with project construction.
The Central Office Right of Way and Utilities Division will obtain any necessary FHWA authorization for utility work and will furnish the usual utility clearances and estimates to the Scheduling and Contract Division for contract projects and State Force projects with Federal Oversight. If no known utilities and/or railroads are involved, the plans will contain a note so stating.

The responsibility for compliance with applicable regulations, policies and standards is assumed by the District Administrator for "No Plan" secondary projects. The State Location and Design Engineer is responsible for all other roadway classifications. This responsibility is evidenced by affixing the signature of the District Administrator or the State Location and Design Engineer in the appropriate plan signature space.

On Secondary "No Plan" projects, the project designer will transmit the plan assembly directly to the Central Office Plan Coordination Section for processing for construction advertisement or authorization for State Force work on projects with Federal Oversight, whichever is applicable. Primary "No Plan" projects will continue to be transmitted to the Central Office Plan Coordination Section for processing and recommended approval for advertisement. Construction plans will be retained in the District until right of way has been secured and arrangements made for utility adjustments. When retained, status reports (containing applicable correspondence) will be submitted the by District Administrator's staff by the plan-due-date and quarterly until clear.

"MINIMUM PLAN" PROJECTS

Those sites that require an engineering evaluation should be designated as "Minimum Plan" projects. This will permit the development of required engineering studies and will provide a vehicle for transmitting critical information to the contractor.

Projects that should be developed with the "Minimum Plan" concept include:

(a) locations requiring survey
(b) major stream crossing sites
(c) locations that will require environmental evaluation and/or permits
(d) all projects with "B" and "D" designation numbers
(e) locations requiring Hydraulic or River Mechanics studies
(f) locations that involve the acquisition of right of way and/or condemnation

The basic difference between the "Minimum Plan" and the "No Plan" project is the need for a limited survey and topo to provide sufficient right of way plans necessary to acquire right of way. Form RW-205 or individual deed forms are to be used. If any additional right of way or easements are necessary, the usual right of way certification letter and release for advertisement will be required. If additional right of way or easements are not required, the "Minimum Plan" title sheet is to contain a note indicating that "All construction is to be performed within existing right of way."

"Minimum Plan" projects may include relocation or alignment improvements (horizontal or vertical), roadway widening, and the addition of turn lanes. The intent of the "Minimum Plan" project is for it to be constructed using engineering judgment; however, the complete project should not be required to be redesigned during construction.

Special attention should be given to major drainage problems and the limits set for the proposed right of way. The geometrics should comply with the appropriate design standards. However, where it is impractical or not economical to obtain minimum design and an exception is required, permission must be secured from the State Location and Design Engineer and, if applicable, from the Federal Highway Administration.

Quantities computed by the project designer, typical sections, and other similar information generally should be shown on the initial plan and profile sheet. A grade line is required when the grade is to be different than that of the existing road.

When borrow material is anticipated, "Borrow Excavation" is to be set up as a separate bid item in accordance with Section 303 of VDOT's Road and Bridge Specifications. Borrow sources should be located and designated, whenever possible, in accordance with VDOT's Road Design Manual, Chapter 2E, Section 2E-1 - SOIL SURVEY AND PAVEMENT DESIGN.

A unit price for extra excavation is to be established by the District Construction Engineer or the District Administrator's staff and entered on Form C-99 for inclusion in the contract assembly by the contract section.

Utility adjustments shall be handled in accordance with IIM LD-140 and 203.

A general description of work must be provided on Form C-99 and the Field Narrative to denote additional work that is not covered on the plans.

For all projects disturbing more than 929 square meters of soil, (or greater than 232 sq. meters of soil in Tidewater Virginia**) erosion and sediment control measures (narrative, sketch, or station to station summary) must be shown on the plan sheets. Stormwater facilities must also be shown.

For all projects disturbing greater than one acre of land, a Stormwater Management Plan must be developed, reviewed, and approved by appropriate qualified personnel in accordance with the latest version of IIM LD- 195.

** Tidewater, VA, as defined by the Virginia Chesapeake Bay Preservation Act, Title 10.1, Chapter 21, Code of Virginia.

PERMITS AND REVIEWS ("NO PLAN" AND "MINIMUM PLAN" PROJECTS)

The need for 401, 404, navigation, and other environmental permits is to be considered in accordance with the Guidelines for the Preparation of Permit Application. A VPDES permit is required on all projects with a total disturbed area of more than two continuous hectares. (Request Form LD-252).

Historical and archaeological reviews are to be made. (Request Forms LD-252 and EQ-429).
For any project that disturbs greater than 4,047 square meters (one acre) of soil, (except certain maintenance projects specifically exempted by the General VPDES Construction Permit Regulations - 9VAC25-180-10 et seq.), an Erosion and Sediment Control Plan must be developed, reviewed, and approved by appropriate qualified personnel in accordance with the latest version of IIM LD- 11, and a Stormwater Management Plan must be developed, reviewed, and approved by appropriate qualified personnel in accordance with the latest version of IIM LD- 195.

PLAN PREPARATION

The sample plan assemblies for both "No Plan" and "Minimum Plan" projects provide the manner of showing the minimum essential information and the notes necessary to govern construction. For current versions of these sheets, see the CADD No Plan Directory. Variation may be made to the formats to meet the specific project needs and to best utilize all available sheet space, thereby minimizing the total number of project assembly sheets. Careful attention should be given to the notes shown thereon.

The plan assemblies for both “No Plan” and “Minimum Plan” projects are to be placed in Falcon and transmitted electronically to the Plan Coordination Section in the Central Office. The document assembly instructions are located in Falcon along with the other typical drawings needed for “No and Minimum Plan” projects.

Generally, plan variations from AASHTO guidelines, as set forth in the Geometric Design Standards (See VDOT's Road Design Manual, Appendix A), are not readily apparent in an office review; therefore, it is very important that the variations be defined in the project assembly (consisting of the plan details, Form C-99, cost analysis, and narrative or description of the work) by the Project Manager and/or District Administrator.

Aggregate Material No. 21, 21A, 25 or 26 should be set up as a contract item for roadway base or subbase, maintenance of traffic, private entrances, and mailbox turnouts. Normally, one contract item should cover all uses.

SPECIFICATIONS

It is intended that modified versions of parts of VDOT's Road and Bridge Specifications will be followed in order to reduce the field engineering and final computations required; however, the use of such modifications must still be consistent with good construction practices in relation to the kind and type of improvement being provided.
A unit price for extra excavation is to be established by the District Construction Engineer or the District Administrator's staff and entered on Form C-99 for inclusion in the contract assembly by the contract section.

The Special Provisions for "No Plan and Minimum Plan Projects" (available from VDOT's Scheduling and Contract Division) are approved by the Federal Highway Administration for use on a project by project basis. When additional changes to the Specifications are necessary, such changes should be documented and submitted with the project assembly. (Any additional Special Provisions are to be reviewed by the Scheduling and Contract Division in ample time for inclusion in the project bid proposal.)

"No Plan" and "Minimum Plan" projects will often consist of small quantities of materials; therefore, materials testing requirements for most items will fall within the limits of minimum testing as set forth in VDOT's Materials Manual. Compactive effort must be provided by the Contractor in such a manner as to attain the required densities and random compaction tests will be performed to the extent required to assure proper compaction.

Generally, materials from sources that have proven to be satisfactory in the past will normally be accepted by certification as determined by VDOT's Materials Division, subject to visual inspection at the project site.

The Contractor shall perform all construction surveying on "No Plan" and "Minimum Plan" projects in accordance with the Special Provision "Copied Note" for Section 105.10 of VDOT's (See IIM LD- 152) VDOT's Road and Bridge Specifications.

Prospective bidders may be required to attend the Project Showing as a prerequisite for submitting a bid proposal for "No Plan" and "Minimum Plan" projects. When attendance is required, prospective bidders must register with the Engineer at the project showing and all attending parties are to be noted in the project showing letter. The Project Engineer and the Project Inspector must also attend the project showing. The Field Narrative will indicate if attendance is required.

PROJECT LAYOUT

If deemed necessary by the District Administrator or District Construction Engineer, marked stakes shall be established showing the approximate depth at centerline of major fills and cuts which exceed 1.2 m and/or other areas as required. Marked stakes shall be in place at the time of the Project Showing.

Survey work for "Minimum Plan" projects should normally be performed in accordance with the VDOT Survey Instructions Manual or as otherwise determined by the District Administrator or Project Manager.

The designer should determine in the early stages of the plan development where additional survey is needed in order to alleviate any major problem during construction. Normally, on "Minimum Plan" projects, entrance profiles are taken where right of way donations are not anticipated; however, they should not be plotted unless the need for condemnation is required.

INSPECTION AND RECORD KEEPING

Close coordination between the Project Inspector and the Contractor is necessary to assure the success of the "No Plan" and "Minimum Plan" concepts.

Only one loose leaf notebook is normally necessary on a "No Plan" or "Minimum Plan" project and it may be used as a combination diary, materials book, and sketch book provided that electronic versions of these materials are not available.

Alignment and sketches may be entered in accordance with standard procedures or, where feasible, small sketches may be glued into the notebook to properly indicate the work performed.

Where it is determined by the District that "As Built Plans" are more practical, they may be used in lieu of entering alignment, sketches, and summaries in the notebook. When "As Built Plans" are used, any changes, additions, or deletions of any nature are to be clearly indicated on the prints/files furnished to the Inspector with the diary and materials information entered in the notebook.

Upon the completion of a project, all records shall be submitted in accordance with standard procedures; except that after verification of the materials section by the District Materials Engineer, a reproducible copy of the materials section of the notebook/file is to be furnished to the State Materials Engineer in lieu of furnishing the original document/file.

PROJECT: 0624-039-P47, N-501
SAMPLE PLAN ASSEMBLY
NO PLAN PROJECT REV. 3-96
COMMONWEALTH OF VIRGINIA
DEPARTMENT OF TRANSPORTATION

DISTRICT: Culpeper COUNTY: Greene PPMS NO.: 2016

Rural-Local (FUNCTIONAL CLASS) 16003 (FHWA 534 DATA) FOOO (TYPE CODE)

ROUTE: 624 PROJ. 0624-039-P47, N-501 FEDERAL AID: None

FROM: .89 km N of Rte. 623 TO: Int. Rte. 622

LENGTH: 1851 m 1.85 km

TOPO: Rolling DES. SPEED: 50 kmh 101 VPD (1988)

DESIGNED BY: F. E. James R/W DONATION: Yes/No

Utilities Yes/No and/or Railroads Yes/No are involved in the construction of this project.

This project is to be constructed in accordance with the Department's Road and Bridge Specifications dated Jan. 1997, Road and Bridge Standards dated Dec. 1, 1994, Work Area Protection Manual dated Jan. 1996 and as amended by contract provisions and the complete plan assembly.

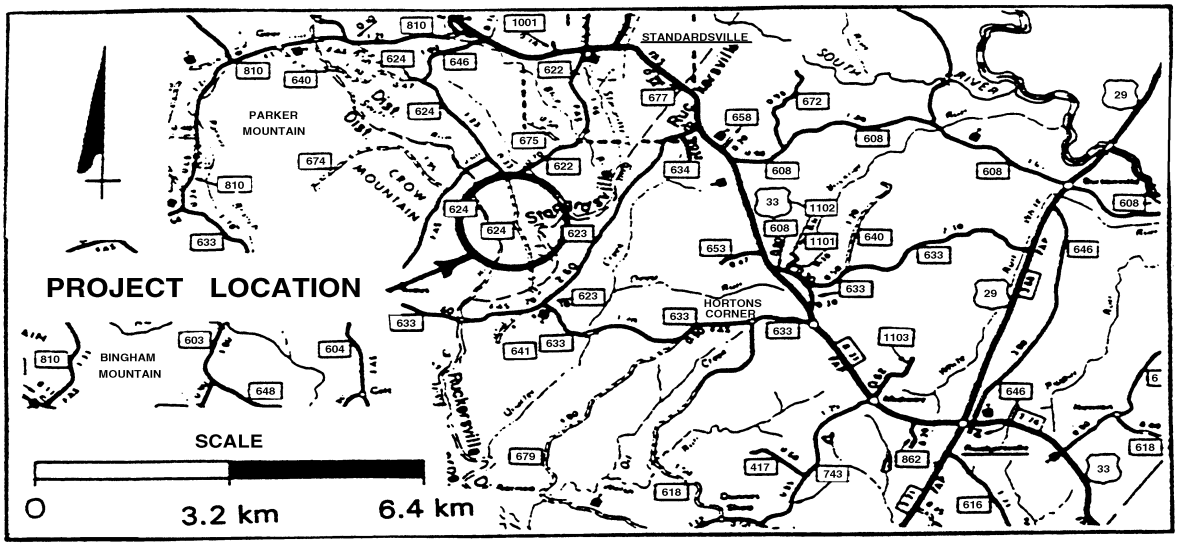
"All curves are to be superelevated, transitioned and widened in accordance with proper highway engineering practices."

RECOMMENDED FOR APPROVAL FOR CONSTRUCTION	
DATE	DISTRICT ADMINISTRATOR
DATE	PROGRAMMING DIVISION DIRECTOR
DATE	CHIEF FINANCIAL OFFICER

APPROVED FOR CONSTRUCTION	
DATE	CHIEF ENGINEER

PROJECT: 0624-039-P47, N-501

LOCATION MAP



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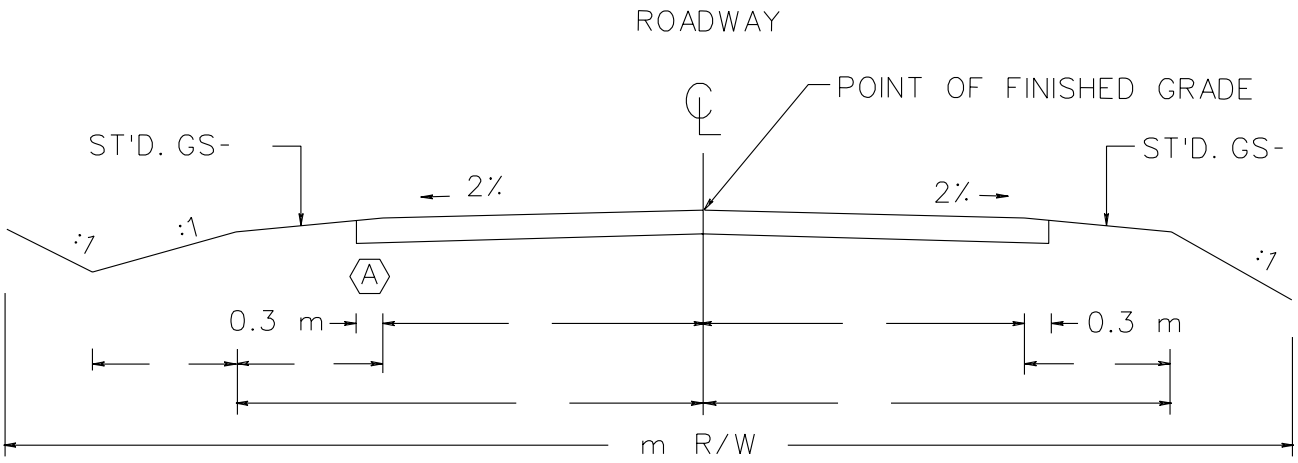
PROJECT: 0624-039-P47, N-501

TYPICAL SECTION



(A) NON-PAVED SHOULDERS WILL RECEIVE 0.3 m OF PAVEMENT WIDENING HAVING THE SAME SLOPE AND STRUCTURE AS THE MAINLINE PAVEMENT; HOWEVER, THIS 0.3 m EXTENTION IS INCLUDED IN THE OVERALL WIDTH OF THE SHOULDER.

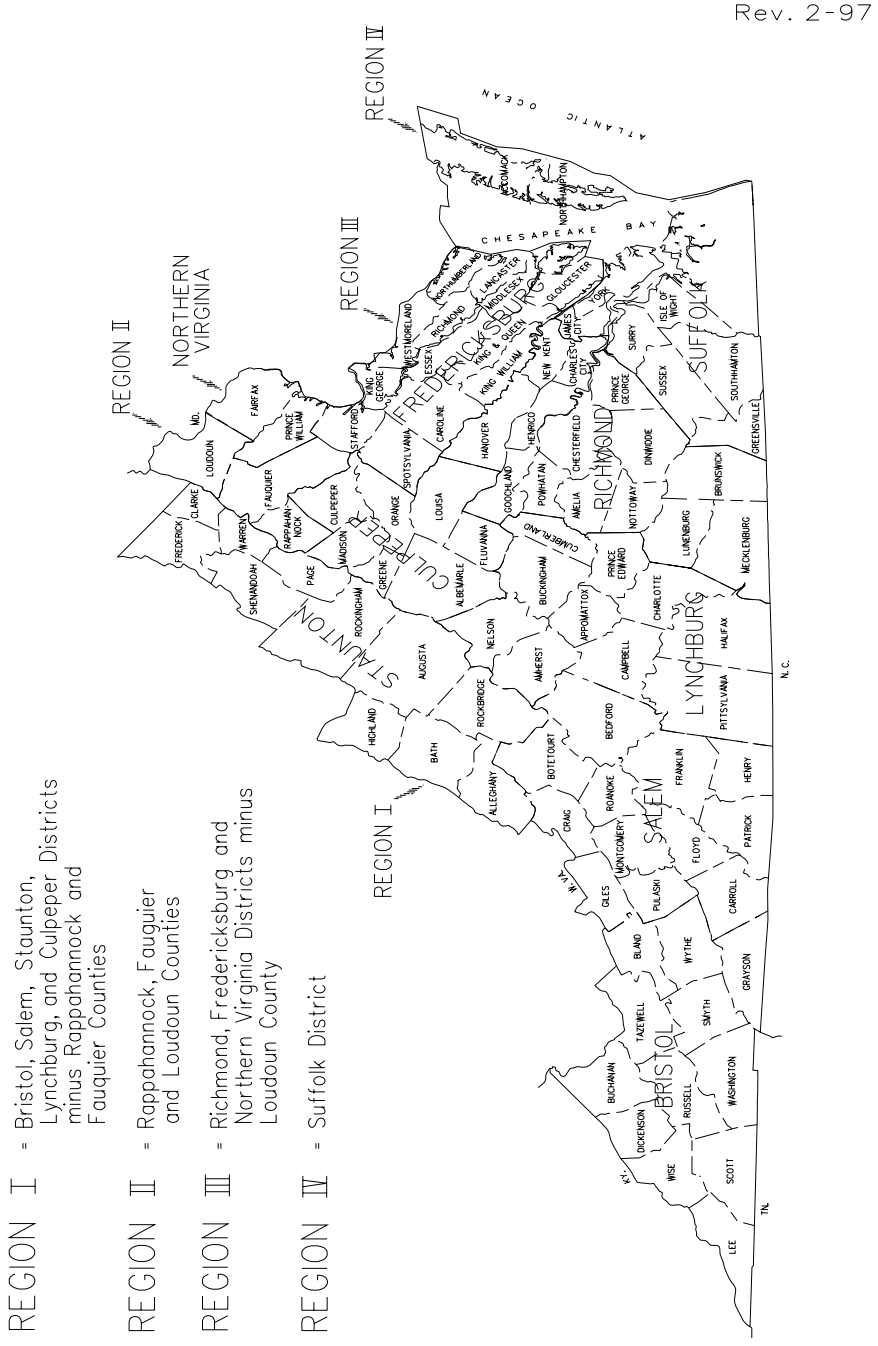
NOTE: Aggr. depth to be placed as directed by the Engineer (150 mm depth to be used for **estimating purposes only).**

NOTE: Fill shoulders to be increased by 0.9 m where guardrail is required.

PRIME & DOUBLE SEAL SURFACE TREATMENT					
PRIME		INITIAL SEAL		FINAL SEAL	
LIQUID ASPHALT MATERIAL	COVER MATERIAL AGGREGATE	LIQUID ASPHALT MATERIAL	COVER MATERIAL AGGREGATE	LIQUID ASPHALT MATERIAL	COVER MATERIAL AGGREGATE
RC-70, RC-250 or MC-250 @ 1.8 L/m²	NO. 68 Stone, Slag or Crushed Gravel @ 16 kg/m²	CRS-2, CMS-2 or CMS-2h @ 1.2 L/m²	NO. 8P Stone, Slag or Crushed Gravel @ 10 kg/m²	CRS-2, CMS-2 or CMS-2h @ 1.2 L/m²	NO. 8P Stone, Slag or Crushed Gravel @ 10 kg/m²
LITERS	METRIC TONS	LITERS	METRIC TONS	LITERS	METRIC TONS

PROJECT: 0624-039-P47, N-501

Rev. 2-97



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PROJECT: 0624-039-P47, N-501

Rev. 2-97

ROADSIDE DEVELOPMENT

CORE MIX

MIX	MINIMUM kg/hectare	DESCRIPTION
1	115	100% CERTIFIED FINE FESCUE
2	115	100% CERTIFIED TALL FESCUE
3	60 60	50% CERTIFIED TALL FESCUE 50% CERTIFIED FINE FESCUE
4	60 60	50% ORCHARD GRASS 50% CERTIFIED KENTUCKY
5	60	100% BERMUDA GRASS
TEMPORARY		
3/1 – 5/16 and 8/16 – 3/1	60 60	50% CERTIFIED TALL FESCUE 50% WHEAT, BARLEY OR RYE
5/16 – 8/16	60 60	50% FOXTAIL MILLET 50% CERTIFIED TALL FESCUE

ADDITIVES

TYPE	MINIMUM kg/hectare	DESCRIPTION
A	2 10	100% LOVE GRASS OR 100% FOXTAIL MILLET
B	25	100% RYE GRAIN, WHEAT OR BARLEY
C	25	100% CROWN VETCH
D	25	100% SERICEA LESPEDEZA
E	10 10	100% FOXTAIL MILLET OR 100% ANNUAL RYEGRASS

SEEDING SCHEDULE

	SLOPES SEED MIX WITH ADDITIVE	MOWED SEED MIX WITH ADDITIVE	SLOPES SEED MIX WITH ADDITIVE	MOWED SEED MIX WITH ADDITIVE	SLOPES SEED MIX WITH ADDITIVE	MOWED SEED MIX WITH ADDITIVE
I	2, 3, 4 B, C, D	1, 2, 3, 4 B	2, 3, 4 A, C	1, 2, 3, 4 A, E	2, 3, 4 B, C, D	1, 2, 3, 4 B
II	4 B, C	4 B	4 A, C	4 E	4 B, C	4 B
III	2, 3 B, C	2, 3 B	2, 3 A, C, D	2, 3 E	2, 3 B, D	2, 3 B
IV	2, 5 B, C, D	2, 5 B	2, 5 A, C, D	2, 5 E	2, 5 B, C, D	2, 5 B

REGIONS	SPRING & FALL MONTH & DATE	SUMMER MONTH & DATE	LATE FALL & WINTER MONTH & DATE
I	4/1 – 6/15 8/1 – 9/30	6/16 – 7/31	10/1 – 3/31
II	3/1 – 5/15 8/1 – 9/30	5/16 – 7/31	10/1 – 2/29
III, IV	3/1 – 4/30 8/1 – 10/31	5/1 – 7/31	11/1 – 2/29

MIX REQUIREMENTS THIS PROJECT

SEED MIXTURE RECOMMENDATIONS MAY AT TIMES DEVIATE FROM THE SEED MIXTURE GUIDELINES ON THE ROADSIDE DEVELOPMENT SHEET. RECOMMENDATIONS FOR THE APPLICATION OF SEED MIXTURES (CORE MIX AND ADDITIVES), FERTILIZER, LIME, ETC. ARE TO BE OBTAINED FROM THE DISTRICT ENVIRONMENTAL MANAGER ON FORM RD-100.

PROJECT NUMBERS						

B5
(CONTINUED)

A-92
Metric

PROJECT: 0624-039-P47, N-501

ROADSIDE DEVELOPMENT NOTES

Rev. 2-97

Approximately _____ hectares will be disturbed on this project and will require the establishment of grasses and /or legumes.

NOTES FOR FIELD USE ONLY

Supplemental seeding consists of overseeding or regular seeding as determined by the Engineer.

Over seeding rates shall be 50% of the seed mixture specified and fertilizer rates shall be 33% of the rates specified.

The Engineer will require the Contractor to perform supplemental seeding when less than 75 percent uniform stand of the permanent grass specified in the mixture obtained. (Annual species such as, Rye and Millet are temporary varieties and require supplemental seeding.)

Tall and Fine Fescue shall not be used in Loudon, Fauquier and Rappahannock Counties. (Mix 4 only) Orcharch Grass mixture shall be used for these counties. Type II mulch only.

NOTES APPLY TO SCHEDULE

Legume seed mixes (Crown Vetch and Sericea Lespedeza) and weeping Lovegrass shall not be used on shoulders and other locations flatter that 3:1 slope.

A temporary mix of erosion control mulch, as directed by the Engineer, is to be used only on areas that are to be regraded or later disturbed, if left dormant for more than 30 days, between March 1 and November 30.

Spring and Fall defined for the purpose of determining whether hulled or unhulled Bermuda and Sericea Lespedeza seed is required:

Spring - May 1 - Sept. 30
Fall - Oct. 1 - Apr. 30

Type I mulch (Straw or Hay) to be used on newly seeded areas adjacent to all waterways, wetlands, swamps, or any area in which drainage flows toward areas under the jurisdiction of the environmental regulatory agencies.

Type I mulch shall be applied at 4.5 metric tons per hectare to provide a minumum 90% coverage.

Type I mulch shall be tacked with Fiber mulch at the rate of 840 kg per hectare.

Type II mulch (Fiber mulch) may be substituted for Type I mulch at the recommendation of the District Environmental Manager.

Type II mulch shall be applied at a rate of 2000 kg (net dry weight) per hectare.

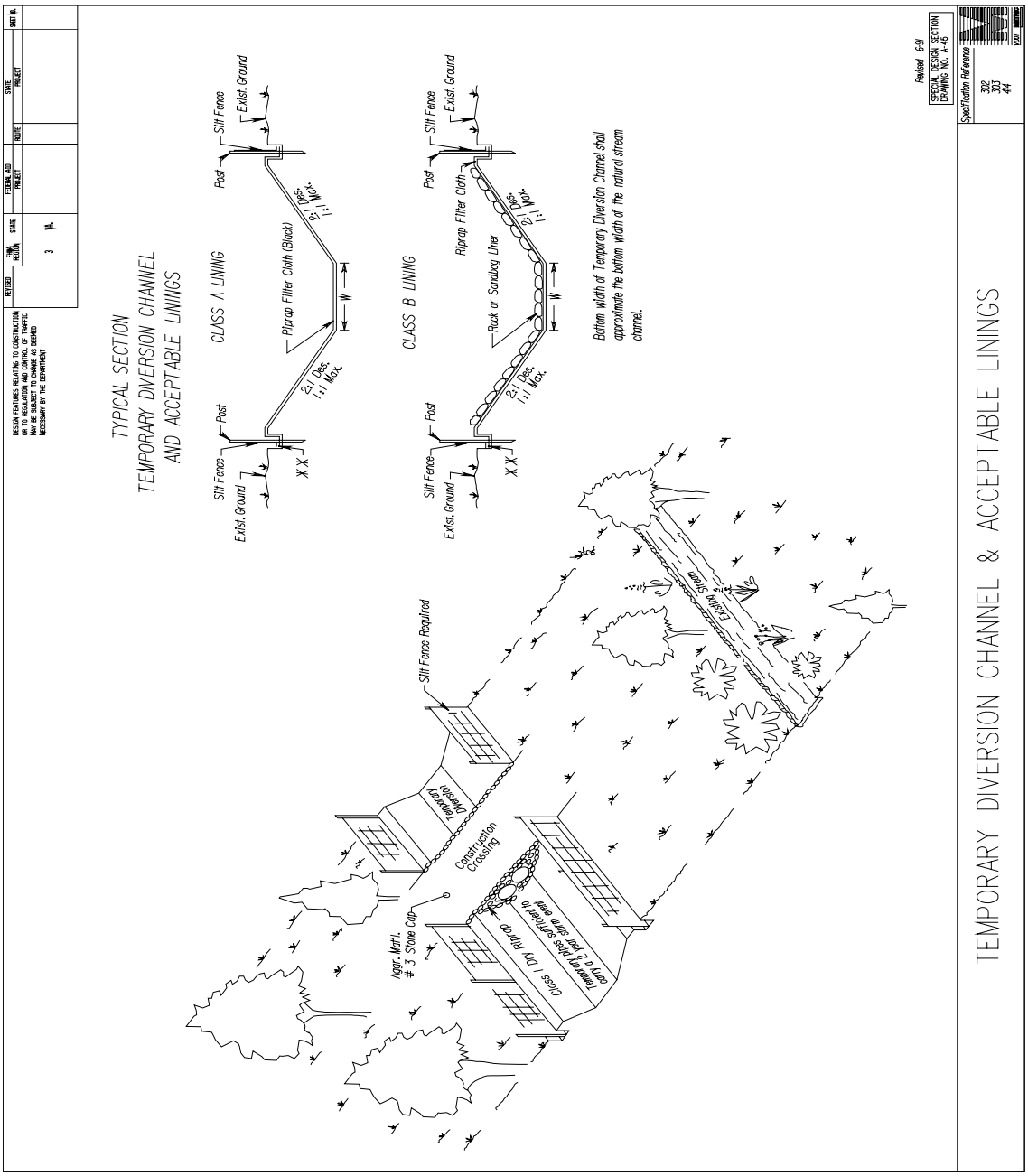
Erosion Control Mulch, as listed on the VDOT Approved Products List, shall be applied in accordance with the manugacture's recommendations.

Erosion Control Mulch shall provide 100% coverage of all denuded areas.

All topsoil is to be free of hard lumps, clods, rocks and foreign debris and is to be hand raked to tie into existing lawns.

All seed must be in conformance with VDOT seed specifications for Grasses & Legumes and be provided at the project site in bags not opened and labeled for use on VDOT projects with a green tag certifying inspection by the Virginia Crop Improvement Association.

PROJECT: 0624-039-P47, N-501



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(CONTINUED)

PROJECT: 0624-039-P47, N-501

STREAM DIVERSION
GENERAL NOTES

Slopes

Maximum steepness of side slopes shall be 1:1. Depth and grade may be variable, dependent on site conditions, but shall be sufficient to ensure continuous flow of water in the diversion.

Excavation

No excavated material shall be stored or stockpiled next to the diversion or in such a manner that siltation of the stream should occur.

Pipe Culverts

Pipe culvert(s) may be used to divert a stream provided they are properly sized to safely carry the flow of a mean annual flood. Undersized pipes shall be used for no longer than 72 hours provided less than 50% threat of rain can be reasonably expected within that time period and they are approved by the Engineer.

When the contractor uses pipe culverts in lieu of the diversion channel or portion of the channel, payment will be made based on the price bid for the quantities shown on the plans for Temporary Diversion Channel Excavation and Temporary Diversion Channel Lining Class specified.

Linings

The contractor shall have the option of using a higher class of lining than that specified on the plans. No additional compensation will be allowed for using the higher class.

Stream diversion liners shall be secured at the upstream and downstream sides with non-erodible weights such as erosion control stone. These weights shall allow normal flow of the stream. Soil shall not be mixed in with stream diversion weights. Weights may also be needed along the stream diversion's length.

Jute mesh (EC-2) staples or non-erodible weights shall be used as necessary to anchor stream diversion liners to the side slopes of the diversion. Wooden stakes shall not be used on the diversion's bottom or side slopes.

Stream diversion liners shall be overlapped when a single or continuous liner is not available or is impractical. Overlaps shall be such that continuous flow of the stream is maintained. An upstream section shall overlap a downstream section by a minimum of 450 mm. Overlaps along the cross-section shall be made such that a liner is placed in the stream diversion bottom first and additional pieces of liner on the slopes overlap the bottom piece by a minimum of 450 mm.

Stream diversion liners shall be entrenched at the top of the diversion slopes (slope breaks) with a line of silt fence.

(CONTINUED)

PROJECT: 0624-039-P47, N-501

General

The downstream plug shall be removed prior to the upstream plug when opening a stream diversion for the transport of water.

Non-erodible materials such as erosion control stone, concrete barriers, sandbags, plywood, or sheet piling shall be used both to divert the streams away from their original channels and to prevent or reduce water backup into a construction area.

Streams may be diverted through an existing or incomplete structure provided they will not re-enter a disturbed area, come into contact with wet concrete, and/or become partially or wholly impounded, sifted, or otherwise contaminated.

Streams shall be rediverted upon completion of the drainage structure(s) for which the diversion was built. Prior to rediversion, any materials used to prevent water backup into the downstream end of the drainage structure(s) shall be removed. This material shall not be placed in the downstream end of the diversion until after water has been rediverted to the drainage structure(s). A stream shall be rediverted by removing all of the materials damming the upstream end of the drainage structure(s) before placing it in the upstream end of the stream diversion. The diversion shall be sealed off at the downstream end and then backfilled.

Once started, any work to relocate a stream (plugs) shall not be discontinued until it is completed.

Any deviations to the above noted stream diversion design, installation, or maintenance shall be approved by the Engineer.

Basis of Payment

Silt Fence will be measured and paid for in meters in accordance with Section 303. Temporary Diversion Channel Excavation will be measured and paid for in cubic meters in accordance with Section 302.

Temporary Diversion Channel Lining Class __ will be measured and paid for in square meters in accordance with Section 302.

PROJECT: 0624-039-P47, N-501
HYDROLOGIC DATA
(To be used if applicable)

The data presented herein was statistically derived by empirical methods and from field observations. It is presented as an estimate of the hydraulic performance of these facilities during the passage of actual flood events.

1. Estimated 100 year frequency flood data (unless otherwise.) this magnitude of flooding may pass through the proposed facility or it may obtain the necessary hydraulic conveyance by partial inundation of the roadways and/or partial by pass of the facility.

2. Specified frequency flood data. It is anticipated that this magnitude of flooding will be conveyed through the proposed hydraulic facility under estimated conditions which satisfy the design criteria applicable to the site.

3. This data was obtained from observations by persons familiar with the area and/or official records combined with an evaluation by empirical methods. the reliability of this data is relative to the accuracy of the source. A future flood of the same magnitude may achieve a significantly different stage elevation from that shown due to changes in the physical characteristics of the watershed.

FIELD INSPECTION STAGE__ FINAL DESIGN STAGE					BASE FLOOD		DESIGN FLOOD		
Sheet No.	Station	Stream Name	Drainage Area	Structure Size	Discharge (m^3/s)	Stage Elevation (m)	Discharge (m^3/s)	Estimated Exceedance Probability %	Storage Elevation (m)

		OVERTOPPING FLOOD		HISTORICAL DATA		
Sheet No.	Station	Discharge (m^3/s)	Stage Elevation (m)	Estimated Exceedance Probability %	Data	Estimated Exceedance Probability %

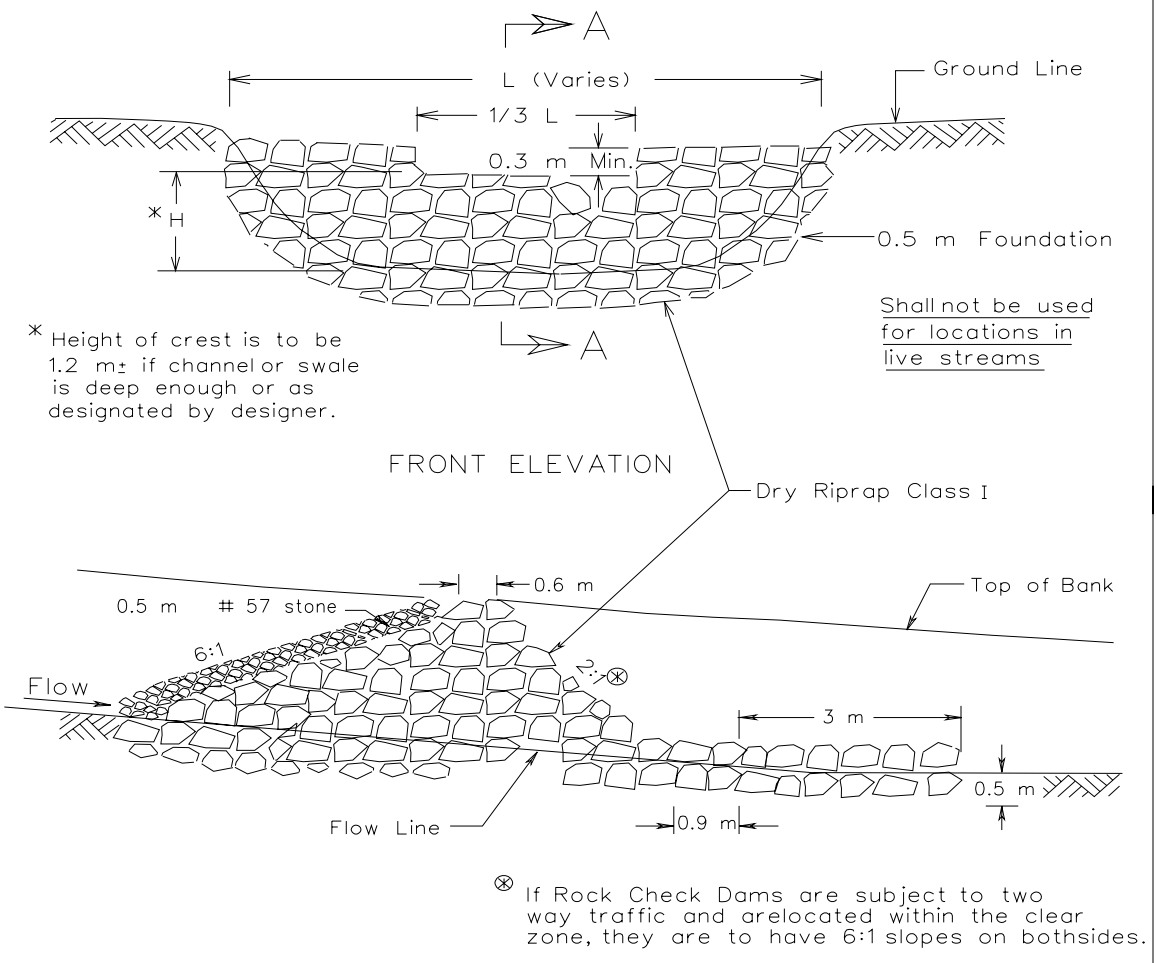
REMARKS: Source of information and other related data.

PROJECT: 0624-039-P47, N-501

TEMPORARY EROSION & SILTATION CONTROL

Rev. 6-97

CHECK DAMS
TYPICAL DETAIL FOR ROCK CHECK DAM TYPE I



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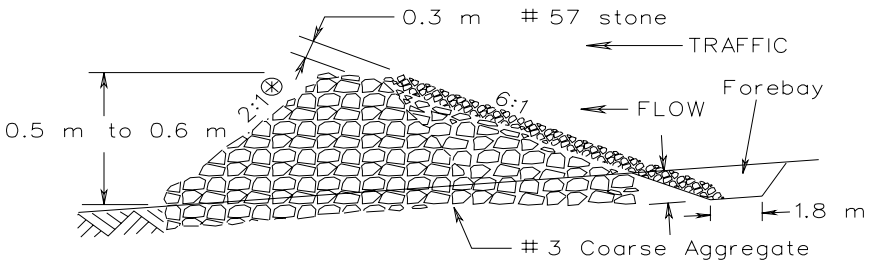
PROJECT: 0624-039-P47, N-501

TEMPORARY EROSION & SILTATION CONTROL

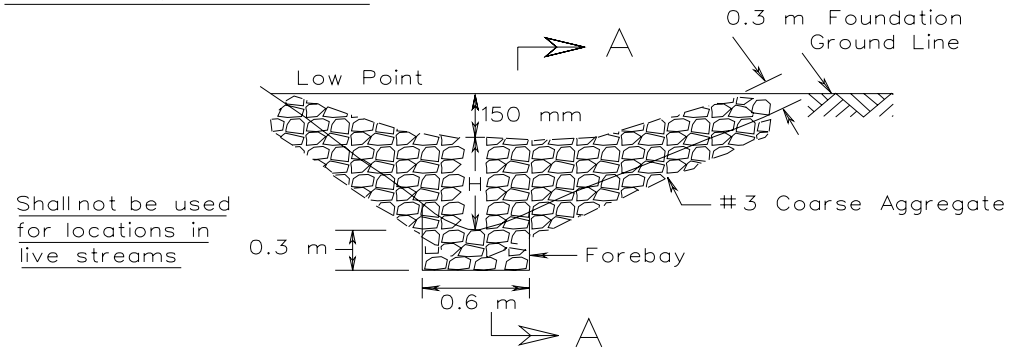
Rev. 6-97

TYPICAL DETAIL FOR ROCK CHECK DAM TYPE II



SECTION A-A

Shall not be used in cut ditch within clear zone when H > 0.3 m



FRONT ELEVATION

NOTES:

Rock Check Dams that are designated on the plans as a Stormwater Management (SWM) item are to be left in place as a permanent installation.

H = Height of dam 0.3 m or as designated by designer.

Where drainage areas exceed 0.4 hectares or ditch grade exceeds 3%, a temporary sediment trap shall be installed with minimum dimensions of 0.3 m deep and 1.8 m in length.

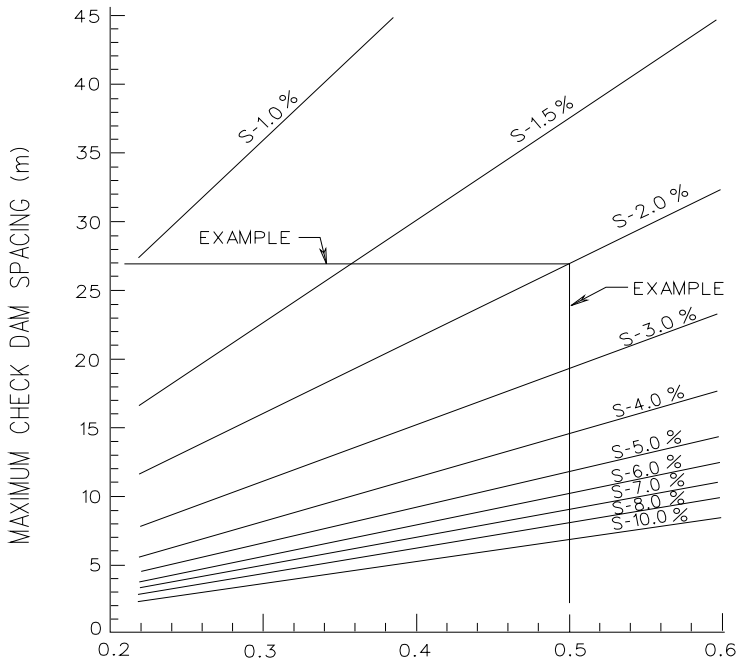
⊛ If Rock Check Dams are subject to two way traffic and are located within the clear zone, they are to have 6:1 slopes on both sides.

PROJECT: 0624-039-P47, N-501

TEMPORARY EROSION & SILTATION CONTROL

Rev. 6-97

ROCK CHECK DAM SPACING



CHECK DAM HEIGHT (m)
MEASURED AT BOTTOM OF SPILLWAY

DESIGN OF STONE CHECK DAM SPACING
(n=0.030, V=0.6 m/s)

EXAMPLE: HEIGHT OF STRUCTURE 0.5 m
GRADE 2%
EXTEND PERPENDICULAR FROM 0.5 m HEIGHT TO INTERSECT 2% GRADE
EXTEND 90° TO THE LEFT TO DETERMINE SPACING (27 m±)

B13
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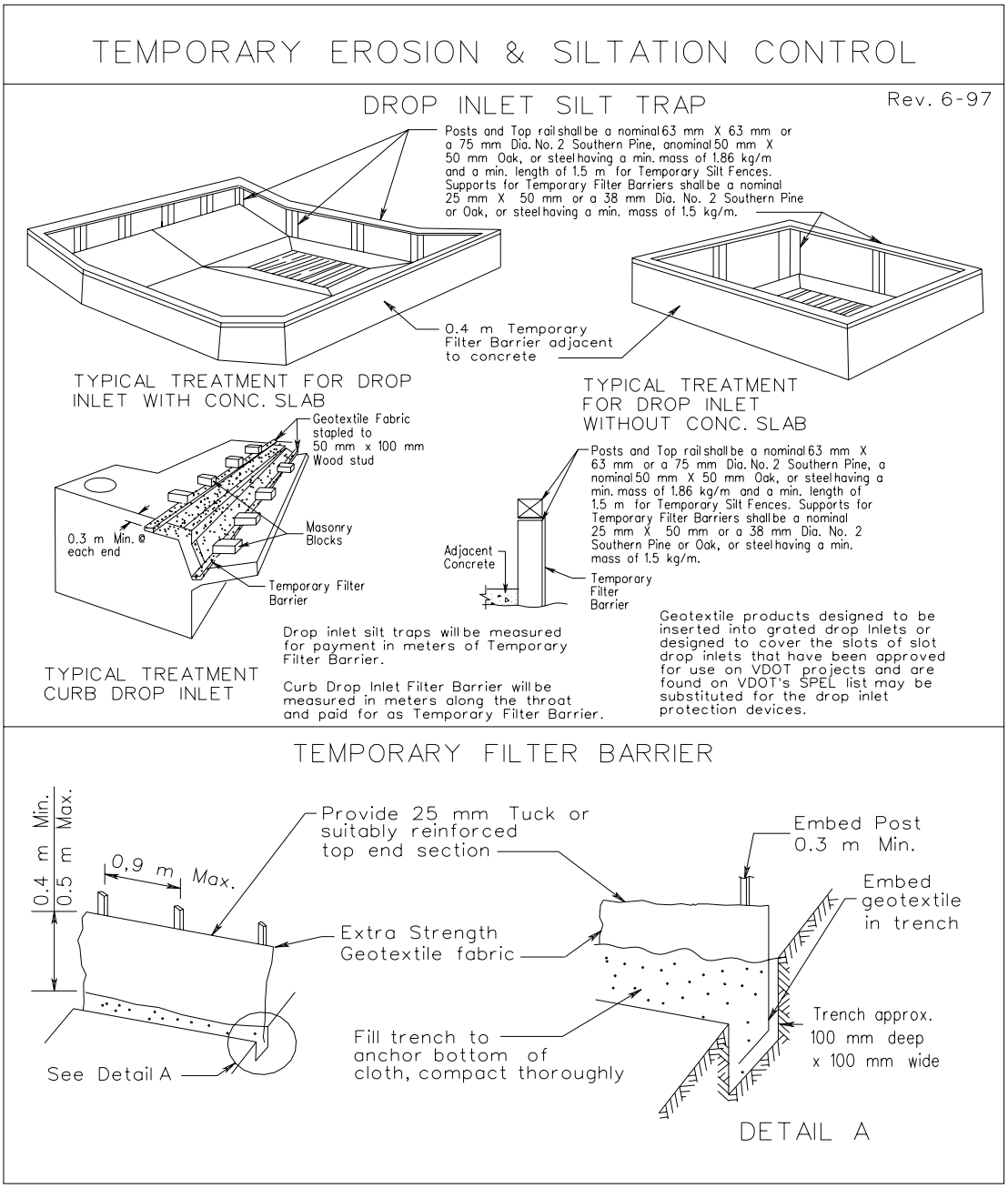
PROJECT: 0624-039-P47, N-501



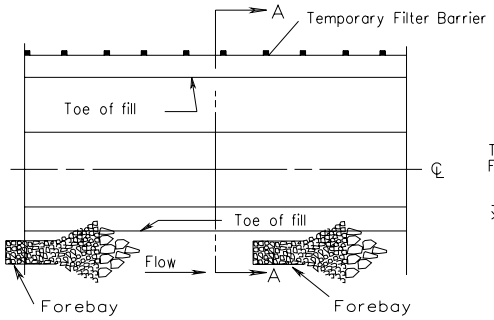
B14
(CONTINUED)

PROJECT: 0624-039-P47, N-501

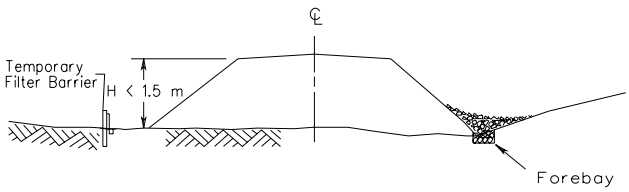
TEMPORARY EROSION & SILTATION CONTROL

TYPICAL DETAIL FOR TEMPORARY FILTER BARRIER AT TOE OF FILL

Rev. 6-97

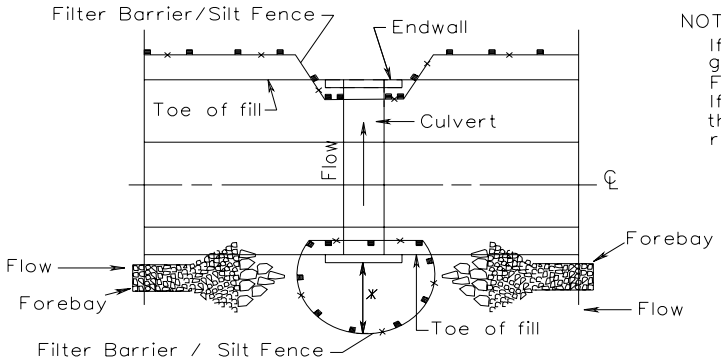


PLAN



SECTION A-A

TYPICAL DETAIL FOR TEMPORARY FILTER BARRIER / SILT FENCE AT CULVERT OR PIPE



NOTE:
If any portion of Fill is greater than 1.5 m, Silt Fence is required.
If Fill height is less than 1.5 m, Filter Barrier is required.

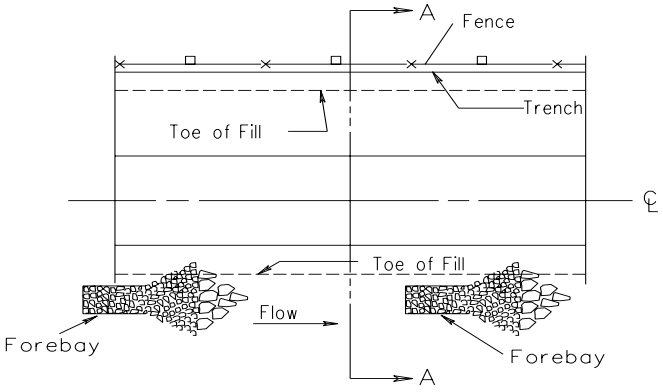
* Distance is 1.8 m minimum if flow is toward the embankment. To be contained in right of way or easement.

PROJECT: 0624-039-P47, N-501

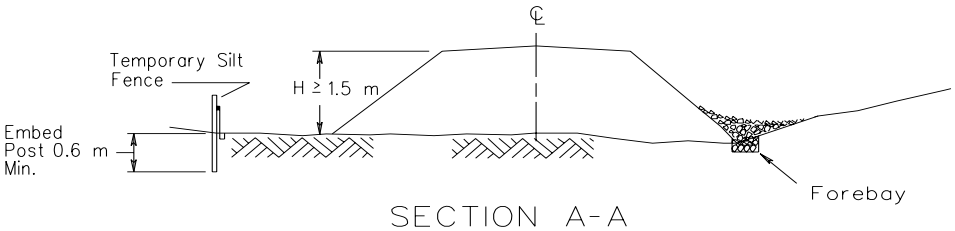
TEMPORARY EROSION & SILTATION CONTROL

Rev. 6-97

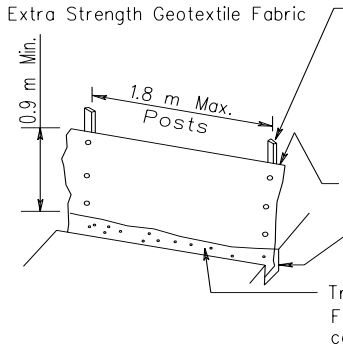
TEMPORARY SILT FENCE



NOTE:
Rock Check Dam is to be constructed in accordance with the Road and Bridge Specifications, and Standard ESC-INS sheet 115.01.



SECTION A-A



Posts for temporary silt fences shall be a nominal 63 millimeters by 63 millimeters or a 75 millimeter diameter No. 2 Southern pine, a nominal 50 by 50 millimeters oak, or steel having a weight of at least 1.86 kilograms per meter and a length of at least 1.5 meters.

Supports for temporary filter barriers shall be a nominal 25 by 50 millimeters or 38 millimeter diameter No. 2 Southern pine or oak, or steel having a mass of at least 1.5 kilograms per meter.

Provide 25 mm Tuck or suitably reinforced top end section.

Embed Geotextile Fabric approx. 200 mm in trench.

Trench approx. 100 mm deep X 100 mm wide
Fill trench to anchor bottom of Fabric, compact thoroughly.

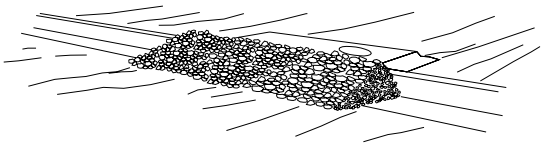
B16
(CONTINUED)

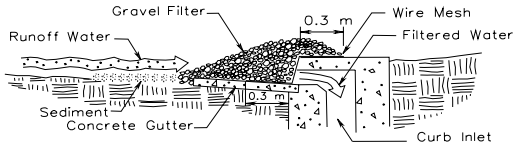
PROJECT: 0624-039-P47, N-501

TEMPORARY EROSION & SILTATION CONTROL

ALTERNATE DROP INLET SILT TRAP (GRAVEL TYPE)

Rev. 6-97





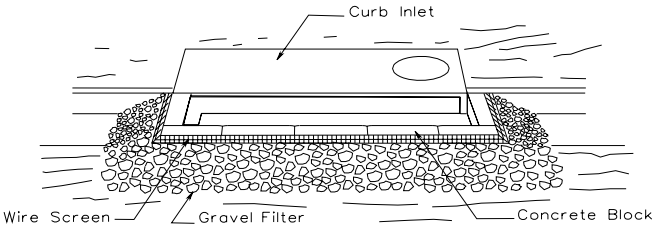
SECTIONAL VIEW

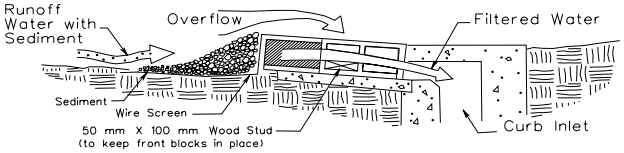
Specific Application

This method of inlet protection is applicable at curb inlets where ponding in front of the structure is not likely to cause inconvenience or damage to adjacent structures and unprotected areas.

Geotextile products designed to be inserted into grated drop inlets or designed to cover the slots of slot drop inlets that have been approved for use on VDOT projects and are found on VDOT's SPEL list may be substituted for the drop inlet protection devices.

ALTERNATE DROP INLET SILT TRAP (BLOCK AND GRAVEL TYPE)





SECTIONAL VIEW

Specific Application

This method of inlet protection is applicable at curb inlets where an overflow capability is necessary to prevent excessive ponding in front of the structure.

Geotextile products designed to be inserted into grated drop Inlets or designed to cover the slots of slot drop inlets that have been approved for use on VDOT projects and are found on VDOT's SPEL list may be substituted for the drop inlet protection devices.

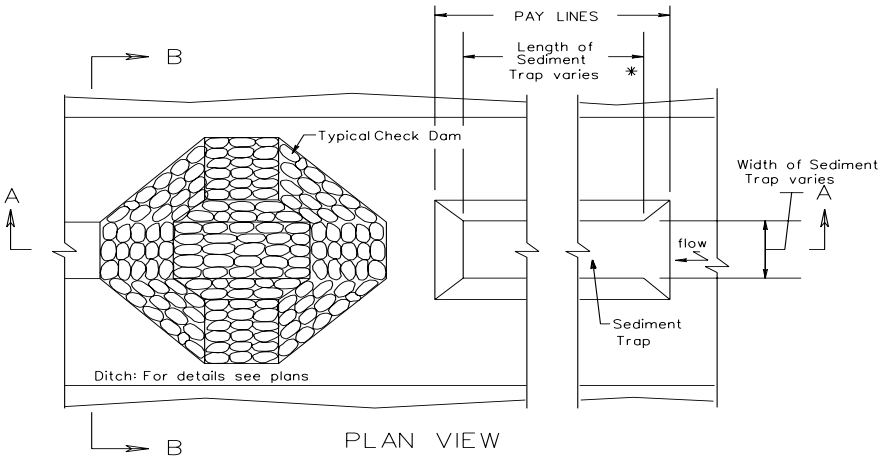
B17
(CONTINUED)

PROJECT: 0624-039-P47, N-501

TEMPORARY EROSION & SILTATION CONTROL

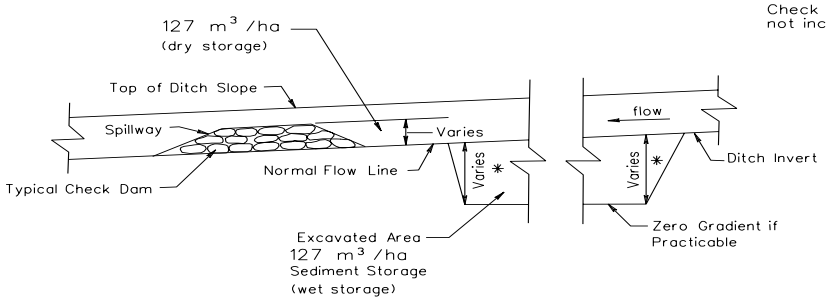
Rev. 6-97

TYPICAL SEDIMENT TRAP



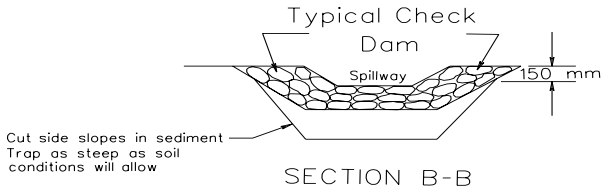
PLAN VIEW

NOTES:
Check Dam is shown for illustration only and is not included in payment for Sediment Trap.



SECTION A-A

Note: The sediment storage volume shall be 254 m³/ha of total contributing drainage area and shall consist of half in the form of wet storage and half in the form of dry storage.



SECTION B-B

* Where drainage areas exceed 0.4 ha or ditch grade exceeds 3%, a Sediment Trap shall be installed with each Check Dam with minimum dimensions of 0.3 m deep and 1.8 m in length.

B18
(CONTINUED)

SAMPLE NARRATIVE FOR
EROSION CONTROL PLAN
("NO PLAN" AND "MINIMUM PLAN" PROJECTS)

Route 624: From 0.89 km north of intersection with Route 623 to intersection with Route 622.

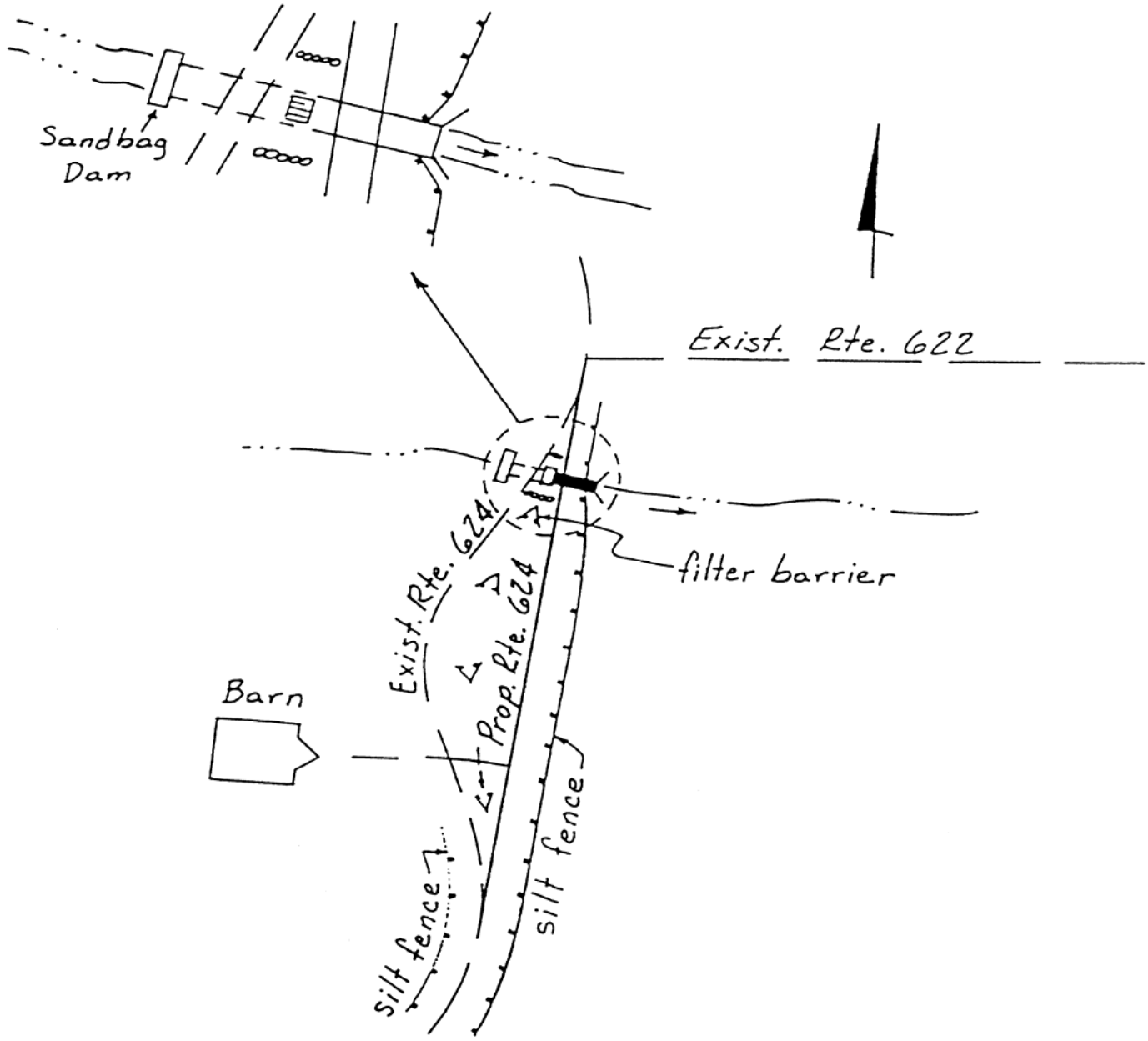
Route 624 will be rebuilt on new location approximately 0.24 km east of its present location. The hill at Mr. John Brown's property near his barn will be cut to create a near level roadway. The alignment will tie in to curves at the termini with a tangent section across Mr. Brown's property. A line of silt fence will be required along the east side of the project at the toe of fill. A line of silt fence will be required on the west side of Route 624 from the proposed entrance to Mr. Brown's barn to the end of the project. An entrance is proposed from the new alignment tying in to Mr. Brown's old entrance to his barn. A 375 mm C.M. pipe is required at the new entrance. Filter barrier is required at the inlet to the 375 mm pipe. Filter barrier is also required every 60 m in the ditch line on the west side of Route 624.

A 1200 mm C.M. pipe 90 m south of the intersection with Route 622 will require a 12 m extension. A St'd. EW-2 is required at the outlet end. A St'd. DI-1 is required in the joint between the existing and proposed pipes. A temporary stream diversion is required while laying the pipe extension. Rock check dams are required north and south of the joint between existing and proposed pipes.

USE NARRATIVE OR SKETCH

A-106
Metric

SAMPLE SKETCH FOR
EROSION CONTROL PLAN
("NO PLAN" AND "MINIMUM PLAN" PROJECTS)



USE NARRATIVE OR SKETCH

PLANS DESIGNED BY RICHMOND
DISTRICT DESIGN UNIT

SURVEYED BY M.S. KIDD (804) 447-5043
SUPERVISED BY G.E. COSTLEY, JR. 524 6144
DESIGNED BY B.V. STEWART 524 6281
CADD OPERATOR B.V. STEWART 524-6281
REVISED BY

INDEX OF SHEETS

SHEET NO.	DESCRIPTION	STA. TO STA.
1	Title Sheet	
1A	Geometric Data Sheet	
1B	Preliminary Right Of Way Data Sheet	
1C	Revision Data Sheet	
1D	Construction Baseline Coordinate Sheet	
2	Typical Section, General Notes, & Summary Sheet	
2A	Roadside Development Sheet	
2B thru 2D	Erosion & Siltation Control Sheets	
3 and 3A	Plan and Profile sheet	10+00 - 12+00
3B	Profile sheet Conn. Rte. 609	10+00 - 12+00
4 and 4A	Plan and Profile sheet	12+00 - 16+00
5 and 5A	Plan and Profile sheet	16+00 - 20+00
6 and 6A	Plan and Profile sheet	20+00 - 24+00
7 and 7A	Plan and Profile sheet	24+00 - 28+00
8 and 8A	Plan and Profile sheet	28+00 - 32+00
9 and 9A	Plan and Profile sheet	32+00 - 36+00
10 and 10A	Plan and Profile sheet	36+00 - 40+00
11 and 11A	Plan and Profile sheet	40+00 - 44+00
12 and 12A	Plan and Profile sheet	44+00 - 48+00
13 and 13A	Plan and Profile sheet	48+00 - 50+00

COMMONWEALTH OF VIRGINIA

DEPARTMENT OF TRANSPORTATION

PLAN AND PROFILE OF PROPOSED STATE HIGHWAY

MECKLENBURG COUNTY
FROM: 0.114 km S.INT. RTE. 609
TO: 0.064 km N.INT. RTE. 605

FHWA 534 DATA 6003
PPMS # 8569

FHWA REGION	STATE	FEDERAL AID PROJECT	STATE ROUTE	STATE PROJECT	SHEET NO.	TOTAL SHEETS
3	VA.		695	0695-058-P65,M-501 See Tabulation Below For Section Numbers	1	

FUNCTIONAL CLASSIFICATION AND TRAFFIC DATA	
RURAL LOCAL - ROLLING - 50km/h MIN. DESIGN SPEED	
	Fr: 0.114 km S. Int. Rte. 609 To: 0.064 km N. Int. Rte. 605
ADT (1991)	110 VPD
ADT	
DHV	
D (%)	
T (%)	
V (KM/H)	○

○ SEE PLAN AND PROFILE SHEETS FOR HORIZONTAL AND VERTICAL CURVE DESIGN SPEEDS.

ONLY THE COMPLETE PLAN ASSEMBLY AS AWARDED, INCLUDING ALL SUBSEQUENT REVISIONS, WILL BE THE OFFICIAL CONSTRUCTION PLANS. ANY COMBINATIONS OF LAYERED SHEETS, IF AVAILABLE, WILL NOT BE CONSIDERED A PART OF THE OFFICIAL ASSEMBLY.

THIS PLAN ASSEMBLY HAS BEEN CADD GENERATED AND IS AVAILABLE IN LAYERED FORMAT. THE CONTRACTOR SHALL REQUEST SPECIFIC LAYERED SHEETS FROM THE ENGINEER IN WRITING.

DESIGN FEATURES RELATING TO CONSTRUCTION OR TO REGULATION AND CONTROL OF TRAFFIC MAY BE SUBJECT TO CHANGE AS DEEMED NECESSARY BY THE DEPARTMENT.

THIS PROJECT IS TO BE CONSTRUCTED IN ACCORDANCE WITH THE DEPARTMENT'S ROAD AND BRIDGE SPECIFICATIONS DATED JULY 1994, ROAD AND BRIDGE STANDARDS DATED DECEMBER 1, 1994, WORK AREA PROTECTION MANUAL DATED JANUARY 1, 1996 AND AS AMENDED BY CONTRACT PROVISIONS AND THE COMPLETE PAPER COPY OF THE PLAN ASSEMBLY.

ALL CURVES ARE TO BE SUPERELEVATED, TRANSITIONED AND WIDENED IN ACCORDANCE WITH STANDARD TC-5R EXCEPT WHERE OTHERWISE NOTED.

CONVENTIONAL SIGNS

STATE LINE
COUNTY LINE
CITY, TOWN OR VILLAGE
RIGHT OF WAY LINE
FENCE LINE
UNFENCED PROPERTY LINE
FENCED PROPERTY LINE
WATER LINE
SANITARY SEWER LINE
GAS LINE
ELECTRIC UNDERGROUND CABLE
TRAVELED WAY
GUARD RAIL
RETAINING WALL
RAILROAD
BASE OR SURVEY LINE

LEVEE OR EMBANKMENT
BRIDGES
CULVERTS
DROP INLET
POWER POLES
TELEPHONE OR TELEGRAPH POLES
TELEPHONE OR TELEGRAPH LINES
HEDGE
TREES
HEAVY WOODS
GROUND ELEVATION
GRADE ELEVATION

STATE PROJECT NO.	SECTION	FEDERAL AID PROJECT NO.	TYPE CODE	PPMS NO.	EQUALITIES METERS	LENGTH INCLUDING BRIDGE(S) METERS	LENGTH INCLUDING BRIDGE(S) KILOMETERS	LENGTH EXCLUDING BRIDGE(S) METERS	LENGTH EXCLUDING BRIDGE(S) KILOMETERS	TYPE PROJECT	DESCRIPTION
0695-058-P65	M-501	NONE	F000	8569	NONE	3,893.40	3.893	———	———	Gr., Drain. & Pave.	FROM: 0.114 km S. Int. 609 TO: 0.064 km N. Int. Rte. 605

NOTE: PROJECT LENGTH BASED ON CONSTRUCTION CENTERLINE.

REVISED

RECOMMENDED FOR APPROVAL FOR RIGHT OF WAY ACQUISITION
DATE — SECONDARY ROADS ENGINEER
DATE — STATE LOCATION AND DESIGN ENGINEER
DATE — ASSISTANT COMMISSIONER FOR FINANCE
DATE — CHIEF ENGINEER

APPROVED FOR RIGHT OF WAY ACQUISITION
DATE — COMMISSIONER

RECOMMENDED FOR APPROVAL FOR CONSTRUCTION
DATE — SECONDARY ROADS ENGINEER
DATE — STATE LOCATION AND DESIGN ENGINEER
DATE — ASSISTANT COMMISSIONER FOR FINANCE

APPROVED FOR CONSTRUCTION
DATE — CHIEF ENGINEER

APPROVED
DATE — DIVISION ADMINISTRATOR, FEDERAL HIGHWAY ADMINISTRATION, U.S. DEPARTMENT OF TRANSPORTATION

PLAN NO.	PROJECT	FILE NO.	SHEET NO.
A	0695-058-P65		

04/18/96 15:59:20 DOCS NO. 6010

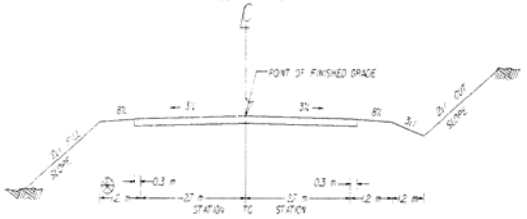
A-108
Metric

TYPICAL SECTIONS

REVISED	DIST. REGION	STATE	FEDERAL A.D. PROJECT	STATE ROUTE	STATE PROJECT	SHEET NO.
	3	WA.		195	0698-058-P&E,M-50	2

DESIGN FEATURES RELATING TO CONSTRUCTION OR TO REGULATION AND CONTROL OF TRAFFIC MAY BE SUBJECT TO CHANGE AS DEEMED NECESSARY BY THE DEPARTMENT

Σ 6m X VAR. DEPTH AGGREGATE BASE MATERIAL, TYPE 1, NO. 21-B
WITH PRIME AND DOUBLE SEAL SURFACE TREATMENT
7.8m CLEAR ROADWAY



0+00.00	-	11+31.2	MAINLINE
11+37.72	-	49+20.00	MAINLINE
10+00.00	-	12+00.00	CONN. RTE. 609

SHOULDERS ARE TO BE CONSTRUCTED IN ACCORDANCE WITH STD. 12

WHERE GUARDRAIL IS REQUIRED SHOULDER IS TO BE WIDENED 0.3 m TO ALLOW A 0.3 m OFFSET TO FACE OF GUARDRAIL

USE 200 mm (8") DEPTH FOR ESTIMATING PURPOSES. DEPTH TO BE PLACED AS DIRECTED BY THE ENGINEER. QUANTITY TO BE BASED ON ACTUAL DEPTH CONSTRUCTED.

SHOULDER, DITCHES & SLOPES ARE TO BE SEEDED AND FERTILIZED.

FOR ADDITIONAL PAY ITEMS, SEE SHEET NO.

DENOTES ITEMS TO BE PAID FOR ON BASIS OF PLAN QUANTITIES IN ACCORDANCE WITH CURRENT ROAD AND BRIDGE SPECIFICATIONS.

ESTIMATED QUANTITIES

ITEM	UNIT	QUANTITY

GENERAL NOTES

GRADING

a. The grade line denotes top of finished pavement unless shown otherwise on typical sections or plans.

DRAINAGE

a. The locations of all drainage structures shown on these plans are approximate only with the exception of structures showing specific stations.

Pipes are to conform to any of the allowable types listed below within the applicable fill height limitations for strength, steel thickness or gage thickness and diameters, gages, height of fill, limitations and method of bedding required for a particular height of cover. See standard drawings PD-1 and PB-1.

Height of cover for drainage structures is minimum unless otherwise noted on plans.

All existing entrance pipe is to be removed unless otherwise noted or directed by the Engineer. The cost of removing existing pipe is to be included in the price bid for Lump Sum Grading.

PAVEMENT

a. The materials listed below are to be paid on a tonnage basis on this project. The theoretical tonnage shown on these plans is based on the weight shown hereon. The weight will vary in accordance with the specific gravity of the aggregates and the asphaltic content of the mix actually used to secure the design depth. The weight of the asphalt concrete is based on 96% of theoretical maximum density.

b. Aggregate Base Material Type 1 No. 21B @ 156 kg/m³. (Plus 6% moisture correction)

INCIDENTALS

When no centerline is shown for a proposed entrance is to be constructed in the same location as the existing entrance.

All proposed entrances to be standard PE-1 unless otherwise noted on plans.

A minimum 15 m Right of Way is to be secured based on the centerline shown on the plans together with the Right and Easement to use the additional areas as may be necessary for the proper execution and maintenance of the work as indicated on the plans.

SUGGESTED SEQUENCE OF CONSTRUCTION / TRAFFIC CONTROL

Traffic is to be maintained throughout the project on the present road or on the grade where the present road is to be raised or lowered. Short periods of stoppage, flag controlled, traffic will be allowed at the option of the Engineer.

ALLOWABLE PIPE TYPES (UNLESS OTHERWISE SHOWN ON PLANS)
SEE STANDARD DRAWING PD-1 FOR HEIGHT OF COVER LIMITATIONS FOR EACH TYPE

LOCATION	CONCRETE	FULLY BITUMEN COATED CORRUGATED STEEL WITH PAVED INVERT	UNCOATED CORRUGATED STEEL	CORRUGATED ALUMINUM ALLOY	POLYETHYLENE CORRUGATED	POLYETHYLENE SMOOTH WALL	ALUMINUM COATED (TYPE 2) CORRUGATED STEEL	ALUMINUM COATED (TYPE 2) STRUCTURAL PLATE CORRUGATED STEEL	PVC RIBBED CULVERT PIPE
MAINLINE	X	X	X	X	X	X	X		X
ENTRANCE	X	X	X	X		X	X		X
ROW	X	-	X	X	X	X	X		X

PAVEMENT SURFACING

INITIAL SEAL		INTERMEDIATE SEAL		FINAL SEAL	
LIQ.ASPH. MAT'L.	CONV.MAT'L. AGGR.	LIQ.ASPH. MAT'L.	CONV.MAT'L. AGGR.	LIQ.ASPH. MAT'L.	CONV.MAT'L. AGGR.
RC-71 OR CRS-2LCMS-2 OR MC-250 @ 1.6 L/m²	NOBR STONE, SLAG OR CRUSHED @ 16 kg/m²	CRS-2LCMS-2 OR CMS-2h @ 1.2 L/m²	NOBP STONE, SLAG OR CRUSHED GRAVEL @ 10 kg/m²	CRS-2LCMS-2 OR CMS-2h @ 1.2 L/m²	NOBP STONE, SLAG OR CRUSHED GRAVEL @ 13 kg/m²
LITERS	METRIC TONS	LITERS	METRIC TONS	LITERS	METRIC TONS
*	*	*	*	*	*

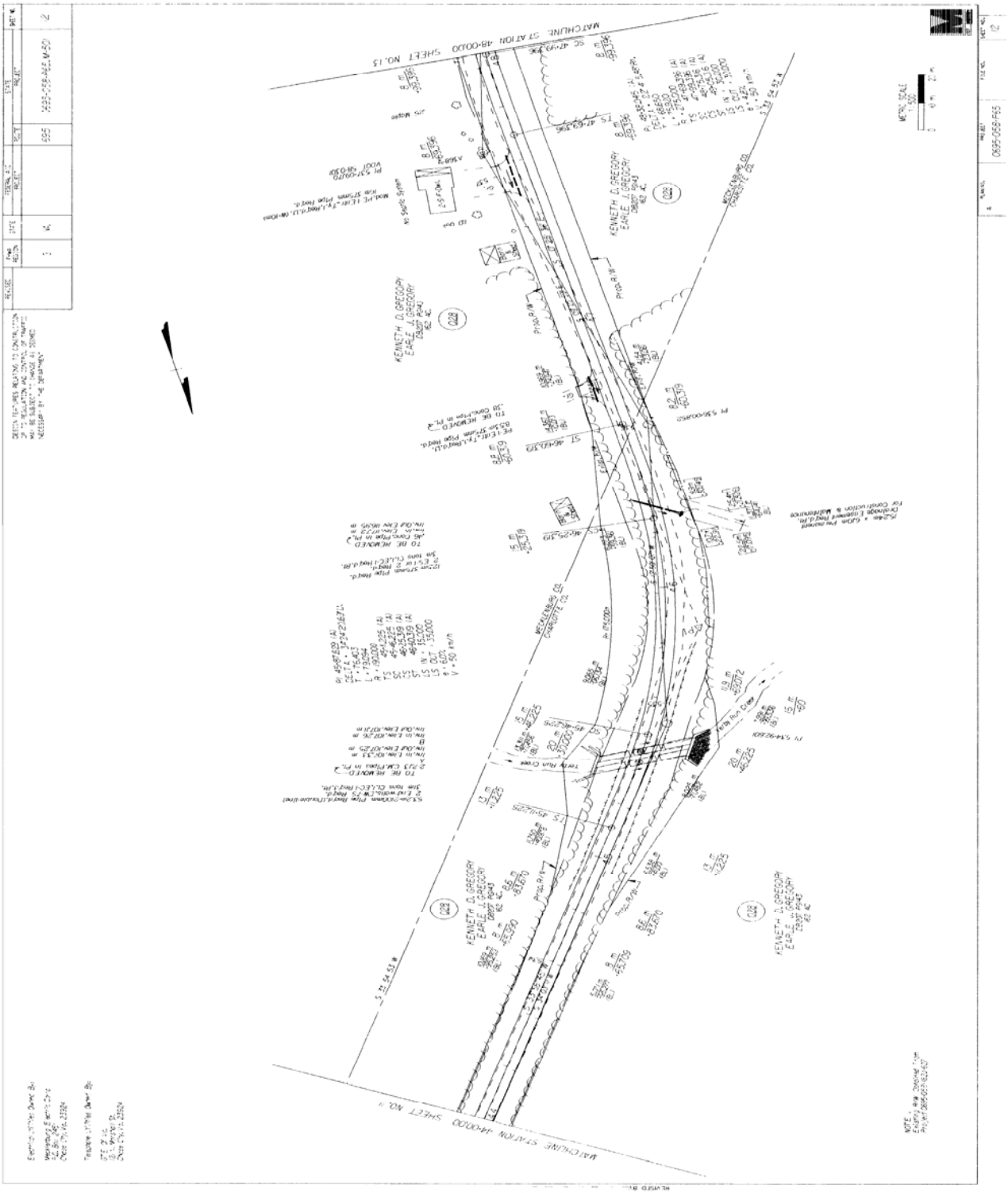
* QUANTITIES ARE SHOWN FOR ESTIMATING PURPOSES ONLY AND ARE INCLUDED WITH THE ESTIMATED QUANTITIES

DEMOLITION OF BUILDING

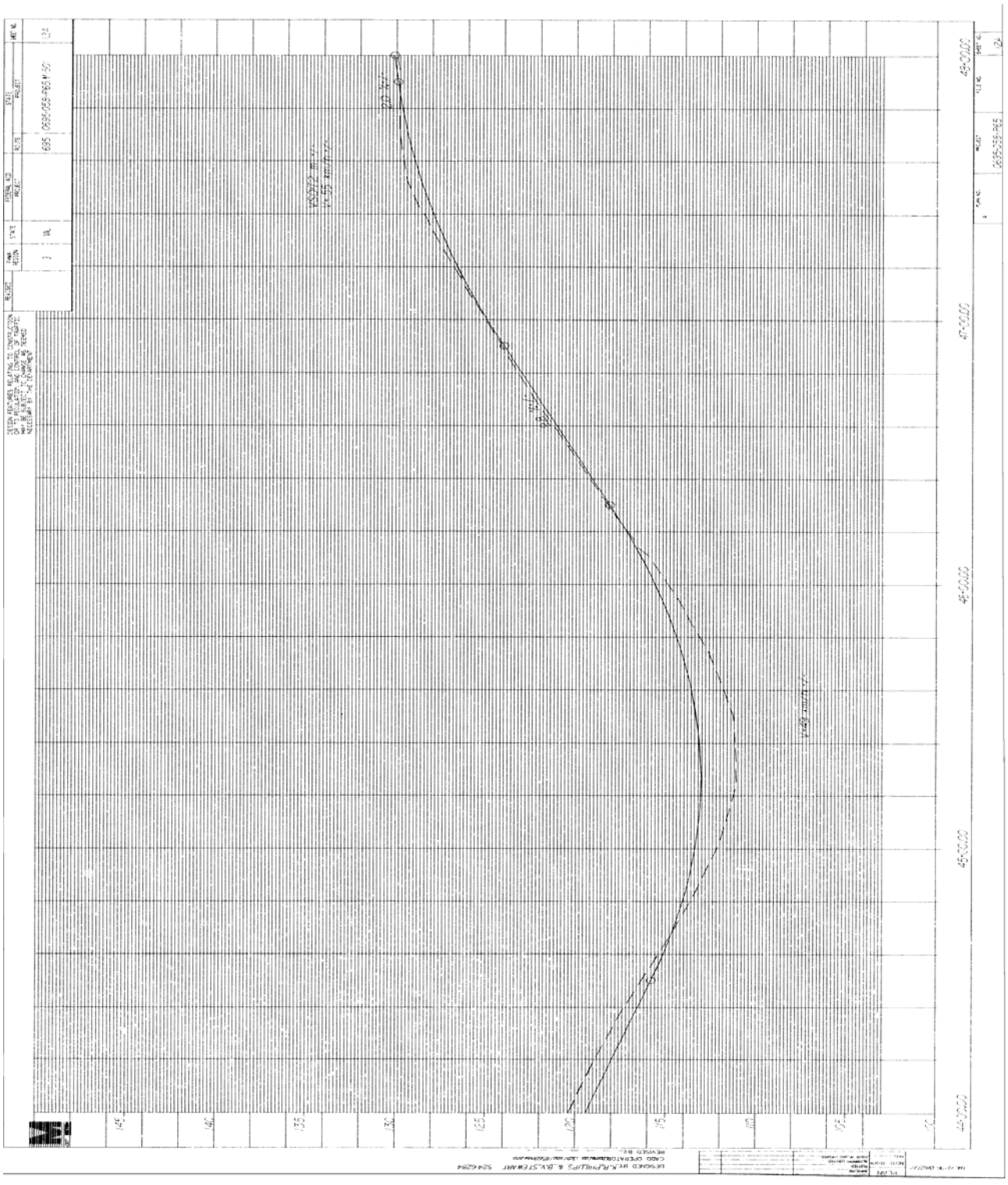
ITEM NO.	DEMO. NO.	PROPERTY OWNER	STATION	DESCRIPTION	LUMP SUM	PARCEL NO.
7	D-1	Carter	27+80 Lt.	Tobacco Barn	L.S.	013
8	D-2	Gregory	34+25 Rt.	Frame Barn	L.S.	020
9	D-3	Gregory	34+70 Lt.	Barn & Shed	L.S.	39
11	D-4	Gregory	44+90 Rt.	Frame Barn	L.S.	723

WORK TO BE DONE BY STATE FORCES (NON-PARTICIPATING)

PLAN NO.	PROJECT	FILE NO.	SHEET NO.
2	0698-058-P&E		2



A-110
Metric



SECTION A-8M-SEQUENCE OF CONSTRUCTION/MAINTENANCE OF TRAFFIC

INTRODUCTION

These guidelines serve as a tool to assist the designer in plan preparation. Sequence of construction, maintenance of traffic and constructability are related topics and significantly affect the quality of our plans. Broad issues of constructability and quality control are commented on, however they are not the focus of these guidelines. The purpose is to familiarize individuals with the technique and importance of preparing an adequate sequence of construction and maintenance of traffic plan. Constructability issues concerning sequence of construction and maintenance of traffic are covered. Reference material is located elsewhere in this section and in the Instructional and Informational Memoranda (IIM). References listed at the end of these guidelines provide additional resources and the list of items to consider may serve as a checklist.

As related issues, the sequence of construction and maintenance of traffic are included in one plan. The plan includes diagrams and appropriate notes to inform the contractor of when each operation is to be accomplished. The plan delineates traffic control procedures necessary prior to, during and following construction. The sequence is to be a guide with a step by step procedure from the beginning to the end of construction. It is important to provide the plan in a clear and easy to follow manner. Do not sacrifice plan clarity to reduce pages. The plan is necessary to insure that a project can be built as designed without undue difficulty and with minimum work orders. Developing a sequence of construction and maintenance of traffic plan is an essential part of the overall project design and may affect the design of the facility itself. Design of the proposed improvements should be coordinated with the maintenance of traffic plan. There may be acceptable design alternatives which would improve tie-ins to existing pavement and facilitate significantly smoother flowing sequence of construction and maintenance of traffic.

A plan is necessary for complex projects when construction warrants a step by step explanation of the construction process. Such projects may have high traffic volumes, peak hour traffic backups, major cuts and fills, major drainage structures, bridges, or utility relocations requiring traffic detours or shifts. Begin planning in the very early stage of design and continue to solicit assistance throughout the design process to finalize the plan. Request input at Field Inspection and other appropriate meetings as necessary.

Throughout the design process it is important to keep in view the big picture. Before beginning to prepare a sequence of construction plan, walk or drive the project to become familiar with the project and critical construction areas. Take notes, make sketches, video tape and take pictures to assist in communicating issues to consider.

Develop a draft sequence of construction plan, thinking through each step as it relates to the other steps. These guidelines contain some helpful suggestions and references. Reviewing examples of well prepared sequence of construction plans is an excellent way to learn about the various issues. Brain storm alternative construction sequences to arrive at the most practical. It may be helpful to color code each phase of construction and make a written narrative of each phase.

Seek advice from individuals, sections or other divisions with particular expertise or experience necessary in preparing sequence of construction plans. Methods of obtaining advice include requesting individuals to review a sequence plan or setting up a meeting to discuss concerns and alternative solutions. There is a wealth of knowledgeable and experienced individuals within VDOT to consult when preparing sequence of construction and maintenance of traffic plans.

The road designer should consult and coordinate input from the Scheduling and Contract, Environmental, Asset Management, Materials, Right of Way, Structure and Bridge, Traffic Engineering, and Local Assistance Divisions, the Project Engineer and Inspector throughout the process of developing a sequence of construction and maintenance of traffic plan. It may be appropriate to contact the District and Central Office representatives of referenced Divisions, particularly the District Traffic Engineer. Advantage should be taken of all opportunities to solicit public input concerning the planned sequence of construction and maintenance of traffic. The public commutes the subject area every day and is in a position to point out situations of concern. Evolution of a sequence of construction and maintenance of traffic plan is an ongoing process and modifications will be necessary prior to and during construction as issues surface or difficulties develop.

The road designer is responsible for preparation of the plan for inclusion in the plan assembly. Preparation will involve requesting, coordinating and organizing input from numerous other individuals. The designer is not expected to know all of the traffic control options and construction techniques and other related expertise necessary to prepare a comprehensive plan. The plan should be located in the front portion of the plan assembly, within the 1 series of sheets.

The Location and Design policy concerning sequence of construction and maintenance of traffic plans is as follows:

Preliminary Maintenance of Traffic/Sequence of Construction Plans are to be developed by the roadway designer in the earliest possible stage of plan development and reviewed by the Traffic Engineer prior to Field Inspection.

Maintenance of Traffic/Sequence of Construction Plans should safely and efficiently maintain traffic while providing capacity and operating speed comparable to the typical highway conditions where feasible.

The following note is to be shown on the Maintenance of Traffic/Sequence of Construction Plan:

> "Unless otherwise approved or directed by the Engineer, the Contractor shall plan and prosecute the work in accordance with the following:"

The Traffic Engineering Division will determine locations where detailed plans for traffic control devices are required for inclusion in the final Maintenance of Traffic/Sequence of Construction Plan.

Following the Field Inspection, plans are revised to incorporate the District Administrator's Field Inspection recommendations, and prints of updated plans are provided to the Traffic Engineer (Central Office or District). The Traffic Engineer prepares necessary plans for traffic control devices and provides plans to the road designer for inclusion in the construction plan assembly.

The Maintenance of Traffic/Sequence of Construction Plans are reviewed as follows:

1. Quality Review for Field Inspection

2. Field Inspection

   a. Recommendations from the District Administrator at Field Inspection are submitted to the Location and Design Engineer and copied to the Traffic Engineer.

   b. After accepted Field Inspection recommendations have been incorporated into the plans, prints are provided to the District Traffic Engineer and State Traffic Engineer for review prior to Public Hearing/Right of Way Stage.

   c. Detours, right of way, and easements must be completed in sufficient detail for the right of way requirements to be incorporated into Public Hearing/Right of Way plans.

3. Right of Way and Constructability Review

4. Advertisement Quality Review

5. Pre-advertisement meeting

SEQUENCE OF CONSTRUCTION

A sequence of construction plan is to include diagrams and appropriate notes to inform the contractor of when each operation may to be accomplished and advise of traffic control necessary during construction.

Except for the most simple projects, a sequence of construction is necessary. Delays and redesign during construction are often extremely costly, may also cause an unsafe situation and can unnecessarily cause additional disruption of traffic patterns. Our desire is to minimize the inconvenience to the public. To the extent possible, the plan should have flexibility. Recognize that the contractor may, with the Engineer's approval, modify the sequence of construction, but to approach a project without a plan is risky. The sequence may seem simple at first glance but thinking through the steps helps make us aware of possible difficulties. Each project presents unique challenges and developing a sequence of construction offers opportunities to address these concerns at an early stage.

The road designer is responsible for determining the need for barricades and detours during construction. The designer is also to review the plans carefully to determine if it will be necessary to shift traffic lanes away from the normal position during construction and determine required easements. If shifting lanes is necessary, a sequence of construction is to be prepared by the designer with input from the appropriate Assistant Scheduling and Contract Engineers and/or Assistant District Engineer. The sequence of construction plan is to be reviewed by District office representatives and individuals from applicable divisions and agencies at each stage of plan development. The Scheduling and Contract, Environmental, Asset Management, Materials, Right of Way, Structure and Bridge, Traffic Engineering, and Local Assistance Divisions, Project Engineer and Inspector should be consulted concerning their respective areas of responsibility.

When a Sequence of Construction Plan is necessary, it will be included in the plans that are distributed for review at the Field Inspection and it will be of sufficient detail to present the basic concept for discussion and determination of environmental, traffic, safety, and right-of-way requirements. Reviewing examples of well prepared sequences of construction plans is an excellent way to learn about the various issues to be addressed. Examples should address different construction challenges. Discussion should take place at the Field Inspection concerning a narrative if a Sequence of Construction Plan is not necessary. All of the above items are to be discussed thoroughly at the Field Inspection and recommendations included in the Field Inspection Report.

A copy of the sequence of construction plan, with the accepted Preliminary Field Inspection recommendations incorporated, is to be furnished to the Traffic Engineer prior to the Field Inspection/Right of Way stage. If detours, right of way or easements are required for the maintenance of traffic, the sequence of construction must be completed in sufficient detail for the right of way requirements to be incorporated into the Field Inspection /Right of Way plans.

When a sequence of construction plan or narrative is unnecessary for a particular project, the file will be documented accordingly with the listing of the names of those involved in the decision and the reasons for the decision. The field inspection prints must also indicate that a sequence of construction plan or narrative is not necessary and that only such items as flagging, warning lights, etc., will be required.

ITEMS TO ADDRESS UNDER SEQUENCE OF CONSTRUCTION:

Adjoining projects and sequence of construction must be coordinated. There may be occasions where a portion of one project would be more efficiently constructed at a designated stage of the construction sequence of another project. This may apply at intersections or other locations. Surplus material may be utilized from an adjoining project. Section 105 of the Road and Bridge Specifications specifies that there shall be cooperation among contractors on adjoining projects.

Bridge construction should be addressed in the sequence of construction. The coordination of the bridge construction with the roadway portion should be evaluated relative to connecting temporary bridge parapet with the traffic barrier service to insure the proper tie when performing the installations. Bridge construction often requires very large cranes and other large equipment and materials. It is desirable to avoid constructing a bridge in sections. Also avoid setting beams over traffic. Input should be furnished by the Structure and Bridge, Scheduling and Contract and Traffic Engineering Divisions to provide a plan taking these issues into account. Detours may be necessary during periods of bridge construction.

Construction activity: Sequences of construction should be designed to prevent worker activity left and right of traffic at the same time. This situation makes the driver feel restricted, slows traffic and endangers workers. Construction normally takes place on the outside portion of the project and moves in (on major widening or reconstruction projects). Weather and other factors impact the length of construction time. Weather may affect concrete pavement and other concrete construction.

Drainage: Temporary ditches or pipes may be necessary. Replacement of existing drainage may require a temporary diversion ditch or pipe. Jacking versus open cut for pipe causes less interruption to traffic but is normally a considerably more expensive method of pipe installation.

Proposed pipes under roadways with high traffic volumes or difficult detours options are candidates for jacking. New construction and extensions of box culverts require considerable construction time. Urban projects should incorporate precast drainage items as much as practical, since improvements in urban areas are generally adjacent to and performed under traffic. Precast items would reduce worker exposure time to traffic and vice-versa since a precast item can be installed much quicker than a cast in place item. Openings for cross-drain pipes on interstates should be designed to prevent small children and animals from accessing the freeway.

Environmental concerns include avoiding wet lands and seeding disturbed slopes at the earliest appropriate stage of construction.

Excavation and earthwork: The Grading Summary and material hauls must match maintenance of traffic and sequence of construction plans. Consider borrow material versus surplus material at each stage of the sequence. Address locations where surplus material may be placed. Areas of graded slopes may be appropriate locations to waste surplus material. Consider areas of major cut or fill to anticipate slope tie in difficulties. In development of the Grading Diagram and Summary, it is essential that the project sequence of construction be taken into consideration to avoid specifying use of material which is not available in the appropriate phase of construction. On complex projects, it may be necessary for the designer to develop rough grading diagrams and summaries for each phase of work to accurately determine the grading effort required.

Example plans: Review example plans and seek advice from individuals with experience.

Funeral homes and Churches: Construction should be prohibited in the immediate vicinity of funeral homes and churches during services. This is common courtesy and enhances public relations. This consideration will normally be addressed during preconstruction meetings, but may warrant a plan note.

Intersection reconstruction may require a Sequence of Construction/Maintenance of Traffic Plan as these areas may be very involved.

Material hauls: The contractor should plan the transfer of materials and equipment in a manner that minimizes the impact on traffic movement, as much as practical.

Nighttime construction: In order to reduce the disruption of traffic flow and avoid stopping traffic, certain construction activities, such as the placement of bridge beams or overhead sign structures should be accomplished at night. However, additional safety precautions may be necessary when accomplishing this activity.

Note in the plans that the Contractor shall plan and execute the work in accordance with the Sequence of Construction Plan unless a change is approved or directed by the Engineer.

Note in the plans that it is not the intent of the sequence of construction plan to enumerate every detail which must be considered in the construction of each stage, but only to show the general handling of traffic.

Pavement or structure demolition sequence should be considered.

Railroad crossings or construction adjacent to rail lines should be considered. Input should be obtained from the Virginia Department of Rail and Public Transportation concerning special requirements. Avoid situations where traffic signals, road intersections, road grades and etc. could trap vehicles on the tracks.

Sound barrier walls: The sequence of constructing sound barriers should be closely reviewed, especially when located on the shoulder, since access for work vehicles may require a lane closure. Consideration should be given to sound barrier construction at an early stage of the project construction to help shield adjacent areas from noise.

Time of day, holidays or other day and time restrictions may be necessary stating when construction or traffic flow restraints are not allowed. Notes may be necessary stating specific dates/times. Local ordinances such as noise may restrict when work can be performed. Section 105 of the Road and Bridge Specifications specifies restricts Holiday work times unless permission is granted by the Engineer.

Utilities: On some projects utility relocations are complete prior to beginning the road construction. Existing utilities should be addressed in the sequence of construction as to when and by whom they will be relocated. A portion of the road construction may be necessary prior to installing or relocating utilities.

Walk or drive the project: Take pictures, notes, video and make sketches. This process will help in recalling and conveying to others the areas of concern.

MAINTENANCE OF TRAFFIC

A maintenance of traffic plan is necessary to insure that motorists, pedestrians and construction workers can safely travel or perform their jobs during roadway construction. A well-thought-out and carefully developed plan will contribute significantly to the safe and expeditious flow of traffic as well as the safety of the construction forces. The goal of any maintenance of traffic plan should be to safely route vehicle, bicycle, worker and pedestrian traffic, including persons with disabilities, through or around construction areas.

Geometrics and traffic control devices should operate in a manner comparable to the existing operating situation while providing room for the contractor to work effectively. A maintenance of traffic plan informs the contractor in writing as to how we expect the traffic to be maintained throughout the project and how the summaries have been worked up. The plan may constitute a traffic maintenance sequence and include drawings and diagrams to convey instructions. Traffic flow arrows are recommended.

It is advantageous to prepare and evaluate the maintenance of traffic plan from the motorist's point of view. We have all been delayed in traffic due to road construction. Many times it is unavoidable. Preparing an efficient maintenance of traffic plan is one way we can better serve the public. It has been said that the shortest distance between two points is always under construction. This may be the public's perception when they are inconvenienced. Imagine how a driver would view the plan in operation.

Realize that there may be an element of surprise or uncertainty for the driver, who will likely be unfamiliar with the revised traffic pattern and hazards. The maintenance of traffic plan must be coordinated with the sequence of construction. Reviewing examples of well prepared maintenance of traffic plans is an excellent way to learn about the various issues to be addressed. The examples should address different construction challenges. Do not hesitate to seek advise from Divisions, sections or individuals with expertise or experience in preparing a maintenance of traffic plan, particularly the District Traffic Engineer.

Maintaining a safe flow of traffic during construction must be carefully planned and executed. Although it is often better to provide detours, frequently it will be necessary to maintain the flow of traffic through the construction area. Construction areas are protected by barriers, appropriate speed limits, channelizing devices, signs, signals, lighting, impact attenuators, truck mounted crash cushions and flagging to provide safe traffic control during construction. Construction area devices may include variable message signs or divided highways. Sometimes it will also be necessary to encroach on the through-traffic lanes or shift lanes entirely in order that the construction can be undertaken. When this is necessary, designs for traffic maintenance should produce as minimal an effect as possible on normal traffic flow. The plan depends on the nature and scope of the improvement, volumes of traffic, highway or street pattern, and capacities of available highways or streets. The plan should have some built-in flexibility to accommodate unforeseen changes in work schedule, delays, or traffic patterns.

Adequate advance warning and sufficient follow-up information are needed for the motorist. Standards for the use and application of signs and other traffic control devices when highway construction occurs are set forth in Part VI of the Federal Highway Administration's Manual on Uniform Traffic Control Devices, MUTCD. Designs for the use and application of signs and other traffic control devices are developed by the Traffic Engineering Division of VDOT. Traffic control devices instructions published by the Traffic Engineering Division are included in The Virginia Supplement to the Manual on Uniform Traffic Control Devices.

Part VI of the Virginia Supplement was modified and reproduced as a separate publication, Virginia Work Area Protection Manual. Location and Design is responsible for the design of the facilities (except bridges) to accommodate the traffic.

The stopping of public traffic by a flagger or any other means should be avoided where possible and should be approved by the District Administrator. Designs that provide for constant movement around an obstruction in the roadway, even if it is slow, are more acceptable and are less irritating to drivers than requiring them to stop. Construction operations frequently create the need for adjustments in traffic patterns including the shifting of lanes.

Splitting traffic in the same direction on both sides of construction is not acceptable. The minimum taper length for lane transitions in construction areas can be computed by a formula found in the MUTCD. Various configurations are illustrated in the MUTCD and should be used in developing maintenance of traffic plans.

Designed shifts in traffic flows are to conform to the geometrics shown in the standards for detours (Standard GS-10) and/or as indicated in the "Safety Guidelines for Construction Zones" (See IIM LD- 93).

Depending on various project conditions, the Traffic Engineering Division may recommend one of the following methods of maintaining traffic for a project.

A. Under the following circumstances a simple sequence would normally be used:

1. If the Average Daily Traffic volume (ADT) is 1000 or less.
2. If there are no pipes that are 1200 mm (48") or greater in diameter.
3. If there are no double lines of 600 mm (24") pipe or greater.
4. If there are no major drainage structures.
5. If no major off-site detours are required.
6. If there are no major utility relocations required.

A simple sequence may read:

"Traffic is to be maintained throughout the project on the present road or on the grade where the present road is to be raised or lowered. Short periods of one-way, flag controlled traffic may be allowed at the option of the Engineer."

B. Under the following conditions a simple sequence requiring time restrictions should be considered, but keep in mind that these are only meant to be used as general guidelines. Time restrictions may not be necessary in all of the following situations:

1. If the ADT is 1000 or more and could present a problem with peak-hour traffic backup;
2. If there are pipes larger than 1200 mm (48") in diameter;
3. If there are double lines of 600 mm (24") pipe or larger.
4. If there are major drainage structures.

A simple sequence with "time" restrictions may read:

"Traffic is to be maintained throughout the project on the present road or on the grade where the present road is to be raised or lowered with a minimum lane width of ____. Two-way traffic is to be maintained between the hours of ____: a.m. to ____:____ p.m. weekdays, and at all times on Saturdays, Sundays and Holidays, unless otherwise directed by the Engineer."

C. A more in depth sequence or an off-site detour may be required in situations where neither of the simple sequences listed above are appropriate. This may require a step by step description of the sequence.

When construction operations are scheduled to take place adjacent to passing traffic, a clear zone should be called for in the plans between the work and the passing traffic. Under most conditions, positive barriers or time restrictions are justified.

ITEMS TO BE ADDRESSED UNDER MAINTENANCE OF TRAFFIC INCLUDE:

Access to adjacent residential and commercials properties should be maintained at all times. Maintenance of traffic and sequence of construction notes should reflect this policy and emphasis the requirement at fire stations, emergency rooms and other emergency facilities. Section 104 of the Road and Bridge Specifications specifies that entrances shall be maintained.

Asphalt medians: Temporary medians should be considered where construction creates situations with new traffic patterns for motorists. This channelizing will provide improved safety by forming a positive separation of opposing traffic.

Barrier, attenuator service and truck mounted attenuator guidelines and standards are contained in the Construction Zone Safety IIM LD-93. Engineering Services will be contacted to design the Impact Attenuators. The location of drums, barriers, or barricades, as means of channelizing traffic, should be detailed in the maintenance of traffic plans when special conditions exist. Channelizing devices are addressed in the Virginia Work Area Protection Manual (Page 50). Concrete barrier placement is important. There will be instances when construction access in runs of traffic barrier service will be necessary for the contractor to access with materials and equipment. These locations should be reviewed to determine if attenuators or a transition is needed, or time restrictions and use of surface treatment to prevent debris on public travelway. Runs of traffic barrier should be properly transitioned on either end, in the clear zone, as indicated in the Virginia Work Area Protection Manual, for the operating

speed during construction. Otherwise, temporary impact attenuators will be required. Applicability of Quickset Barrier System; use of Quick Change barriers may facilitate changing the number of lanes during rush hour. There may be times when it is practical to implement the Quick-change Traffic Barrier System to maintain roadway capacity in the AM and PM peak hours, yet provide additional work space for specific work activities during off-peak times. The NEAT attenuator system is an end treatment for temporary work zones which has FHWA approval for use on these barrier systems.

Bridges; Temporary bridges may be cost effective for reconstruction of existing bridges.

Bridge rails, existing: In many instances, existing bridges do not have the accepted approach guardrail runs and terminal treatments. Due to the unusual and distracting work techniques used in bridge construction that may be in the immediate vicinity of traffic during the erection of the proposed structure, maintaining traffic on the existing structure may require guardrail, at least on the right side of approaching traffic to eliminate run off the road or fixed object impacts by an errant motorist.

Clear zone: Clear zone requirements should be maintained and the contractor should be instructed to maintain the clear zone free of stored materials and parked equipment as much as practical.

Construction equipment: Idle construction equipment must not impact sight distances at intersections and especially in school zones or entrances. When the construction site is in the vicinity of an airport, consideration should be given to include a note on the plans that the contractor shall be responsible to insure construction equipment does not violate Federal or airport clearance regulations.

Coordinate work: There may be times that several contractors are working in the same vicinity. During these times advanced work zone signing should be coordinated to insure driver expectancy is not compromised by the placement of unnecessary or conflicting signing.

Detours may be necessary to provide the smoothest and safest traffic flow around work zones. If a temporary detour is shown in the traffic control plan, it should be graphically indicated in the plan assembly, with the proper directional advanced signing for the contractors guidance prior to initiating work activities. Address issues of alignment, grade, length, width, pavement strength, truck restrictions, detour capacity for rerouting traffic, detour quantities (including grading, drainage, pavement, etc.) and a detour removal detail (with pay items). Temporary detour grades are necessary where such grades are not obvious such as paralleling existing pavement. When shoulders are used as a detour, the pavement width and strength should be reviewed to accommodate the appropriate vehicle loads.

Detour operating speed should approximate existing highway operating speed (every attempt should be made to not reduce the speed by more than 16 km/h (10 mph)). Attention should be given to maintaining emergency (fire, etc.) vehicle, bus and mail routes. It may be appropriate to request District input, research or communication with the fire department, school authorities and other authorities concerning the maintenance of traffic patterns. Include traffic items provided by the District Traffic Engineer.

Edgeline markings: A 0.3 m (one foot) offset should be provided between the face of traffic barriers and the edgeline marking. This provides some lateral distance for distracted or crowded drivers to maneuver if needed.

Emergency access: During construction of roadway improvements and especially one lane maintenance projects and bridge projects, construction and flagger crews should be alert to the access needs of fire, rescue and police vehicles in the vicinity. Safety of the workers and public on the project and elsewhere is of primary importance.

Glare screens: Consideration should be given to using glare screens where practical, and when sight distances will not impact merging motorists. Glare screens reduce motorists distractions to worker activity behind the traffic barrier service and may result in a better quality product since workers would not be distracted by traffic.

Also, reducing distractions will enhance safety, improve traffic flow and decrease rubber-necking.

Grades are important to consider when establishing maintenance of traffic. Vertical and horizontal alignment must be considered. Design alternatives for the vertical and horizontal alignment of the proposed improvements should consider the maintenance of traffic plan. There may be acceptable design alternatives which would improve tie ins to existing pavement and facilitate a significantly smoother flowing sequence of construction and maintenance of traffic. Detours, material haul roads, temporary access locations and road connections must be vertically and horizontally evaluated. Also, insure that required construction fill will not encroach on existing travel way and maintained traffic while constructing deep cuts and high fills. When sheet piling is necessary, it requires subsurface investigation.

Grading diagram coordination is important with the maintenance of traffic plan. Plan the traffic plan to facilitate implementation of the grading diagram.

Guardrail laps should be switched when traffic flow is reversed for a significant length of time.

Highway advisory radio: Interstate improvements may warrant the need for highway advisory radio broadcast, to provide advanced warning to motorists that delays should be expected unless the suggested alternate route in used.

Impact attenuators: These are required at the introductory locations of traffic barrier service, unless the traffic barrier can be transitioned as indicated in the Virginia Work Area Protection Manual. Engineering Services will be contacted to design the Impact Attenuators.

Lane closures: When lane closures are proposed in the traffic control and sequence of construction plan, the use of electronic arrowboards and variable message signs should be addressed. This subject is normally addressed at Field Inspection by the Traffic Engineer.

Lanes, number of: While it may not always be possible to provide the same number of lanes that were available prior to initiating construction activities, the same number of lanes should be provided during peak hours. Lane restrictions may not be appropriate during certain periods and this should be noted on the plan.

Lane shifting: Lane shifting should be designed to accommodate the operating speed for the particular work zone. When these areas are on 4 lane divided facilities and the operating speed is considerably high, the proper superelevation is imperative. Also, the adequate horizontal and vertical alignment must be available to maintain driver expectancy and should not be designed for more than a 16 km/h (10 mph) speed reduction than that of the remainder of the work zone.

Lane widths: Adequate lane widths should be available. Geometric Design Standards in the front of Appendix A of the Road Design Manual specify lane widths. Lane widths should be a minimum of 3.3 m (11') and in minor work zones 3.0 m (10'). When determining lane widths, the percent of truck traffic should be considered.

Navigable streams: Advanced up and down stream signing should be provided for sportsmen, canoeist and fishermen when overhead construction activities are required for bridge placement over navigable streams.

Pavement design should incorporate existing pavement when practical. Pavement design should consider temporary markings, so proper courses may be specified at appropriate construction stages. Milling may excessively weaken existing road pavement strength, such as at bridge approaches and the Materials Division should be consulted for appropriate instructions.

Pavement markings for temporary use may be covered with the final pavement course. Details should provided for any special pavement marking requirements. Pavement marking eradication information is in IIM LD- 93. Temporary pavement markers should be considered to provide more positive guidance at nighttime and during inclement weather.

Pavement surface within the construction and detour areas should be maintained in a condition that will permit the safe movement of traffic at a reasonable speed.

Peak traffic hour work: The maintenance of traffic plan should direct the contractor not to perform work which would impede the flow of traffic during peak hours of traffic congestion, holidays, etc.

Pedestrian traffic must be maintained. The maintenance of traffic plan should accommodate pedestrian traffic as well as automobile traffic, particularly in urban areas.

Phases: Engineering studies indicate work zone lengths should not exceed 0.8 km (0.5 mile) in length. Research in work zones indicates an increase in accident rates when motorists are subjected to extended travel times adjacent to work zone activities. Consideration should be given to constructing the facility in phases containing 0.8 km (0.5 mile) work zone lengths, where practical. There may be situations with minimal driver distractions and inconvenience where a work zone should be as much as two miles in length.

Railway crossings must be considered. Avoid designs where traffic signals, road intersections, road grades and etc. could trap vehicles on the tracks. This was also mentioned under sequence of construction.

Right of way or temporary construction easements may be required for construction or temporary detours: Sheet piling may be more economical in some situations.

Safety issues are always of paramount importance. They encompass more items when maintaining traffic through a construction site because safety of the workers is an additional element. The worker is often protected only by the barriers or other features of the maintenance of traffic plan.

Shoulders: In relatively long work zone areas, the construction of an adequate shoulder is desirable, to provide lateral placement of stalled or disabled vehicles beyond the travel lanes.

Sight distance: Adequate vertical and horizontal sight distance must be maintained for safety reasons.

Signalization, temporary and permanent: Existing and proposed pole locations must be taken into account. Signal timing: When construction activities, such as resurfacing, require the closure of an existing lane, it may be necessary to lengthen the green time for that leg. This would help retain the capacity of the intersection.

The State Traffic Engineer is responsible for preparation of the sign, signal and lighting plans. Temporary traffic signalization may be required at some locations for construction purposes. They will require detailed plans, just as permanent signals.

Signs with variable messages: Due to terrain or inclement weather, the use of passive signing may not be enough to maintain the desired element of safety. It may be appropriate to install variable message signs to attract the driver's attention when approaching a changing traffic pattern.

State police: There may be certain roadway improvements where the worker is adjacent to motorists and there is a danger of automobile encroachment into the work area. These projects may require the participation of state police for the enforcement of posted speed limits within the work zone. See State Police Participation in IIM LD- 93. Interstate roadway improvements may warrant an increase in the number of existing safety patrols to reduce delays and provide assistance to stranded motorists within the travel lanes.

Stubs should be designed where appropriate to facilitate improved maintenance of traffic for future road extension. Pavement stubs and "tie-in" construction should be addressed in the maintenance of traffic plan.

Tapers are needed for lane drops or at locations where traffic must be shifted laterally. Appropriate values for taper lengths can be found in Part VI of the MUTCD.

Traffic volume capacity: Attempt to maintain the traffic volume capacity of existing roads.

Turn lanes should be maintain (left and right).

Utility adjustment must be accommodated.

Wrecker service: Some work zones, mainly on limited access facilities, may require the implementation of 24 hour wrecker availability for the towing of disabled vehicles.

NOTES WHICH MAY BE APPROPRIATE ON MAINTENANCE OF TRAFFIC AND SEQUENCE OF CONSTRUCTION PLANS INCLUDE:

(These notes should be developed in coordination with the District Traffic Engineer)

Unless otherwise approved or directed by the Engineer, the contractor shall plan and prosecute the work in accordance with the following sequence of construction and maintenance of traffic plan and this shall be coordinated with the bridge plans.

It is not the intent of the sequence of construction plan to enumerate every detail which must be considered in the construction of each stage, but only to show the general handling of traffic.

All areas excavated below existing pavement surface and within the clear zone, at the conclusion of each workday, shall be back filled to form an approximate 6:1 wedge, against the existing pavement surface for the safety and protection of vehicular traffic. All cost for placing, maintaining and removing the 6:1 wedge shall be included in the price bid for other items in the contract and no additional compensation will be allowed.

Traffic barrier service shall be installed and removed so as not to present any blunt end or hazard to the motoring public. The placement and removal of the traffic barrier service and barricades are to be coordinated by the Project Safety Officer.

LIMITATION OF OPERATION notes may include:

The following restrictions will apply, except in cases where the Engineer determines they are not in the best interest of the Department and/or the traveling public.

Traffic shall not be detained on route_____for longer than five minutes at any time, unless directed by the Engineer.

Closing of traffic lanes or shoulders is only permitted between 10:00 P.M. and 6:00 A.M. Monday through Friday.

No lane restrictions will be permitted from 12:00 Noon Friday until 9:00 A.M. Monday and during the following period: 6:00 A.M. Dec. 23, 1996 through 7:00 P.M. Jan. 3, 1997;

Note concerning southbound traffic may read: All travel lanes shall be open between the hours of 4:00 P.M. and 6:00 P.M. Monday through Friday. One travel lane may be closed all other times with the exception of dates listed below.

CONSTRUCTABILITY

Constructability relates to whether the project can be constructed as designed with the information shown in the plans. Many of the necessary items to consider when determining the constructability of a project are included in the Road Design Manual's Quality Control Checklist.

There is a huge advantage in having a construction expert review the concept of a project before even preliminary plans begin. A construction expert can review the proposed project and what it is intended to achieve, the proposed location of a project, the duration for design and construction and various design alternatives. This review should involve a dialogue with the design leaders of the project.

The construction expert will look at the proposed project through the eyes of the constructor and will consider the advantages and disadvantages of the potential design alternatives. There should be a review of the site and of the surrounding areas.

Geology, topography, accessibility, utilities, existing infrastructure, businesses, residences, etc., should be examined from the contractor's perspective. Potential strategies likely to be adopted by the contractors to deal with all these site issues should be discussed with the design team to see how the design might be developed to dovetail with strategies that are beneficial to the contractors and the local population in the prosecution of the project.

The review may go several miles beyond the environs of the project to examine access for large equipment.

There are issues that can impact design decisions and should be examine early. It provides the opportunity for the designer to begin design with certain key issues in mind which can frequently be accommodated in the design without adverse cost impact to the design. It is not that constructability issues drive the design but that design accommodates constructability in its evaluation. This is much better than trying to inject constructability into the design later.

The construction expert should have a broad knowledge of construction in several fields, not just highways and bridges, together with an understanding of, and empathy with, both the designer and the constructor. Constructability is more than simply making life easier for the contractor. It is the incorporation of construction expertise into the design process so that it will meet all of the design requirements, including aesthetics, at the lowest reasonable cost of construction.

A construction expert will have this broad expertise, together with the ability to work cooperatively and sympathetically with the design team and to respect the integrity of their design. In this way, the constructability review process becomes a team operation where the constructability resource and the design team work together cooperatively to integrate constructability into the design process.

ITEMS TO BE ADDRESSED UNDER CONSTRUCTABILITY INCLUDE:

Access to adjacent residential and commercials properties should be maintained at all times.

Contractor operations: Adequately evaluate and explain appropriate construction task and operations. This may include the order of construction activities.

Drainage issues: Drainage network errors have had the largest dollar impact and account for 25% of total errors on plans; last minute design changes to the roadway plans, which often require adjustments to the drainage plans, caused many of these errors. Check inverts of culverts and systems to insure positive drainage and outfall. Utility conflicts can significantly affect the sequence of construction. Address the need for temporary drainage for construct, detours, slope drains, etc. (IIM LD-11).

Easements and right of way must be sufficient to construct Project. Few issues can cause more construct delay than the lack of necessary easements or right of way.

Environmental issues: These are issues that can cause more construction delay or unexpected cost. Environmental Division representatives will provide guidance on these issues such as permits required for construction in live streams or concerning wetlands.

Equipment necessary such as pans, cranes, etc.: Adequate equipment clearance such as a crane swing radius is a constructability issue, for safety and functional reasons. Large equipment deserves special consideration as to how it will be transported to the job site and to provide adequate maneuvering clearance during construction. The Scheduling and Contracts Division is a source for advice.

Excavation near existing structures: One issue may be a question of providing adequate horizontal distance to maintain the integrity of existing structures. A subsurface investigation may be appropriate for some locations. The Scheduling and Contract Division is a source for advice.

Materials supply: Consider where and how materials may be supplied to the project. Consider what form of transportation may be utilized to transport material to the job site.

Picture how each aspect of the project will be constructed from the beginning as it would look in the field rather than from plan view.

Plan information: Provide comprehensive plan information for construction of the project.

Plan views, profiles and cross sections must agree.

Precast versus cast-in-place structures should be addressed when appropriate.

Quantity summaries must be complete.

Right of way and easements must be adequate to construct project, store material and operate equipment. Signing, lighting, signalization and other issues present possible needs for additional easements or right of way.

Utility conflicts and relocations can significantly affect project construction schedules.

REFERENCES:

Guidance concerning sequence of construction, maintenance of traffic and their impact on constructability are found in the following references:

Road Design Manual:

1E- 1	Quality Control and Checklist
2D-24	Pavement Termination
2E-11	Traffic Barriers - Guardrail and Concrete Barriers
2E-74	Safety Items and Sequence of Construction
2G-11	Temporary Detours

INSTRUCTIONAL AND INFORMATIONAL MEMORANDA:

LD- 11 Erosion and Sediment Control, construction entrances
LD- 93 Construction Zone Safety
LD-138 Earthwork Quantities, Sheet 3 (first paragraph)
LD-173 Construction Access, Temporary Construction Causeway Design
LD-213 Pavement Markings, Construction Signs, Type III Barricades, Insertable Sheets to be included in applicable plan assemblies

Road and Bridge Standards:

Standard GS-10, Minimum Design Criteria for Temporary Detours

Road and Bridge Specifications:

Section 104, Scope of Work and Section 107, Legal Relations and Responsibility to the Public

The Federal Highway Administration's Manual on Uniform Traffic Control Devices, MUTCD

The Virginia Supplement to the Manual on Uniform Traffic Control Devices

The Virginia Work Area Protection Manual replaces Part VI of the Virginia Supplement to the Manual on Uniform Traffic Control Devices

SEQUENCE OF CONSTRUCTION AND MAINTENANCE OF TRAFFIC ITEMS TO CONSIDER

A. SEQUENCE OF CONSTRUCTION

(Items to Consider)
Adjoining projects
Bridge construction
Construction activity
Drainage
Environmental concerns
Excavation and earthwork
Example plans

Funeral homes and Churches
Intersection reconstruction
Material hauls
Nighttime construction
Note in the plans
Pavement demolition
Railroad crossings
Sound barrier walls
Time of day, holidays or other time restrictions
Utilities
Walk the project; take notes, make sketches and take pictures and videos.

B . MAINTENANCE OF TRAFFIC

(Items to Consider)

Access to adjacent properties
Asphalt medians, temporary
Barrier and attenuator service
Bridge rails, existing
Clear zone
Construction equipment
Coordinate work
Detours
Edgeline markings
Emergency access
Glare screens
Grades
Grading diagram
Guardrail laps
Highway advisory radio
Impact attenuators
Lane closures
Lanes, number
Lane shifting
Lane widths
Navigable streams
Pavement design
Pavement markings
Pavement surface

MAINTENANCE OF TRAFFIC

(Items to Consider)
-continued-

Peak traffic hour work
Pedestrian traffic
Phases
Railroad crossings
Right of way and easements
Safety issues
Shoulders
Sight distance
Signalization
Signs with variable messages
State police
Stubs
Tapers
Temporary grade separation
Traffic volume capacity
Turn lanes
Utility adjustment
Wrecker service

C. CONSTRUCTABILITY

(Items to Consider)

Contractor operations
Drainage
Easements and right of way
Environmental
Equipment
Excavation
Materials
Picture each aspect
Plan
Plan/profiles/cross sections agree
Precast versus cast-in-place
Quantity summaries
Signing, lighting, signalization
Utility conflicts